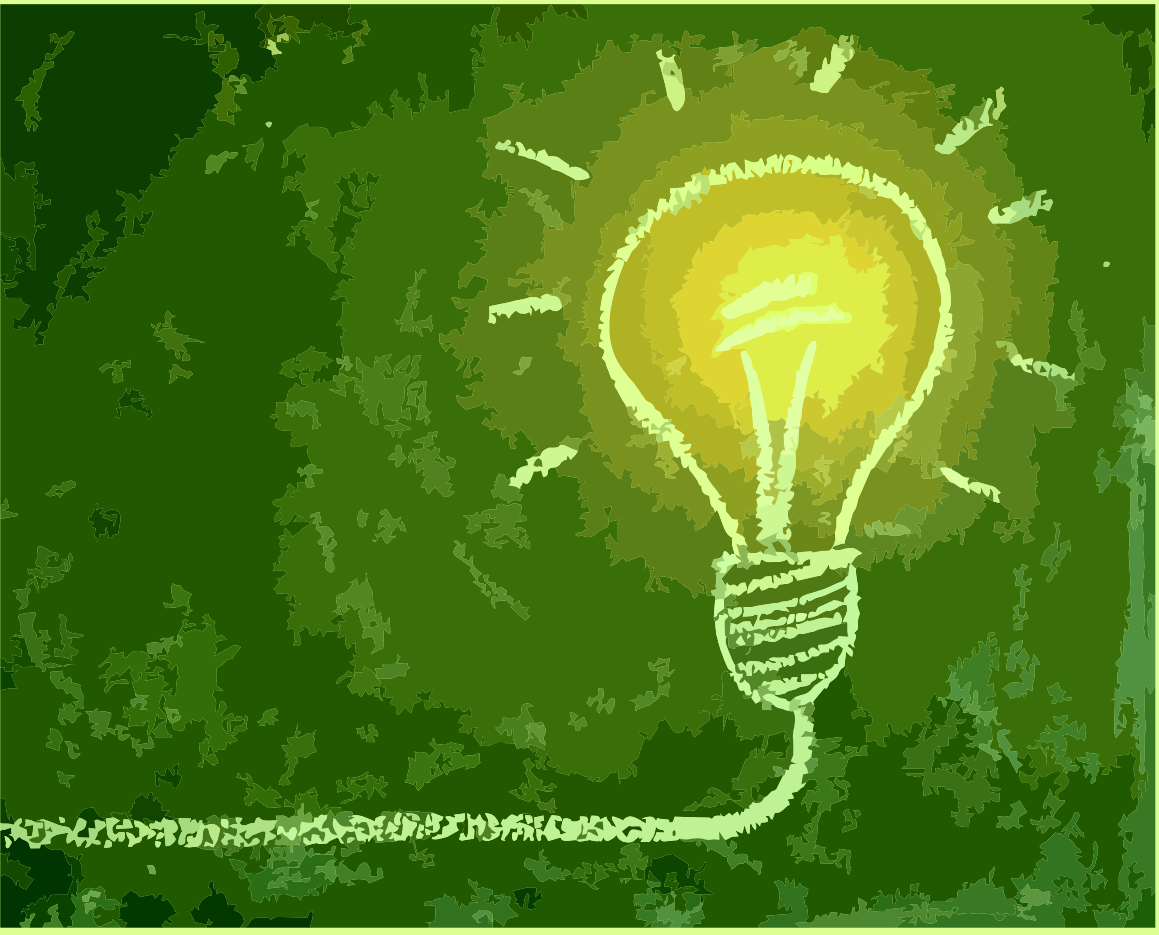
Darie Gavriluț

REGIONAL DEVELOPMENT AND INNOVATION IN THE CONTEXT OF THE ROMANIAN START-UP SECTOR



Presa Universitară Clujeană

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Preface

Extensive cohorts of individuals, predominantly hailing from low to middle-income strata, alongside a cadre of well-educated, technically adept youth, are underpinned by a robust information technology (IT) infrastructure that pervades the entire nation. Concurrently, Romania bears witness to elevated levels of internet connectivity and mobile device utilization. These collective facets collectively serve as catalysts, distinctly illuminating the burgeoning landscape of start-up enterprises within the country. However, embarking on the entrepreneurial journey necessitates a meticulously constructed checklist, comprising well-defined, strategically plotted, and methodically executed initiatives. This checklist must encompass a comprehensive evaluation of both intrinsic and extraneous variables that possess the potential to influence the sustainable viability of the entrepreneurial endeavor. Fundamental to this deliberation is the articulation of the venture's fundamental concept, the meticulous delineation of market dimensions, revenue channels and magnitudes, profit objectives, and the precise demarcation of the target demographic. In the realm of entrepreneurial endeavors, punctilious time management, collaborative synergy, and resolute decision-making constitute pivotal constituents that veritably demarcate the line between success and stagnation.

Furthermore, start-ups encounter a cadre of formidable challenges. These encompass a multi-faceted array, ranging from the encompassing infrastructure that encompasses legal, informational, and financial domains, to the intricate weave of governmental regulations, which exert a profound influence. Furthermore, the availability of comprehensive guidance and financial resources, commensurate with the various stages of growth, loom large as impediments that necessitate astute navigation.

Within the pages of this book, we have proffered a plethora of definitional constructs for the term “start-up.” Among these, one noteworthy definition, provided by the North-East Regional Development Agency,

posits that a start-up may be encapsulated as "an independent organization (legal entity or not, depending on development phase), which has (or is in search of) a scalable business model, the capacity to disrupt and innovate, is developed under conditions of uncertainty, and requires funding for high and rapid growth. Startups are considered a specialist subset of SMEs" (RoStartup, 2021).

Within the multifaceted landscape of contemporary society, start-up enterprises, encompassing various dimensions spanning academia, economics, sociology, technology, and finance, have attained a juncture where they wield substantial influence over our global milieu. In the modern era, the ubiquitous concept of globalization permeates every facet of existence, profoundly impacting both the commercial sphere and the broader spectrum of human life. Despite the conventional belief that globalization and its attendant benefits were exclusive purviews of corporate behemoths and multinational conglomerates, recent years have substantiated the capacity of diminutive enterprises, including nascent start-ups, to expeditiously transition from localized operations to a global ambit. These nimble enterprises have, intriguingly, exhibited an ability to evolve in such a manner as to concurrently serve the exigencies of both local and global markets. Thus, they emerge as "glocal" agents of transformative change, precipitating a discernible shift in the prevailing power dynamics. Evidently, the ascendancy of start-ups to the status of "market makers" looms on the horizon.

It is incumbent to underscore that not all founders of commercial entities, business ventures, enterprises, and start-ups possess a comprehensive acumen regarding the nuanced complexities entailed in the administration, cultivation, management, and governance of a business entity. It is precisely these considerations that underscore the salience of notions related to start-ups and strategies for augmenting their presence and operational footprint within specific geographic regions, a pivotal focus of this literary work.

While extant literature has expounded upon themes encompassing entrepreneurship, novel business inception, creativity, innovation, and the burgeoning domain of start-ups, it is imperative to posit that investigations concerning the cultural underpinnings of start-ups, their role in regional

development, and comprehensive explorations of start-up ecosystems within nations yet to fully realize their potential in this domain (Romania being emblematic of such a category) remain conspicuously absent. It is within this lacuna that this endeavor finds its impetus and motivation, aspiring to elucidate the intricate tapestry of start-ups in hitherto underexplored contexts.

Start-up enterprises, increasingly in recent times, have assumed a central role, garnering significant attention for multifarious reasons. Their salience extends beyond mere economic implications, encompassing social, technological, and informational dimensions. Of particular interest is the profound impact and manifold advantages that these entities confer upon diverse stakeholders. Start-ups are conceived with a distinct focus on enhancing and innovatively fulfilling prevalent needs. Their fundamental ethos revolves around the strategic utilization of both individual and corporate requirements, culminating in the generation of intellectual property (IP) rights. These rights, in turn, bestow upon start-ups and enterprises a unique competitive advantage within their respective domains. Typically, start-ups are characterized by the involvement of one or more visionary founders, sharing an inherent desire for innovation and disruptions. However, it is crucial to delineate that while innovation serves as a prominent hallmark, not all start-ups inherently embody this quality. Nevertheless, the subsequent sections of this discourse will expound upon mechanisms through which levels of innovation may, to a certain extent, be heightened. Thus, commensurate with the significance attributed to start-ups, the discourse will concurrently engage with the multifaceted concept of innovation. This exploration finds its impetus in discerning exemplars from advanced nations, underscoring the pivotal role that start-ups assume within the regions or nations where they operate or originate. Central to our inquiry is the pursuit of strategies aimed at augmenting start-up performance, proliferation, and innovative output. These constituents, in turn, underline the significance of the start-up landscape, bearing academic, regional, and subsequently national ramifications. As elucidated throughout this treatise, national measures targeting the enhancement of the start-up ecosystem are poised to pave the way for prosperity fostered by the presence of these dynamic entities. Consequently, this work aspires to provide comprehensive

insights into the following pivotal elements: the analysis of mechanisms for bolstering start-up survival rates, the delineation of strategies conducive to the accelerated blossoming of innovation, the establishment of effective communication channels (bridging academia and the start-up sector, interfacing local governance with the start-up milieu, facilitating dialogue between national authorities and the start-up ecosystem, fostering synergies between the business environment and start-ups, and fortifying connections between investors and the start-up sector). Furthermore, it seeks to furnish empirical evidence delineating the connection between Gross Domestic Product (GDP) and the start-up sector, alongside the correlation between unemployment rates and the start-up landscape. Lastly, it endeavors to facilitate the dissemination of information and insights within regional and national contexts. Beyond the academic considerations, predicated upon identified gaps, particularly within the literature pertaining to Eastern countries, this book assumes paramount significance. It is poised to furnish legislators with a compendium of measures, exemplars, and best practices, designed to illuminate the national start-up landscape. Embodied within this discourse is an extensive portrayal of the contemporary status of two northwestern Romanian cities, Oradea and Cluj-Napoca, which is expected to facilitate the sharing of vital information, statistical analyses, strategies, operational paradigms, and future-oriented data utilization.

The impetus driving this book underscores the core objectives underpinning its conception. Foremost among these objectives is the comprehensive investigation of the intricate interplay between two pivotal macroeconomic indicators, namely *Gross Domestic Product (GDP)* and the *Unemployment Rate*, and their discernible impacts, whether direct or indirect, on the presence and evolution of start-up enterprises within a delineated geographic region. In the context of this work, the specific geographical domain of interest encompasses the North-West region of Romania, with a pronounced emphasis on the urban centers of Oradea and Cluj-Napoca. The secondary cardinal objective intrinsic to this scholarly work entails the aggregation of invaluable insights germane to the realm of start-up enterprises. It endeavors to proffer a nuanced comprehension of the multifaceted facets pertaining to start-ups, encompassing facets such as their numerical proliferation, ownership of intellectual property rights, employed

strategic paradigms, and the extent of gainful employment engendered. It is noteworthy to underscore that, to the best of our knowledge, a unified repository housing these aforementioned components remains conspicuously absent. Thus, an inherent facet of this literary undertaking, serving as a pivotal ancillary objective, lies in its mandate to proffer, in part, a repository of data pertaining to the aforesaid elements. In summation, this book stands as a testament to its multifarious objectives, comprising an extensive inquiry into the intricate dynamics interweaving GDP, the Unemployment Rate, and the emergence of start-ups within the North-West region of Romania. Additionally, it aspires to furnish readers with invaluable insights into the variegated dimensions of start-up enterprises, which, to date, have eluded comprehensive consolidation within a singular database.

The objectives of this book are complemented by a set of subordinate objectives, numbering four in total, each intrinsically linked to specific segments of the book's narrative. The initial of these secondary objectives entails the comprehensive compilation and presentation of knowledge derived from existing literature pertaining to entrepreneurship, start-ups, business establishment, creativity, and development. Furthermore, this objective seeks to substantiate the contemporary significance underpinning these theoretical constructs.

The subsequent secondary objective revolves around the exhaustive scrutiny, explication, and validation of the instrumental role played by innovative start-up ventures in nurturing regional and local development. This facet of inquiry further encompasses an assessment of innovation levels within the North-West region of Romania. A subsequent (3rd) secondary objective aspires to provide a meticulous exposition of the mechanisms employed to cultivate and foster start-up enterprises within the environs of Oradea and Cluj-Napoca. This comprehensive analysis seeks to elucidate the distinctive attributes characterizing the start-up landscape within these two cities. The resultant insights, extending beyond the purview of the start-up ecosystem, hold potential relevance for legislators, academia, and the broader business milieu. The final (4^{th}) secondary objective is oriented toward the dissemination of information pertaining to the determinants of start-up success, tailored to a diverse array of key stakeholders intricately

linked to the start-up landscape. This dissemination effort transcends the geographical confines of Oradea and Cluj-Napoca, encompassing a pan-national perspective. The intent is to furnish universities, enterprises, financial entities, and legislative bodies with a compendium of knowledge that can facilitate informed decision-making and policy formulation, further underscoring the comprehensive scope and significance of this study.

Structurally, the present book is developed in four chapters, starting with *Chapter 1, The Evolution of Business Creation: Theoretical Foundations and Historical Context* (this book aims to explore the contemporary implications of literature in the domains of business creation, business model generation, and legislation; the focus is on presenting objective evidence, maintaining a clear and logical structure, using formal register and precise word choice, and adhering to standard grammar and style guidelines; no biased or ornamental language will be employed, and common academic sections will be included for clarity and coherence; the aim is to foster a balanced view of the subject matter and promote a rigorous understanding of the topics at hand), and continues with *Chapter 2*, *Innovative Enterprises and Their Impact on Local and Regional Development (*this book aims to assess the growth of Romania's start-up sector and analyze its research and development efforts in comparison to EU standards), and concludes with *Chapter 3*, *Innovation, Startups, and Local Development in Oradea and Cluj-Napoca* (which will be concerned with providing an in-depth analysis of the start-up landscape from a three-point perspective, namely by detailing the North-West region of the country, followed by a detailing of the cities of Oradea and Cluj-Napoca; what is more, an analysis of the innovation levels of the two cities will be carried out), and *Chapter 4, Econometric Modeling of the Impact of the Research and Development (R&D) Sector on Economic Growth: A Vector Error Correction Model (VECM) for Romania, the North-West Region, Cluj, and Bihor Counties* (which will address research-related issues connected to testing the relationship between economic growth and R&D). Following the four chapters, the book addresses several conclusions based on the present research.

As has been mentioned, *Chapter 1, The Evolution of Business Creation: Theoretical Foundations and Historical Context* is conceived with the explicit purpose of elucidating the contemporary implications of literature within

the domains of business creation, business model generation, and legislation. Structurally, the inaugural chapter embarks upon a systematic evaluation, commencing with an exploration of foundational concepts encompassing the origins, present-day landscape, and the prevailing entrepreneurial ethos in the realm of business creation. Subsequently, it proceeds to scrutinize notions and frameworks germane to business model generation. It is imperative to underscore the pivotal role that literature assumes in this context, notably as an instrument intended to guide and empower entrepreneurs and founders in their decision-making processes. Within the intricate tapestry of modern-day business dynamics, the journey of establishing, managing, and cultivating enterprises is frequently fraught with uncertainty. However, literature serves as an invaluable reservoir of insights, offering strategic guidance to steer enterprises in the direction of success. Within the compass of the first chapter, our objective is to present these insights, meticulously curated from the works of eminent authors who have not only shaped their respective fields but continue to exert a palpable and practical influence in the present era. Adopting a chronological framework, we shall delineate the findings, ideational progressions, foundational premises, and enduring theories propounded by venerable thought leaders and authors. The field of entrepreneurship, by its very nature, spans a wide expanse of discourse, yielding a copious corpus of literature. To provide a comprehensive view of its evolution, we have selected both classical and contemporary authors, thereby affording an illustrative panorama of the field's metamorphosis over time. Our exploration commences with the elucidation of the concepts of specialization, innovation, and the contemporary relevance of these ideas within the context of start-ups, drawing from the seminal works of Smith and Schumpeter. Building upon this foundation, we delve into the realm of profit-driven entrepreneurship, as epitomized by Baumol. As we navigate the evolutionary currents of entrepreneurship and economic thought, chapters shall be dedicated to internationalization, exemplified by Casson, and the dynamics of competitiveness, as articulated by Kirzner. In recognition of its profound influence on contemporary start-ups and enterprises, a pronounced emphasis shall be accorded to the concept of “lean” and the principles of the lean start-up methodology. Moreover, our

first chapter is also devoted to the facets of creativity and innovation enhancement, particularly with respect to their application at the organizational level. Herein, we seek to illuminate methodologies and practices that facilitate the optimization of outcomes and outputs within the purview of both companies and start-ups. In tandem, this chapter underscores the pivotal role played by innovation at all strata of corporate enterprises. It aspires to provide insights into the pragmatic integration of innovation across the entire organizational spectrum. Furthermore, within the realm of entrepreneurial pursuits, the element of chance, often characterized as a "hit-or-miss" proposition, can be notably mitigated by a well-developed legislative framework. To this end, our chapter will delve into pertinent aspects of legislation at the national level within the context of Romania. This inquiry is not confined solely to legislation concerning business establishment and enterprises; it extends its purview to encompass intellectual property and intellectual property rights. Importantly, this section will underscore the potential gains that accrue to start-ups through judicious engagement with intellectual property rights. Of additional relevance are the barriers to entry within specific markets or niches, coupled with the attendant challenges, both legislative and bureaucratic, encountered when operating within particular geographical jurisdictions. Through this chapter, our contribution to the discourse on start-up development and business model generation assumes the form of a consolidated repository of information. It serves as a resource by which authorities can better navigate the path of process enhancement and the formulation of strategic directions for the burgeoning start-up sector.

Chapter 2, Innovative Enterprises and Their Impact on Local and Regional Development is primarily centered on the exploration of methods aimed at augmenting and nurturing the creative and innovative potential inherent in decision-makers and employees. The overarching goal is to enhance innovation-related outcomes and ascertain how innovation contributes to the establishment of agile business models characterized by high growth potential. As previously delineated, the principal objective of this chapter is to undertake a comprehensive assessment of the trajectory of the start-up sector within Romania. Additionally, it involves a detailed analysis of Romania's research and development efforts vis-à-vis European Union

benchmarks. Furthermore, an integral facet of this chapter is to underscore how start-ups, through the adoption of innovative practices, play a pivotal role in shaping regions and ushering in benefits, enhancements, and progress. Consequently, the chapter delves into an in-depth examination of the future prospects and trajectories that the start-up sector in Romania may follow. It further seeks to offer an overarching perspective on the contributions of innovation and entrepreneurship toward catalyzing regional development. The progression of this chapter commences with a comprehensive evaluation of prevailing trends within the start-up sector. This entails an analysis of the trends deemed most likely to exert a substantial future influence, coupled with an exploration of various opportunities endemic to specific regions. Simultaneously, the chapter endeavors to furnish an encompassing overview of the manifold roles that innovation and entrepreneurship can assume in bolstering regional development. This is achieved through an appraisal of start-up survival rates and a critical review of the existing start-up infrastructure, elucidating the profound impacts that legislative and policy frameworks can exert upon the development of this sector. The research and assessment conducted in this chapter are instrumental in shedding light on the innovation levels prevalent in Romania, juxtaposed against European Union and United States averages. This comparative analysis hinges upon the determination of the relative significance of 18 innovation-related indicators concerning both regional and national development. This approach facilitates the comparison of various regions across the European Union, allowing for a comprehensive assessment of the Romanian average scores for these 18 indicators in relation to EU averages. Furthermore, the chapter engages in an examination of funding levels, sources of funding, and the accessibility of pertinent information, elucidating key facets that necessitate scrutiny. Consequently, the insights gleaned from this chapter hold the potential to inform the formulation of development strategies across distinct tiers of regional structures.

Chapter 3, Innovation, Startups, and Local Development in Oradea and Cluj-Napoca is dedicated to a comprehensive examination of the start-up ecosystem from a multifaceted perspective. This analysis unfolds in a tripartite manner, commencing with an exploration of the North-West

region of Romania, followed by a granular dissection of the cities of Oradea and Cluj-Napoca. In addition, a meticulous assessment of the innovation levels prevailing within these two urban centers will be conducted. Within the rubric of the third chapter, we delve into a profound exploration of the intricate interplay between macroeconomic variables and their pronounced influence, not only on the presence of start-ups but also on the emergent trends, developmental trajectories, sectoral growth, and overall activity of start-up enterprises. Structurally, this chapter embarks on an extensive elucidation of the start-up ecosystem within the North-West region. It then proceeds to craft a comprehensive portrait of the endeavors undertaken by the cities of Oradea and Cluj-Napoca in their pursuit of fostering start-up development. This entails the creation of an overarching framework that seeks to delineate the pivotal roles played by innovation and entrepreneurship in the broader context of regional development. The scrutiny of the start-up landscape within the North-West region of Romania is conducted from a multidimensional standpoint. This includes an appraisal of various facets, such as unemployment and the unemployment rate prevalent in Bihor and Cluj counties, the gross domestic product within these two counties, an assessment of innovation levels in Romania vis-à-vis European Union and United States benchmarks, an examination of the dynamics governing new business establishment within the North-West region, and a detailed analysis of the relative significance, weight, and distribution of innovation indicators across different Romanian regions. Through these multifaceted evaluations, our aim is to provide a nuanced comprehension of the potential applications of best practices, elucidating how they can be extrapolated to benefit other regions within the country. Furthermore, our analysis seeks to transcend mere benchmarking by delving deeper into an exploration and appraisal of the accomplishments achieved by the cities of Oradea and Cluj-Napoca in the realm of start-up development. This endeavor encompasses a meticulous delineation of successful projects, programs, and initiatives aimed at enhancing the allure, engagement, and overall advancement of the start-up ecosystem.

The last chapter of this book, *Chapter 4, Econometric Modeling of the Impact of the Research and Development (R&D) Sector on Economic Growth: A Vector Error Correction Model (VECM) for Romania, the North-West Region, Cluj, and*

Bihor Counties is meticulously crafted to scrutinize the intricate relationships prevailing within the following domains: the interplay between the total expenditure on R&D, the workforce employed in the R&D sector, and economic growth in Romania; the dynamic nexus between the total expenditure on R&D, the workforce engaged in the R&D sector, and economic growth in the North-West region; the symbiotic relationship between the total expenditure on R&D, the workforce operating in the R&D sector, and economic growth within Cluj County; and finally, the consequential interactions between the total expenditure on R&D, the workforce participating in the R&D sector, and economic growth in Bihor County. In this segment of the book, our primary objective has been to embark on a thorough investigation of the intricate links between economic growth, measured in terms of current prices (million RON) denoting Gross Domestic Product (GDP), and the total expenditure on R&D, also expressed in current prices (million RON) as EXP. Furthermore, we have ventured into an exploration of the dynamic interplay between economic growth (expressed in current prices - million RON) denoting GDP, and the workforce engaged in the R&D sector, measured in full-time equivalent positions (EMP). These relationships are scrutinized across four distinct geographical entities: Romania as a whole, the North-West region, Cluj County, and Bihor County. To undertake this complex analysis, we have adopted a multifaceted approach, incorporating the utilization of the Johansen cointegration test, the Vector Error Correction Model (VECM), and Granger causality testing. As is evident from our descriptive statistics, the EXP and EMP variables within Cluj County exhibit a negative skew, whereas, in all other cases (Romania, the North-West region, and Bihor County), these variables demonstrate a positive skew. Furthermore, with regard to the kurtosis measure, it is noteworthy that the majority of variables manifest a low kurtosis, with the sole exception being the EXP variable in the context of Bihor County. This concluding chapter of the book endeavors to provide a comprehensive exposition of causality and elucidate the directional dynamics characterizing the relationships between these pivotal variables. To this end, we have formulated and rigorously tested six hypotheses, thus contributing to a more profound understanding of the

intricate interactions between economic growth, R&D expenditure, and the workforce within the R&D sector.

The book culminates by presenting the definitive conclusions derived from the extensive research expounded within its pages. Following this, it proceeds to encapsulate the author's unique contributions, thereby offering a synthesis of the findings. Subsequently, the book imparts several recommendations pertinent to economic and legislative policies as they pertain to start-ups. To bring closure to this scholarly endeavor, the book encompasses a comprehensive bibliography and two appended sections.

Given the expansive scope and the nuanced specificity of the book's exploration, which was dedicated to the in-depth investigation of a matter of profound significance not only at the national level but with a particular emphasis on the North-West region of Romania, specifically Bihor and Cluj counties, it is asserted that this tome represents a noteworthy addition to the academic literature. This contribution, both theoretical and practical in nature, serves to broaden the horizons of prospective research endeavors. Furthermore, it offers a substantive basis for the formulation of concrete economic policies tailored to regional contexts, thereby invigorating economic and social activities and fostering the prosperity of local communities.

Throughout the book, the research methodology deployed incorporates an intricate interplay of analytical approaches. It encompasses the critical analysis and interpretation of economic literature, frequently drawing from multidisciplinary perspectives and aligning with the predefined research objectives. Additionally, the investigation entails an extensive review and scrutiny of a myriad of articles, publications, reports, and studies sourced from national, European, and international outlets. These sources collectively illuminate facets of regional economic development, entrepreneurship's role, the dynamics of small and medium-sized enterprises across various sectors, and the dynamics of start-ups. Such comprehensive engagement with these sources has culminated in the crystallization of substantiated and scientifically valuable assertions.

The rich tapestry of bibliographic resources, amply underscored by the inclusion of 288 distinct titles within the bibliography section, comprises a diverse array of materials. This compilation spans books, reports from

esteemed international public and private entities, articles culled from reputable scientific journals, European and national legislation, press releases, and a compendium of statistical databases. Each of these resources has been meticulously harnessed in the pursuit of substantiating and elaborating upon the analyses, ultimately shaping the book's conclusive statements.

This book is based on the PhD thesis entitled “Regional development and innovation in the context of the Romanian start-up sector”. The thesis has been defended public on the 5th of January 2022, receiving the Education Ministry Order No. 3466/23.03.2022.

Chapter 1. The Evolution of Business Creation: Theoretical Foundations and Historical Context

In accordance with common practice in the academic realm, it is imperative to acknowledge that the term "start-ups" is imbued with multifarious interpretations. It is pivotal to underscore that, in addition to embarking upon the initiation and immersion within the sphere of start-ups, it is equally imperative to underscore that enterprises cannot and should not indefinitely remain entrenched within this initial phase. Start-ups are conceived with the primary objective of adroitly and innovatively addressing and satiating various needs. Their foundational framework is meticulously crafted to discern the avenues through which both the exigencies of individuals and enterprises can catalyze the emergence of intellectual property (IP) rights. These rights confer upon start-ups and corporations an unparalleled competitive edge vis-à-vis their counterparts. Typically, the genesis of start-ups orbits around the pivotal figure of one or, on occasion, a select cadre of founders. It is worth noting that an inverse relationship exists between innovation and the centralization of decision-making processes. This implies that as the decision-making apparatus becomes progressively insular and restricted to a single individual or a limited cohort, the innovative prowess of the organization tends to wane correspondingly (Subramanian & NIlakanta, 1996).

Nonetheless, it is imperative to commence our discourse by furnishing precise definitions and cultivating a comprehensive comprehension of the fundamental nature of start-ups. Additionally, it is salient to acknowledge the following reality: while a profusion of definitions, theories, and conceptions pertaining to the concepts of enterprise and entrepreneurship exists within the corpus of literature, the body of literature dedicated exclusively to the elucidation of start-ups remains relatively limited and underdeveloped. Although there are proponents of the view that there exists no categorical demarcation between these concepts (enterprise and start-up),

this treatise endeavors to articulate and substantiate the contention that start-ups do not conform to the same conventional and orthodox paradigms that govern traditional enterprises. It is our considered opinion that, for the sake of enhancing the comprehension of these concepts, the most salient notions, discoveries, and theories underpinning them should be initially presented.

Prior to proceeding further, it is paramount to underscore that start-ups are inherently associated with innovation. It is essential to elucidate that while not all start-ups can be characterized as innovative, the ensuing sections of this tome will elucidate various methodologies by which levels of innovation can, at least in part, be augmented. Thus, innovation, being tantamount in significance to the concept of start-ups, shall be expounded upon extensively throughout this compendium. The spectrum of innovation encompasses numerous facets, and it is germane to recognize that innovation is not invariably confined to the realm of technology or the Information Technology (IT) sector; rather, it possesses a far-reaching purview that extends to a multitude of domains. Although a uniform definition remains elusive, with numerous authors advancing diverse interpretations, innovation in its most expansive manifestation can be construed as "an integral facet of nearly all economic endeavors" (Fagerberg, et al., 2010); In light of this, it is imperative to underscore that innovation is intricately intertwined with economic activities and extends upon the research conducted by Kline and Rosenberg (Kline & Rosenberg, 1986). Consequently, we discern that innovation is intimately linked to economic endeavors and examinations, encompassing a multifaceted spectrum of facets, subjects, functionalities, and concepts.

1.1. Business Creation: Origins, Current Trends, and Entrepreneurial Culture

When delving into the realm of literature and theories pertaining to entrepreneurship, it becomes paramount to scrutinize both classical and neoclassical theories within the entrepreneurial domain. It is imperative to grasp the following fundamental concept: whether one is examining classical

or contemporary theories, each novel facet of entrepreneurial knowledge is constructed upon preceding fragments of wisdom. Even though the evolution of entrepreneurial thought and theory can be discerned and tracked, it predominantly adheres to an incremental paradigm.

The manner in which this evolutionary process unfolds within the entrepreneurial and start-up field (Popper, 1972) can be aptly represented as follows:

$$P1 \longrightarrow TT \longrightarrow EE \longrightarrow P2$$

From the previous framework, we can infer the process by which, originating from a fundamental yet intricate problem (referred to as P1), one progresses towards a provisional theorem (abbreviated as TT). These newly formulated theories or concepts subsequently elicit critical scrutiny of the initial notion, and through the mechanisms of logical reasoning and the systematic elimination of errors (termed EE), they engender fresh sets of issues and complexities (abbreviated as P2).

If this foregoing sequence delineated by Popper bears a resemblance to a familiar pattern, it is because it closely mirrors the manner in which both start-ups and established enterprises come into existence: through the pursuit of innovative resolutions to extant predicaments (with an emphasis on solutions with prospective utility). This endeavor is facilitated by the application of logical reasoning, deductive analysis, unconventional thinking, and the optimal utilization of talents and resources, all directed towards the attainment of an overarching objective that serves the collective interests within the newly formed start-up.

In the following segments of this book, we shall embark upon a comprehensive examination, discussion, and analysis of the contributions put forth by esteemed authors in this field.

1.1.1. Classical and Neo-Classical Theories of Innovation and Entrepreneurship

Within the realm of classical theories, particularly in the contemporary context, the enduring works of eminent luminaries such as Adam Smith and David Ricardo underscore the profound and pervasive significance of

entrepreneurship. Classical theory elucidates the virtues inherent in factors such as competition, unfettered trade, and the cultivation of specialized skills. These tenets are predicated on the assumption of the availability of key means of production, encompassing capital, land, including natural resources, and labor. Although their primary objective was to proffer a model showcasing the advantages of a self-regulating economic system, it is patently evident that such a system no longer exists in the present day (Ricardo, 1817) (Smith, 1776).

Smith and Ricardo's seminal works underscore the pivotal role of innovation, free trade, and competition in wealth accumulation, challenging the conventional notion that social status was the preeminent determinant of affluence. This emphasis extends beyond intra-industry competition to encompass inter-industry competition and a form of cross-industry specialization, yielding positive outcomes both at local and national levels. This transformative paradigm shift engendered an entrepreneurial and economic revolution. It is worth noting that, unlike the metaphorical "invisible hand" posited by classical economics, the endeavors of entrepreneurs in their pursuit of profit are conspicuously tangible, sometimes rudimentary, and occasionally inequitable. Nevertheless, their contributions to the benefits of individual specialization in specific domains have been empirically validated. Equally salient in the discourse on specialization is the articulation of the concept of diminishing returns to wealth from variously owned resources. However, Smith and Ricardo were unable to disprove or extricate subjectivism from the notion of value at the level of individual utility (Murphy, et al., 2006). This matter continues to be a contemporary concern, as the significance and valuation of specific attributes vary significantly across the populace of a given region or nation. These distinctions in the perceived importance of attributes manifest among individuals and groups, further emphasizing the subjective nature of such assessments.

Let us progress to the contemporary era and explore the potential outcomes if companies were to evolve into specialized innovators. By attaining profound expertise in a specific domain, it becomes feasible to transcend its limitations, restrictions, and constraints, thereby facilitating enhancements (Cannan, 2000). The concept of specialization, initially

introduced by Adam Smith, remains as pertinent today as it was in its inception. Classical economic theory has consistently stressed the significance of cross-industry specialization. Contemporary examples of fintech and biotech startups serve as illustrations of how they are venturing into multiple fields, a departure from the traditional, classical perspective where such combinations were infrequent. In the context of diminishing returns, startup founders seeking to divest their business ideas for profit exemplify Smith's enduring ideas. Startups continually demonstrate their pivotal role in generating innovative ideas, novel products, and in becoming experts in innovation and qualitative research output.

However, it is important to acknowledge that the views of Smith and Ricardo represent only one dimension of the multifaceted landscape of economic theories. Neoclassical theories, in contrast, posit that entrepreneurs and the enterprises they represent operate in a completely rational manner, with unrestricted and comprehensive access to profit-related information. This assumption implies that entrepreneurs and corporate decision-makers consistently make perfectly optimal and rational choices. These neoclassical models are static and non-dynamic, emphasizing a perpetual state of optimal equilibrium. While the concept of perpetual equilibrium may be theoretically attainable on paper, it is far from realistic in practical situations. One of the significant limitations of neoclassical theories is their disregard for the role of creativity and innovation, portraying them as non-existent in such a framework, both in the present and future. Moreover, neoclassical theory places heightened emphasis on external factors influencing economic performance and contends that profit opportunities are limited, suggesting that increased entrepreneurial presence reduces such opportunities within a marketplace (Roche, 2017).

The conceptual challenges posed by the static system envisaged by neoclassical economists have found partial resolution in the theories advanced by scholars associated with the Austrian Market Process (AMP) movement. Within this framework, dynamism emerges as a central and critical element. Information pertaining to profit opportunities is characterized by its imperfection, imbalance, and incompleteness. The AMP movement has been developed specifically to challenge and counter the assumptions of neoclassical economics. However, it should be noted that

AMP has not addressed certain regulatory aspects, particularly those concerning monopolies (Murphy, et al., 2006). The persisting issues caused by monopolies remain relevant in contemporary contexts, affecting both established enterprises and emerging startups. Monopolies exert a dual inhibitory effect on economic landscapes, hindering not only the flourishing of creativity and innovation but also acting as formidable barriers to the ingress of new competitors across diverse markets. This transformation in the modus operandi of monopolistic entities, transitioning from the historical acquisition of tangible resources to an increasingly discernible pursuit of dominion over information repositories and assets, represents a pivotal shift in contemporary economic dynamics. This shift may be succinctly encapsulated as a transition from an erstwhile emphasis on financial wealth as the embodiment of power to the present-day ascendancy of information possession and control as the preeminent conduits to amass financial affluence.

The deleterious impact of monopolies on creativity and innovation has been widely expounded upon in academic literature. Scholars such as Joseph Schumpeter have illuminated how monopolistic structures, by virtue of their insulation from competitive pressures, tend to stifle innovative dynamism within industries (Schumpeter, 1942). Similarly, in the context of monopolistic practices that prioritize information dominance, notable scholars like Robert McChesney have underscored the detrimental consequences for democracy and societal well-being, elucidating how concentrated control over media and information sources can undermine pluralistic discourse and public access to diverse perspectives (McChesney, 1999). Furthermore, the role of monopolies in discouraging market entry finds resonance in the scholarship of John Sutton, who has delved into the intricate dynamics of barriers to entry. Sutton's work highlights how monopolistic incumbents, fortified by their market power, can employ a range of strategies, including predatory pricing and exclusive contracts, to dissuade and impede potential entrants (Sutton, 1991).

In summary, the contemporary transformation of monopolistic entities from traditional resource-centric models to information-centric dominions underscores the evolving nature of economic power dynamics. This transition has profound ramifications for creativity, innovation, and market

competition, as elucidated by prominent scholars in the field. It serves as a clarion call for regulatory frameworks and antitrust measures to address the challenges posed by the burgeoning influence of information monopolies in the present era.

1.1.2. The Schumpeterian Model of Innovation

In contrast to the classical economic theorists, Joseph A. Schumpeter's seminal contributions placed innovation at the forefront of entrepreneurial dynamics. Schumpeter's perspective recognizes innovation as an outcome of entrepreneurial endeavors, characterized by both conscious and, intriguingly, unconscious processes, which can occasionally manifest as accidental discoveries. It is worth acknowledging that this inclination toward pioneering new systems, products, services, functions, and processes might appear to entail the "destruction" of existing systems, which, though not inherently obsolete, may struggle to keep pace with the relentless surge of innovation. However, empirical evidence substantiates a contrary narrative, one that underscores the potential for a harmonious coexistence of "creative destruction" and cumulative progress, as expounded by Schumpeter in his work of 1911 (Schumpeter, 1911). The concept of specialization within a specific domain has been empirically validated repeatedly. Enterprises possess the capacity to attain specialization across diverse fields or domains, contingent upon the availability of requisite resources, spanning financial, informational, and human resources.

In a departure from the perspectives of other classical theorists, Schumpeter introduced a distinctive lens through which to scrutinize the motivations that drive entrepreneurs to initiate and cultivate businesses. He posited that entrepreneurs are propelled by a triad of fundamental motives. Firstly, entrepreneurs are driven by the aspiration to assert autonomy and sovereignty, effectively becoming the rulers of their own entrepreneurial realms. Secondly, the pursuit of financial competition and achievement is a potent motivator, akin to a race or a challenging bout. Lastly, Schumpeter recognized the intrinsic need for satisfaction derived from the creative process itself as a compelling impetus for entrepreneurial action (Śledzik, 2013).

Schumpeter's seminal work has profoundly elucidated the distinction that delineates an entrepreneur, who assumes the role of orchestrating and catalyzing innovation, both within their industry and beyond, from inventors and capitalists. This conceptual demarcation endures as a salient and applicable framework in contemporary discourse, resonating with undiminished relevance. When we turn our attention to the founders of start-ups, they frequently epitomize the archetype of innovators. The innovative founders conceive and manifest novel amalgamations and configurations that represent pioneering instances within their purview. As progenitors of these inventive amalgams, innovative founders may temporarily occupy a quasi-monopolistic niche. However, it is essential to underscore that this distinctive market position deviates markedly from the traditional monopolistic model. Instead, it serves as a foundational launching pad, inviting emulation and emulation-driven innovation by subsequent market entrants. While innovators may act as trailblazing first movers, their pioneering initiatives, albeit indirectly, function as catalysts that engender innovation across the industry. This catalytic effect expedites the pace of incremental advancements, propelling the industry into an era characterized by rapid and continual transformation. In today's dynamic landscape, the velocity of change has surged to unprecedented levels. It is imperative to recognize that innovation constitutes a potent driver of enhanced profitability. Fostering this connection, it is paramount to perceive innovation as an iterative and spiraling process. Neglecting this iterative dimension may precipitate a decline in profitability, a consequence that is increasingly evident in the contemporary business milieu (Baumol, 1993). Even in the contemporary milieu, where innovation, akin to other forms of development, frequently exhibits an incremental character, it must be an incessant and pervasive process. Innovation, undeniably, remains entrenched at the epicenter of not only prospective profitability but also the dynamics of competition, competitive positioning, and societal progress. In consonance with Schumpeter's insights, the mechanism governing innovation can be delineated into a tripartite framework, akin to a trilogy of distinct phases. These phases traverse the following trajectory:

- The inaugural phase is the phase of “Invention,” constituting the crucible within which nascent ideas and concepts germinate and take

root. Here, the intellectual and ideational seeds are sown, representing the wellspring of innovative thought.

- Subsequently, the continuum advances to the "Innovation" stage, signifying the tangible manifestation of the antecedent phase's intellectual progeny. During this pivotal stage, the abstract and conceptual ideas conceived in the antecedent phase acquire physical and marketable embodiments, ready to be transmuted into transformative products or services.
- The culmination of this process unfolds in the "Diffusion" stage. In this definitive phase, the fruits of innovation, embodied in viable products or services, traverse the threshold to become readily available, presented to the market, and disseminated widely among diverse segments of society. It is here that the innovative offerings become integral components of the societal fabric, catalyzing progress and redefining the contours of the market landscape (Kaya, 2015).

Schumpeter's renowned concept of "creative destruction" extends beyond its traditional interpretation concerning the renewal of products, ideas, norms, and services; it also symbolizes the broader evolutionary trajectory of our capitalist society. To address this inherent limitation, a fundamental transformation of the behavioral paradigms governing enterprises and start-ups within their respective markets becomes imperative. In this paradigm shift, both entities, enterprises, and start-ups, actively engage in cultivating the ethos of the "sharing economy." This cooperative ethos represents just one facet of the multifaceted strategies employed to mitigate the adverse repercussions of capitalism. Undoubtedly, the landscape of contemporary economics and society will continue to witness innovative methodologies that seek to redefine and ameliorate its underlying structural challenges. Schumpeter's conceptual brilliance resides in its elegant simplicity, as it amalgamates diverse facets of quotidian business operations by synergistically harnessing both incumbent and novel resources. This holistic approach empowers start-ups to cast a wider net, reach a more expansive audience, accelerate their market penetration, while concurrently curbing expenditures and resource utilization. It is worth noting that the term "innovation" may be perceived as overly broad and nebulous. Critics contend that a more granular delineation of

entrepreneurial activities, integral to the innovation process, is requisite. Herein, Schumpeter provides invaluable elucidation regarding the nuanced constituents of innovation. According to his exegesis, innovation, being the quintessential element of entrepreneurship, encompasses a multifaceted spectrum of activities. These include, but are not limited to, technological advancements (inclusive of incremental innovations). Furthermore, innovation encapsulates the following dimensions: the introduction of novel goods or enhancements to existing products, the implementation of fresh production systems and methodologies, the initiation of nascent markets and market segments, the procurement of novel sources of raw materials for the production process, and lastly, the incessant orchestration, oversight, and regulation of organizational structures (inclusive of market management, governance, and control) (Baumol, 1990).

Schumpeterian theory, celebrated for its profound insights into economic innovation and entrepreneurial dynamics, has garnered significant attention over the years. However, it is essential to recognize that this influential framework is not without its detractors. Two noteworthy critics, Joseph Steindl and Hyman Minsky, have emerged as prominent voices challenging certain aspects of Schumpeter's theory (Steindl, 1952), (Minsky, 1977). Joseph Steindl's critique centers on Schumpeter's concept of creative destruction and, in particular, the role of monopolies within this framework. Schumpeter extolled the virtues of monopolies, emphasizing their potential to drive innovation and entrepreneurial activities by generating substantial profits. However, Steindl posits that this perspective tends to overlook the potentially adverse consequences of monopolistic dominance. Steindl's argument revolves around the idea that monopolies can curb competition, leading to reduced consumer choice and, in some cases, a detriment to overall economic welfare. This critique serves as a crucial reminder that economic systems must consider both the positive and negative impacts of monopolies on innovation and competition (Steindl, 1952). Hyman Minsky presents an alternative perspective by focusing on Schumpeter's portrayal of financial markets as stabilizing forces in the entrepreneurial process. Schumpeter posited that financial intermediaries play a crucial role in supporting entrepreneurship and economic development. However, Minsky challenges this perspective, emphasizing

the inherent proclivity of financial institutions and markets for speculative behavior and risk-taking. In Minsky's view, financial intermediaries can contribute to financial fragility and instability, particularly during periods of speculative excess. This critique raises important questions about the stability of financial systems within the entrepreneurial context, urging a more nuanced examination of their role (Minsky, 1977). While Schumpeterian theory has undoubtedly enriched our understanding of these dynamics, these critiques remind us of the need for a comprehensive assessment of both the positive and potentially negative aspects of these elements within the broader economic landscape.

When discussing the opus of Joseph A. Schumpeter, it is paramount to acknowledge the evolution of his perspectives over time. In scholarly discourse, his contributions during and prior to 1911 are denoted as the "Mark 1" phase, while those published in 1943 and thereafter are identified as the "Mark 2" model. Under the Mark 1 paradigm, Schumpeter portrays innovation not as a uniform and regimented procedure but as a dynamic phenomenon stemming from a multitude of entrepreneurs, emanating from both within and outside one's specific industry. However, the advent of extensive in-house, industry-specific Research and Development (R&D) centers during the latter half of the 20th century has compelled Schumpeter to revise his perspective. In the Mark 2 model, innovation is construed as a routinized and relatively standardized process, predominantly prevalent within specific oligopolistic frameworks. This transformation in Schumpeter's outlook underscores the shifting dynamics of innovation within contemporary economic landscapes (Cantwell, 2001). In summary, it is imperative to regard these two modes of thought as mutually reinforcing. During this juncture, Schumpeter has articulated two hypotheses pertaining to the concept of innovation:

H1: Given economies of scale and market power advantages, big companies can manage in a more suitable manner to bring about routine, unremarkable, but regular innovation.

H2: Size and market power convey certain enticements as regards the development of routine-type innovation so as to maintain the monopolistic position (uncertainty and risk is somewhat avoided in this situation) (Dekkers, et al., 2014).

The contemporary landscape does not adequately align with Schumpeter's Mark 2 model. Research and Development (R&D) is, to a certain extent, perceived as an exclusive and insular domain, necessitating substantial investment to yield innovative ideas, products, or services. It is noteworthy that Schumpeter's conception of innovation transcends the realm of physical goods and services, encompassing systems, concepts, mechanisms, and processes.

Schumpeter's insights into the attributes of an entrepreneur remain as relevant and substantiated today as they were in his era. He underscored the distinction between "invention" and economic leadership, asserting that inventions, if not translated into practical applications, hold no economic relevance. Effectuating improvements demands a distinct set of competencies, disparate from those required for the act of invention itself. The words of Schumpeter regarding/referring to what an entrepreneur ought to be considered are as provable and sound today as they ever were: "Economic leadership in particular, must hence be distinguished from 'invention'. If they are not carried into practice, inventions are economically irrelevant. And to carry any improvement into effect is a task entirely different from the inventing of it, and a task, moreover, requiring entirely different kinds of aptitudes" (Schumpeter, 1936). In the contemporary business setting, the enduring relevance of Schumpeter's seminal ideas has been demonstrated time and time again. Schumpeter's profound emphasis on innovation and evolutionary processes as central drivers of corporate growth resonates not only with established enterprises but also with emergent start-ups. What sets start-ups apart lies in their remarkable capacity to disrupt sectors historically characterized by incumbents wielding exclusive and insular Research and Development (R&D) apparatus. It is noteworthy that start-ups achieve this transformative impact through cost-effective methodologies, accelerated development cycles, and heightened accessibility to a global audience. The process of innovation, accompanied by its associated components, holds an inexorable allure, especially in light of the pervasive applicability of Schumpeterian tenets on a global scale.

Indeed, the trajectories of regional development are profoundly influenced by multifaceted factors encompassing socio-economic conditions, cultural dynamics, and resource endowments. However, it is imperative to

recognize that regional development does not occur in isolation; instead, it is intrinsically linked to the formation and sustenance of broader regional networks. These networks play an instrumental role in shaping the evolution of entrepreneurial ecosystems, where innovative enterprises, including start-ups, find fertile ground for growth and collaboration.

The capacity of start-ups to disrupt established industries aligns with Schumpeter's notion of "creative destruction" (Schumpeter, 1942). Schumpeter posits that innovation-driven entrepreneurship, often embodied by start-ups, propels economic progress by dismantling existing paradigms and creating new market dynamics. Furthermore, contemporary scholars like Clayton Christensen have expanded upon these ideas in the context of disruptive innovation, emphasizing how start-ups leverage technological advancements and novel business models to challenge incumbents (Christensen, 1997).

Moreover, the role of regional networks in facilitating innovation and entrepreneurship has been explored by scholars such as Michael E. Porter, who underscores the significance of clusters in driving competitiveness and innovation within regions (Porter, 1998).

In conclusion, Schumpeter's insights into innovation and entrepreneurship endure as guiding principles in the modern business landscape, with start-ups exemplifying their dynamic applicability. The interplay between regional development, entrepreneurship, and the formation of regional networks underscores the complex ecosystem within which these principles unfold.

From the perspective of fostering innovation, as elucidated by Tidd, Bessant, and Pavitt, there exist seven distinctive network typologies: "new process development consortium, sectoral forum, new technology development consortium, emerging standards, supply chain learning, and cluster and topic network" (Tidd, et al., 2005). What holds paramount significance is not merely nomenclature, but rather the inherent capacity and prospective efficacy of any of the seven network typologies to augment, enhance, and contribute to the progression of both business enterprises and the quality of human life. It is conspicuously evident that, within the context of Romania, specific regions exert a more pronounced allure upon start-up founders, thus emerging as fertile grounds for the inception and maturation

of start-up ventures. In Romania's particular case, the epicenter of entrepreneurial activity does not invariably reside in the capital city of Bucharest. Conversely, the western region of the country has emerged as a magnet, drawing a substantial influx of start-up creators and facilitating the growth potential of these enterprises. Recent years have borne witness to the propensity of certain regions to engender greater magnetism, thereby soliciting an amalgamation of talent, resources, capital infusion, innovative concepts, and bolstered community endorsement. The perpetuation of novel ideation necessitates not only a sustained transmutation from antiquated paradigms to emergent ones but also an enhanced adaptability quotient, tailored to efficaciously accommodate the swift and dynamic cadences characterizing developmental trajectories.

1.1.3. William J. Baumol and the Impact of Entrepreneurship on the Economy

William J. Baumol, a celebrated and profoundly influential American economist, occupied the esteemed position of Academic Director at the Berkley Center for Entrepreneurship and Innovation. His indelible contributions have left an enduring mark on the realm of economics, particularly in the domain of entrepreneurship. It is by virtue of his scholarly endeavors that we have acquired an enriched comprehension of the intricate interplay between enterprises and the broader socioeconomic milieu. During epochs of economic advancement, entrepreneurship emerges as a linchpin, wielding a profound impact on the trajectory of development. It is in these periods that burgeoning enterprises assume the mantle of architects for regional and national economic upswings. This phenomenon is underpinned by a confluence of factors, encompassing political stability, educational infrastructure, resource accessibility, innovative ideation, and a multifaceted spectrum of determinants. Notwithstanding the pervasive pervasiveness of entrepreneurship's influence, its deliberate incorporation and systematic examination within economic frameworks have regrettably languished in relative neglect (Baumol, 1990). Fortunately, in the contemporary era, we have witnessed a transformation in this landscape. Research endeavors dedicated to the realm of entrepreneurship have gained

momentum. However, it is essential to acknowledge that there remains a substantial expanse of uncharted territory within this domain, necessitating further scholarly investigation and exploration.

Baumol's perspectives on entrepreneurship revolve primarily around the pursuit of profit. According to the Baumol school of thought, entrepreneurs are principally motivated by their aspiration to attain financial gains. This assertion finds ample contemporary validation, with numerous instances showcasing entrepreneurs' unwavering focus on profit generation. Although it remains an underexplored area, a noticeable distinction is emerging between start-ups and traditional enterprises concerning the extents to which they are willing to go in their profit-seeking endeavors. While a definitive answer eludes us at present, research delving into the depths of their profit-seeking behavior would undoubtedly yield valuable insights into the field of entrepreneurial dynamics. Baumol astutely underscores that the rewards of entrepreneurial innovation transcend mere pecuniary benefits, encompassing other facets like influence, power, and reputation. Moreover, it is imperative to recognize that while entrepreneurs are subject to economic influences and regulations, they also possess the capacity to shape and redefine market dynamics, occasionally assuming the role of market-makers (Mccaffrey, 2018). Nonetheless, an enduring partnership characterized by mutual engagement and collaboration between the two entities must persist. Baumol's seminal contributions to the field of entrepreneurship are notably centered on the paramount role of profit maximization. Within the framework of Baumol's entrepreneurial theory, the central driving force for entrepreneurs lies in their relentless pursuit of financial gain (Baumol, 1968). This perspective aligns seamlessly with contemporary manifestations, as a plethora of instances vividly illustrate entrepreneurs' unwavering dedication to profit generation. While the realm of entrepreneurial profit-seeking behavior remains an underexplored domain, a conspicuous demarcation is gradually crystallizing, differentiating start-ups from their conventional enterprise counterparts based on the extent to which they are willing to venture in their quest for financial success. Although a definitive resolution to this dichotomy remains elusive, in-depth research scrutinizing the intricate dimensions of entrepreneurial profit-seeking behavior undoubtedly harbors the potential

to furnish invaluable insights into the labyrinthine landscape of entrepreneurial dynamics.

Baumol astutely underscores that the benefits arising from entrepreneurial innovation transcend mere pecuniary rewards, encompassing a broader spectrum of intangible facets, including influence, power, and reputation (Baumol, 1990). Furthermore, it is imperative to recognize that entrepreneurs, while susceptible to the prevailing economic milieu and regulatory frameworks, concurrently possess the capacity to wield influence and effect transformative shifts in market dynamics, periodically assuming the pivotal role of market-makers.

This discernible divergence in profit-seeking inclinations among entrepreneurs, notably within the context of start-ups versus established enterprises, dovetails seamlessly with the prevailing conceptualization of entrepreneurship as a multifaceted and nuanced phenomenon. Schumpeter (Schumpeter, 1942), in his magnum opus on entrepreneurial innovation, expounds upon the disruptive nature of entrepreneurial activities and their profound role in reshaping economic paradigms. Schumpeter's seminal insights provide a comprehensive contextual framework for comprehending entrepreneurial dynamics and the manifold motivations that underpin entrepreneurial ventures.

Furthermore, Baumol's perspective resonates harmoniously with contemporary scholarly explorations investigating the broader implications of entrepreneurship. Notably, Shane and Venkataraman (Shane & Venkataraman, 2000) delve into the concept of entrepreneurial opportunities, accentuating the centrality of profit as a pivotal driver of entrepreneurial actions. Their contributions serve to underscore the enduring significance of profit motives within the entrepreneurial landscape. Baumol's assertion regarding profit as the linchpin of entrepreneurship resonates profoundly within contemporary entrepreneurial practice. While profit remains a paramount consideration, entrepreneurs traverse a complex and multifaceted terrain where intangible rewards and the potential to shape market dynamics loom prominently.

As previously indicated, entrepreneurship and the economy share a symbiotic relationship. According to Baumol, a robust entrepreneurial-based economy hinges on four key elements, namely: the facilitation of new

business establishment, equitable recognition and remuneration of successful enterprises by institutions (enabling broader participation in public contracts, beyond established major players), the implementation of government initiatives aimed at fostering economic growth (rather than further fragmenting existing resources), and, finally, governmental bodies and institutions (at both local and national levels) must actively promote and support successful enterprises and entrepreneurial endeavors to facilitate engagement in activities that foster innovation and overall development (Griffiths, et al., 2012). This may appear to be a straightforward matter, yet in numerous economies worldwide, the opposite scenario prevails. Consequently, many entrepreneurs encounter discouragement due to bureaucratic hurdles, regulatory constraints, and the actions of local or national governments, which dissuade them from embarking on entrepreneurial endeavors. It is worth noting that they are not impervious to the aforementioned challenges; however, start-ups often possess a competitive edge over traditional entrepreneurial ventures. This advantage arises from the heightened levels of courage, determination, and audacity exhibited by founders, which can surpass those of conventional entrepreneurs. Despite the manifold and wide-ranging benefits associated with entrepreneurship, it is essential to acknowledge the presence of certain drawbacks. It is Baumol who has drawn our attention to the concept of "rent seekers". In the context of income redistribution decisions, the allocation of resources involves expenditure. When governmental bodies or management entities are introduced into this discourse, Baumol has highlighted the potential emergence of social disadvantages. Consequently, a clear demarcation between "productive" and "destructive entrepreneurship" has been delineated (Baumol, 1990), (Foss & Klein, 2004). This, indeed, constitutes the principal hypothesis underpinning the body of work presented within *Entrepreneurship: Productive, Unproductive, and Destructive*, namely: "the exercise of entrepreneurship can sometimes be unproductive or even destructive, and that whether it takes one of these directions or one that is more benign depends heavily on the structure of payoffs in the economy-the rules of the game" (Baumol, 1990). Due to this demarcation elucidated by Baumol, governmental entities, be they at the local or national level, possess the capacity to exert influence on economic-driven innovation.

Enhanced legislation pertaining to innovation and improved conditions fostering the sound development of both start-ups and established enterprises will conduce to an elevated likelihood of innovative endeavors. Consequently, a persistent "symbiotic" relationship, as posited by Baumol, between institutions, entrepreneurship, and the economic sphere must be in place to facilitate accelerated rates of innovation and growth (Henrekson & Eliasson, 2004).

Baumol's entrepreneurial theory, renowned for its insights into the motivations and behaviors of entrepreneurs, has encountered substantive opposition from scholars who offer contrasting viewpoints on the nature of entrepreneurship. Amar Bhide's critique challenges Baumol's emphasis on the concept of asset specificity within entrepreneurial theory (Bhide, 2000). Baumol's framework suggests that entrepreneurs often invest in assets that are highly specific to their ventures, thus limiting their ability to adapt or switch to alternative opportunities. Bhide argues that this viewpoint does not sufficiently account for the adaptability and resourcefulness of entrepreneurs. He asserts that entrepreneurs possess the ability to repurpose and reconfigure their assets, thereby mitigating the risks associated with asset specificity. Bhide's critique encourages a more nuanced understanding of the adaptability and resourcefulness inherent in entrepreneurial endeavors. What is more, Scott Shane, in his work, has challenged Baumol's focus on small and medium-sized enterprises (SMEs) as the primary locus of entrepreneurship (Shane, 2008). Shane argues that entrepreneurship is not limited to SMEs and that innovation can occur in various forms and sizes of organizations. Also, Howard Aldrich and Martin Ruef offer a network-based perspective on entrepreneurship that differs from Baumol's individualistic approach (Aldrich & Ruef, 2006). Aldrich and Ruef emphasize the importance of social networks and social capital in shaping entrepreneurial activities, highlighting the collaborative and community-driven aspects of entrepreneurship.

1.1.4. Max Weber and the Theory of Social Change

Maximilian Karl Emil Weber, a prominent figure in the realms of sociology and political economy, staunchly advocated the notion that progress, be it

societal, economic, or social in nature, could and should be realized through the prism of rationality. It is paramount to underscore that the concept of rationalization held a hallowed place in Weber's intellectual framework. He contended that individuals, as well as economic actors and agents, such as enterprises, could engage in two modes of rational behavior. The first is substantive rationality, wherein the means employed to attain objectives are rational, albeit the ultimate ends may not align with this rationality. The second is formal rationality, denoted as "zweckrational," which manifests when both the means to achieve a particular desire and the ultimate objective are meticulously calculated and rationale is diligently employed in their pursuit (Weber, 1964). In his perspective, Max Weber posits that not only do entrepreneurs operate in a manner subjected to rational considerations, but their pursuits of profit are intricately linked to rational entrepreneurial endeavors. This pursuit of profit, according to Weber, resides at the intersection of ethical dimensions, encompassing both morally commendable and morally contentious facets (Denham, 2005).

The assertions made by the author extend beyond the purview of businesses limited to his era, as it becomes evident that the author, Max Weber, alludes to the actions and desires of enterprises not only in his contemporary context but also anticipates their relevance in subsequent periods.

Recent advancements in entrepreneurship research have witnessed the emergence of social entrepreneurship, a domain that has, in part, evolved from theories formulated by Max Weber. While it is not asserted that Weber serves as the sole progenitor of social entrepreneurship, his contributions to understanding the social dimensions of entrepreneurial activities have provided contemporary entrepreneurs with a robust framework for further development.

Weber's conceptualization of social actions, as articulated by the author, pertains to actions undertaken by individuals in which subjective meanings are attributed to their behavior, encompassing overt or covert actions, omissions, or acquiescence. Action is "social insofar as its subjective meaning takes account of the behavior of other and is thereby oriented in its course" (Weber, 1968). Indeed, this phenomenon of social behavior becomes conspicuous when the endeavors of individuals and enterprises involve the

creation or provision of something of substantive value, rather than being characterized by superficiality.

As the author cogently elucidates, this significance or value inherently assumes a subjective nature, irrespective of whether it is openly communicated to others or retained as an individualized construct. This assertion holds true, for the societies within which we operate, irrespective of geographic or cultural variances, are comprised of interrelated individuals, each driven by the pursuit of their subjective requisites. In contemporary contexts, particularly when considering social start-ups or enterprises focused on social entrepreneurship, discernible patterns emerge in the comportment of these ventures. Such enterprises are motivated to effect change, contribute positively, and exert influence on others, compelling founders and entrepreneurs to engage in purposeful actions.

These actions manifest across a spectrum, encompassing:

- rational actions, wherein entrepreneurs meticulously consider their own behavior and anticipate the responses of their target audience within specific scenarios, drawing upon these expectations and experiences to reach reasoned conclusions.
- emotional actions come into play, entailing the incorporation of personal beliefs and societal norms, which influence not only profit-seeking endeavors but also the overarching objectives of the entrepreneur.
- traditional actions are also observable within this spectrum of behaviors (Oyedokun, 2016).

Within Weber's extensive body of research, the binary considerations of “means and ends” emerge as a pivotal duo deserving of profound examination. It is imperative, however, to exercise caution when attempting to apply these constructs to affectual behavior. As delineated earlier, Weber's scholarly pursuits pivot prominently upon the axis of rationality. It is paramount to recognize that affectual behavior, by its very essence, remains divorced from the realm of rationality. Consequently, future inquiries must scrupulously deliberate upon the taxonomic frameworks they employ for their investigations (Etzrodt, 2005). In Max Weber's extensive work of sociological scholarship, the conceptual dichotomy of “means and ends” surfaces as a pivotal framework, warranting meticulous inquiry.

Nevertheless, it is imperative to approach the application of these constructs to the realm of affectual behavior with judicious caution. As previously elucidated, Weber's scholarly endeavors are firmly anchored in the domain of rationality, serving as the central axis of his analytical framework. It is paramount to acknowledge that affectual behavior, in its intrinsic essence, resides beyond the purview of rationality. Consequently, forthcoming research endeavors must exercise rigorous contemplation regarding the choice of taxonomic frameworks employed in the investigation of affectual behavior.

Weber's conceptualization of the "means and ends" paradigm assumes a central role in his sociological discourse, prominently featured in his seminal work, "The Protestant Ethic and the Spirit of Capitalism" (Webber, 1905). In this groundbreaking publication, Weber delves into the intricate nuances of rationality as a driving force in human conduct, thereby profoundly influencing subsequent sociological scholarship.

To foster a more profound comprehension of these distinct forms of actions (rational, emotional and traditional) and to meticulously account for the element of rationality intertwined within them, the ensuing table is proffered:

Table 1. Rational/non-rational decisions and types of actions as proposed by Webber

Type of decision\ perceived utility	Ends (has utility)	Ends (with other types of value- do not possess utility)
Rational/Conscious type of decision	Instrumentally rational action	Value-rational action (norms)
Non-rational type of decision	Affectual behavior	Traditional behavior (has meaning)

Source: Adapted by the author from Etzrodt (Etzrodt, 2005)

While it may seem straightforward to categorize the actions of social entrepreneurs into the aforementioned delineations, we posit the following argument: these actions should not be regarded as mutually exclusive. If rationality stands as a focal point in Weber's scholarship, it is this very rationality that may lead us to infer the following: contemporary social enterprises and start-ups have the capacity to concurrently employ the action types delineated by Weber, not necessarily for the sole purpose of profit

maximization, but rather to enhance their endeavors in effecting a more substantial societal transformation, with the objective of reaching a broader spectrum of individuals.

The amalgamation of Weber's notions of rationality and social dimensions, along with Schumpeter's emphasis on specialization and innovation, holds the potential for substantial progress.

Weber's concept of rationality ought to be construed as primarily pragmatic, notwithstanding the contemporary emergence of more self-centric individuals and enterprises in today's society. This does not necessarily imply egoism as a characterization of present-day society; rather, it underscores the heightened significance attributed to personal wants and desires. The individual occupies a central role in their own universe, with personal development being deemed vital in facilitating the advancement of others. Weber's perspective on rationality is fundamentally utilitarian, geared toward streamlining everyday life.

Max Weber's Theory of Social Change, a seminal work in the field of sociology, has sparked substantial debate and critique from scholars who offer alternative viewpoints on the nature and drivers of social change. While Weber's theory is renowned for its emphasis on rationalization, bureaucracy, and the Protestant work ethic as key forces shaping modern society, several prominent opponents have challenged and enriched the discourse by providing contrasting perspectives (Marx, 1867), (Durkheim, 1893), (Adorno & Horkheimer, 1947). Karl Marx, a foundational figure in sociology and economics, presents a fundamental critique of Weber's analysis of capitalism. In his magnum opus, "Das Kapital," Marx contends that Weber's emphasis on cultural and religious factors as determinants of social change neglects the underlying economic structures of capitalism (Marx, 1867). Marx asserts that capitalism's inherent contradictions, such as class struggle and the exploitation of labor, are the primary drivers of social change. He argues that the dynamic interplay of bourgeoisie and proletariat classes, rooted in the material conditions of production, propels societal transformation. This critique challenges Weber's focus on ideas, values, and the Protestant work ethic as key drivers of societal evolution, asserting the primacy of economic forces.

Emile Durkheim, another influential sociologist, offers a contrasting critique by challenging Weber's individualistic approach to understanding social change (Durkheim, 1893). Durkheim contends that Weber's focus on individual actions and rationality overlooks the collective and normative aspects of society. He argues that social change is primarily driven by collective consciousness, shared values, and moral integration within a society. Durkheim asserts that social cohesion, characterized by the strength of norms and the integration of individuals into a collective conscience, plays a pivotal role in shaping societal transformation. This critique challenges Weber's emphasis on individual rationality as the central driver of modernization, highlighting the importance of collective forces.

The Frankfurt School, a group of critical theorists including Theodor Adorno and Max Horkheimer, offers a broader critique of Weber's theory of rationalization (Adorno & Horkheimer, 1947). They argue that Weber's notion of rationalization as a one-sided, technocratic process neglects the broader societal implications. Their critique challenges Weber's perspective by delving deeper into the implications of unchecked rationalization and its potential consequences for society. Weber's theory of rationalization celebrated the idea of calculative reason and instrumental rationality, which he believed would lead to greater efficiency and predictability in society. However, the Frankfurt School's scholars saw a darker side to this relentless pursuit of rationalization. They argued that, in its extreme form, rationalization could have dehumanizing effects, leading to the loss of individuality, creativity, and critical thinking. In their influential work " Dialectic of enlightenment: Philosophical fragments ", Adorno and Horkheimer explored how rationalization could result in the re-enchantment of the world" through bureaucratic and technocratic means. They contended that the unchecked drive for efficiency and predictability could lead to a conformist, authoritarian society where individuality and autonomy are suppressed in the pursuit of an all-encompassing rational order. In this scenario, humans become mere cogs in a vast bureaucratic machine, and the pursuit of genuine freedom and enlightenment is stifled.

Furthermore, the Frankfurt School's critique highlighted the potential for instrumental reason to lead to cultural homogenization and a shallow consumer culture, where critical thought and cultural diversity are sacrificed

in the name of standardization and efficiency. They warned of the dangers of a society where individuals are reduced to passive consumers and the critical capacity to challenge the status quo is eroded. Even though Frankfurt School's critique of rationalization challenges Weber's optimistic view of rationalization as a one-sided, technocratic process. Instead, they draw attention to the potential consequences of unchecked rationalization, including dehumanization, cultural homogenization, and the erosion of critical thinking. Their work encourages a more nuanced exploration of the complex relationship between rationalization and societal transformation.

Throughout his works, Weber frequently draws upon historical examples of rational thinkers to substantiate the advantages of rationality and its practical utility (Kalberg, 1980). The same rationale can be extended to contemporary contexts. Conducting business operations guided by rational methodologies gleaned from accomplished entrepreneurs, whether they are engaged in social entrepreneurship or not, has the potential to democratize the business landscape, elucidating the "rules of engagement" for all participants. It is precisely within this context of a "level playing field" that the impetus for further innovations may be catalyzed.

1.1.5. Mark Casson and the Theory of Internationalization

Mark Casson is widely recognized as one of the progenitors of internalization theories. His contributions in this domain have significantly facilitated the international expansion of numerous enterprises.

In contemporary contexts, it is imperative to discern and evaluate distinctions among companies, enterprises, and start-ups, particularly concerning their profit-driven motivations or, conversely, their commitment to non-profit objectives, exemplified by entities engaged in social entrepreneurship. Casson's scholarly pursuits allow for a nuanced differentiation between a firm and entrepreneurship. He contends that entrepreneurship not only builds upon firm theories but also refines and acts as a filter for them. Furthermore, Casson underscores the indispensability of entrepreneurial decision-making in navigating complex market dynamics and conditions. Present times emphasize the importance of critical thinking and decision-making. However, it is due to Casson's pioneering work that

these concepts are readily accessible and practicable. This quality stands as a hallmark of authentic entrepreneurial endeavors: an entrepreneur's capacity to engage in discerning decision-making processes geared towards minimizing the inherent risks associated with profit-seeking pursuits. While contemporary perceptions often depict entrepreneurs as risk-takers, Casson asserts that the application of critical thinking and rational judgment aids in mitigating uncertainties associated with the pursuit of profit. It is worth noting, though, that risk assessment remains inherently subjective, with varying risk tolerances across individuals and enterprises. The precision of information thus assumes paramount importance in shaping informed judgments concerning acceptable risk thresholds (Casson, 2002). Nonetheless, in the contemporary landscape, it is evident that unfettered access to information is not guaranteed. Information often becomes subject to the discretion of those who control its dissemination, leading to situations where its distribution is markedly unequal.

The entrepreneurial inclination toward risk-taking can be examined from an alternative vantage point. As elucidated by Schumpeter, specialization confers numerous advantages, much like innovation. However, it is through the insights of Casson that we can elucidate an additional noteworthy synergy: entrepreneurs specialize in the assumption, assessment, and management of risks. This specialization not only enables them to navigate these activities adeptly but also fosters proficiency in identifying and seizing novel opportunities. In the pursuit of these opportunities, entrepreneurs, in a sense, engender the markets within which they operate, thus assuming roles akin to market makers. Through their persistent efforts, they not only orchestrate and oversee the emergence of fresh opportunities but also manage the allocation of resources. Furthermore, in their capacity as market makers, entrepreneurs occasionally participate in shaping the very rules, frameworks, and norms that govern their respective domains (Casson, 2005).

Another intriguing aspect associated with Casson's work pertains to the realm of multinational enterprises and internationalization. As previously elucidated, entrepreneurs cultivate expertise in risk management and opportunity exploitation, thereby assuming the role of market makers. Contemporary enterprises, as observed, actively aspire to achieve global

expansion, encompassing not only the enlargement of their business footprint but also the dissemination of their business models, practices, and proprietary information, among other facets.

Despite its contemporary prevalence, Casson's insights transcend convention by delineating a cogent rationale: through the emulation of their own operational practices in foreign locales, companies fortify themselves against the imitation of their products, information, research, and business models by foreign counterparts within the target markets of their international expansion endeavors (Alvarez, et al., 2014). The process of expanding operations into foreign markets often evokes perceptions of a journey fraught with risks and uncertainties. However, it is imperative to underscore that this aligns seamlessly with a foundational tenet of Casson's entrepreneurship theory. Entrepreneurs, armed with their critical thinking acumen and discerning judgment, inherently possess the capacity to navigate the intricate terrain of situations marked by indeterminate outcomes. While it is undeniable that volatile international markets harbor a multitude of uncertainties, entrepreneurs bear the responsibility of synthesizing available information to chart viable pathways toward profitability. Notwithstanding the widely held perception that internationalization poses greater challenges than domestic market operations, the contemporary landscape of globalization, buoyed by the pervasive reach of the internet as a communication medium, has significantly facilitated the journey toward global recognition and the attainment of status as innovative trailblazers (Casson, 2005).

Mark Casson's Theory of Internationalization, a foundational framework in the field of international business, has elicited significant debate and critique from scholars who provide alternative perspectives on the complexities of international firm expansion. While Casson's theory centers on entrepreneurship and resource allocation as key drivers of the internationalization process, several prominent opponents have challenged and enriched the discourse by offering distinct explanations for the internationalization of firms.

John Dunning, a seminal scholar in international business, presents a substantial critique of Casson's theory through the introduction of the Eclectic Paradigm (Dunning, 1988). Dunning's paradigm argues that

Casson's exclusive focus on entrepreneurship as the principal driver of internationalization is overly simplistic. Instead, Dunning emphasizes the importance of three key factors: Ownership, Location, and Internalization (OLI). Dunning's critique asserts that the internationalization process is influenced not only by entrepreneurial actions but also by firm-specific advantages, host-country attractiveness, and the mode of entry. The OLI framework provides a more comprehensive understanding of why firms venture into international markets.

Johanson and Vahlne's Uppsala Model (Johanson & Vahlne, 1977) offers an alternative perspective on internationalization, contrasting with Casson's entrepreneurship-driven approach. The Uppsala Model proposes that firms gradually increase their international commitments through experiential learning and market knowledge accumulation. It underscores the importance of "psychic distance," or the cultural and linguistic differences between home and host countries, as a key determinant of the internationalization process. This model challenges Casson's emphasis on entrepreneurship and resource allocation by highlighting the gradual nature of internationalization and the significance of market knowledge.

Raymond Vernon's Product Life Cycle Theory (Vernon, 1966) provides another opposing viewpoint to Casson's theory by focusing on product-related factors as drivers of internationalization. Vernon argues that firms internationalize to exploit their innovations and extend the life cycle of their products. This perspective diverges from Casson's emphasis on entrepreneurship and resource allocation as primary drivers of international expansion. According to Vernon, internationalization is driven by the need to access larger markets as products move through different stages of their life cycle.

Mark Casson's Theory of Internationalization, while a seminal contribution to the field, has faced robust opposition from these prominent scholars. These critiques challenge Casson's singular focus on entrepreneurship and resource allocation by introducing broader dimensions, including firm-specific advantages, experiential learning, and product-related factors, into the discourse on why and how firms internationalize. Dunning's Eclectic Paradigm emphasizes the role of ownership, location, and internalization, Johanson and Vahlne's Uppsala

Model highlights the gradual nature of internationalization and the importance of market knowledge, and Vernon's Product Life Cycle Theory underscores the significance of product-related factors. Collectively, these opposing viewpoints enrich our understanding of the multifaceted nature of international firm expansion and encourage a more nuanced exploration of the internationalization process.

1.1.6. Israel M. Kirzner and the Theory of Information Gaps

While several scholars have emphasized the significance of amassing pertinent information, Kirzner introduced a novel perspective by contending that entrepreneurs, driven by the pursuit of profit, capitalize on informational voids originating from the actions of individuals and enterprises within a particular market. Despite the pervasive practice of planning in contemporary entrepreneurial endeavors, which invariably takes into account and is a manifestation of the information available or its absence, planning frequently exhibits a spectrum spanning from unwarranted optimism to profound pessimism. Kirzner's seminal contributions center on what he identifies as the two distinct knowledge predicaments encountered by entrepreneurs. In his schema, "knowledge problem A" manifests as an excessively optimistic outlook and possesses an inherent self-adjusting characteristic, whereas "knowledge problem B" is characterized by an excessively pessimistic orientation, yet notably lacks any self-adjusting attributes (Mulligan, 2018). The author has made a significant contribution to the field of entrepreneurship by introducing the concept of delineation and segregation of activities and functions.

Entrepreneurs engage in actions motivated by their perception of market opportunities, driven by diverse objectives such as profit maximization, social considerations, and more. These opportunities manifest in various forms, as elucidated by Kirzner, encompassing arbitrage opportunities, equilibrating opportunities, discovery opportunities, commonplace opportunities, and information-related opportunities (De Jong & Marsili, 2010). Entrepreneurs contribute to the attainment of equilibrium primarily through their awareness of market conditions and their exploitation of price differentials. It is essential to recognize that these entrepreneurial actions can

lead to market disruptions and ultimately give rise to instances of "creative destruction" (Langlois, 2002). While each entrepreneurial endeavor can be perceived as an extension of the founder's vision, it is essential, as emphasized by Kirzner, that the process of perceiving information and subsequent actions remain as objective as possible. However, it is important to acknowledge that an objective decision-making process is not immune to errors, and entrepreneurs are bound to make mistakes at various points in their journeys. In the contemporary landscape, distinguishing between managers and entrepreneurs has become increasingly challenging. Kirzner's work provides valuable insights into this matter. According to the author, the entrepreneurial function, which, in principle, does not inherently involve costs, should be distinct from the managerial function. Identifying opportunities and acting upon them fall within the purview of the entrepreneurial function, with the managerial function assuming its role subsequently (Lewin, 2002). Expanding upon the concepts and principles originally introduced by Schumpeter, it becomes evident that the segregation of these functions is imperative due to the distinct and specialized nature inherent to each of them.

While some contemporary scholars tend to center their analyses on equilibrium, often presupposing the existence of such balanced states, it is imperative to delve into the dynamics of competition within these equilibrium contexts. According to Kirzner's seminal work (Kirzner, 1973), the answer to this inquiry is unequivocal: under such circumstances, competition becomes irrelevant or may even cease to exist. However, it is crucial to underscore that equilibrium states are inherently fragile and should not be taken for granted. Real-world market dynamics, influenced in part by entrepreneurial actions, exhibit a proclivity toward equilibrium. This perspective aligns seamlessly with the economic realities we confront today. In the realm of everyday business operations, competition unfolds as a vigorous and global force, further fueled by contemporary tools such as internet-based business models. Within this intricate milieu, the preparedness and agility of entrepreneurs emerge as pivotal factors distinguishing success from mediocrity (Dixit & Nalebuff, 2008).

While response speed is undeniably important, proactive engagement is equally critical. Entrepreneurs and founders must proactively anticipate

market trends, future opportunities, and developmental trajectories. The Kirznerian entrepreneur, characterized by its vigilance and swift responsiveness to market stimuli, hinges on how entrepreneurs assimilate and react to market information (Douhan, et al., 2006). One potential downside arising from this heightened state of vigilance is the potential impediment it poses to creativity and innovation.

Hence, as elucidated by Krizner, we discern a trade-off between creativity and a state of alertness and vigilance (Kirzner, 2008). Although the commonly accepted perspective implies a rigid trade-off and mutual exclusivity, Kirzner has, in fact, elucidated the perception of his own theory and posited the following proposition: a dual state wherein entrepreneurs can concurrently maintain vigilance and foster creativity can indeed exist, and is advantageous both in the short term and the long term (Kirzner, 2008). The ramifications of this duality are palpable not only within the confines of a company, where it leads to improved outcomes, but also beyond, where it influences the levels of satisfaction pertaining to needs and desires.

Kirzner's Theory of Information Gaps, which emphasizes the entrepreneurial role in identifying and closing market inefficiencies arising from information asymmetry, has faced opposition and critique from various scholars offering alternative perspectives on market dynamics and entrepreneurial behavior. These opponents challenge Kirzner's conceptualizations and provide alternative explanations for market phenomena.

Joseph Stiglitz, a Nobel laureate in economics, presents a significant critique of Kirzner's Theory of Information Gaps through his work on Information Economics (Stiglitz, 2000). Stiglitz argues that Kirzner's focus on entrepreneurial alertness and the profit motive is an oversimplification of market dynamics. Stiglitz's critique asserts that information gaps in markets are not always rectified through entrepreneurial action. Instead, he contends that there can be situations where information asymmetry persists due to external factors, such as government regulations, creating market inefficiencies. Stiglitz's Information Economics emphasizes the role of government intervention and public policy in addressing information gaps and market failures.

George Akerlof's seminal work, “The Market for Lemons” (Akerlof, 1970) offers an opposing viewpoint to Kirzner's theory by focusing on adverse selection resulting from information asymmetry. Akerlof's critique highlights how asymmetric information can lead to market failure, especially in the context of used car markets. He argues that in situations where sellers have more information than buyers, the market may collapse, leading to adverse outcomes. Akerlof's work challenges Kirzner's optimism regarding the entrepreneurial role in closing information gaps by illustrating instances where market breakdown occurs due to information asymmetry.

Michael Spence's Signaling Theory (Spence, 1973) provides another opposing perspective to Kirzner's theory. Spence argues that individuals, including entrepreneurs, can use signals to convey information about their quality or abilities in situations characterized by asymmetric information. This theory challenges Kirzner's emphasis on entrepreneurial alertness as the sole mechanism to close information gaps. Instead, Spence's theory suggests that individuals may engage in signaling behaviors, such as obtaining degrees or certifications, to bridge information disparities and enhance their market prospects.

In the realm of entrepreneurial economics, Israel M. Kirzner's Theory of Information Gaps has garnered considerable attention and influence. However, it is important to note that this theory has not been without its critics. Some scholars present alternative perspectives on the causes of market inefficiencies resulting from information imbalances. These opposing viewpoints bring into focus additional factors such as government intervention, instances of market failures, and the role of signaling behaviors. Collectively, these critiques enrich the ongoing discussion surrounding information gaps and how entrepreneurs navigate them within markets, offering a more nuanced and comprehensive understanding of this multifaceted phenomenon.

1.1.7. Lean Concepts

Throughout the preceding sections, we have developed upon the theories and ideas put forth by seminal thinkers, with a primary focus on the entrepreneur and the entrepreneurial domain. While these thinkers have

emphasized notions such as specialization, creativity, uncertainty, and strategies for mitigating uncertainty, the concept of "lean" and "lean manufacturing" brings a more targeted perspective to bear on issues related to operational efficiency, waste reduction, and methods for enhancing productivity. In essence, the core tenet of the lean concept is predicated on the notion that enterprises should either maintain or augment value for the customer while expending less effort, thereby reducing waste. Crucially, the concept of lean is fundamentally oriented toward addressing the "how" in the context of expeditious goods and services production, providing solutions for achieving desired outcomes efficiently (Bosch , et al., 2013).

The concept of lean, although initially rooted in Asian manufacturing paradigms, remains highly relevant in contemporary contexts. Its principles find application across diverse domains and industries and have gained substantial traction, particularly in the realm of startup development. Normatively, the concept of lean comprises four foundational elements: comprehensiveness, which extends to processes encompassing production, manufacturing, and services; the establishment of a direct and unambiguous linkage between goods or service suppliers and end-users; a clear and singular focus for each product or service; and, lastly, a systematic and scientifically grounded approach to corporate-level enhancements (Poppendieck & Poppendieck, 2003). While the application of lean methodologies and concepts may pose challenges within the context of service-oriented or internet-based startups and enterprises, it is important to emphasize that the concept of lean is universally relevant, irrespective of whether one is referring to traditional brick-and-mortar businesses or service-focused startups. Drawing upon the fundamental tenets of the lean concept, scholars such as Womack and Jones have articulated five key propositions aimed at elucidating the overarching principles of lean manufacturing:

- ***Value Assignment***: At the core of lean manufacturing lies the process of assigning value to each product within a company's portfolio.
- ***Process Streamlining***: Emphasizing the practicality of the entire process while eliminating superfluous steps and bottlenecks.
- ***Value-Centric Process Flow***: Aligning the entire operational process with the concept of value to the end-user.

- ***Customer-Centricity***: Placing the customer at the forefront of the business model, with the client's demands and preferences dictating and propelling all organizational activities.
- **Continuous Improvement**: Embracing an ethos of ongoing enhancement and refinement (Womack & Jones, 2008).

It is worth noting that these principles can be effectively applied to a wide spectrum of businesses, including service-oriented startups and internet-based enterprises, enhancing their efficiency and effectiveness.

While the incorporation of these principles at the organizational level may encounter challenges pertaining to functional-level implementation, both in the immediate and enduring contexts, these concepts hold the potential to empower startups in the dynamic realignment of their focal points. This, in turn, enables them to respond more promptly to market stimuli and facilitates the swifter development of products and services that are in demand within the market.

It is intriguing to observe the assimilation of the lean concept within the startup industry. One plausible explanation for the widespread adoption of this concept can be attributed to the remarkable success of Eric Ries' 2011 publication, "The Lean Startup." In this work, the author extends the foundational principles of lean manufacturing and tailors and models them to align with the exigencies, challenges, and requisites encountered by startups during that era. Remarkably, Ries introduces, right from the inception of the book, five guiding principles intended to steer any aspiring startup toward the realization of lean practices. These principles are delineated as follows (Ries, 2011):

- Entrepreneurial individuals are ubiquitous, hailing from diverse backgrounds and domains,
- Entrepreneurship is widely regarded as an established institution and entails a form of management,
- The acquisition, dissemination, and exchange of information form the nucleus of startup endeavors, with learning serving as a pivotal driver for startup advancement,
- The iterative cycle of "Build-Measure-Learn" assumes paramount importance,

- Continuous scrutiny, validation, and documentation of progress and innovation outcomes are imperative at all junctures.

Despite the remarkable semblance between these principles and the original tenets of the lean concept, it is the second principle articulated by Ries that warrants particular attention within the context of this discourse. According to Ries, the distinction between a manager and an entrepreneur is exceedingly nominal, signifying that their functions and roles bear striking resemblances. As elucidated earlier, given the well-established premise of specialization, it is only fitting to extend this notion to encompass these two roles. Nonetheless, it is our contention that the entrepreneur and manager roles should not be regarded as mutually exclusive; rather, they should coexist and become intricately interwoven. An individual can seamlessly transition between the roles of manager and entrepreneur, perpetuating a continuous spiral of engagement. Furthermore, it is conceivable to have employee-managers and employee-entrepreneurs (commonly referred to as intrapreneurs) tasked with nurturing innovation within their respective teams or representing units, thereby fostering novel ideas and products. This dynamic process can be initiated from both a bottom-up and top-down perspective, with innovation even germinating laterally. In emphasizing the importance of innovation, the author propounds a straightforward measurement method for startups: one must gauge the number of end-users who have adopted and integrated a product or service that did not exist three years prior, and the proportion of revenue derived from products and services introduced within the same temporal span (Ries, 2011). The author astutely underscores the indispensable nature of cultivating revenue streams rooted in innovation, while concurrently empowering individuals to embrace novel products or services. This innovation may assume an incremental or disruptive character, but its genesis invariably hinges upon perpetual learning and experimentation. Start-up enterprises are compelled to operate within a milieu characterized by augmented uncertainty, transcending the conventional realm experienced by brick-and-mortar counterparts. This pervasive uncertainty emanates not only from internal sources within the company but also from the intricacies of the target market. Consequently, it becomes imperative to deliberate, strategize, and effectively navigate this uncertainty, with the ultimate objective of ushering forth at

least an incrementally innovative offering, service, or operational process. In consonance with the author's viewpoint, it is incumbent upon start-up founders and their respective teams to embrace the concept of pivoting, wherein they remain unswervingly adaptable and open to redirecting their trajectory in the pursuit of product development. A salient tenet emphasized by Ries pertains to the indispensability of a "minimum viable product" (MVP) for the survival and advancement of start-up ventures. The presence of an MVP is quintessential, serving as a foundational cornerstone that not only enables the commencement of sales but also augments the prospect of securing essential investment capital, thereby catalyzing the developmental trajectory of these nascent enterprises (Ries, 2011). We advance the following proposition: while conventional enterprises adhere to established business models, start-ups operate in a mode of spontaneous generation. Hence, it becomes imperative not only to possess a Minimum Viable Product (MVP) but also to embrace the concept of a Minimum Viable Process (MVP), a Minimum Viable Strategy (MVS), and analogous components. This assertion finds resonance in the scholarly contributions put forth by Ghezzi, Cavallaro, and Balocco (Ghezzi, et al., 2015).

Naturally, the adoption of the lean and lean-start-up concept does not provide an infallible shield against the failure of start-up enterprises; however, it serves as a valuable tool for risk mitigation. According to studies conducted by Shikhar Ghosh at Harvard Business School, a staggering 75% of start-ups in the United States experience a shortfall in achieving their objectives. While it is reasonable to infer that the failure rate of start-ups in Romania may approximate the figures suggested by Ghosh, a more comprehensive examination of success and failure rates specific to the Romanian context will be elucidated in subsequent sections of this book (Blank, 2013). As delineated at the inception of this subsection, the incorporation of lean methodology within the start-up domain has garnered prominence in recent years. It is our contention that an extended temporal horizon is requisite for subjecting this concept to comprehensive scrutiny. As elucidated by certain erudite authors, notwithstanding the pivotal importance of validation in fostering innovation, a discerning examination of the nexus between validation of novel assumptions and the overarching triumph of a specific start-up or teams operating within it is warranted.

Pertaining to interactions with end consumers, judicious consideration must be accorded to the ramifications engendered by incessant communication and feedback on the perspectives of the start-up team. The consequential effects of such undertakings have been substantiated by scholars like Ted Ladd (Ladd, 2016). His research has demonstrated that an increased influx of feedback from end-customers tends to impel founders and their respective teams towards a perpetual oscillation in the central concept and principal pitch of their start-up endeavor. An additional drawback, as posited by the author, inherent to the lean start-up methodology, pertains to the emergence of "false negatives." In accordance with the author's discoveries, initially meritorious concepts are often forsaken and rejected, whether erroneously or not, primarily due to the absence of well-defined regulations and constraints stemming from the processes of testing and validation (Ladd, 2016).

While this sub-chapter has been dedicated to the exploration of theories and concepts related to start-ups and enterprises, the subsequent sub-chapter will delve into the intricacies of business model generation, providing a comprehensive elaboration on this subject matter.

1.2 Crafting Business Models

In the realm of initiating and advancing a business venture, it is a common misconception that success can be effortlessly secured by adhering to a straightforward formula. However, an article featured in the Harvard Business Review expounds on the complexities and requisites associated with commencing a business (referenced here are both classical enterprises, but also start-ups), one must "write a business plan, pitch it to investors, assemble a team, introduce a product, and start selling as hard as you can" (Blank, 2013). In the contemporary landscape, the mentioned approach may not align with the exigencies of dynamic and progressive start-up enterprises. Nevertheless, it is imperative to underscore that innovation in the realm of business models should not be confined solely to the conception of entirely new models from scratch. An equally essential facet of

entrepreneurial practice is the continuous pursuit of enhancements and refinements within pre-existing models, which ought to remain a perpetual agenda for companies, whether they fall under the traditional brick-and-mortar business paradigm or operate as innovative start-ups (IBM Global Business Services, 2008). Our reference extends beyond the scope of exclusively online enterprises. It is imperative to dispel the misconception that a start-up is inherently synonymous with a purely digital existence. Depending on the specific industry and sector in which they operate, certain start-ups may find it advantageous, if not essential, to maintain a tangible, physical presence in addition to their digital or online manifestations.

Start-up enterprises are subject to the influences of both internal and external determinants. Applying a similar line of reasoning, it becomes evident that business models exhibit inherent (internal) as well as extrinsic (external) dimensions. The internal aspect encompasses the establishment of internal norms, operational protocols, regulatory frameworks, and organizational structures. Conversely, the external facet pertains to the strategies and mechanisms through which a start-up intends to harmonize with external variables and dynamic forces (Casadesus-Masanell & Heilbron, 2015). While standardizing specific activities holds undeniable significance, it should not transpire at the detriment of creativity and innovation. Employing a business model should not entail a compromise on the creative and innovative returns. In fact, the business model has the potential to be innovation-centric and should function as a catalyst for the cultivation and augmentation of creativity.

A definitive interpretation regarding the boundaries, extent, and precise delineation of the term "business model" remains elusive. Regrettably, there exists no unanimous consensus within the academic community pertaining to the functions, breadth, and limitations of the business model. It is our contention, however, that the utilization of the term "business model" is not merely a passing trend; rather, it carries substantive significance. The presence of a well-defined business model should not be perceived as a transient phenomenon; instead, it should be recognized as an essential element. Even though start-ups often engage in on-the-fly creation, the formulation and evolution of a business model should be customized to

align with their specific undertakings. Moreover, this concept holds relevance not only for internet-based enterprises and start-ups but also for conventional firms (Dasilva & Trkman, 2013). So as to better make sense and understand the sheer number of definitions in use, attention should be paid to the following table:

Table 2. Various definitions of the business model

Author	Concept/Definition
Allan Afuah	"Business model is a framework for making money. It is the set of activities which a firm performs, how it performs them and when it performs them so as to offer its customers benefits, they want and to earn a profit." (Affuah, 2003).
Itami and Noshino	"Business model is a profit formula, system of business and learning system." (Baden-Fuller & Morgan, 2010).
John Mullins Randy Komisar	"Business model is the pattern of economic activity – cash flowing into and out of your business for various purposes and the timing thereof – that dictates whether or not you run out of cash and whether or not you deliver attractive returns to your investors. In short, your business model is the economic underpinning of your business, in all of its facets." (Mullins & Komisar, 2009).
Henry Chesbrough	"The business model is a useful framework to link ideas and technologies to economic outcomes." (Chesbrough, 2006)
Alfonso Ganbardella and Anita McGahan	"Business model is a mechanism for transformation ideas to revenues through the acceptable costs." (Baden-Fuller & Morgan, 2010).

Source: Adapted by the author from Slavik and Bednar (Slávik & Bednár, 2014)

The preceding table, as indicated by its title, primarily addresses the dimensions and facets of a business model within the economic context. However, it is imperative to acknowledge that a purely economic perspective offers an incomplete representation of this concept. A comprehensive understanding of a business model necessitates an examination from the vantage point of value creation, an integral aspect of the contemporary business landscape, with a central focus on the end-user or customer. It is crucial to recognize that value creation holds significance not only for the end consumer but also for business entities and start-ups.

In the development of a Business Model (henceforth referred to as BM), it becomes essential to contemplate a diverse array of relationships and concepts. The prevalent framework for BM design, proposed by Osterwalder

and Pigneur, is known as the Business Model Canvas. According to the Business Model Canvas, there exist nine fundamental criteria that serve as foundational elements for constructing a business model or can be employed to deconstruct an existing one.

These criteria encompass the unique value proposition, customer segments, distribution channels, customer relationship channels, key activities, key resources, strategic partnerships, revenue model, and cost structure (Osterwalder & Pigneur, 2010). Central to these nine foundational components lies the concept of the value proposition. This concept pertains to the methods by which an extant challenge encountered by the customer segment can be effectively resolved or managed. Additionally, it denotes the rationales underpinning why this specific product or service holds superior value, significance, and utility when juxtaposed with analogous offerings from competitors (Fritscher & Pigneur, 2009). Indeed, the value proposition constitutes a pivotal element, yet the attainment of a successful value proposition is contingent upon the development and realization of the remaining eight building blocks. Furthermore, in the process of crafting the value proposition, start-ups must remain vigilant not only regarding extant issues but also future potential challenges that the targeted customer segment may encounter.

The Business Model Canvas, as highlighted in the preceding section, plays a significant role in rendering start-ups more adaptable to market demands and stimuli. Moreover, given the inherent uncertainty characterizing the sectors in which start-ups operate, this canvas serves as a potent tool for mitigating uncertainties, rendering them more tangible, and facilitating a comprehensive mapping of their potential repercussions. It is imperative to emphasize that the canvas is capable of evaluating not only external market-specific uncertainties but also addressing internal deficiencies, weaknesses, and limitations. Consequently, the utilization of the canvas furnishes a proactive approach to addressing the ramifications of uncertainty, encompassing both internal and external dimensions.

In the context of rendering a visual representation of this canvas, in its most rudimentary manifestation, the canvas can be delineated as follows:

Table 3. The 9 elements of the business model canvas structure

<table>
<tr><td rowspan="2">Key partners</td><td>Key activities</td><td rowspan="2">Value propositions</td><td>Customer relationship</td><td rowspan="2">Customer segments</td></tr>
<tr><td>Key resources</td><td>Channel</td></tr>
<tr><td colspan="2">Cost structure</td><td colspan="3">Revenue streams</td></tr>
</table>

Source: Adapted by the author from https://www.strategyzer.com/canvas/business-model-canvas

It is imperative to emphasize that each cell within the canvas can be populated at one's discretion, taking into account all the startup-specific elements, activities, and concepts associated with each of the nine building blocks. Irrespective of its scale, this constitutes a pivotal instrument for the visualization of both current and prospective operations of any given startup. Moreover, it establishes connections not solely with the end consumer but also with aspects related to competition, financial aspects, and future prospects. In terms of its potential utility, it ought to serve as a natural extension of frameworks such as Porter's Diamond Model, SWOT analysis, and analogous tools designed to navigate the labyrinthine landscape of the business realm.

The Business Model Canvas, while a widely used tool for mapping out business strategies, is not without its limitations. One significant flaw lies in its static nature, as it often fails to capture the dynamic and evolving nature of modern business environments. While it provides a snapshot of a company's operations at a particular moment, it may not adequately address the need for ongoing adaptation and flexibility.

Additionally, the Canvas can oversimplify complex business dynamics, leading to oversights or misinterpretations. It may encourage a superficial analysis of certain elements, such as customer relationships or revenue streams, without delving deep into the nuances that can significantly impact success. Another critique is its tendency to focus heavily on product-centric businesses, potentially neglecting service-based or platform-based models. This bias can limit its applicability across various industries and business types, making it less effective for certain enterprises. Furthermore, the Canvas often lacks guidance on implementation and execution, leaving businesses unsure of how to translate their Canvas into actionable strategies. Without clear direction on execution, companies may struggle to turn their

conceptual ideas into tangible results. Lastly, the Canvas may not adequately address the ethical and social implications of business models, such as sustainability, social responsibility, or ethical sourcing. Ignoring these factors can lead to reputational damage or regulatory issues in the long run.

While the concepts expounded upon in this subsection pertain to the establishment and structuring of a business endeavor through the application of a robust and well-crafted business model, the ensuing subsection will delve into aspects concerning the harnessing of creativity and the augmentation of innovation.

1.2.1. Fostering Creativity, Innovation, and Creative Business Development

While it is a common belief that creativity, or the capacity for creative thinking, is a faculty bestowed upon only a fortuitous subset of individuals, it is noteworthy that virtually any person or group can acquire the requisite knowledge to reach a moment of epiphany. Divergence from the norm is what sustains the vitality of organizations. Furthermore, startups assume a central role in effecting transformation, irrespective of their domain of operation. Although creativity is highly coveted, the journey toward becoming creative enterprises and startups necessitates addressing several fundamental questions, questions such as:

- Is creativity an evolving process, or should it be regarded as a definitive outcome?
- Could it be plausible that both interpretations hold validity?

Rather than offering a mere definitional encapsulation of creativity, scholars like Mumford opt for a dissection and deconstruction of the concept, elucidating its constituent elements and ramifications. In this vein, creativity serves as a metric of performance, denoting the actions undertaken by an individual or group. Secondly, creativity emerges as an outcome of human cognition. Thirdly, unlike automatic cognitive processes, such as information retrieval or recognition, creative problem-solving is situated at an elevated echelon of human cognitive functioning (Mumford, 2012). An alternative explication of creativity as posited by Torrance (Torrance, 1965) somewhat situates the domain of creativity within the daily operations of organizations. It is articulated as follows: “a process of becoming sensitive to

problems, deficiencies, gaps in knowledge, missing knowledge, missing elements and disharmonies" (Torrance, 1965). This specific approach underscores the significance of accumulated knowledge and the contextual milieu. Noteworthy within this context is the utilization of the term "developing sensitivity." Sensitivity, in this context, does not solely entail the generation of innovative resolutions to existing quandaries, nor does it inherently necessitate venturing beyond one's customary sphere of comfort. Nonetheless, this definition contributes by highlighting the utilization of knowledge and elucidating how the elimination of particular lacunae can yield originality. Another eminent scholar in the realm of creativity is Mihaly Csikszentmihalyi, who delineates creativity in terms of its origination sources or loci. According to the renowned author, "creativity results from the interaction of a system composed of three elements: a culture that contains symbolic rules, a person who brings novelty in the symbolic domain, and a field of experts who recognize and validate the innovation" (Csikszentmihalyi, 1998). The consequences stemming from innovative ideation serve to enhance and enrich the organizational milieu within a company, consequently ameliorating not only the quality of the work environment but also elevating the caliber of products, services, and the levels of satisfaction experienced by consumers. The systemic model propounded by the author, which complements his concept of "flow," posits that creativity comprises three integral elements. Firstly, there is the *domain*, encompassing the rules and procedures of symbolic value, which can be, to some extent, correlated with the notion of culture. Secondly, we encounter the *field*, constituting all individuals who function as evaluators within the domain, responsible for the selection of novel ideas worthy of acknowledgment, recognition, and preservation. Finally, the *person* represents the third component of creativity according to Csikszentmihalyi. It is through the utilization of the symbols intrinsic to a particular domain that a person engenders innovative ideas. Subsequently, when such a freshly generated idea gains admission into the relevant domain, the process of creativity comes to fruition (Csikszentmihalyi, 1998). The ensuing diagram serves as a graphical depiction elucidating the operational mechanics of the system postulated by the author:

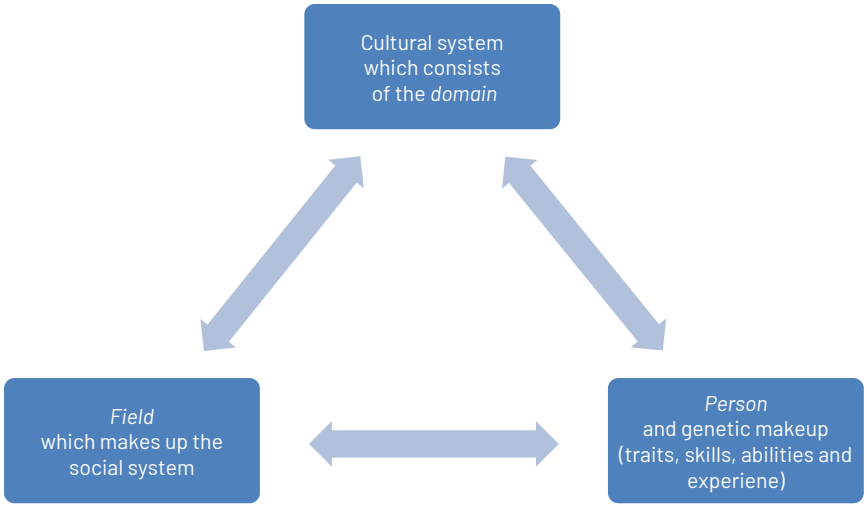

Figure 1. The design of the creativity system as proposed by M. Csizkentmihalyi

Source: Adapted by the authors from Csikszentmihalyi (Csikszentmihalyi, 1998)

In addition to the scholarly endeavors of Csizkentmihalyi, several other authors have made significant contributions to the discourse on creativity. Among them, David Jones stands out for his extensive work on the generation and effective implementation of ideas. Jones posits that problem-solving can be approached through two distinct avenues. The first involves a rational, systematic method, while the second, which is of particular interest to us, pertains to creativity. Jones's seminal work in this realm centers on the "Random Ideas Generator" (RIG) model, which is expounded upon in the subsequent passage.

Within this model, the author delineates the intricacies of the ideation process, traversing the transition from the unconscious to the conscious realm. Subconsciously, individuals instinctively seek solutions to existing problems, resulting in the generation of a multitude of ideas. These ideas subsequently traverse the threshold into our subconscious, where a metaphorical censor sifts through them, permitting entry to the conscious mind only for those ideas deemed plausible. This censor serves as a counterbalance to the "Random Ideas Generator" (RIG), tethering us to practicality and retaining frivolous and fallacious notions within. While the censor undertakes the responsibility of selecting ideas, it falls upon the "Observer-Reasoner" residing in our conscious mind to scrutinize these

ideas against the backdrop of reality. The author posits that individuals with limited creative capacity often grapple with excessively stringent censors. Consequently, enhancing creativity involves cultivating a more permissive censor, achievable through continual experimentation, stepping outside one's comfort zone, and embracing novel experiences. Moreover, the work environment plays a pivotal role in influencing the generation of innovative ideas (Jones, 2012).

The aforementioned model, while notably uncomplicated and comprehensible, serves as an apt analogy for the experiences of both employees and founders. Their inherently restrictive mental censors serve as impediments to the emergence of innovative ideas. When managers exhibit willingness to engage in open dialogue with their employees, encouraging them to articulate their thoughts, proffer novel concepts, and transcend conventional boundaries, the process of conceiving fresh ideas, devising innovative solutions, and introducing novel products and practices is catalyzed at an accelerated pace.

Beyond theoretical constructs, well-established methodologies aimed at enabling enterprises to derive novel solutions for extant challenges and fostering heightened levels of innovation and creativity have been systematically delineated and advanced by Rory Kenny (Kenny, 2005) and are briefly detailed in the next table:

Table 4. The 3 stages of new solution development and description of 18 creativity enhancing techniques

Stage	Techniques used	What such techniques imply
Preparation	Trust creating	Playing games, storytelling, telling jokes
	Momentum creating	Create time pressure and excitement
	Controversy creating	Emotional involvement of participating groups
	Suspending of judgment	Changing paradigms, becoming a "yes-man"
	Flow	Constant brainstorm
	Green housing	Building up and nurturing ideas
Breakthrough	Experimental thinking	Radical idea generation and debate
	Brain-writing	For generating connection with previously mentioned ideas
	Excursion	Temporarily removal of the idea from one's head
	Metaphorical thinking	Re-expressing and re-stating the problem
	Analogies	Making comparisons

Stage	Techniques used	What such techniques imply
	Association	Connecting two or more ideas
	Imagination	Taking a leap into future events
	Dream	Thinking above and beyond what is real
Enhancing	"What's not there"	Visualize gaps in new opportunities but problems alike
	Storyboarding	Narration of problems, ideas, and solutions
	Scenario planning	Predict future scenarios, somewhat contingency planning.
	Evaluation grid	Judging, compare and rank ideas

Source: Adapted by the author from Kenny (Kenny, 2005)

The question that remains to be addressed pertains to the identification of the optimal techniques for implementation. Prior to resolving this inquiry, it is imperative for both teams and individuals to delineate their objectives and the intended applications of these techniques, along with the underlying purposes. In this regard, the preliminary step entails the determination of whether these techniques are to be employed collectively within groups or by individual practitioners. Simultaneously, the decision-makers must ascertain the temporal commitment they are willing to allocate to these activities, ranging from brief intervals such as ten or fifteen minutes to more substantial durations of half an hour or an hour, among others. Additionally, stakeholders must deliberate whether the primary aim of employing these techniques is environmental analysis, encompassing the organizational, team, or external contexts, or whether the focus is on hypothesis generation.

James C. Kaufman is a prominent figure within the realm of creativity, renowned for his significant contributions as both a theorist and practitioner. While he has engendered a multitude of creativity theories throughout his career, one theory of particular relevance to this discourse is the "The Four C Model of Creativity," which he co-developed in collaboration with dr. Ron Bagheto. Central to this theory is the dichotomy of "Big C" and "little c," concepts that have been previously expounded upon within the academic domain. In this framework, "Big C" connotes creativity exemplified by individuals of extraordinary genius, yielding outcomes that transcend generations and remain indelibly etched in societal memory. Conversely, "little c" denotes the realm of ordinary or everyday creativity, characterized by commonplace instances of innovative thinking and problem-solving (Kaufman & Beghetto, 2009).

James C. Kaufman's theoretical framework introduces a novel taxonomy by incorporating the concepts of " little c" and "pro-c" alongside the previously established categories of "big C" and "little c." This additional categorization is prompted by the recognition that the overarching classifications of "big C" and "little c" exhibit a certain degree of generality and lack granularity. The category of " little c" is specifically designed to elucidate instances of creative ideation within the context of formal education and scholastic endeavors. Conversely, "big c" designates individuals characterized by their status as creative experts, despite not yet having garnered the full extent of recognition commensurate with their creative prowess, or whose prominence has not been widely acknowledged within their respective domains (Kaufman , 2009).

Several conclusions can be derived from the preceding discussion, which extends beyond the confines of the model presented above. As posited by various scholars, it is imperative to recognize that originality alone does not necessarily signify creativity. In addition to originality, the context or environment in which an individual operates at a given moment can exert a profound influence on creative thinking, yielding both positive and negative effects. Despite the initial impression that creative thoughts may spontaneously arise in a fleeting instant, the reality is markedly different. Creative ideation often demands sustained effort, perseverance, and dedication. Ultimately, the toil invested in this creative thinking process is offset by the rewards it yields, benefiting not only the individual but also the organization. In light of the ever-evolving landscape of the startup sector and the dynamic nature of the field of management, scholars such as Fangqi Xu and Tudor Rickards, recognizing the pivotal role of creativity in the realm of business, have proffered three fundamental principles underpinning creative management. The aforementioned principles are detailed bellow:

a. The principle of "universality"- this principle underscores the inherent presence of creativity within all individuals, regardless of their roles or positions within an organization.
b. The principle of "enrichment/development"- under specific conducive conditions that foster employee growth, individuals can harness their latent creative potential, transforming it into manifest creativity.

c. The principle of the "environment"- various attributes and elements of the surrounding milieu play a significant role in nurturing and manifesting creativity (Fangqi & Rickards, 2007).

For organizations to thrive in achieving their desired innovative outcomes, it is imperative that they establish a conducive context for nurturing creativity within their internal milieu. Furthermore, they must cultivate an environment that not only responds proactively to external stimuli but also attracts creative individuals, companies, and innovators, encouraging their active participation and investment in the organization.

In terms of strategic choices related to innovation and research and development, firms and decision-makers must deliberate carefully. They face the decision of adopting either an offensive business model and strategy, where they proactively introduce new ideas, services, and products to the market, or a defensive strategy, where they await competitors' initiatives to mitigate uncertainties associated with launching new products. Correspondingly, start-ups can opt for various strategies, including imitative, dependent, or opportunistic approaches; these choices significantly influence their innovation and competitive positioning (Miles & Snow, 1978). Start-ups must not only sustain but ideally enhance the pace at which they respond to both internal and external variables. Simultaneously, these firms must diligently preserve the fundamental elements of their core business model. Moreover, when evaluating the risk associated with adopting a new strategy, measures should be systematically instituted to mitigate and minimize potential risks (Cohen & Levinthal, 1990).

The Oxford Handbook of Innovation presents a comprehensive categorization of innovation, encompassing regional, sectoral, and ultimately, national dimensions (Fagerberg, et al., 2005). Despite the empirical evidence suggesting improvements in competitiveness and heightened research and development (R&D) productivity, it is imperative to adopt a bottom-up approach. While a robust and expanding economy might intuitively be presumed to bolster R&D performance, an intriguing observation is noted in the context of Romania and Cyprus. In these cases, the research and innovation landscape has exhibited a decline, even in the

face of a 5.8 percent increase in "innovation output" at the European Union level (European Commission, 2018).

During periods of economic contraction, the unwavering allocation of financial resources to innovation and research and development (R&D) assumes paramount significance. While this concept warrants recurrent examination, empirical investigations conducted by Archibugi et al. (Archibugi, et al., 2013) substantiate the resilience exhibited by firms that have adhered to this practice during economic recessions. These enterprises not only successfully weathered the adverse economic climate but also continued to advance and prosper.

As previously articulated within this manuscript, the theoretical paradigms delineated by various scholars over time are intended to serve as guiding principles for startup founders and entrepreneurs.

However, irrespective of the robustness of one's theoretical foundation, enterprises, including startups, necessitate a legal infrastructure that can facilitate their effective operation and growth. Consequently, the forthcoming subsection will be dedicated to a comprehensive examination of the legislative landscape pertaining to the startup business sector at the national level in Romania.

1.2.2. Legislative Insights on Start-ups and Intellectual Property Rights

At the outset of this subchapter, it is imperative to delineate that the principal objective and purview herein do not encompass an exhaustive discussion of Romanian legislative measures aimed at fostering entrepreneurship and catalyzing entrepreneurial and startup endeavors on a national scale. The primary objective of this subchapter is to elucidate the manner in which the perspectives and sentiments of the populace contribute to the formulation of extant Romanian legislation pertaining to startups and to assess the reverberations of the prevailing legislative framework on the entrepreneurial milieu.

In the present regulatory framework of Romania, the establishment of a new business enterprise entails a procedural timeline of approximately 20 working days, involving a sequence of six formal and legal requisites to initiate and commence operational activities. A study conducted by the

World Bank Group has situated Romania at the 91st position among 190 nations, reflecting its relative standing concerning the facilitation of commencing entrepreneurial endeavors (World Bank Group, 2018).

A rapport published in 2014 by the Organization for Economic Co-operation and Development (OECD) concerning competitiveness in Romania mentions the following: "the protection of SMEs or similar structural concerns does not play any major role on competition policy or law enforcement" (OECD, 2014). Undoubtedly, a considerable passage of time has transpired since the aforementioned period, resulting in notable developments within the current legislative landscape pertaining to entrepreneurship and start-up ventures. While it is true that there have been initiatives designed to foster and support entrepreneurial activities, it is imperative to acknowledge that each such development can yield either positive or negative consequences. Shifting our focus to the year 2018, within that temporal span, a total of 236 modifications to the fiscal code were introduced, with 97 of these adjustments coming into effect on the 1st of January 2018. This regulatory flux has undeniably left its mark on the business ecosystem of the nation, manifesting adverse effects such as heightened bureaucratic complexities, increased operational burdens related to compliance and regulatory adherence, elevated administrative expenditures, diminished competitiveness, and augmented market entry obstacles. In the backdrop of these myriad fiscal alterations, the year 2018 bore witness to a decline in newly established enterprises stemming from Foreign Direct Investment (FDI) sources, amounting to 4,718 companies. Furthermore, the tally of newly registered businesses experienced a reduction of 8,457 entities, resulting in an aggregate count of 121,061. Notably, the incidence of business insolvencies surged by 28.07% in comparison to the preceding year, denoting a significant departure from the prior economic landscape. A total of 13 normative acts have instigated revisions encompassing 139 articles within the fiscal code (Raluca Abrihan, 2018). Hence, it is evident that legislation wields multifaceted influences on the business sphere, profoundly impacting its operations. Furthermore, legislation exerts a pronounced influence on the competitive landscape, not only within a single nation but also on a global scale. While various factors contribute to international competitiveness, the ease and transparency of

conducting business within a specific country, as dictated by national legislation, emerge as pivotal determinants. As substantiated by the 2018 Global Competitiveness Index, Romania secured the 52nd position, accompanied by a competitiveness score of 63.5 (World Economic Forum, 2018). In the year 2019, a discernible progression is observable, wherein Romania's national ranking has advanced, currently standing at the 51st position in the global competitiveness landscape, accompanied by a commendable score of 64.4 (World Economic Forum, 2019). These reports have been conducted on a sample of 140, respectively 141 countries.

Of course, from the vantage point of legislative frameworks and national progress, the Romanian Governmental Strategy for the Advancement of Small and Medium-sized Enterprises (SMEs) and the Business Environment underscores its ambition to foster the emergence and growth of over 670,000 vibrant SMEs by the year 2020. This strategic endeavor aspires to achieve a density of 36 SMEs per 1000 inhabitants by the same milestone year, thus substantiating its commitment to enhancing the entrepreneurial landscape (OECD, 2018). When evaluating a nation's economic performance and capacity, conventional assessments often revolve around quantifying the density of enterprises or firms per capita. We contend that this approach warrants reconsideration. Not all operational entities, particularly small and medium-sized enterprises (SMEs), possess the potential to exert significant influence on a nation's populace. Instead, we propose a shift in focus toward the number of startups as a pivotal metric when appraising a region's economic potential. Startups, due to their distinctive characteristics, tend to yield a more pronounced impact on both regional and national levels than their conventional SME counterparts. Consequently, the adoption of meticulously researched, comprehensive legislation aimed at fostering and championing the cause of startups is imperative.

In light of the prevailing circumstances within Romania, characterized by the scope, intricacies, and robustness of its judicial framework, a consensus among various experts has emerged. It is widely acknowledged that the establishment of an autonomous national council and agency dedicated to fostering innovation and entrepreneurship is imperative. Such entities would play a pivotal role in furnishing essential resources and financial support for entrepreneurial initiatives. Furthermore, it is equally

paramount to enact legislation conducive to the cultivation of entrepreneurship with a long-term orientation, as underscored by the European Commission in 2018 (European Commision, 2018).

Another salient aspect pertaining to the legal framework pertains not only to the business environment but encompasses the entire legal system, emphasizing the crucial attributes of clarity and precision in lawmaking and regulations. A well-structured legal framework should be meticulously crafted to obviate conflicts and contradictions within the body of legislation. Regrettably, such instances of legislative incongruence are pervasive in the Romanian context, precipitating an upsurge in bureaucratic hurdles and eroding confidence in the market's potential. It is imperative to underscore that this predicament extends beyond the confines of Romanian business proprietors, exerting a deleterious influence on prospective investors from diverse international origins who seek opportunities within an increasingly globalized market milieu (Institute of Export, 2015).

It is paramount to acknowledge that start-ups proliferate across diverse sectors encompassing technology, biotechnology, financial services, transportation, and education, among others. Given this broad spectrum and the intricate nature of each start-up and its associated sector, legislative frameworks are inherently susceptible to harboring ambiguities and inefficiencies. Consequently, it becomes imperative for legislation to adopt a proactive stance, perpetually seeking avenues for enhancement, not only in response to prevailing issues but also in anticipation of future trends and the evolving trajectory of the business and legal landscape.

The essence of innovation constitutes the very nucleus of start-ups. Within the current Romanian business milieu, the significance attributed to intellectual property (IP) and communal knowledge remains relatively limited. To harness the potential of communal knowledge effectively, four fundamental constituents must be in place: openness, collaborative engagement, knowledge-sharing, and a global outlook (Tapscott & Williams, 2008). Collective knowledge, driven by the constituent elements of openness, collaborative engagement, knowledge-sharing, and a global outlook, emerges as a pivotal catalyst for innovation. Its strategic implications are multifaceted, yielding numerous benefits that underscore its growing significance in the contemporary landscape. Furthermore, the associated

costs linked to the utilization of collective knowledge pools exhibit a progressive trend toward greater affordability, thereby rendering this invaluable resource accessible to an expanding cohort of start-ups. The contributions harnessed from and directed toward online communities, coupled with the functionalities of data mining, recommendation engines, profile construction, web and text mining, as well as the integration of artificial intelligence (AI), collectively exemplify the diverse avenues through which the wisdom of the masses is harnessed to bolster innovation endeavors (Maithili, et al., 2012). While the nascent stage of collective knowledge utilization may initially appear as a limitation, it should be regarded as a burgeoning frontier brimming with forthcoming opportunities. Emerging paradigms of open-source collaboration, both within and among enterprises, the proliferation of co-working spaces, the establishment of regional innovation hubs, and the expanding embrace of collective knowledge are progressively gaining traction, particularly in the Eastern European context (Schiavone, 2009). The extent to which Romania can be regarded as a formidable contender in terms of its developmental potential on the European stage is yet to be conclusively determined. Undoubtedly, latent potential exists, yet the ultimate trajectory, objectives, and outcomes of this potential remain in a state of evolution and anticipation.

Regarding property rights, at the national level in Romania, the primary legislative framework governing copyright matters is Law 8/1996. This law has undergone multiple revisions and amendments, largely in response to directives originating from the European Union that necessitated corresponding adjustments at the Romanian national level. Law 8/1996 specifically pertains to the copyright protection of literary works, artistic creations, scientific works (including software), among others. According to Law 210/2015, copyright entitlements endure for the duration of the author's lifetime and extend to the author's heirs for a maximum of 70 years. In the realm of patents, these intellectual property rights are conferred by the Office for Inventions and Trademarks (OSIM) and are governed by Law 64/1991. Patents remain valid for a period of 20 years (KPMG Romania, 2018). Moreover, with regard to intellectual property rights, Romania is signatory to the 1883 Paris Convention for the Protection of Industrial Property (Institute of Export, 2015).

In Romania, the legal framework pertaining to patent and intellectual property rights comprises a total of 33 legislative enactments, 12 regulatory texts for the implementation of rules and regulations, and 3 legislative texts related to the approval of international treaties (World Intellectual Property Organization, 2019). As indicated in the World Intellectual Property Report for the year 2018, Romania has submitted 33 patent applications, 37 trademark registrations, and 32 design applications. Of particular significance in this context is the observation that the magnitude of a nation and its population are not the primary determinants of intellectual property (IP) productivity. Notably, Romania experienced an increase of 10.8% in its IP output from 2017 to 2018 (World Intellectual Property Organization, 2018).

From an objective vantage point, patents bestow a plethora of advantages. Throughout the expositions within this compendium, it has been reiterated several times that fostering creativity and innovation necessitates specific incentives. As posited by scholars such as Mazzoleni and Nelson, the rationales underpinning the objectives and imperatives of patents can be broadly categorized into four principal theories: firstly, the "motivate to innovate" theory, predominantly driven by economic incentives; secondly, the "induce commercialization" theory; thirdly, the theory emphasizing information disclosure; and fourthly, the "exploration control" theory, alternatively known as the prospect theory, which postulates that an inaugural discovery serves as a catalyst for subsequent developments and inventions (Mazzoleni & Nelson, 1998). The previous authors are not the only ones sharing this belief. Other authors such as Arrow (1962), Nordhaus (1969) and Kitch (1977) Exercise a profound influence concerning discoveries in the realm of intellectual property rights, encompassing the costs, benefits, and prospects entwined with intellectual property.

It is imperative to highlight that, in addition to their economic implications, patents also yield social benefits that extend beyond company-specific advantages, aiming to disseminate these benefits throughout the broader population. Whether considering social or economic motivations, it is essential to recognize that patented innovations pertain to novel creations

that do not yet exist but will become accessible to various entities and individuals.

It should be emphasized that patents represent merely one facet among many for incentivizing innovation and creativity. Furthermore, a well-structured patent regulatory framework fosters the swift dissemination of information, knowledge, and value. While conferring a temporary monopoly, patents offer distinct advantages to their holders. However, in the long run, they contribute to heightened competitiveness and the acceleration of innovation within a particular industry. This, in turn, creates an environment conducive to newcomers who can approach existing challenges with innovative perspectives without infringing upon patent laws (Langinier & Moschini, 2002). Indeed, as underscored by the authors, it is crucial to explore strategies for optimizing the economic benefits derived from patents. The trajectory of innovation stemming from patents typically unfolds in a sequenced manner. It is reasonable to anticipate that second-stage innovation may yield greater economic returns than initial-stage innovation. Consequently, it is imperative that patents be meticulously crafted to safeguard the interests of both the entities responsible for pioneering the patented innovation and the broader industry.

Having furnished insights and data concerning innovation, legislative frameworks, and patent regulations, the ensuing subsection will pivot towards elucidating the pivotal role assumed by local and national authorities in shaping the prospects for success and fostering the entrepreneurial drive of emerging startups and enterprises.

1.2.3. The Role of Local and National Governance in Startup Development

Across the European Union (EU), member states exhibit varying levels of performance across a spectrum of dimensions that collectively constitute the landscape of innovation. These dimensions encompass a range of factors, including but not limited to: "human resources, attractive research systems, innovation friendly environment, finance and support, firm investments, innovators, linkages, intellectual assets, employment and sales impacts" (European Commission, 2018). The reduction of research and development (R&D) costs and the facilitation of innovation, particularly in eastern regions,

can be achieved through the utilization of "financial incentives" provided by western companies. However, the augmentation of innovation scores at both national and regional levels entails a broader spectrum of strategies. It is essential to pose the question: Is it possible for innovation to transpire at a reduced expenditure? The response to this query should not be overly simplistic. Although certain companies may affirmatively respond in favor of innovation occurring at lower costs, it is imperative to maintain a stance of continuous analysis and research to firmly substantiate such claims.

Furthermore, it is important to acknowledge the inadequacy of a universally applicable approach in the endeavor to enhance creative and R&D prospects within diverse countries and regions. Given the myriad distinctions encompassing geography, culture, economics, education, and politics among nations, a significant challenge confronting regulators, such as the European Union (EU), national governments, and regional authorities, involves the establishment of specialized commissions entrusted with steering the future development of creativity and innovation within these distinct locales.

It is worth noting that as regions advance in terms of their innovation and research capabilities, a cascade effect is expected to ensue, enhancing various facets of human existence and business operations. To accomplish this, countries and regions must be willing to cede a portion of their national authority.

Concerning their developmental strategies, enterprises and decision-makers must meticulously deliberate upon the type of strategic orientation they opt for in the realm of innovation and research and development. They face a pivotal choice between an offensive business model and strategy, which entails pioneering innovation in the market by introducing novel ideas, services, and products, or adopting a defensive strategy characterized by a readiness to observe market dynamics, allowing competitors to address uncertainties associated with the launch of new products. Consequently, startups find themselves confronted with several strategic alternatives, including the imitative strategy, which involves emulating existing models and ideas; the dependent strategy, entailing reliance on external entities or partners for innovation; and the opportunistic strategy, which leverages unforeseen chances and market conditions for innovation and growth (Miles

& Snow, 1978). The velocity at which start-up enterprises adjust to both internal and external variables must be sustained, with the ultimate goal of augmenting the pace of adaptation, ideally. Concurrently, these firms must ensure the preservation of the fundamental underpinnings of their core business model. Furthermore, they should conduct a comprehensive risk assessment with respect to a novel strategy, facilitating the implementation of measures aimed at mitigating potential risks (Cohen & Levinthal, 1990).

As is the case with any strategic approach, it is imperative to emphasize that the selected strategy should yield advantages and prospects not solely for the executing entity but also for the sphere of "co-opetition." This sphere encompasses suppliers, customers, competitors, collaborators, and other supplementary stakeholders (Afuah, 2000). If founders can formulate a strategy that confers benefits upon all the involved stakeholders, the entire start-up enterprise will operate at peak efficiency. It will facilitate the unimpeded flow of innovation both within and outside the company, making innovative output and ongoing research and development integral components of the founders' vision and mission statements. However, founders may occasionally lack the requisite decision-making skills. This is where co-working spaces prove invaluable. Such facilities foster collaboration not only among start-ups but also between start-ups and experienced and knowledgeable business angels, mentors, and other enterprises. While it is common for privately held enterprises to manage these co-working spaces in the present era, it is imperative for local and national authorities to consider the development of state-owned or locally governed co-working spaces.

Another significant opportunity that Romania is poised to leverage pertains to the potential impact and significance of universities in promoting open and streamlined models of innovation and collaboration. Concepts advocated and substantiated by scholars like Chesbrough and Vanhaverbeke demonstrate how universities could serve as the bedrock for the advancement of smart cities, ultimately leading to the creation, adaptation, and adoption of novel ideas and business ventures. In the case of Romania, as with other cities worldwide, the proliferation and accelerated impact of smart cities are evident. This not only spurs the growth of existing start-ups but also attracts more talent and ideas, resulting in an increased

number of start-ups being established in these areas. In this context, it becomes imperative for local and national policymakers and governments to pave the way for such developments, particularly regarding the involvement of universities in attracting, nurturing, and supporting start-ups. In this specific scenario, universities assume roles not only as primary sources of intellectual capital and human resources but also as consultants to newly formed enterprises.

In addition to influencing the general welfare of the population, innovations and advancements stemming from start-up enterprises yield another crucial advantage: the influx of intellectual property in the form of patents, a facet that has historically been underappreciated. While start-ups may not yet contribute as much taxable revenue to the treasuries of the states in which they operate compared to large corporations, they indeed possess the potential to generate substantial revenue. Building upon the foundational assumption that start-ups have the capacity and willingness to fulfill their tax obligations, several critical points warrant consideration: Should start-ups be subject to the same tax regulations as well-established enterprises? Which jurisdiction's legislation should govern the taxation of start-ups? Is there a need for broader European legislation governing the status, rights, and obligations of start-ups? Should a European fund be established exclusively to foster the growth of start-ups? The inescapable conclusion that emerges from these foundational assumptions is as follows: the contemporary implications and significance of start-ups are manifold, extensive, and in some instances, still obscure. Beyond their economic ramifications, it is imperative to grasp the sociodemographic and technological implications inherent in the development of regional start-up hubs.

Currently, Berlin stands as Europe's preeminent start-up capital, attracting brilliant, creative, and visionary individuals. Eastern Europe, however, possesses the potential to nurture its own burgeoning start-up hotspots. Over time, Cluj-Napoca could emerge as a strong contender for the position of a European start-up hotspot, or at the very least, a strategic hub for start-ups. Nonetheless, numerous hurdles must be overcome to realize this potential. Collaboration among technology hubs is an imperative step in this direction. By fostering cooperation, cities like Oradea and Cluj-Napoca

can evolve into not only vital think tanks, hubs, and cluster leaders at a regional level but also wield influence on a national scale. Further details regarding the state of affairs in Oradea and Cluj-Napoca will be expounded upon in subsequent chapters. Such collaborative efforts also serve to enhance Romania's visibility within the European start-up sector.

In 2016, the European Commission proposed earmarking 3 percent of the total GDP of the European Union for research programs. This allocation has the potential to underpin the creation of approximately 3.7 million jobs by 2020. The 2016 Innobarometer revealed that in all member states, excluding Lithuania, companies were more likely to report that their innovations accounted for between 1 and 25 percent of their 2015 turnover (European Commission, 2016). The rationale for addressing research and development endeavors at the European level is readily apparent. Romania currently ranks second to last within the European Union concerning its expenditure on research and development, a meager 0.48 percent of its Gross Domestic Product (GDP). This figure falls considerably short of the EU's objective, which seeks a commitment from its member states to allocate 3 percent of their GDP to research, development, and innovation initiatives (Eurostat, 2016).

Of course, there exist alternative avenues through which governmental authorities can facilitate the growth of businesses and startups. One pivotal approach involves the establishment of a robust legal and operational infrastructure that enables newly established enterprises to access and qualify for various forms of international funding, exemplified by European-backed grants and funds. At the national level, initiatives such as “Start-up Nation” and “Start-up plus” have achieved notable outcomes. For instance, in terms of outcomes, the “Start-Up Nation” program in 2019 contributed to the establishment and financial support of 11,576 new businesses (www.startupcafe.ro, 2019). According to data from the National Institute of Statistics, as of January 1st, 2019, Romania boasted a population of approximately 19 million inhabitants. Should we divide the total population of Romania by the number of start-ups established through the “Start-up Nation” program in 2019, we arrive at a quotient of 1641, signifying that one new enterprise emerged through the aforementioned program for every 1641 individuals in the population. It is essential to underscore that this

book's scope extends beyond the examination of such programs, like the aforementioned "Start-up Nation" initiative. The mention of this program in this context is justified due to the fact that a considerable number of companies have been initiated under its auspices. However, it is crucial to clarify that not all companies financed through such programs are inherently innovative. To the best of our knowledge, no comprehensive investigations have been conducted to assess the levels of innovation exhibited by companies supported through the "Start-up Nation" program. Consequently, this represents a compelling avenue for prospective research endeavors.

Establishing the legal framework to facilitate access to various forms of international funding represents just one facet of the broader challenge. As per a study developed and run by Ernst and Young (Ernst and Young, 2017), various factors influence individuals' decisions to initiate and cultivate their own enterprises. According to the aforementioned study, the predominant impediment deterring individuals from embarking on entrepreneurial ventures is the substantial bureaucratic hurdles. Notably, while in 2016, only 11% of respondents cited bureaucracy as a hindrance to entrepreneurial initiation, this figure surged to 28% in 2017. Consequently, a straightforward deduction emerges: to foster the expansion of the startup sector by stimulating business creation, authorities must meticulously craft an apt legal framework and streamline bureaucratic processes. The same study has identified an additional set of four government interventions that respondents believe would exert the most significant impact on the commencement and development of businesses, factors that will be detailed in the following table:

Table 5. Potential government measures for start-up development, as envisioned by the respondents, presented as share of total responders.

Solutions for financing start-ups	27% of respondents
Tax exemptions for start-ups	24% of respondents
Relaxation and tax simplification	20% of respondents
Fiscal predictability	4% of respondents

Source: Adapted by the author from an Ernst and Young report (Ernst and Young, 2017)

The advancement of innovation stemming from startup enterprises brings about several significant advantages. It enhances competitiveness,

reduces developmental expenditures, introduces positive market disruptions, augments research initiatives, and further nurtures open-source collaboration. Moreover, it has a direct impact on improving living standards and elevating educational levels. Although concepts like crowdfunding, angel investors, seed funding rounds, and collaborative knowledge and development have been in existence for a considerable duration, their successful execution has been notably prevalent in the Western World, including Western Europe. In contrast, the emergence of startups in Romanian industries represents a relatively untapped potential. As we delve deeper into understanding these concepts and their underlying principles, we can anticipate comprehensive enhancements across various domains such as business, quality of life, security, finance, healthcare, and education. The ramifications and reach of startups will extend not only nationally but also globally. It is worth noting that while the aforementioned cities may not exhibit the same level of internationalization as some metropolises, they are dynamic in their own right. The findings and research of Lumpkins and Dess, repeatedly tested, reaffirm the positive influence of dynamic environments on innovation. Such dynamic settings serve as incubators for innovation, whereas in more stable environments, the pace of creative and innovative endeavors within companies is notably subdued (Lumpkin & Dess, 1996). Considering the rapid pace of development within the business environments of Cluj-Napoca and Oradea, the trajectory of innovation by startups originating from these two cities appears to follow an encouraging trend. However, it is essential to recognize that present-day accomplishments do not guarantee the future performance of startups in these localities. A comprehensive analysis and collaborative support effort involving various stakeholders, including founders, local governments, and both the private and public sectors, are imperative to augment the performance, productivity, and quantity of startups emanating from these strategically significant cities.

It is worth noting that the proliferation of startups in the Eastern European region has been notably slower compared to its Western counterparts. Regarding Romanian startups, several salient points merit consideration. First, Romania has produced fewer startups that have achieved notable international success or secured international funding.

Additionally, the longevity of startups originating in Romania, in terms of their activity and presence in both domestic and international markets, tends to be shorter than that of their European counterparts. Moreover, the level of support from both the public and private sectors in Romania is relatively lower than in other European nations, and access to relevant information is limited. Therefore, up to this point, it is reasonable to assume that distinctive factors contribute to the successful development of startups. It is evident that a one-size-fits-all approach regarding rules and determinants of success is not applicable. When embarking on the creation of a startup, various essential conditions and factors must align to motivate a founder's decision to proceed. To facilitate this decision-making process, the OLI Model (Dunning, 1988) can be effectively employed. This model, which encompasses Ownership, Location, and Internalization, proves valuable when assessing the advantages a company possesses when entering a new or foreign market. By addressing questions pertaining to ownership, location, and internalization, companies can transition from macro-level analyses of business opportunities to micro-level assessments of company-specific strengths, weaknesses, and strategies to mitigate them (Lorraine, 2003). As not by Lorraine (Lorraine, 2003), the OLI model serves as a valuable framework for elucidating the rationale, geographical context, and operational strategies underpinning SME activities. Nevertheless, startups grapple with a significant intricacy when endeavoring to apply this model for the purpose of expanding their operations across multiple countries, driven by their aspirations to establish a global footprint. This particular challenge warrants consideration as a prospective avenue for future research, focusing on elucidating the utilization of the OLI analysis for conducting multi-country assessments.

As previously elucidated, the decision to penetrate a specific market, sector, or field arises from the confluence of three distinct advantages or benefits: ownership advantage, location advantage, and internationalization advantage. In this context, “advantages” denotes the competitive edge derived from possessing specific attributes, including trademarks, entrepreneurial acumen, production techniques, patents, and brand recognition (ownership advantage). Location advantage pertains to the attractions or resources inherent to a particular geographical area that

startups can leverage in their business development efforts. These may encompass the availability of raw materials, favorable labor cost structures, the potential to attract talented personnel, and a high level of educational attainment among the local workforce. Finally, the internationalization advantage encapsulates the strategic benefits associated with scaling operations beyond national borders (Dunning, 1988). Local governments play a pivotal role in enhancing the allure of a specific town or region to prospective startup founders. The suggestion to employ the OLI model also extends to stakeholders beyond startup enterprises, encompassing local and national governmental bodies. This model can be effectively harnessed by authorities to evaluate the existing attractiveness of a region or country to foreign investors, the potential workforce, and the reservoir of human capital.

It is essential to acknowledge that disparities will inevitably manifest among various regions. Nevertheless, such an analytical approach serves as an initial reference point for formulating regional transformational strategies and diversifying their portfolio of assets, mirroring the strategies often employed by corporations (Lorraine, 2003).

In the prevailing market landscape, competition remains exceptionally intense, transcending industry sectors, and originating from global quarters. Consequently, it is imperative that at the national level in Romania, authorities expedite the pace of innovation and actively foster the establishment of nascent startup enterprises.

Chapter 2. Innovative Enterprises and Their Impact on Local and Regional Development

As gleaned from the preceding chapters, innovation assumes a pivotal role within the dynamic and transformative domain of startup enterprises. While there exists a myriad of steps and strategies that startup decision-makers can employ to assess their current internal and external strengths, weaknesses, and future prospects, it is evident that local and national authorities wield a commensurately significant influence in facilitating conducive conditions for startup proliferation across various regions of Romania. The dual role inhabited by decision-makers, both from the private and public sectors, adds a layer of complexity and dynamism to this sector. Thus far, public authorities have predominantly adopted a reactive stance regarding sectoral development, contrasting with the proactive, market-shaping approach embraced by startup businesses. It is imperative that local and national administrations expedite the transition from this reactive orientation to a proactive and market-enabling approach (Ernst and Young, 2017). As expounded upon in the preceding chapter, a discernible inverse relationship exists between innovation and the centralization of decision-making processes. This correlation intimates that as the decision-making mechanism becomes more confined, tending to be monopolized by a singular individual or a select few, the innovative potential of the organization is inclined to diminish (Subramanian & NIlakanta, 1996). This does not imply a reverse relationship for local authorities. Given that decision-making authority within local and national governmental bodies tends to be centralized, the expectation is that such centralization should ideally foster innovation capabilities or, at the very least, create a conducive environment for innovation and the flourishing of start-ups. However, as we will delve into, this expectation is not met in the context of Romania. Instead, it is precisely this centralization that impedes and diminishes Romania's innovation capabilities.

When referring to authorities, both local and national, it becomes apparent that the presence of specialized individuals well-versed in concepts related to start-ups, innovation, and the transformative economy is essential to creating the optimal conditions for new business ventures. Thus, there is a need for authorities to transition from a passive, market-taker approach to a proactive, market-maker approach.

As such, this chapter will encompass an examination of findings and analyses concerning the working conditions of start-ups, their development trajectories, market shares, and value propositions. Furthermore, it will place significant emphasis on assessing how the process of transformation occurs at regional levels, with a focus on understanding how cities are facilitating accelerated start-up growth. Given that this research is centered on the cities of Oradea and Cluj-Napoca, the analysis of urban evolution and development will be concentrated on these two cities and their respective regions.

In addition to this regional perspective, the chapter will explore nationwide collaborations among local authorities aimed at fostering the creation of smart cities. We will investigate ways in which cities can enhance their reputation in terms of innovation, engage their communities in the decision-making process, and attract and nurture a pool of skilled individuals who can contribute to the local business ecosystem. The continuous collaboration between the private sector (start-ups) and the public sector (local authorities and universities), coupled with robust technological infrastructure (high connectivity), serves as a crucial step in elevating ordinary cities to smart cities.

Furthermore, we will examine the impact of digital technologies on development, particularly how they influence innovation, efficiency, and community engagement. While specialization will be underscored, we will also explore the shifting role and significance of transitioning from single specialization to cross-sector specialization throughout this chapter (Cannan, 2000).

As of the period in which this study was conducted, there appears to be a notable absence of a cohesive and standardized framework within the European Union concerning the start-up sector. While financial resources and grants are allocated to national authorities by the European Union, the

responsibility for formulating frameworks conducive to start-up development primarily rests with these national entities (Eurostat, 2016). However, it is noteworthy that the European Commission houses the Directorate-General for Research and Innovation (DGRTD), which has established a support facility operating at the European level. The primary function of this entity is to offer expertise and advisory services. It is crucial to underline that its role is essentially collaborative and contingent upon the willingness of member states to engage in such partnerships (European Commission Directorate-General for Research and Innovation, 2017). Hence, discernible disparities among the various member states within the EU become apparent. In light of this situation, a comprehensive analysis of the constraints encountered in various regions concerning start-up development will be undertaken, and valuable insights will be expounded. Furthermore, an extensive comparative study between the European and U.S. landscapes in the start-up sector will be conducted. Additionally, this chapter will address the current disparities prevalent across different European regions and elucidate the overarching directions and trends observed in the start-up sector.

Given the intrinsic relationship between innovation, entrepreneurship, and start-ups, it is imperative to delve into the mechanisms underpinning this interconnectedness and elucidate the impact of innovation and entrepreneurship on regional development. Thus, this chapter assumes the task of providing insights into how the start-up sector influences regional development. Building upon an OECD (Organization for Economic Co-operation and Development) report regarding the enhancement of the economic environment to foster heightened economic dynamism (OECD, 1998), a dual-pronged approach will be adopted to assess regional readiness levels for start-up activities. This approach hinges on a fundamental question: does the start-up sector primarily drive regional development, or are the inherent strengths and opportunistic attributes of regions the key drivers that attract the development of the start-up sector?

Subsequently, in the ensuing subchapter, a comprehensive exploration of the overarching trends within the start-up sector will be expounded. These discussions will encompass not only Romania as a whole but also European regions and the United States, providing a holistic perspective on the subject matter.

2.1. The Start-up Ecosystem: An Overview

When discussing the realm of start-ups, it is imperative to acknowledge that their operations should not remain static, as the start-up sector is subject to ongoing and multifaceted transformations. While the progress of start-up development varies across countries and regions, it becomes essential to examine the mechanisms that have facilitated these favorable advancements. This chapter, therefore, endeavors not only to scrutinize public and private policies aimed at enhancing the start-up sector but also to delve into the impacts stemming from the robustness of funding initiatives, overarching trends within the start-up domain, and a comparative analysis of various regions.

2.1.1. Emerging Trends in Startup Development

In the context of the widespread presence and ongoing global proliferation of start-ups, it is imperative to recognize that while there exist regional and geographical disparities in their establishment and evolution, there are also overarching commonalities that pervade the majority of start-ups. Hence, our initial focus in this book shall be to delineate general developmental trends within the start-up sphere. Subsequently, we will turn our attention to specific cases, commencing with an examination of the European Union (EU), followed by an exploration of the situation in Romania, and ultimately a discussion and analysis of nuances pertaining to the United States market. It is pertinent to acknowledge that, like any business domain, exceptions do exist within the start-up sector. Nevertheless, this book does not endeavor to concentrate on such exceptional developmental patterns and opportunities, even though they may constitute a compelling subject for scholarly inquiry that remains underexplored.

When we broach the topic of trends in the realm of start-ups, it is advantageous to delineate precisely which types of trends we are considering. Are we alluding to trends as strategic pathways that start-ups

should pursue? Or are we referring to the sectors and industries that will be influenced by start-ups? Should trends encompass only the needs, problems, or challenges that start-ups aim to address? In this multifaceted context, discussions of future trends encompass all the aforementioned facets. Our exploration will commence by outlining general trends within the start-up sector, and subsequently, we will scrutinize the trends that influence major operational models adopted by start-ups and their corresponding industries.

It is essential to underscore that while trends can be approached from a geographical standpoint, and while it is acknowledged that start-ups in different regions may follow distinct trends and developmental trajectories due to unique contextual factors, our primary concern is with overarching trends. Consequently, our focus will center on trends encountered by the majority of start-ups, trends that encompass the processes of learning, innovating, creating, disseminating, satisfying, monetizing, and ultimately subsisting. It is noteworthy that future research should aspire to disentangle and amalgamate geographically specific trends among start-ups.

Augmented learning capacities, untapped potential, and elevated research endeavors are pivotal in augmenting not only the survival prospects of start-ups but also those of conventional enterprises. Such educational enhancements appear to engender greater rates of innovation, both for individual company advancement and for the overarching cause of regional development. However, it is imperative to recognize that survival rates fluctuate over time and are contingent upon a plethora of factors including the state of the economy, policy dynamics, external and internal opportunities, and others. To exemplify the 2017 scenario, enterprise survival rates over a five-year period are summarized in the subsequent table:

Table 6. Survival rate of businesses and distribution throughout countries in 2017

Country	5-year survival rate (%)	Country	5-year survival rate (%)
Malta	72.88	Latvia	43.95
Sweden	61.42	United Kingdom	42.53
Belgium	59.85	Romania	42.48
Luxembourg	54.82	Norway	42.10
Netherlands	53.32	Spain	41.84
Croatia	51.84	Italy	41.14
Austria	51.29	Poland	41.12
France	49.05	Iceland	40.69

Country	5-year survival rate (%)	Country	5-year survival rate (%)
Slovenia	48.36	Finland	40.00
Slovakia	47.36	Germany	38.97
Estonia	46.45	Hungary	38.62
Bulgaria	46.19	Denmark	36.36
Czechia	45.29	Portugal	30.06

Source: Adapted by the author from Eurostat, Business Demography (Eurostat, 2020)

The table data presented above illustrates that Malta exhibits the most robust five-year survival rate for enterprises, closely trailed by Sweden and Belgium. Remarkably, nations characterized by robust economies, such as Germany and Denmark, paradoxically report comparatively lower survival rates, registering at 38.97% and 36.36%, respectively. In the context of Romania, during the year 2017, the survival rate for enterprises stood at 42.48% (Eurostat, 2020).

In a simplified analytical approach, one method of addressing the prevailing trends encountered within the start-up sector involves directing our focus towards the proliferation of start-ups operating within specific industries. Evidently, there is a discernible surge in the number of start-ups venturing into sectors characterized by green energy and the cultivation of eco-friendly business practices. Additionally, the sector is witnessing a surge in experience-based start-ups, dedicated to innovating user experiences and pioneering novel utilization paradigms for particular goods and services. Furthermore, health and medical-oriented start-ups, financial-based initiatives, and research and development-focused enterprises have experienced substantial growth.

However, it is imperative to emphasize that a mere escalation in the quantity of start-ups within a particular domain does not inherently guarantee an accelerated pace of innovation, nor does it imply that all start-ups will contribute significantly to innovative progress.

Moreover, when examining trends, due consideration must be given to replication prospects and opportunities. Given that start-ups often adopt a "born-global" mindset, it becomes paramount to ensure that the outcomes, products, and services they yield are replicable on a global scale, consistently and efficiently (Knight & Cavusgil, 2004). Such endeavors can potentially demarcate the decisive boundary between the survival and demise of start-ups. Nevertheless, it is discernible that collaborative inclinations and the

amalgamation of tasks and resources have gained substantial traction in recent times. This phenomenon is attributed to a more equitable distribution of workloads, resulting in the expeditious cultivation of outcomes.

Furthermore, trends should encompass the pedagogical process, underscoring the notion that prolonged immersion in a specific domain engenders a heightened affinity for that particular field, sector, or domain. Consequently, heightened satisfaction derived from start-up activities correlates with the accelerated generation of innovative output by the founders and their collaborators within the start-up enterprise (Lee & Kim, 2019).

Regarding developmental trajectories, an observable inclination among founders and entrepreneurs pertains to expediting the developmental journey—specifically, the progression from a nascent idea to achieving a global footprint in the shortest conceivable duration. Succinctly, the developmental trajectory of a start-up can be encapsulated as a sequential odyssey: commencing with the generation of ideas and potential solutions to prevailing predicaments or challenges, a collective of individuals harnesses their competencies to address these identified issues. This entails the validation of a business concept, the expansion of the concept to enhance the overall operational efficiency of the start-up, thereby extending its influence to a wider audience of individuals and enterprises. Ultimately, through a systematic refinement and amplification of their business model, start-ups embark on a trajectory that culminates in international prominence (startupcommons.org, 2020). Nonetheless, to attain such a ubiquitous global presence, founders must initially strategize methods for securing essential funding, surmount impediments associated with orchestrating the start-up's organizational intricacies, cultivate and refine novel skill sets, and formulate ideas that generate knowledge and revenue streams.

The 2015 OECD Entrepreneurship report imparts the following perspective: for a significant proportion of start-up ventures, cessation or closure of operations is anticipated to occur during the initial five years of inception (OECD, 2015). In light of this situation, it becomes imperative to explore strategies aimed at either prolonging the lifespan of start-ups or extending the time horizon before their eventual exit. Nonetheless, the same study highlights that even if start-ups cease operations within this initial 5-

year timeframe, the impacts of their endeavors, albeit not translating directly into economic gains for their founders, yield social returns to the community within which the start-up is situated and operates. It is noteworthy that while the prevailing exit timeframe often gravitates towards the initial 5 years, research in the domain of start-ups has indicated that those entities or start-ups surpassing this 5-year threshold tend to experience accelerated growth and heightened productivity levels compared to their earlier phases of operation (Decker, et al., 2014).

The lifecycle and trajectory of a start-up are subject to multifarious influences, encompassing both intrinsic factors unique to the start-up and extrinsic variables extending from competitive forces to prevailing market conditions and enacted regulatory frameworks. Pertinently, in the context of this chapter, it is noteworthy to emphasize the ascendance of macro-level implications that have garnered prominence in recent years, particularly within the purview of national and international regulatory bodies. Nevertheless, these policy trends, albeit assuming a broad-ranging character, remain contingent upon nation-specific prerequisites, perspectives, and orientations toward the facilitation of start-up development. There exists a consensus among both national and supranational policymakers that efficacious policies, designed to foster and support the growth of start-ups and enterprises, must be geared toward "shaping opportunity recognition, influencing market entry, and stimulating market growth" (OECD, 2015). Global ambitions have been directed towards streamlining the process of business establishment, with a particular focus on facilitating the legal, fiscal, and financial dimensions of start-up and enterprise formation. Nevertheless, it is essential to acknowledge that substantial progress remains imperative to achieve these objectives comprehensively. In this context, the Organization for Economic Co-operation and Development (OECD) has delineated a pivotal policy domain essential for expediting innovation within the sphere of start-ups and entrepreneurship: "policies focused on entreprenerial spirit and creativity, equity financing and venture capital, programs targeting SMEs, young firms and start-ups, collaborative networks with start-ups, education for non science and technology (S&T) skills for innovation" (OECD, 2015). The amalgamation and systematic analysis of the aforementioned policies

can yield a more lucid perspective, encompassing both national and regional dimensions. The OECD's report on Science, Technology, and Innovation Policy (STIP) not only offers valuable insights into policy transformations aimed at enhancing the domains of start-ups and entrepreneurship but also furnishes a comprehensive view of specific policies targeted at advancing the realms of science, technology, and innovation (Directorate for science, technology and innovation committee for scientific and technological policy, 2019). Despite its initial experimental nature upon its development in 2016, the continuous iteration of the STIP indicator underscores its value, offering insights that prove beneficial to both policymakers and researchers.

As of 2020, data extracted from the OECD STIP database reveals the existence of 42 policy initiatives at the national level in Romania, all oriented towards the promotion of science, innovation, and technological advancement. These initiatives are structured into distinct categories, comprising 14 governance policies, 10 policy initiatives targeting the public research system, 11 initiatives dedicated to entrepreneurial innovation, 6 endeavors focused on the dissemination and transfer of knowledge between science and industry, 4 policy initiatives addressing the cultivation of human resources for research and innovation, 4 policies aimed at research and innovation for societal purposes, and 1 policy initiative concerned with emerging trends in science, technology, and innovation policy (OECD STIP Compass, 2020). The majority of these policies, as delineated in the country profile sourced from the OECD database, amounting to a total of 17 policy initiatives, have been conceived and instituted under the purview of the Romanian Ministry of Research and Innovation.

Within the cluster of 11 policy initiatives pertaining to entrepreneurial innovation, a nuanced breakdown reveals that 7 of these initiatives are primarily directed towards the provision of financial support for activities related to research and development (R&D). Additionally, there is one policy initiative explicitly designed to stimulate the demand for innovation and foster market development. Furthermore, one policy initiative is strategically oriented toward cultivating an entrepreneurial culture conducive to innovation. Two distinct policies within this spectrum are tailored to formulate effective business innovation strategies. Another policy focuses on furnishing non-financial support for R&D undertakings, and lastly, an

additional policy is expressly designed to provide support to emerging enterprises, particularly those of a youthful nature (OECD STIP Compass, 2020). In light of the varying degrees of economic development across OECD member countries, it becomes imperative to engage in a meticulous examination of country profiles. A straightforward juxtaposition between robust economies, such as the United States, and those still in the developmental phase, such as Romania, would yield predictable outcomes. It is reasonable to postulate that the United States excels in terms of both the quantity of policies and the financial allocations dedicated to enhancing Science, Technology, and Innovation (STI) output when compared to Romania. Hence, it would be prudent to institute an analytical framework aimed at investigating the potential "trickle-down" or transformative impact that advanced, developed economies exert on their developing counterparts. Moreover, there exists an exigent need for the formulation of mechanisms conducive to knowledge sharing and transfer across economies, facilitating the collective pooling of informational resources and the dissemination of best-practice paradigms.

Nevertheless, a comprehensive examination pertaining to country-specific policy scores concerning entrepreneurship and start-ups will be expounded upon in the subsequent sections. As such, the latter segment of this treatise will be dedicated to the comparative analysis of the start-up landscape in Romania, the European Union, and the United States. In the context of governmental policy formulations, two pivotal aspects warrant attention: the year of policy adoption and the operational conditions germane to policy implementation. It is the policies endorsed within analogous temporal frameworks, for instance, within the past five years, that ought to serve as the cornerstone for benchmark analyses. Furthermore, with respect to the design and intricacies of specific policies, it is worth acknowledging that while the initial impetus for policy conception may emanate from public or governmental sources, there are instances where the private sector plays a pivotal role in the granular configuration of said policies (Paunov, et al., 2019).

2.1.2. Factors Shaping the Startup Landscape

As elucidated in the introductory section of this subsection, a spectrum of prevailing trends exerts its influence upon the landscape of the start-up sector. While the initial segment of this subsection was dedicated to an exhaustive explication and delineation of extrinsic trends impacting the start-up realm from supranational, national, and regional policy vantage points, it is equally imperative to scrutinize the overarching trends as conceived and envisioned by start-up entities themselves, particularly in relation to their respective domains of operation. In accordance with our empirical investigations, we have ascertained that, in a general context, the principal focal points and trajectories shaping the labor dynamics and operational paradigms of start-ups encapsulate the ensuing facets:

- *Amplification of Accelerator Programs*: The relentless expansion and enhancement of accelerator programs and the methodologies underpinning their accessibility represent a pivotal axis of influence. This augmentation serves as an instrumental catalyst in fortifying the developmental journey of start-ups.
- *Sustained Innovation and Product Development*: There exists an unwavering commitment to the continual advancement and diversification of product and service portfolios within the start-up milieu. Concomitant with this pursuit is an accelerated tempo of product ideation, creation, and expeditious delivery to end-user demographics, all constituting cornerstone elements of the operational ethos.
- *Elevation of Open and Collaborative Knowledge Ecosystems*: The drive towards the augmentation and refinement of open and collaborative knowledge frameworks and innovation laboratories is of paramount significance. These endeavors are underpinned by the imperative of fostering a milieu conducive to collective ideation, knowledge dissemination, and innovation proliferation.

These trends, emblematic of the dynamic contours within which start-ups operate, coalesce to sculpt the overarching landscape of the start-up sector, underpinning its resilience and adaptability in the face of evolving economic exigencies (Paunov, et al., 2019). As articulated previously, the aforementioned enumeration pertains to developments and trends in a

generalized context. The same scholars expound upon a set of pivotal measures to expedite the progression of advancements in artificial intelligence (AI). This strategic paradigm encompasses the following phases: a heightened focus on research within the AI domain, augmentation of AI competencies, the establishment of conducive conditions for enterprises to assimilate AI tools and applications, and the standardization of this operational framework. It is noteworthy that while the antecedent study is devised as a framework for national policies, it necessitates a profound specialization within the core business domain. As delineated in the ensuing section, specialization emerges as a cardinal trend governing the evolution and maturation of prospective start-up ventures.

Transitioning from a state of specialization or exclusive engagement within a solitary business sector to the assimilation of cross-specialization within the entrepreneurial model signifies a profound injection of innovation into particular domains or the introduction of disruptive influences into discrete sectors. In this context, the term "disruption" denotes the radical transformation of an industry through the amalgamation of insights, tools, and technologies gleaned from disparate fields. Coined by Christensen (Christensen, 1997), innovative disruption, in essence, encompasses the strategic exploitation, typically by a novel entrant to a specific market, of untapped, concealed, or underappreciated niches or particular market segments. Irrespective of the sector in which these disruptors operate, it is imperative to pose and address a salient inquiry. This question not only serves as a fundamental analytical tool when assessing disruptors but also assumes paramount significance from the vantage point of aspiring founders seeking to advance their business endeavors. Namely, it revolves around the prospect of whether the endeavors of a nascent start-up have the potential to exert a transformative influence or disrupt the operations of extant market participants. The trajectory of a start-up's future evolution necessitates meticulous consideration of this pivotal query.

It is pivotal to underscore that the term "specialization" pertains to the proficiencies possessed by individuals involved in the life cycle of a start-up. These competencies significantly shape the trajectory and orientation of the start-up. Conversely, "cross-specialization" alludes to the strategic expansion of the business's operational domain, wherein the start-up

endeavors to operate, proliferate, and scale its activities. This expansion is achieved by acquiring and harnessing novel proficiencies, tools, and technologies. Start-ups may cultivate, for instance, expertise in the realm of finance. They achieve this by leveraging the insights, knowledge, and potential patents cultivated by their workforce. This multifaceted approach enables them to expand their operational purview, rendering them cross-specialized, encompassing both technological and financial domains. A pertinent illustration of cross-specialization within the realm of start-ups can be observed in the burgeoning field of financial technology (FinTech). The choice to exemplify cross-specialization through the FinTech sector is substantiated by the sector's pronounced importance and its dynamic developmental trajectory. Over the years, global investments in the financial technology sector have experienced substantial growth. For instance, in 2008, investments in FinTech were valued at 990 million dollars, and this figure surged to 12 billion in 2014. Notably, the European FinTech landscape witnessed the most substantial growth rates, with investments in the sector within the European Union (EU) surging by an impressive 215% during the 2008-2014 timeframe (StartUp Europe Awards, 2016); moreover, this upward trajectory exhibited even greater acceleration in the subsequent year, 2015, when global investments surged to an impressive valuation of 22 billion dollars (Dickerson, et al., 2015). Innovation within the realm of financial technology, or fin-tech, encompasses a spectrum of advancements spanning diverse facets, including payment methodologies, blockchain integration, micro-lending platforms, lending facilitation systems, and novel approaches to credit provision, notably exemplified by peer-to-peer lending models.

Another rationale underpinning our emphasis on the fintech sector draws from the insights articulated by Kaufman et al. These insights underscore that while startups wield the capacity to effect transformative shifts and disrupt industries, incumbent enterprises entrenched within the financial domain predicate their contemporary prosperity increasingly on technological innovations (Kauffman, et al., 2015). Articulated eloquently by Hannan and McDowell, it becomes evident that the presence of rules, regulations, and established norms presents a significant impediment to the expeditious adaptation and integration of new technologies within the operational framework of banks (Hannan & McDowell, 1984). Start-ups can

effectively leverage the competitive disadvantage faced by large banking institutions. Through rapid adaptation to emerging technologies, and in some cases, the development of innovative solutions from the ground up, start-ups are poised to reduce transaction costs for end-users. Simultaneously, they can enhance the quality of services and bolster security measures. Of equally significant import is an observation drawn from contemporary contexts: financial technology (fin-tech) start-ups do not invariably operate under the assumption that their services and products serve as perfect substitutes for those offered by traditional banking sectors. This salient point was initially delineated by Li, Spigt, and Swinkels (Li, et al., 2017). The research conducted by Li, Spigt, and Swinkels suggests that the innovative disruptions introduced by financial technology (fin-tech) start-ups operate in a complementary rather than a substitutive manner concerning the banking industry. Consequently, the authors assert that fin-tech start-ups predominantly exert positive effects on the stock returns of companies within the banking sector. Their findings are underpinned by a fundamental, robust, and time-tested argument, namely, the constructive impact of competition within a specific industry. Despite the relative disadvantage they may face, competition from start-ups compels major banks to undertake appropriate measures and implement improvements. Equally as important as the actual findings of Li, Spigt and Swinkels (Li, et al., 2017) An additional noteworthy aspect of their endeavors lies in the tangible impact they have on prevailing market conditions. Furthermore, corroborating studies conducted by various other researchers and corporate entities have reinforced the trajectory that markets are following, aligning with the initial propositions presented by Li, Spigt, and Swinkels. A case in point is the extensive research conducted by the prominent auditing firm PricewaterhouseCoopers (PwC), as delineated in their 2016 Global Fintech Survey. This survey discerns the sectors within the banking industry that are most susceptible to disruption by emerging fintech start-ups, namely, consumer banking, fund transfers and payments, investment and wealth management, as well as small and medium-sized enterprise (SME) banking (PwC, 2016); although this study has unveiled a certain degree of apprehension toward heightened competition among professionals engaged in the aforementioned sectors, it is imperative to underscore that the

research, conducted on a representative sample of 544 individuals active in various segments of the banking industry worldwide, with a significant proportion occupying the role of Chief Executive Officers (CEOs), reaffirms the previously elucidated concept pertaining to the salutary repercussions of competition within a given industry. It is noteworthy that a substantial 74% of the surveyed CEOs exhibited a pronounced inclination towards advocating the adage that "offense is the best defense." Specifically, these executives expressed a compelling desire for a more robust integration of fintech and its affiliated services into their overarching strategic frameworks (PwC, 2016). It is essential to clarify that the aforementioned 74% of CEOs did not explicitly seek collaboration with start-ups. Rather, they concurred on the potentially disruptive impact of start-up activities and aspired to harness this momentum, leveraging internal resources to capitalize on the opportunities inherent to a fintech-oriented approach within their organizations. Consequently, the study underscored that only 32% of respondents had established active partnerships with fintech entities, which were not exclusively limited to start-ups.

Nevertheless, the survey participants delineated a strategic roadmap delineating the steps essential for their firms to access and integrate the benefits associated with a fintech orientation and cross-specialization. These steps encompassed:

- *Facilitating and Encouraging Innovation*: Fostering an organizational culture that promotes innovative thinking and practices.
- *Embracing a Fintech Mindset*: Cultivating a corporate mindset receptive to fintech innovations and their potential applications.
- *Cultivating an Agile Enterprise*: Developing the capacity for agile and flexible responses to dynamic market conditions and technological advancements.
- *Enterprise-Wide Digitization*: Implementing comprehensive digital transformation throughout the entire organization.
- *Nurturing and Attracting Talent*: Cultivating a talented workforce by both developing existing employees and strategically acquiring new talent.
- *Creating an Appealing Employer Brand for Talent Development*: Establishing an attractive corporate brand to enhance employee development initiatives (PwC, 2016).

Although extensive research remains a requisite, it is imperative to recognize the prospective benefits stemming from the operations of start-up enterprises. These benefits extend not only to the industries wherein these start-ups are situated but also exert an influence on the conduct of their competitors, rendering them potentially advantageous. Nonetheless, it is imperative to exercise caution, as the compatibility of products and services may be universally applicable across diverse domains.

This phenomenon is particularly evident in the fintech banking sector, where disruptions have yielded an environment conducive to complementary relationships. Conversely, in alternative sectors, the products and services developed by start-ups may serve as substitutes for existing offerings within specific markets.

As elucidated earlier within this discourse, cross-specialization emerges as a pivotal determinant necessitating proactive engagement by start-up enterprises. In the context of established enterprises, the course of specialization is apt to follow a generalized sequence: "hire functional experts to take the enterprise to the next level, add management structures to accommodate increased head count while maintaining informal ties across the organization, build planning and forecasting capabilities, and spell out and reinforce the cultural values that will sustain the business" (Gulati & DeSantola, 2016). Hence, a cascade of information dissemination initially originating externally and subsequently permeating the internal organizational framework becomes evident. It may initially appear paradoxical, but start-up enterprises can effectively employ a similar strategy for the purposes of specialization. Cross-specialization, in addition to facilitating the establishment of more efficient operational procedures, bears the potential to confer a distinct competitive advantage, thereby enhancing business expansion and scalability—a notion frequently embraced by many start-ups.

However, founders must exercise judicious discernment. While scaling engenders myriad advantages, it simultaneously functions as a process that necessitates a departure from the original ethos and culture of start-up enterprises. The authors underscore the importance of transitioning from a paradigm in which all constituents of the start-up (founders, collaborators, partners) partake in multifarious tasks to an approach wherein specialized

roles are assigned to key individuals. This transformation is indispensable for the progressive evolution of the start-up enterprise (Gulati & DeSantola, 2016). Of equal significance is the recognition that, although in the nascent phases of start-up evolution, founders are conventionally perceived as the principal instigators of both progress and innovation, the prevailing trend of cross-specialization in start-up enterprises renders it imperative to avert the emergence of management (in the context of established enterprises) or founders (in the context of start-ups) as impediments that stymie the advancement of innovation and enhancements.

In addition to the burgeoning trend in various sectors for cross-specialization, another notable trajectory pertains to the enhanced development of Artificial Intelligence (AI) technologies within the activities of start-up enterprises. Succinctly defined, the AI-focused start-up sector is primarily concerned with the facilitation of information and progress. Specifically, AI contributes to the streamlining of research processes and the dissemination of findings, which bear significant implications for end users. Furthermore, it underscores the paramount importance of predictive capabilities and the precision of the disseminated information.

Prior to delving further, it is imperative to elucidate the raison d'être of AI-driven start-ups, not in terms of their overarching purpose, but rather, in relation to the pivotal role they play in the problem-solving paradigm. This context pertains to the expected contributions of AI start-ups, delineating the forthcoming opportunities and challenges that they aim to address. Consequently, AI-driven start-ups are poised to address the following aspects:

- **Increase of productivity:** a study undertaken by Purdy and Daugherty postulates that artificial intelligence (AI) is anticipated to engender a noteworthy surge in productivity, potentially reaching an augmentation of up to 40 percentage points by the year 2035 (Purdy & Daugherty, 2016). Both of these authors hold esteemed positions within the renowned consultancy firm, Accenture. It is of paramount significance to note that the projected enhancements in productivity are expected to transpire across a multitude of industries, albeit to varying extents.
- **Automation:** considering the rapid progress and the velocity at which the AI industry is evolving, the substantial enhancements achieved

through AI are not solely confined to the pervasive deployment and accessibility of automation. Instead, these improvements pertain to the celerity with which the automation process is being executed across diverse domains, signifying an acceleration in the automation procedure (Graetz & Michaels, 2018).

- **Diffusion to other fields:** inferred from the preceding two trends, it is evident that AI is poised to exert significant influence across a multitude of domains, with discernible effects already observable in diverse industries. The progression of AI technologies, alongside associated costs, signifies that the proliferation of AI applications and technologies into both related and unrelated industries will transpire at an accelerated pace. An noteworthy consequence of the diffusion of AI into these different domains pertains to the augmentation of individuals' learning capabilities and capacity. However, in this specific context, the enhancement of skills and knowledge will be, to a certain extent, incumbent upon individuals (Acemoglu & Restrepo, 2018). Nevertheless, the continuous refinement of competencies and acquisition of up-to-date knowledge possess the latent capacity to propel further progress, predominantly through the cultivation of heightened specialization within a specific domain.
- **Improve working conditions and creation of new work sources and categories:** a significant manifestation of AI's potential lies in its capacity not to supplant human aspirations, but rather to complement human labor conditions by offering assistance in enhancing decision-making processes, enabling a heightened focus on core tasks, and promoting overall well-being. With individuals afforded the ability to concentrate more effectively on essential functions, the integration of AI is poised to engender enhancements across various facets intrinsic to human activities. Extensive research by numerous scholars and studies substantiates AI's potential to augment creativity, foster critical thinking, and notably, facilitate the development of empathy (EOP, 2016); Beyond the amelioration of individual working conditions, the optimization of worker productivity and satisfaction is poised to engender a consequential enhancement in overall company-wide productivity. These outcomes stand as salient examples of the favorable

consequences ascribed to the utilization and progression of AI technologies (Deloitte, 2017). Furthermore, AI and its application will serve as a custodian, safeguarding the working conditions, regulations, rules, and opportunities pertinent to the labor force (Wong, 2017).

- **Governance and policies:** progression within the realm of AI, coupled with its evolution by start-up enterprises, will yield enhancements in both the utilization, implementation, and governance of AI on one facet, and modifications in the deployment, application, and regulatory frameworks stemming from AI development on the other facet (UNI, 2018).

As elucidated by the aforementioned prominent trends pertaining to AI-driven start-ups, a pivotal question remains, necessitating the passage of time for its resolution: With the accelerated pace of AI advancements and its proliferation across diverse industries, is the human workforce adequately prepared for this transformative transition? To gain deeper insights into the progress of this transition, the forthcoming section will furnish pertinent statistics for examination.

2.1.3. Regional Opportunities and Dynamics in Startup Ventures

On a global scale, the AI start-up sector serves as a compelling testament to its profound significance and revolutionary potential. In 2016, private equity investments targeting AI start-ups reached a cumulative valuation of $16 billion. Furthermore, by 2018, AI start-ups had assumed a central position in the landscape of private equity investments worldwide, drawing in more than 12% of the total global equity investments directed toward start-up enterprises (OECD, 2019). The same comprehensive study highlights that AI-focused start-ups, in consonance with the cross-specialization trend expounded earlier, primarily direct their efforts toward the following domains:

- *Transportation and Logistics*: This involves the advancement of machine learning and the development of autonomous vehicles.
- *Data Management*: Specifically, the collection, processing, and refinement of extensive datasets, commonly referred to as big data.

- *Healthcare Sector*: Encompassing applications in diagnostics, research, and secure information storage within the healthcare domain.
- *Information Security*: Pertaining to the enhancement of digital and informational security measures.
- *Financial Services*: Entailing diverse financial applications.
- *Advertising and Marketing*: Focused on augmenting predictive capabilities regarding consumer behaviors and preferences.
- *Agriculture*: Incorporating AI-based discoveries for agricultural applications (OECD, 2019).

It is imperative to clarify that when we reference AI applications, we do not exclusively allude to smartphone applications, but rather signify the broader utilization of AI by start-ups, resulting in the integration of AI-driven activities and prospects across the aforementioned sectors.

Moreover, AI-centric start-ups not only embody the concept of cross-specialization but also embody the principle of disruption, as previously elucidated. Encouragingly, the common denominator across these diverse AI applications is their ultimate benefit to the end user or customer. To provide context, recent OECD studies substantiate that: "AI start-ups in the United Kingdom received 55% of the European Union total investment between 2011 and mid-2018, followed by German (14%) and French ventures (13%). This means that the remaining 25 countries shared less than 20% of all private AI equity investments received in the European Union" (OECD, 2019). Nevertheless, the same comprehensive report underscores the notable imbalance in the establishment of AI-based start-ups. Remarkably, a staggering 93% of AI-based start-ups globally originate from three principal regions: the United States, China, and the European Union. Furthermore, in the realm of corporate acquisitions, the majority of AI start-up buyouts in 2018 surpassed the remarkable threshold of $100 million USD, with an overwhelming 66% of all AI-based start-up acquisitions exceeding this valuation. Beyond this, AI-driven start-ups exhibit the capacity to expedite access to novel discoveries and information, reduce experimentation costs, and present enhanced prospects for the dissemination of knowledge.

It is essential to acknowledge that certain start-up sectors yield greater significance and returns than others. We do not purport that only a select few such start-ups have garnered access to equity sources. Nevertheless, in

addition to such funding avenues, start-ups must strategically leverage various other financing programs and opportunities at their disposal. Drawing from precedent examples and empirical research, it is anticipated that competition within the domain of AI start-ups will serve as a driving force propelling this sector towards further advancements (PwC, 2016). Furthermore, we anticipate that the monetary value of acquisitions within the AI start-up sector will escalate over time, consequently attracting a greater pool of talent and fostering the emergence of additional AI-based start-ups. To a certain extent, this phenomenon can be construed as an industry-specific manifestation of a trickle-down effect: the heightened frequency of substantial acquisitions of start-ups is poised to allure individuals to allocate their resources and efforts towards the establishment of AI-based start-ups. While the trend of escalating financial investments in AI-based start-ups is poised to persist in the foreseeable future, it is imperative to exercise caution. AI start-ups should endeavor to evade replicating the historical "bubble" tendencies reminiscent of the "dot-com" era. To mitigate this risk, due consideration must be accorded to system prerequisites, regulatory frameworks, and policies.

Nevertheless, it is imperative to acknowledge that this domain is not without its challenges. Some scholars contend that among the foremost challenges encountered by AI start-ups encompass a spectrum of factors. These encompass the underdeveloped state of information technology infrastructure in numerous regions across the globe, issues pertaining to data quality (both in terms of AI-generated results and data employed for AI development, which are still in the nascent stages of refinement), and the imposition of elevated transactional costs upon users, particularly in the context of agricultural AI start-ups (Rakestraw, 2017).

This information aligns with the insights presented in the 2019 Global Start-up Ecosystem Report, as it underscores the congruence between the trends delineated herein and those expounded within the purview of this book. Analogous to the findings of the Global Start-up Ecosystem Report, this book discerns notable dynamism within select start-up sectors, tracing their trajectories from 2010 onwards. Prominent among these dynamic sectors are:

- *Advanced Manufacturing Solutions*: This sector has demonstrated remarkable growth, expanding by an impressive margin of 107.9% since the inception of the decade in 2010.
- *Blockchain Technology and Applications*: The blockchain domain has exhibited substantial maturation, reflecting a substantial increase of 101.5% in its scope and application since 2010.
- *Agriculture and Emerging Food Technologies*: This sector has undergone a significant transformation, experiencing an impressive surge of 88.8% in its scope and influence since 2010.
- *Artificial Intelligence and Big Data Utilization*: The domain encompassing artificial intelligence and the harnessing of big data has also witnessed substantial expansion, with a notable growth rate of 64.5% recorded since 2010 (Start-up Genome, 2019).

Concepts related to the realm of AI start-ups encompass a wide array of multifaceted and comprehensive dimensions. Nonetheless, the AI-driven start-up sector prominently unfolds an array of prospective developmental pathways and prevailing inclinations. In particular, these pertain to the subsequent domains:

- **Financial tendencies:** the pursuit encompasses the advancement of expeditious and secure approaches for enhancing financial lending practices, a ubiquitous implementation of blockchain technology to this end. Concomitantly, it aspires to reduce transactional expenditures while enhancing the efficacy of detecting fraudulent activities. This endeavor also entails the refinement of algorithmic trading mechanisms and the augmentation of predictive capabilities concerning market trends (Financial Stability Board (FSB), 2017).
- **Language and translation tendencies:** the manipulation of languages during translation tasks and the presentation of data in a meticulously structured format (Hinds, 2018)
- **Scientific, research, and medical tendencies:** expediting health-related research endeavors and interpreting, as well as archiving, research outcomes (Canadian Institute for Health Information, 2013).
- **Judicial tendencies:** the advancement of AI-driven big data analytics and algorithmic systems by start-up enterprises, aimed at enhancing the predictive capabilities of the justice system. This includes efforts to

forecast case outcomes and assess the probability of recidivism in criminal activities (Aletras, 2016).

- **Online security tendencies:** The augmentation of AI-driven digital and online security measures in response to the growing frequency of cyberattacks, with the aim of automating and autonomously managing threat detection, protection, and mitigation processes (MIT, 2018). Additionally, the proliferation of AI-focused start-ups contributing to various AI-driven recognition and tracking systems (MIT, 2018).

Regarding future trends in the realm of start-ups, irrespective of their geographical location, it is imperative to identify appropriate sources for funding these entrepreneurial ventures. A comprehensive report conducted by the Silicon Valley Bank group, encompassing 1,100 start-up founders, the majority of whom are engaged in technology and healthcare-related enterprises, hailing from the United States, the United Kingdom, China, and Canada, has yielded significant insights. It revealed that 41% of the respondents expressed the view that securing financing has become progressively more challenging. In contrast, 47% of the participants asserted that the funding landscape had remained unchanged over the course of 2019. These individuals perceived that the conditions and opportunities for obtaining financial support had exhibited a degree of stability, with neither discernible positive nor negative alterations in the funding process for their respective countries (Silicon Valley Bank (SVB), 2020). This discovery holds significant import as it sheds light on the prevailing work environment confronting start-ups. It can be contended that the conditions and opportunities for securing funding should deviate from those governing traditional enterprises and established corporations. Consequently, in view of this external constraint, we posit that diversifying the sources of financing assumes paramount significance and occupies a prominent position on the agenda of numerous founders, start-ups, tech hubs, and investors.

Discipline, a topic meriting heightened consideration, is of profound consequence for founders, start-ups, and investors, as their conduct exerts a tangible impact on the markets they engage with. It is imperative to underscore that market discipline and regulation serve as mechanisms to ensure that adverse occurrences remain infrequent anomalies, thereby fostering favorable conditions conducive to market growth.

The invocation of discipline concerning the financing sources for the start-up sector is rooted in an examination of historical market practices in financing diverse ventures. Furthermore, it serves as an endeavor to comprehend the intricate notions of risk associated with start-ups. Scholars such as Nanda and Rhodes-Kropf posit that an escalation in financing activities correlates with a propensity toward more lenient perspectives regarding funding ventures fraught with risk. Consequently, this trend engenders opportunities for the financing of ventures that, while laden with greater risk, are also endowed with a heightened degree of innovation and potential (Nanda & Rhodes-Kropf, 2011). Markets appear to operate in accordance with the paradigm delineated by the authors, wherein emerging technologies exert an inclination towards catalyzing more audacious investments by venture capitalists. Nonetheless, it is imperative to note that the theoretical framework advanced by these authors exclusively pertains to the infusion of capital from venture capital (VC) sources, without affording due consideration to funding procured from alternative avenues, such as business angels, various funding rounds, and grants.

Comprehensive deliberation on both the proclivity for risk and the thresholds of risk tolerance assumes paramount importance when formulating strategies for the operation of a start-up enterprise. It is worth emphasizing that endeavors characterized by a proclivity for risk-taking have the potential to engender repercussions that resonate beyond the confines of the start-up itself, thereby impacting the broader regional context within which the operations of the start-up are situated.

An often understated source of financing deserving greater consideration pertains to the realm of public-private partnerships forged between governmental entities and nascent start-up enterprises. This prompts contemplation as to the viability and prudence of cultivating public-oriented start-ups, a concept predicated on the cultivation of collaborative relationships between local or national governmental authorities and visionary founders.

Within the context of this inquiry, it becomes evident that innovation and entrepreneurship assume pivotal roles in the cultivation and advancement of regional development. Thus, the subsequent section is meticulously constructed to expound upon salient insights aimed at both

nurturing innovation and rendering the fruits of innovation more readily accessible, with a view to benefiting an even broader spectrum of communities.

2.2. The Nexus of Innovation and Entrepreneurship in Driving Regional Development: Strengths and Limitations

This section elucidates the multifaceted impacts of start-ups and entrepreneurship on regional dynamics. The intricate interplay between start-ups and regions is predicated on the inherent reliance of both entities on the competencies and aptitudes harbored within the regional labor force. Consequently, a dual objective emerges, seeking to enhance regional development by concurrently augmenting the skill sets, knowledge base, and labor conditions of the regional workforce. This twofold mission not only fosters an environment conducive to the inception of new start-ups but also serves to attract a broader demographic of individuals to the region, engendering a continuous cycle wherein heightened skills drive start-up creation, thus propelling innovation in tandem with risk-taking endeavors.

Underpinning this overarching concept of regional advancement, as delineated by scholars like Fischer and Nijkamp, are three pivotal and intricately interconnected catalysts for growth: knowledge enrichment, a culture steeped in innovation, and the fortification of public infrastructure (Fischer & Nijkamp, 2009). It is imperative to underscore and elaborate upon the triad postulated by Fischer and Nijkamp. Innovation often adheres to an incremental trajectory, and by extension, so does the progression of regional development in certain contexts. The evolution of an entire region is an inherently protracted undertaking that cannot be expedited abruptly. Such an intricate process necessitates sustained deliberation, meticulous planning, forward-thinking strategies, multifaceted stakeholder involvement, and the consideration of various contributory factors. Consequently, this gradual character inherent in regional development is intricately entwined with incremental transformations at both the individual start-up and start-up cluster levels.

2.2.1. Theories and Perspectives on Regional Development

This recurrent cycle, as elucidated in subsequent sections, also encompasses the ripple effects exerted by start-ups on regional development. The externalization and diffusion of the advantages instigated by start-ups find substantiation to a certain degree in the works of scholars such as Hyytinen, Pajarinen, and Rouvinen. Although these scholars allude to the notion that such benefits can materialize during pivotal junctures like start-up closures (Hyytinen, et al., 2015), we posit that this dissemination of benefits and opportunities is not confined to a singular temporal occurrence. Rather, it unfolds across multiple iterative phases conducive to dissemination.

In the context of regional development, both start-ups and established enterprises are recognized for their pivotal roles in enhancing economic performance, market dynamics, and regional adaptability in response to various disruptions. Furthermore, entrepreneurial activities and the establishment of start-ups are intrinsically associated with the generation of fresh capital and its equitable distribution, the proliferation of income-generating prospects within specific regions, the provision of employment opportunities, the elevation of living standards, bolstering economic self-reliance, and the amplification of innovative outcomes concomitant with economic advancements. Notably, entrepreneurship and the inception of start-ups also contribute to the harmonization of development disparities among diverse regions (Dhaliwal, 2016). Regarding facets pertinent to innovation, it is customary to conceptualize entrepreneurs as agents capable of facilitating the diffusion of innovation from one source, individual, or organization to other entities, encompassing individuals, corporations, or geographical regions (Ranjan, 2019). Of paramount significance is the comprehensive exploration of the mechanisms through which the catalyzing of regional development, coupled with the introduction and widespread propagation of innovation, transpires.

In contrast to the neoclassical perspectives on economic growth theory, exemplified by the work of Robert Solow (Solow, 1956), we posit that the growth at the regional or national level is constrained to a certain extent by the second input factor. Notably, the first input factor, as delineated by

Solow, pertains to capital, whereas the second factor concerns the availability and quantity of labor within specific regions. There exist numerous instances where regions, characterized by a sparsity and uneven dispersion of their population, have successfully cultivated development, enhanced their competitive edge, and elevated their standards of living. An exemplary illustration of this scenario can be found in Switzerland, a nation boasting a relatively modest population compared to larger counterparts yet demonstrating commendable competitiveness across various pivotal sectors.

However, we concur with Solow regarding the pivotal role of capital, which we posit assumes a dynamic and progressively significant role, not solely in the current vitality of a region or nation but, critically, in rendering a region more appealing to prospective investors and prospective entrepreneurs. Capital functions as a potent incentive and serves as a wellspring of potential opportunities, propelling the concurrent advancement of both enterprises and regions by aligning with the motives driving entrepreneurs to establish businesses or prompting founders to initiate new ventures and startups.

Beyond these prospective opportunities, wherein capital operates as a compelling catalyst, an often overlooked consequence of accessible capital pertains to competition. In regions characterized by the abundance of capital and the facilitation of free capital mobility (where both availability and the facilitation of competition are equally pivotal), the acceleration and intensification of market competition are notably pronounced. This heightened market competition, in turn, engenders innovation as its primary outcome. Thus, these entrepreneurial and startup-driven effects serve as catalysts, radiating far-reaching impacts across diverse dimensions, encompassing geographical, spatial, societal, and cultural domains. Indeed, startups may not invariably attain the same extensive reach as established and well-developed enterprises. Nonetheless, by extending their outreach even to minor stakeholders within particular markets, startups play a crucial role in engendering implications of consequence through the sharing and interconnection of their products, services, and resources. Our departure from the neoclassical theory of the production function, which places a certain extent of opposition upon it, as elucidated earlier in our discourse, draws its foundations from a body of knowledge and empirical

investigations conducted by esteemed scholars. Notably, the perspectives of scholars such as Acs (Acs, 1994), Audretsch (Audretsch, 2004), and the research endeavors undertaken by de Groot and his associates (de Groot, et al., 2004), have been instrumental in shaping our viewpoint. These scholars, coherently aligned in their perspectives, advocate the idea that the augmentation of regional wealth, encompassing both monetary affluence and the broader dimensions of resource endowment and societal well-being, hinges upon a concerted emphasis on fostering entrepreneurial endeavors and cultivating a thriving startup ecosystem. As asserted by these scholars, the pivot toward nurturing an entrepreneurial ethos bears direct and indirect correlations with the generation of employment prospects. This, in turn, catalyzes the aggregation of wealth and the accrual of monetary incentives. Throughout the course of this book, the term "networking" has been recurrently invoked. While the term has been employed without formal elucidation, it aptly characterizes the modus operandi of startups and nascent enterprises. These entities function collectively, operating as interconnected networks or clusters of companies. In so doing, they facilitate the dissemination of information, research, knowledge, opportunities, and wealth. In this contemporary manifestation, we find empirical validation of the seminal work articulated by Piore and Sabel (Piore & Sabel, 1984).

It is important to note that not all clusters and networks engage in collaboration with external counterparts. This lack of collaboration often stems from considerations related to competitive advantages and legal constraints, resulting in exceptions to the rule. Furthermore, these clusters should not be perceived as exclusive domains solely for private legal entities; they remain open to participation by public authorities, institutions, and groups with the capacity and opportunity to join their ranks. Given the profound influence wielded by networks comprising startups, hubs, and clusters on regional dynamics, it becomes imperative for governing bodies to explore avenues through which they can harness and effectively manage such potential. Organizing and facilitating conducive working environments for these networks holds the promise of yielding substantial dividends for the regions.

As previously elucidated, the activities of startups are subject to regulation and promotion through a variety of policies and programs,

spanning supranational, national, and regional levels. Therefore, it stands to reason that regions should actively encourage and incorporate startups into their broader development strategies.

This collaborative approach, wherein regional and entrepreneurial development become intertwined, fosters synergistic interactions between the private and public sectors. Such collaborations have the potential not only to yield social benefits but also to stimulate economic and research-oriented advantages. Thus, entrepreneurship should be accorded a central position and be the focal point of regional policymaking (Płaziak & Rachwał, 2014). Płaziak and Rachwał astutely emphasize the imperative need for cohesive linkages between national and regional strategies. A regional strategy, when bereft of support from higher national authorities, encounters formidable obstacles in its implementation, sustainability, and the dissemination of its resultant benefits. Conversely, pursuing an approach where central/national initiatives lack continuity and regional support is equally onerous. In this scenario, the genesis originates at the central/national level, necessitating subsequent regional dissemination.

However, when policies are harmonized with entrepreneurship and regional growth as their central tenets, the prospects for success and broader regional and population benefits are significantly enhanced, facilitating the convergence of both bottom-up and top-down approaches.

While certain markets present entry barriers and various impediments to cross-border trade within trading blocs, the existence of developmental barriers, impacting both regional development and startups, is also discernible. The overarching objective of a multifaceted policy framework should be to incentivize the formation of diverse entities, including startups, enterprises, and public-private partnerships, capable of contributing to the overall development of various geographic areas, encompassing cities, regions, counties, and nations.

Moreover, it is imperative to delineate the types of policies to be implemented, their spatial allocation, and the appropriate levels of governance for their execution. As elucidated by Fischer and Nijkamp, the aspiration to formulate regional policies centered on knowledge creation to propel innovation can be categorized into the following domains (Fischer & Nijkamp, 2009):

a. Specific/focused policy measures: these measures are precision-engineered to establish an enabling environment conducive to the augmentation of innovation endeavors among Small and Medium-sized Enterprises (SMEs).
b. Broad policy measures: encompassing initiatives geared towards enhancing research ecosystems, including the establishment of research systems, laboratories, research facilities, universities, and fostering synergistic partnerships between the public and private sectors.

One of the pivotal determinants contributing to the allure of a region or locality for the establishment and maturation of start-up enterprises pertains to the level of education. Elevated educational attainment within a particular area renders it an enticing destination for nascent businesses to conduct their operations. While the presence of renowned university hubs and research establishments undeniably holds significance in influencing the propensity for new business ventures to emerge within a given locale, an even more critical factor impacting the rate of start-up formation resides in the prevalence of high school graduation among the regional populace (Motoyama, et al., 2014).

This phenomenon is notably pervasive across various regions, where locales and cities that place a strong emphasis on educational advancement demonstrate a heightened propensity for the establishment of new start-up enterprises. In this context, the interplay between education and the socio-economic well-being of a region assumes a dualistic character: augmented educational attainment levels engender a more pronounced prevalence of nascent business ventures, and this elevated rate of start-up inception, in turn, contributes to the enrichment of the educational and research landscape within the area. Once again, the discernible presence of spillover effects becomes evident, as regions characterized by elevated educational achievements, particularly with respect to high school, college, and university completion rates, tend to diffuse resources and opportunities to neighboring areas, thereby enhancing the overall appeal of these adjacent regions.

2.2.2. Distinct Regional Impacts of Increased Startup Activities

A 2019 report jointly conducted by Deloitte, a prominent auditing and consultancy firm, in collaboration with the electronic journal "El Referente," an examination of the 100 most innovative start-up enterprises in Spain was undertaken. The findings of this study illuminated a prevailing trend wherein the majority of these innovative start-ups are primarily engaged in sectors such as fintech, e-health, food technology, and associated services. Furthermore, the research underscored that, despite the nationwide dispersion of start-up establishments, regions with robust economic development, exemplified by Madrid and Catalonia, have emerged as focal points for both the inception and financial sustenance of these enterprises. Notably, Madrid boasts 27 start-ups on this prestigious list, while Catalonia leads with 38 of its start-ups being featured. In light of these observations, it becomes imperative to comprehend the ramifications of start-ups on the prospective evolution of regions that are already well-developed (El Referente, 2019). We posit that while start-ups indeed have the capacity to extend their influence to a broader audience, their impact on well-developed regions would be comparatively less pronounced than on their counterparts in the developmental phase. To expound upon this assertion, the publication "El Referente" offers insights into the conditions fostering the growth of the start-up ecosystem across Spain. At the national level, Spain has instituted 185 support initiatives meticulously designed to bolster, diversify, and fortify the start-up ecosystem. Furthermore, Spain is presently home to 3,600 active start-ups, collaborating synergistically with a multitude of incubators and accelerators dispersed across the nation. Presently, Spain can lay claim to 63 accelerators, 50 acceleration programs, and 29 incubators, each contributing to the proliferation of start-ups. Additionally, it is noteworthy that Spain has witnessed a discernible uptick in the emergence of scale-ups and the acquisition of start-ups over the past few years (El Referente, 2020). The aforementioned statistics allude to the profound influence wielded by start-ups, transcending mere existence within regions to manifesting a multifaceted impact on various dimensions. This impact encompasses elevated employment prospects, augmented economic prosperity, technological progress, cultural enrichment, and the dissemination of knowledge. Moreover, the established support initiatives not only nurture

the growth of start-ups but also endeavor to enhance the attractiveness of the regions they inhabit. The objectives of these support mechanisms encompass the facilitation of capital access, the enhancement of talent acquisition, and the regulation of labor markets to foster an environment conducive to entrepreneurial development.

It is pivotal to underscore that the culture of start-up scaling has not merely confined its effects to the realm of start-ups themselves; rather, its ripple effects resonate across cities and regions. Stemming from the imperative to address contemporary and anticipated challenges, both at the individual and corporate levels, start-ups have risen to prominence in recent years, making substantial contributions to the advancement of contemporary societies. Notably, in the United States, investments in start-ups experienced a 30% surge between 2017 and 2019. Within the OECD member countries, Small and Medium-sized Enterprises (SMEs) represent a staggering 95% of the total corporate landscape. Furthermore, among SMEs, start-ups account for a substantial portion, contributing to around 60-70% of employment opportunities (Mayer-Haug, et al., 2013). However, it is imperative to approach this statistic with caution, taking into consideration several contextual factors, such as the overall advancement of various regions, the density of start-ups within each region, and the relative significance of start-ups within their respective domains. Notwithstanding this cautionary stance, a discernible trend has emerged concerning the longevity of start-up enterprises. Historically, prior to 2013, the data indicated that approximately 30% of start-ups could sustain their operations for a duration of up to two years (Solomon, et al., 2013). As delineated in the preceding subsection, recent years have witnessed a shift in this pattern, with a significant number of start-ups experiencing closure within the initial five years of their inception (OECD, 2015). While this augmentation may appear modest in scale, it is essential to recognize that the endeavors dedicated to product and service refinement during the intermediate span of survival, spanning from two to five years, exert a notable spill-over impact on the communities wherein these nascent enterprises are situated.

An investigation undertaken by a South Korean private research entity has yielded noteworthy insights into the longevity of start-up enterprises. Within the initial year following their establishment, start-ups exhibit a commendable survival rate of 65.3%. However, this rate experiences a

gradual decline over time. By the conclusion of the second year of operation, the survival rate diminishes to 50.7%, and subsequently recedes further to 41.5% following the completion of the third year of activity (Statistics Korea, 2018). An additional aspect of apprehension pertains to the viability of start-ups subsequent to their initiation of an Initial Public Offering (IPO). It is a matter of notable concern that the survival prospects for start-ups post-IPO are rather grim, with a meager fraction of less than 1% managing to persist. It is worth emphasizing that this statistical representation is specific to the United States region (Gage, 2012). In both instances, the causes of cessation do not stem primarily from insufficient financial resources. Instead, the attributions for failure are rooted in deficiencies within the organizational strategy framework and an insubstantial foundation of business sustainability.

According to empirical research, for the effective dissemination of innovation aimed at bolstering regional development, prosperous start-up enterprises must demonstrate proficiency across various domains. These encompass an entrepreneurial mindset, a propensity for innovation in general, an orientation towards tangible market outcomes, adept networking competencies, a commitment to technological innovation as a driver, and proactive engagement with governmental policies and opportunities (Buli, 2017). In the final analysis, scholars such as Lee and Kim have elucidated in their research that attributes such as innovativeness, proactiveness, and a disposition towards risk-taking exhibited by entrepreneurs exert a favorable influence on the performance of start-up ventures, concurrently enhancing their business sustainability (Lee & Kim, 2019). The sustainability of these businesses, coupled with the comprehensive performance of the start-up enterprises, manifests itself in augmented productivity concerning goods, services, and innovation, with start-ups as their epicenter. This phenomenon, in turn, cascades to enhance the overall welfare of the regions in which these start-ups are situated. Furthermore, it is worth noting that owing to the global reach of start-ups, this positive impact on the well-being of various geographical areas materializes, as individuals and corporations gain access to the developmental outputs generated by these start-up entities. This transformative influence reverberates across local, national, and international landscapes, ushering in an era of heightened economic vitality,

cross-border collaboration, and enhanced quality of life for diverse populations worldwide.

2.2.3. Firm Survival, Job Creation through Startups, and the Dissemination of Knowledge and Resources

In the context of innovation and its impact on regional development, it is pivotal to emphasize the role of talent attraction, denoting individuals possessing specialized skills and competencies. The term "attracting" implies the facilitation of collective co-location, fostering enhanced communication and collaborative work processes, which in turn catalyze the creation of products, services, and technologies. Innovation, as a fundamental driver, wields profound influence not only on the viability of a start-up but also functions as an irresistible magnet drawing attention to the regions hosting these start-ups.

The perpetual escalation of innovation within regions exerts a magnetic pull on fresh cohorts of individuals contemplating relocation to these dynamic locales. Prominent urban centers such as Berlin, San Francisco (particularly Silicon Valley), and London stand as paradigmatic examples where this phenomenon has become the standard, profoundly influencing the fabric of daily life. Innovation assumes a dual role in the context of start-ups. On one hand, it serves as an agent of enhanced survival by endowing start-ups with advantageous attributes, such as augmented market influence and cost reduction strategies. Conversely, innovation also bestows upon start-ups certain burdens stemming from the associated risks and uncertainties. These burdens encompass amplified market pressures and the expectations of venture capitalists, who seek expedited returns on their investments (Hyytinen, et al., 2015). However, notwithstanding its inherent riskiness, innovation has demonstrated an undeniable capacity to attract and consolidate funding, talent, a profusion of ideas, and resources within specific geographical concentrations, characterized by the presence of start-up clusters, hubs, and cities. Regarding start-up survival, the antecedent research conducted by Hyytinen et al. posits that non-innovative start-ups exhibit a comparatively higher survival rate, ranging from 6% to 7%, in contrast to their innovative counterparts (Hyytinen, et al., 2015). While this

statistical revelation sheds light on the prospects of survival, it is equally imperative to focus on specific temporal dimensions, delineating the duration of survival until start-up cessation or closure. Simultaneously, founders must internalize a fundamental implication emerging from this study: innovation does not furnish an infallible guarantee against start-up failure. However, it is more certain that as a start-up's operational lifespan extends and its sphere of influence expands, the region in which it operates experiences concomitant growth. This growth is manifest in economic expansion, heightened well-being, and a proliferation of opportunities directly or indirectly correlated with the activities of these start-ups.

The following table will present just how much discussion there is around the influence that innovation has upon firm survival. Whereas there are authors that claim that innovation has a positive impact upon survival and development, others claim the contrary, that is it corelates negatively with firm survival:

Table 7. Survival chances of start-ups and the influence that innovation has upon this metric, as envisioned by several authors

Author	Ways to determine influence	Influence upon survival
Cefis and Marsili (Cefis & Marsili, 2004)	Study conducted on a sample of Dutch manufacturing companies.	Positive influence
Coad and Guenther (Coad & Guenther, 2013)	Study conducted on a sample of German tool manufacturing companies from post war period.	Positive influence
Wagner and Cockburn (Wagner & Cockburn, 2010)	Study made on several "dot-com" companies that went through an IPO.	Positive influence
Esteve-Perez and Manez-Castillejo (Esteve-Perez & Manez-Castillejo, 2008)	Study conducted on a sample of Spanish manufacturers.	Positive influence
Audretsch and Mahmood (Audretsch & Mahmood, 1995)	Study conducted on a sample of 12000 U.S. manufacturers.	Negative influence
Cader and Leatherman (Cader & Leatherman, 2011)	Study conducted on a sample of U.S. companies that have in excess of 100 employees.	Negative influence
Boyer and Blazy (Boyer & Blazy, 2013)	Study conducted on a sample of French start-ups that had under 10 employees at the beginning of their activity	Negative influence

Source: Adapted by the author from Hyytinen (Hyytinen, et al., 2015)

The analysis of the above table does not seek to establish a definitive superiority of positive correlations over negative ones. The scholarly community lacks a unanimous consensus regarding which of these effects holds greater sway over the survival prospects of companies. Notwithstanding the variability in results and perspectives across various authors, we posit that the influence of innovation on the survival rates of start-ups is predominantly positive. Consequently, innovation plays a pivotal role in generating employment opportunities and engendering overall regional enhancements in the areas where these start-ups are situated, either through their physical presence or the utilization of their products and services by the local populace. The flexible organizational structures inherent to start-ups facilitate the development of their market capabilities, thereby augmenting their absorptive capacity, as articulated by Zahra and George (Zahra & George, 2002). This, in turn, fosters an amplified capacity for disseminating their innovations across the diverse regions in which start-ups are active.

The influence exerted by start-ups on the generation of new employment opportunities has been a recurrent theme in this subchapter. It is imperative to recognize that start-ups not only provide employment for their own personnel but also extend job opportunities to collaborators, suppliers, students, and various other stakeholders. An illustrative case frequently cited in academic investigations pertains to the job creation impact of start-ups and emerging firms in the United States. A study conducted by Decker, Haltiwanger, Jarmin, and Miranda (Decker, et al., 2014) offers a comprehensive portrayal of the effects of new businesses on employment prospects. According to the findings derived from the aforementioned study, encompassing all categories of business entities, collectively referred to as establishments - encompassing start-ups, ventures, enterprises, and corporations - during the period spanning from 1980 to 2010 in the United States, the aggregate annual job creation rate across these diverse establishments amounted to approximately 18% of the entire workforce. Within this context, it is notable that roughly one-sixth of this total, equivalent to approximately 2.9 million jobs on an annual basis, can be attributed to and traced back to the establishment of new companies (Decker, et al., 2014). Of particular significance within the contemporary market

landscape is the noteworthy observation that, even in cases where start-ups cease their operations, leading to the discontinuation of employment opportunities and the closure of such enterprises, there exists a compensatory mechanism. This phenomenon is eloquently articulated by Decker and colleagues (Decker, et al., 2014), who assert that "the employment losses resulting from the pronounced attrition rate among nascent companies are nearly counterbalanced by the expansion of enduring firms". This extends beyond a mere "survival of the fittest" paradigm, as it suggests that the tenure spent within start-ups not only enhances the workforce's skills and capabilities but also renders them more employable, significantly augmenting their prospects of securing subsequent employment opportunities. Furthermore, the study by Decker et al. (Decker, et al., 2014) provides valuable insights into the dynamics of job creation and destruction during economic expansions and contractions. The authors note that these forces often exhibit counterbalancing effects during periods of economic downturn, such as the recession that commenced in 2009. During such downturns, job losses prompt population redistribution as individuals seek employment in less-affected regions. Conversely, during economic upturns, this migration tends to shift toward more developed regions that offer enhanced opportunities. An additional consequence of job generation by establishments like start-ups is the augmentation of employability within a specific locale, thereby attracting individuals, talent, and workforce from various other regions to relocate.

This migratory propensity induced by the presence and activities of start-ups has been substantiated by numerous scholars over the course of several years. Syverson (2011), Foster, Haltiwanger, and Krizan (2001) and Bartelsman and Doms (2000) have substantiated the empirical evidence illustrating the influence of firm entry, growth, and contraction dynamics on overall profitability. These findings render enterprises more attractive to external parties, including prospective employees and investors. Consequently, this factor contributes to the escalation of migration trends towards regions in which the start-up or enterprise conducts its business operations.

From a practical perspective concerning job creation, it is evident that the future trajectory of start-ups involves a continuous expansion of their

workforce. During the preparatory phases leading up to the launch, encompassing both the pre-launch and seed stages, start-ups typically employ an average of 3.5 individuals. As they progress into the launch stage, this number increases to an average of 6.6 employees. Subsequently, during the growth and maturity stages of development, the average workforce in start-ups ranges from 7.7 to 15.1 individuals (Steigertahl & Mauer, 2018). The aforementioned scholars also highlight discernible regional proclivities concerning the desired workforce expansion envisaged by start-ups. Notably, they underscore that operations conducted within more advanced and robust economies tend to manifest a heightened proclivity for larger-scale hiring initiatives. For instance, in the context of substantial economies such as the United Kingdom, France, and Germany, there exists a strategic intent to onboard a significant number of new employees. Specifically, the United Kingdom anticipates hiring approximately 12.8 fresh personnel, while France aims for an addition of 9.8 employees, and Germany plans to recruit 9 new team members (Steigertahl & Mauer, 2018). This trend aligns with conventional developmental trajectories, considering that a significant proportion of European funding, particularly substantial financial allocations, are predominantly channeled into the economies previously delineated.

2.2.4. Romanian Regional and National Policies Supporting Startup Infrastructure

While much of this section has focused on elucidating the affirmative impacts of innovation and the inception of start-ups on regional development, it is imperative to acknowledge the associated constraints. As delineated earlier, the formulation of policies plays a pivotal role at both national and regional tiers. The strategic enactment of policies, tailored for short and long-term objectives, holds the potential to expedite developmental progress. The concept of clustering start-ups within hubs and fostering partnerships with private entities is noteworthy. Nonetheless, it is crucial to acknowledge that start-ups, despite their aspirations, may not yet possess the maturity or influence required to emerge as regional market leaders. Effective policies serve as linchpins for substantial regional

development. Aspects like access to diverse financing sources, public-private collaborations, and educational attainment levels exert varying degrees of influence on regional stability and advancement. Neglect, whether by governmental authorities or the populace, can precipitate a decline in regional attractiveness.

The subject matter explored throughout this text holds paramount significance at both national and international echelons. The ramifications of start-up development within a national context are fairly straightforward. However, their international implications are manifold. A report evaluating the Romanian start-up ecosystem and infrastructure, commissioned by the Directorate-General for Research and Innovation - a European independent institution under the aegis of the European Commission - outlined several recommendations for enhancing the Romanian start-up environment. These recommendations encompass numerous facets of the start-up landscape and pertain to actions within areas of significant interest that directly impact the well-being of the start-up ecosystem and regional development opportunities. The most salient of these proposals, drawing from the Directorate-General for Research and Innovation's recommendations, revolve around the implementation of strategic initiatives in the following domains (European Commission, 2017):

- The establishment and maturation of the National Innovation and Entrepreneurship Council - represents a pivotal endeavor. Despite the prevailing centralized nature of the Romanian Research, Development, and Innovation (RDI) system, esteemed experts within the Directorate-General for Research and Innovation contend that the creation of an additional centralized entity, specifically dedicated to the advancement of entrepreneurial innovation, holds the promise of yielding manifold advantages in the foreseeable future. This undertaking is intertwined with an imperative for concurrent legal reforms and adjustments to align with the evolving contours of the contemporary market landscape.
- Establishment of Robust Infrastructure and Support Ecosystems for Start-up Cultivation - this includes the development of dedicated hubs, web portals, and the implementation of initiatives recognizing entrepreneurial endeavors. These efforts may encompass mechanisms

such as tax incentives, streamlined access to financing channels, provision of expert guidance, and collaborative promotional activities.

- Systematic Aggregation and Dissemination of Pertinent Data Pertaining to the Start-up Landscape - there is a pressing need to compile, disseminate, and make readily accessible relevant information, which should be freely available for utilization by all stakeholders. The continual monitoring of such data is imperative, facilitating swift and informed decision-making processes.
- Streamlining Bureaucratic Procedures and Enhancing Transparency in Procurement Practices - addressing the reduction of bureaucratization and the enhancement of intelligent and transparent procurement processes are essential facets of optimizing the entrepreneurial ecosystem.
- Cultivation of an Entrepreneurship-Friendly Culture - fostering an environment conducive to start-up inception, financing, and knowledge dissemination is of paramount importance. This entails the implementation of financial literacy initiatives, fostering collaborations between educational institutions and private enterprises, and the facilitation of knowledge transfer programs bridging the public and private sectors.
- Creation of a National Authority for Start-up Funding Initiatives - to bolster the involvement of domestically financed start-ups, there is a need for the establishment of a national or state-owned entity dedicated to funding start-up activities. Such an authority could serve as a cornerstone for state participation in the realm of start-up initiatives. Additionally, collaborative ventures between state bodies, funding institutions, and business angel networks can further invigorate the start-up landscape.
- Implementation of Nationwide Promotion Campaigns for Start-ups - robust promotion campaigns, both domestically and on an international scale, should be devised to advocate the utilization of technologies, services, and products developed by Romanian start-ups. Concurrently, internal adoption of such products, services, and technologies within national structures can catalyze their widespread utilization.

- Enhancement of Collaborative Frameworks among Diverse Stakeholders - collaboration mechanisms amongst various institutions, groups, and policy-makers should be refined to enhance innovation and creative outputs. Initiatives may involve partnerships between academic institutions and start-up hubs to expedite advancements across diverse sectors, including the economy, energy, technology, and information technology and communication (IT&C). Legislative support in the form of innovation and intellectual property laws tailored to the start-up ecosystem can further facilitate these partnerships.
- International Integration and Partnerships - initiatives to integrate and foster international partnerships between hubs, clusters, and accelerator programs should be actively pursued. The aim is to attract foreign participation within a burgeoning national start-up ecosystem, enriching its diversity and potential for growth.

Although the Directorate-General for Research and Innovation has not explicitly delineated a precise timeline for the realization of these initiatives, it is imperative to acknowledge that any delays impeding expeditious action will culminate in diminished outcomes across various domains, encompassing legal, economic, infrastructural, innovative, creative, and collaborative dimensions. Consequently, such delays would ultimately erode the nation's appeal on the international stage.

The discourse surrounding the ramifications of start-up proliferation on regional progress and the overall well-being of communities is a multifaceted and extensive topic. Nonetheless, empirical insights gleaned from various scholarly works and investigations are underpinned by practical relevance, reflecting the substantial influence exerted by start-ups in numerous geographic areas. In this regard, data from the 2016 European Start-up Monitor, encompassing responses from over 600 founders and an exhaustive cohort of 2,515 start-ups at the European level, furnish valuable insights. It is noteworthy that a majority of these nascent enterprises express intentions to augment their workforce by hiring an additional 5.8 individuals in the immediate future. Moreover, propelled by prior funding successes, a collective aspiration among these start-ups is to secure an additional €12 billion in funding during the calendar year 2017.

Furthermore, a predominant commitment among these entities resides in fostering innovation across various dimensions, spanning product,

process, business model, and technological innovation. Of particular significance is the observation that over half of the surveyed start-ups have successfully diversified their revenue streams, transcending the confines of their domestic markets. This expansion beyond national borders augurs positively for the domestic economies, underscoring the salutary impact that start-ups wield on regional and national economic landscapes (Kollman, et al., 2016).

2.3. Innovative Start-ups in Romania and in the European Context

When addressing the dynamics of the start-up sector across various regions, it is imperative to adopt an evolutionary perspective. Despite the relative youthfulness of the start-up sector, particularly when juxtaposed with well-established manufacturing industries or other mature sectors, it has undergone significant transformations over recent years. These transformations, occurring at both micro and macro levels, have left indelible imprints on the sector's landscape. It is noteworthy that these evolutions have unfolded irrespective of geographical boundaries, encompassing regions, nations, and trading blocs.

Recent history bears witness to a series of pivotal events precipitated by economic recessions. Although there has been an overall upward trajectory since the onset of these events in 2009, the journey toward reshaping and revitalizing national economies to pre-crisis levels has proven arduous and protracted for certain countries. The path to recovery has been marked by varying degrees of difficulty, contingent upon each nation's unique circumstances. It is essential to recognize that factors beyond the recent financial crises have also played instrumental roles in shaping and influencing economic development trajectories.

Throughout this chapter, our focus will shift from a nation-specific analysis, exemplified by the examination of Romania's start-up sector, its infrastructure, and developmental trajectories, toward a comparative analysis of the start-up sectors within two global economic powerhouses,

namely, the European Union and the United States. This shift in perspective will enable a broader exploration of the factors that have molded and continue to shape the dynamics of start-up ecosystems on both sides of the Atlantic.

2.3.1. Opportunities for Romania in the Startup Sector

Throughout this book, the terminologies "start-ups" and "SMEs" have recurrently featured. These entities, encompassing both start-ups and SMEs, yield manifold impacts and implications pertinent to development and advancement prospects. Nevertheless, it is imperative to delineate the distinctions existing between them.

While a consensus remains elusive concerning the demarcation between these entities, a heuristic criterion upon which we can predicate our delineation pertains to the envelopment relationship between them. Consequently, it is discernible that while all start-ups fall within the category of SMEs, not all SMEs qualify as start-ups. The discerning characteristics underpinning this differentiation center around temporal aspects, with start-ups being entities founded or established within the past decade, coupled with their pronounced emphasis on innovation and aspirations for growth. These distinguishing attributes align with the recommendations promulgated by the European Commission and can be traced back to scholarly contributions such as those by Decker et al. (European Commission, 2018), (Decker, et al., 2014); it is noteworthy that turnover ought not to be regarded as a discriminating factor segregating SMEs from start-ups, given that both can achieve commendable revenue figures contingent upon their business models, innovative output, and developmental trajectories.

It is crucial to acknowledge the mutual influence wielded by both types of establishments. Furthermore, their collective impact on regional and national development is unequivocal and of paramount significance. Consequently, the ensuing discourse shall expound upon the particularities and opportunities pertinent to start-ups within a multi-country context. Within this intricate tapestry of cross-border entrepreneurship, it is imperative to delve into the intricacies of international collaboration, global

market integration, and the synergistic relationships that propel innovation and economic growth beyond the confines of individual nations.

2.3.1.1. SMEs and the start-up sector in the European Union and Romania

"Over the period 2008 to 2017, gross added value generated by EU-28 SMEs increased cumulatively by 14.3% and SME employment increased by 2.5%" to quote results put forth by the European Commission (European Commission, 2018) underscores the profound significance of the European SME sector. Nevertheless, it also highlights a noteworthy trend observed in 15 member states, namely Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, France, Greece, Ireland, Italy, Latvia, Lithuania, Portugal, Romania, Slovenia, and Spain. These countries, as of 2017, had not succeeded in reinstating SME employment levels to those observed in 2008, with employment figures in SMEs falling short of their 2008 counterparts. This observation is particularly salient given that, within the EU-28, the SME sector accounts for a substantial 47% increase in added value.

Curiously, it is worth noting that a significant 80% of SMEs operating within the EU-28 engage in intra-European trade activities, with only a minority of 20% involved in business partnerships beyond the confines of the EU. To provide further context, in 2017, non-financial SME sectors within the EU-28 encompassed 99.8% of companies within the non-financial business sector, contributed to 66.4% of the total EU-28 employment value, and generated 56.8% of the value added by SMEs, exclusive of the financial sector (European Commission, 2018).

Once again, we discern regional and country-specific disparities concerning the vitality and prevalence of the SME sector. Within the EU-28 during the year 2016, there existed a total of 179,060 high-growth enterprises. These enterprises are characterized by maintaining a three-year employment growth rate of no less than 10%. In terms of their distribution, a substantial majority of such high-growth companies, amounting to 69% of the total high-growth enterprises, were situated in specific countries. Notably, these countries included Germany, accounting for 23.9% of all high-growth companies in 2015, followed by the United Kingdom at 14.4%, Spain at 8.6%, France at 8.4%, Italy at 7.6%, and Poland at 6.4% (European Commission,

2018). The quantity of high-growth enterprises, which stands at 179,060, is substantial to a certain degree. However, it is essential to acknowledge that such a numerical abundance does not inherently signify innovativeness across the entirety of these enterprises. Nevertheless, it is noteworthy that this significant figure can be associated with the broader context that within the European landscape, SMEs contribute to 20% of the overall biotechnology patents granted (OECD, 2019); consequently, we can infer and contend that among the aforementioned high-growth enterprises, approximately 20% of them are likely to serve as the primary source of innovation. It is imperative to acknowledge that although other variables warrant consideration, the operational validity of the 80/20 principle has been well-established across various sectors and industries.

While it is important to note that not all SMEs exhibit high-growth characteristics, the substantial numerical presence of SMEs on the European landscape serves as an indicator of economic robustness. One certainty is that as the quantity of SMEs continues to proliferate, coupled with policies targeting enhanced growth conditions and factors, innovation is poised to occur at an accelerated rate and on a broader scale. A discernible upward trend in the number of SMEs across Europe is evident. This burgeoning SME population entails two facets: in regions with a scarcity of SMEs or enterprises, the potential for development and innovative output is diminished. Conversely, in areas teeming with a multitude of SMEs, yet lacking commensurate innovation-related performance, it suggests that SMEs are not primarily focused on innovation, and the innovation landscape in that specific region is not being constructively nurtured.

In practical terms, this situation can be elucidated as follows: the EU-28 average for the number of SMEs per 1000 inhabitants stands at 57. On one extreme of this spectrum lies Romania, which exhibits a mere 29 SMEs per 1000 inhabitants. Subsequent sections will delve into the innovation, research, and development landscape in Romania, highlighting that innovation efforts tend to be concentrated, and limited incentives are provided to foster private-level innovation advancements (European Commission, 2018).

The same report published by the European Commission highlights the Czech Republic as residing at the opposite end of this spectrum, boasting 115 SMEs per 1000 inhabitants. While a larger pool of companies operating for every 1000 inhabitants, as exemplified by the Czech Republic, significantly augments the prospects of engendering innovation across various dimensions (including institutional, R&D-related, organizational, and product or service-related innovation), it is worth noting that such innovation tends to be of a relatively incremental nature.

However, this proliferation of businesses can wield a dual impact on the economic performance of a region. On one hand, it can yield positive outcomes, such as job creation, amplified added value, and an improved trade balance. Conversely, it can potentially yield negative repercussions, as smaller enterprises often exhibit heightened susceptibility and sensitivity to market disturbances, rendering them more vulnerable to defaults or business closures.

Intriguingly, the prevalence of SMEs per 1000 inhabitants does not necessarily hinge upon the size or economic potency of a country. For instance, while France boasts a ratio of 54 SMEs per 1000 inhabitants, the United Kingdom exhibits a ratio of 40 SMEs per 1000 inhabitants. Meanwhile, Hungary surpasses both with a ratio of 67, and Portugal, despite its modest economic stature, remarkably registers 98 SMEs per 1000 inhabitants (European Commission, 2018). In addition to the density of SMEs per 1000 inhabitants, another crucial metric deserving equal attention is the enterprise birth rate. Interestingly, Romania stands on the higher end of this spectrum, boasting an enterprise birth rate of 12.5% during the 2012-2015 period, which exceeds the EU average of 10%. This revelation serves as compelling evidence that, alongside the sheer quantity of establishments, whether SMEs or startups, certain factors pertaining to productivity, innovation proclivity, and competitive prowess are of paramount importance. These elements, in turn, engender heightened regional impacts and contribute significantly to overall advancement.

Nonetheless, it is imperative to recognize that SMEs encompass diverse categories, and it is from this taxonomy that significant insights can be gleaned. By scrutinizing the prevalence of various SME types within a given country concerning their respective contributions to the total number of

enterprises, one can discern which categories of SMEs serve as the most prolific employers and which exhibit the greatest propensity to enhance levels of added value. The subsequent table has been employed to illuminate the presence and influence of distinct SME types in this context:

Table 8. SME size type and share of total enterprises throughout EU-28 in 2017, as numbers and shares from 3 key metrics (number of such enterprise, unemployed, and value added)

	Micro SMEs	Small SMEs	Medium Sized SMEs	All SMEs	Large enterprises	All enterprises
Number (thousands)	22,830	1,420	231	24,483	46	24,530
% of all	93.1	5.8	0.9	99.8	0.2	100
Value added (trillions of euros)	1,526	1,292	1,343	4,161	3,168	7,328
% of total	20.8	17.6	18.3	56.8	43.2	100
Employment (in thousands)	41,980	28,582	24,201	94,764	47,933	142,697
% of all	29.4	20	17	66.4	33.6	100

Source: Adapted from Eurostat (Eurostat, 2018)

The tabulated data presented above underscores the profound significance and pivotal role that Small and Medium-sized Enterprises (SMEs) play within national economies. Notably, at the European Union (EU-28) level, SMEs constitute a staggering 66.4% of the entire workforce, dwarfing the numerical representation of large enterprises. To expound further, SMEs form the overwhelming majority, comprising 99.8% of the total number of enterprises. Furthermore, these SMEs stand as the primary contributors to the generation of value added at the EU-28 level, collectively generating an impressive € 4,161 trillion in added economic value.

It is imperative to note that while these statistics pertain specifically to the year 2017, their relative eminence and significance have demonstrated a consistent upward trajectory into the subsequent year, 2018. This ongoing trend underscores the perpetuated importance of SMEs, solidifying their continued prominence within the economic landscape for the year 2018, as delineated below:

Table 9. SME size type and share of total enterprises throughout EU-28 in 2018, as numbers and shares from 3 key metrics (number of such enterprise, unemployed, and value added)

	Micro SMEs	Small SMEs	Medium Sized SMEs	All SMEs	Large enterprises	All enterprises
Number (thousands)	23,323	1,472	235	25,032	47	25,079
% of all	93.0	5.9	0.9	99.8	0.2	100
Value added (trillions of euros)	1,610	1,358	1,388	4,357	3,367	7,723
% of total	20.8	17.6	18.0	56.4	43.6	100
Employment (in thousands)	43,527	29,541	24,670	97,738	49,045	146,784
% of all	29.7	20.1	16.8	66.6	33.4	100

Source: Adapted from Eurostat (Eurostat, 2020)

Both of the presented tables elucidate the conspicuous growth trajectory and burgeoning significance of Small and Medium-sized Enterprises (SMEs). This year-over-year expansion demonstrates a consistent pattern, one that offers ample opportunities for innovations and a concomitant surge in employment prospects. Specifically, when we scrutinize the data, we observe that micro-SMEs have expanded their ranks by an impressive 492,994 establishments. Concurrently, small SMEs have recorded an increment of 51,709 SMEs, while medium-sized SMEs, while exhibiting a comparatively more modest increase, have still added 3,811 SMEs during the 2017-2018 period. Collectively, these statistics indicate that a grand total of 548,512 new SMEs emerged within the EU-28 during this temporal span.

Turning our attention to the realm of employment levels, a similar pattern emerges. Micro-SMEs have notably generated an additional 1,547,140 jobs, while small SMEs have contributed 959,006 new positions, and medium-sized SMEs have bolstered the workforce with an additional 468,184 jobs across the EU-28 region. In totality, these data reflect that all SMEs together have played a pivotal role in the creation of 2,974,328 new jobs during the 2017-2018 timeframe.

Moreover, when assessing their importance for overall development, particularly in the context of economic growth and Gross Domestic Product (GDP) augmentation, SMEs have emerged as a linchpin since 2009. Within the purview of the EU-28, the year 2017 witnessed the collective contribution

of all SMEs towards a notable 29% upswing in GDP figures. In a nuanced breakdown, micro and small SMEs accounted for a 10.1% and 8.4% rise in GDP, respectively. These statistics underscore the substantial role that SMEs play in propelling economic growth and fortifying GDP, reaffirming their central position in the contemporary economic landscape (European Commission, 2018). It is somewhat intriguing to note that in the case of France, the collective contribution of all Small and Medium-sized Enterprises (SMEs) amounted to a comparatively modest increase of 15.2% in Gross Domestic Product (GDP). In contrast, the Romanian landscape showcased a scenario where micro and small SMEs made individual contributions of 7.2% and 4.9%, respectively, with the cumulative influence of all SMEs in Romania, as of 2017, contributing to a 16.1% upsurge in GDP. However, the most remarkable impact on GDP growth was observed in Slovenia, where micro and small SMEs made substantial contributions of 21.8% and 17.8%, respectively, culminating in an aggregate SME contribution of 58.9% to the overall GDP increment.

Shifting the focus to the distribution of high-growth enterprises across economic sectors within the European Union for the year 2017, discernible patterns emerge. The sectoral distribution is delineated as follows: "information and communication (17%), administrative and support service activities (15.3%), transport and storage (14%), professional, scientific and technical activities (12.7%), water supply; sewerage, waste management and remediation activities (10.7%), construction (10.5%), manufacturing (10.4%), wholesale and retail trade (10.1%), accommodation and food services (9.7%), electricity, gas, steam and air conditioning supply (7.6%)" (Eurostat, 2020). The percentages mentioned denote the proportion of enterprises or SMEs operating within a specific sector that can be categorized as high-growth entities, exhibiting a proclivity for activities associated with elevated growth trajectories. Notably, in the information and communication sector, this proportion stands at 17%. Conversely, Romania occupied the penultimate position within the EU-28 for the year 2017, with only 2.85% of its enterprises classified as high-growth. In stark contrast, Spain excelled in the same year, boasting an impressive figure of 15.02% for high-growth enterprises.

It is imperative to acknowledge that the statistics concerning EU-28 averages exhibit variations among member states. In the context of 2018, the

EU-28 average for the percentage of micro-SMEs relative to the entirety of SMEs stands at 93%. Greece, in particular, registers the highest figure, with micro-SMEs constituting 97.4% of the total SME landscape. For Romania, this ratio accounts for 88.4% in 2018 (European Commission, 2019). It is of significance to highlight that in the context of 2018, a substantial portion of medium-sized SMEs, specifically 42.9%, are situated within industries characterized by lower levels of knowledge intensity. In contrast, a mere 17.4% of such enterprises operate in sectors classified as knowledge-intensive. Analogously, the distribution among small and micro SMEs mirrors this pattern, with 52.4% of small SMEs functioning within less knowledge-intensive sectors (and only 14.6% in knowledge-intensive domains), while 51.1% of micro SMEs are positioned within less knowledge-intensive industries (European Commission, 2019). It is noteworthy that in the case of micro-SMEs, a substantial 25.5% of them were engaged in knowledge-intensive industries in the year 2018 across the EU-28 region. This heightened degree of knowledge intensity suggests a proclivity for the emergence of start-up enterprises within this category. The European Commission's report provides illuminating insights into this matter, indicating that, on average, 49.5% of small and medium-sized SMEs across Europe participated in innovative activities during the 2014-2016 period. Furthermore, it reveals that 27.3% of all SMEs operate within industries characterized by a high degree of research and development (R&D) intensity. However, it is essential to acknowledge that these averages exhibit variation among different nations. For instance, Romania ranks at the lower end, occupying the last position within the EU in terms of the share of small SMEs engaged in innovation-related activities between 2014 and 2016, with a meager 9.8%. In contrast, Belgium emerges as the top performer in this regard, boasting a remarkable 67.2% of small SMEs actively participating in innovation-related endeavors during the same time frame. Other leading countries in this category include Portugal (66.4%), Finland (63.9%), and Luxembourg (62.9%) (European Commission, 2019). Transitioning to the year 2018, in accordance with the previously cited report, the employment landscape within Romania is predominantly characterized by the dominance of certain SME sectors. Specifically, the distribution of SME employment is as follows: 17.5% of the total SME workforce is engaged in

low-tech industries, 7.2% is dedicated to medium-intensity technological sectors, a substantial 56% of SME employment resides within industries characterized by a lower knowledge intensity, and 15.6% of employment is concentrated in sectors demanding a high degree of knowledge intensity.

It is imperative to underscore that while all start-ups fall under the category of SMEs, not all SMEs can be categorized as start-ups. In view of data precision and relevance, the subsequent section will pivot towards an exploration of the start-up ecosystem, delving into its infrastructure and avenues for potential development.

2.3.1.2. Funding volumes and associated opportunities

In addition to the regional disparities evident in the European start-up landscape, it is essential to highlight the distinctions that delineate the United States from Europe. The foremost disparity lies in the accessibility of capital and human resources, representing a pivotal contrast in the attitudes towards start-ups. Collin aptly encapsulates these distinctions in the realm of venture capital funding, as he articulates: "US funds invest in case your company succeeds, whereas in Europe, they invest because your company succeeded" (Collin, 2014). Further elucidation on the startup sector within these two regions will be expounded upon in the ensuing sections, with a deliberate emphasis on elucidating funding sources, funding magnitudes, the quantity of startups, and the progression of pertinent datasets.

Data gleaned from the Crunchbase platform spanning the timeframe of 2005 to 2020 yields intriguing insights into the sources of financing that European and American startups have secured. This platform functions as an aggregator, consolidating information pertaining to financially backed startups from various databases. The accessibility of this data has been facilitated by scholars Paolucci and Suarez-Ruz. Among the wealth of information, it is discerned that a total of 25,368 startups, domiciled in Europe, have received financial backing from an array of European and American funding entities. Concurrently, a cohort of 6,616 startups has undergone an exit strategy within the 2005-2020 timeframe, with these startups being headquartered in both the United States and European regions. Among the aforementioned cohort of startups (25,368), a subset

numbering 4,580 enterprises has procured funding from American investors (Teare, 2019) (Paolucci & Surarez-Ruz, 2020). Simultaneously, as astutely expounded upon by the aforementioned scholars, it is imperative to acknowledge the existence of 24,159 startups within Europe that have garnered financial support from the European Union. Among this cohort, a subset comprising 2,059 startups has successfully executed exit strategies. A more lucid delineation of the count of prosperous startups, quantified by those startups hailing from both the United States and the European Union that have proficiently executed exit strategies, is meticulously presented in the subsequent tabular representation:

Table 10. Funding and exit values as a comparison between the EU and US, for 2020 levels

Location of start-ups	Source of funding	Number of exits	Total funded start-ups	Total funding values (million dollars)	Total exit amounts (million dollars)
European Union	Europe or US	2185	25368	62.66	171.93
European Union	Also Europe	2060	24195	59.70	138.86
European Union	US	561	4580	39.24	141.16
European Union	Only European	1624	Not applicable	45.87	123.09
European Union	Extra-EU	615	Not applicable	46.10	150.11
Any location	US	6616	Not applicable	399.55	1423.13
United States	US	5321	Not applicable	255.21	942.69

Source: Adapted by the author from Paolucci and Suarez-Ruz (Paolucci & Surarez-Ruz, 2020)

The preceding table has been derived and modified from the scholarly contributions of Paolucci and Suarez-Ruz (Paolucci & Surarez-Ruz, 2020). The data unequivocally underscores the discernible disparities in startup performance between the European Union (EU) and the United States (US). While European-based startups exhibit a tendency to approximately double their initial investments (an average calculation denoting the variance between total funding and exit amounts), startups headquartered in the US manifest a striking multiplier effect, nearly quadrupling their initial investments with a factor of 3.61. Beyond this notable disparity in investment

returns, the previous table also illuminates the differences in funding sources. Specifically, it highlights that EU-based funds directed towards European startups amount to approximately $60 billion, whereas funding from US sources for US-based startups reaches an impressive sum of $140 billion. These figures pertain to the period spanning from 2005 to 2020. These findings are further corroborated by various reports investigating the global impact and reach of startups. According to the 2019 Global Startup Ecosystem Report, the startup sector generated a global value of $2.8 trillion during the period spanning from 2016 to 2018 (Start-up Genome, 2019). As suggested by both the aforementioned reports and the present research, it is evident that in the era of increasingly pervasive communication methods, established and prominent innovation clusters and hubs like Silicon Valley, Tel Aviv, London, and Berlin will undoubtedly persist in fostering and generating new opportunities for startups. However, the proliferation of novel clusters and entrepreneurial ecosystems will primarily hinge upon the accessibility and utilization of communication tools. This trend is substantiated by the data, which reveals that between 2014 and 2016, a total of 29 such ecosystems emerged globally. Furthermore, during the period spanning from 2016 to 2018, an even more pronounced surge occurred, resulting in the establishment of 46 additional ecosystems on a global scale (Start-up Genome, 2019). These entrepreneurial ecosystems, despite their inherent diversity, exhibit notable similarities in their funding dynamics. Within the European context, a substantial majority of startups, encompassing 78% of them, boast a multi-founder composition. Among this cohort, 35% are propelled by the joint efforts of two founders, with the remaining startups spearheaded by teams comprising more than two individuals. Additionally, an intriguing facet of the internationalization process of startups pertains to the fact that 76% of startups rooted in the European Union express a preference for expanding their operations within the EU boundaries. In stark contrast, a comparatively modest 37% express an inclination towards internationalizing beyond the confines of the European Union (Bormans, et al., 2020).

Regarding the regional dispersion of startups and corresponding investment activity, it is imperative to highlight that, within the European Union (EU), a discernible pattern has emerged. Specifically, in 2018, there were a total of 4,199 recorded investments in startups. Notably, data from

the initial six months of 2019 illustrates a substantial figure of 2,301 investments in startups within the EU, cumulatively amounting to an impressive total value of 16.9 billion euros. It is essential to emphasize that these 2,301 investments exclusively pertain to the first half of 2019, with the comprehensive year-end figures surpassing this amount. The ensuing paragraph will provide a comprehensive overview of the final investment tally for the entirety of 2019 (de Best, 2020).

Throughout the encompassing European landscape in the year 2019, a noteworthy total of 4,175 distinct investments and deals came to fruition. This distribution of investments is marked by its particularities: the United Kingdom stands out prominently with a striking 1,425 investments and deals, culminating in a substantial total valuation of 14.8 billion euros. This figure accounts for an impressive 87% of the entire funding value across Europe. In close succession, Germany registered 444 investments and deals, while France closely followed with 425 such transactions. Collectively, these three nations contributed significantly, constituting a collective share of 54% of the overall funding activity experienced in the European context (Teare & Kunthara, 2020). The remaining segment of the investment chart unfolds as follows: Sweden exhibits 278 investments and deals, followed closely by Spain with 270, Switzerland with 246, the Netherlands with 158, Ireland with 113, Finland with 111, and Italy with 106. Furthermore, the broader category encompassing the rest of Europe, including Eastern European nations and those not previously mentioned, collectively amassed a notable count of 699 investments and deals.

This ranking serves to underscore the notion that the size of a country is not the sole determinant of its success in the realm of start-ups. Rather, it emphasizes the pivotal role of concerted efforts in shaping a conducive environment through the implementation of effective policies and support mechanisms, emanating from both private and public sectors to nurture and cultivate the burgeoning start-up sector.

The data pertaining to funding at the European Union (EU) level has exhibited a consistent and upward trajectory since the first half of 2015, signifying a heightened willingness within the private sector, predominantly, to engage in and financially support endeavors characterized by inherent risks and uncertainties. This escalating trend suggests several noteworthy

observations: firstly, it implies that activities closely associated with start-ups no longer carry the same levels of perceived risk as they did before 2015. Secondly, even when acknowledging that endeavors linked to the establishment and progression of start-ups inherently involve elements of risk and unpredictability, the ultimate outcomes stemming from the operations of start-ups far surpass the associated risks and uncertainties. Furthermore, the innovative potential and creative endeavors associated with start-ups contribute significantly to the surge in funding and the diversification of funding sources. Although the influence of a country's size appears to exert a relatively modest impact, it is discernible that prominent cities endowed with flourishing business and academic sectors, sustained influxes of talent, and abundant resources tend to attract more substantial funding allocations.

To delve into the European ecosystem and the funding sources it receives with greater precision, the ensuing table will delineate the funding amounts received by specific cities, with the European Union serving as the funding source:

Table 11. Start-up number and value of investments across various cities from around the world for 2019 levels

City	Number of investments	Total funding amount (billion dollars)	IPO valuation (billion dollars)
Paris	176	1.66	3.76
Berlin	159	10.51	22.15
London	105	4.53	8.10
Stockholm	49	3.18	29.50
Barcelona	49	0.583	N/A
Madrid	44	0.366	N/A
Munich	38	0.522	0.607
Amsterdam	35	0.227	0.235
Dublin	27	4.25	1.61
Vienna	16	0.294	0.438
Moscow	12	1.37	N/A

Source: Adapted by the author from Paolucci and Suarez-Ruz (Paolucci & Surarez-Ruz, 2020)

The previous table has been adapted based on the research of Paolucci and Suarez-Ruz (Paolucci & Surarez-Ruz, 2020). As previously indicated, the

cities listed in the preceding table boast thriving business and academic sectors, accompanied by a steady influx of talent, both domestic and international. It is noteworthy that the majority of the aforementioned cities are situated in Western Europe, with the exception of Moscow, as Eastern European cities are conspicuously absent from this roster. This observation underscores the pivotal role played by higher levels of regional stability and development in shaping the number of start-ups, the quality of start-up-related activities, and the volume and origins of investments in start-up development. To put the information from the previous table into perspective, it is worth nothing that as of January 2024, the global market boasts more than 1,200 unicorn startups, each valued at a billion dollars or more; during the 2020–2021time interval, the number of unicorns worldwide has almost doubled.

Nevertheless, a limitation inherent in the aforementioned table pertains to the authors' perception of Initial Public Offerings (IPOs) as the ultimate yardstick of success for a start-up.

While an IPO represents an aspirational goal for many founders, we contend that there are alternative measures by which the success of a start-up can be evaluated. For instance, the sale of or exit from the start-up—where the value is represented by the price at which a founder is willing to relinquish their respective stake in the start-up—offers a more encompassing gauge of start-up success. This is particularly pertinent considering that a greater number of U.S. companies opt for IPOs and, subsequently, capital market valuations. Thus, the dearth of Eastern European cities in the aforementioned chart should not be misconstrued as indicative of the absence of start-up-related activity in Eastern European regions. While such activity indeed exists, it tends to be characterized by lower quantity, value, and diversity compared to the already-developed Western European cities. Rather than the absence of activity, it is more attributable to the limited availability of data and transparency that hampers these regions from surmounting developmental barriers.

In terms of ecosystems, the San Francisco Bay Area stands out as one of the most robust ecosystems for start-up development. Following the San

Francisco Bay Area, the most significant U.S. cities for start-up development and securing funding include New York, Palo Alto, Boston, and Mountain View. An illuminating report concerning funding values in 2019, on a global scale, underscores the dominance of this area in seed funding and venture capital funding. In 2018, the San Francisco Bay Area attracted 49% of U.S. seed and venture funding, a figure that marginally decreased to 44% in 2019. Meanwhile, seed and private equity funding in unicorns—companies valued at $1 billion or more in private funding—reached a pinnacle of $138.9 billion in 2018 before receding to $79.6 billion in 2019. The same report identifies the most dynamic and prominent countries for unicorn development as the United States (with 77 unicorns in 2019), China (21 unicorns), Brazil (5 unicorns), Germany (4 unicorns), and Great Britain (4 unicorns) (Teare, 2019). While this report primarily focuses on national-level data and metrics, it also sheds light on sectors that exhibited notable growth potential in 2019. These sectors, specifically within the United States, include financial services, which boasts 21 unicorns operating within its purview, as well as shopping and online commerce, with 18 unicorns under its banner. Additionally, the data and analytics sector witnessed significant growth, harboring 14 unicorns. Beyond these sectors, the remaining unicorns, totaling 77, operate across various other sectors. It is important to emphasize that these sectoral insights pertain exclusively to data from the United States (Teare, 2019).

2.3.2. Research and Development (R&D) and Innovation Landscape in Romania and the EU

As elucidated within the context of this manuscript, it is evident that start-up enterprises fundamentally derive their operational foundation from the pursuit of enhancing solutions to existing needs, characterized by increased efficiency, rapidity, and enhanced user engagement. Frequently, the entirety of their business framework, resource allocation, and objectives revolves around the integration of innovative information, research endeavors, and advancements spanning diverse domains. It is, therefore,

unsurprising that the vigor and efficacy of educational systems wield a substantial influence on the inception of start-ups, research and development initiatives, the geographic dispersion of start-up enterprises, and the corresponding levels of regional development. This phenomenon has been underscored in prior research, exemplified by the work of Motoyama et al. (Motoyama, et al., 2014). It can be contended that given the significant ramifications of education on the overall stability of regions and its pivotal role in driving economic growth, a prominent policy orientation should prioritize the augmentation of educational standards. Such policies should aim to elevate educational attainments, particularly with the goal of fostering heightened national progress in the domains of research, development, and innovation. However, it is worth noting that this ideal is not universally realized.

For instance, in the case of Romania, as of the year 2014, the ratio of individuals engaged in research endeavors per capita lagged behind the European Union average by a factor of four. Furthermore, despite a notable uptick in economic growth approaching 3% in 2014 compared to prior years, Romania allocated a mere 0.25% of its Gross Domestic Product (GDP) toward supporting research, development, and innovation (RDI) activities, and only 3% for education. These disparities are particularly conspicuous when juxtaposed with the European average, which stipulated a 6% allocation for education. Such disparities and their associated implications are substantiated by various country-specific reports on Romania, as well as the comprehensive 2014 OECD RIO (Research and Innovation Observatory) Report concerning Romania (OECD RIO Report, 2015). These two critical figures, namely the allocation of a mere 0.25% of the Gross Domestic Product (GDP) for Research and Development (R&D) and a modest 3% of the GDP dedicated to education, collectively underscore the policy imperatives that demand substantial commitment, heightened attention, and proactive measures. It is evident that these two pivotal sectors, despite their significant importance, are currently grappling with inadequate funding and organizational deficiencies.

Furthermore, the same report underscores the conspicuous centralization and predominant concentration of the research, development,

and innovation (RDI) infrastructure within national institutes. A stark observation is the near absence of private sector initiatives in the realm of RDI activities. Most notably, the situation in Romania is particularly noteworthy. Despite its relatively substantial pool of individuals holding doctoral degrees, the nation's innovation and research output are significantly hampered and adversely impacted due to limited funding and a dearth of promotional efforts and opportunities extended to the private sector for research endeavors.

It is evident that Romania's capacity for research and innovation is constrained by these circumstances, as elucidated in the report. Consequently, addressing these systemic shortcomings should be a paramount concern for policymakers and stakeholders alike. According to this report, "Romania first faces the challenge of ensuring a credible path for gradually increasing the public R&D expenditures" (OECD RIO Report, 2015). However, while the information provided in the Research and Innovation Observatory (RIO) country reports is undeniably valuable, it is essential to acknowledge that events and data stemming from a single year offer limited insights into the broader evolutionary perspectives and trajectories of a nation. To comprehensively assess a country's progress and development, it becomes imperative to delve into the historical trends and transformations it has undergone.

For instance, as of the year 2014, the agricultural sector held a dominant position in terms of employment, engaging a substantial 26% of the workforce. This initial observation prompts a significant inference: given the considerable labor force dedicated to agricultural activities, one might reasonably expect that this sector and its associated populace would greatly benefit from innovations introduced by agriculture-focused start-up enterprises. However, as we shall delve into, the reality does not align with this expectation, as the methods, tools, means, and working conditions within the agricultural domain remain notably outdated and inefficient.

To provide a comprehensive overview of Research, Development, and Innovation (RDI) activities undertaken in Romania during the period spanning 2009 to 2013, the subsequent table shall be employed:

Table 12. Comparison between the 8 RDI indicators performances in Romania and the EU average, from 2009 to 2013

Indicators	2009	2010	2011	2012	2013	EU28 2013 average
GDP growth rate (%)	-7.10	-0.80	1.10	0.60	3.50	0
GERD (% of GDP)	0.46	0.45	0.49	0.48	0.39	2.02
R&D funded by business enterprise sector (% of GDP)	0.19	0.17	N/A	0.19	0.12	1.29
R&D performed by government sector (% of GERD)	34.80	37.80	40.80	41.70	48.70	12.40
R&D performed by business enterprise sector (% of GERD)	41.30	37.80	36.70	39.60	30.80	63.90
Employment in high and medium-high technology manufacturing sectors as share of total employment (%)	4.60	4.60	4.60	4.60	4.60	5.60
Employment in knowledge-intensive service sectors as share of total employment (%)	19.80	19.90	20.60	20.30	20.10	39.20
Turnover from innovation as % of total turnover	N/A	14.30	N/A	N/A	N/A	13.4 (for EU 27 in 2010)

Source: Romania RIO Report (OECD RIO Report, 2015)

The preceding table has been derived from the OECD Research and Innovation Observatory (RIO) report for the year 2015 (OECD RIO Report, 2015). It is noteworthy, as indicated in the previous table, that we have employed "N/A" to denote instances of a break in the time series. This decision was made to uphold data accuracy and to refrain from presenting fictitious figures. As previously articulated, the majority of Research, Development, and Innovation (RDI) activities in Romania are conducted in a centralized manner, primarily within public or national institutions. This centralization has deterred the private sector from engaging in novel RDI endeavors. Consequently, we observe that in the EU-28 average, "R&D performed by Business Enterprise Sector" constitutes 63.90%, while "R&D performed by Government Sector" accounts for 12.40%. Although Romania exhibited a higher GDP growth rate in 2013 compared to the EU-28 average (3.5% in Romania's case), it is disconcerting to note that there are discontinuities in the time series for the "Turnover from Innovation as % of total turnover" indicator for multiple years. It is acknowledged that this

indicator may be relatively low for other countries, considering that more advanced EU nations can elevate the average.

From an evolutionary standpoint and recognizing the substantial influence of education and research on innovation levels and startup development, we will progress in our analysis. The ensuing table will elucidate the "Total R&D personnel and researchers by sectors of performance, as % of total active population" indicator for Romania, juxtaposed with EU-28 average values for the period spanning 2009 to 2017:

Table 13. Share of active population involved in RDI, as opposed to EU-28 average share, during the 2009-1017 period

	2009	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**
European Union - 28 countries share (%)	1.55	1.61	1.68	N/A	1.75	N/A	1.84	N/A	1.99
Romania (%)	0.44	0.43	0.48	0.48	0.49	0.48	0.49	0.51	0.50

Source: Adapted by the author from Eurostat database (EUROSTAT, 2020)

The preceding table has been derived from the Eurostat database (EUROSTAT, 2020). It is noteworthy that the indicator in question is absent from EU-28 records for specific years, specifically in 2012, 2014, and 2016. Despite this absence of data for those years, a discernible trend emerges wherein Romania consistently lags behind in this regard. This disparity, characterized by a limited participation of individuals in Research, Development, and Innovation (RDI) activities, coupled with a relatively modest number of RDI policies and insufficient emphasis on RDI, exerts adverse effects on the startup sector and the broader regional and national development landscape. To offer a contextual perspective, in 2011, although Romania and the EU shared an equivalent value for "new doctoral candidates per 1000 inhabitants," namely 1.7 per 1000 inhabitants, the underlying RDI landscape and outcomes distinctly diverge (OECD RIO Report, 2015); by contextualizing this statistic within Romania's population, it becomes evident that the country continues to exhibit disparities in various Research, Development, and Innovation (RDI) sectors. This deficiency in RDI performance carries significant ramifications not only for individual cities but also for Romania as a whole. Delving into this subject matter, it is discernible that the subpar RDI figures are poised to exert a detrimental

influence on the regional performance of cities and the overarching development trajectory of Romania as a nation.

The RDI landscape in Romania confronts a multitude of challenges, which, in turn, have reverberations affecting the growth and progression of startup enterprises. Drawing insights from the OECD 2014 Research and Innovation Observatory (RIO) report, it becomes evident that the foremost challenges besieging the RDI sector in Romania encompass the sector's chronic underfunding, which subsequently results in negligible contributions from the private sector. Furthermore, a notable unpreparedness among various business sectors to engage in RDI activities exacerbates the situation. It is imperative to acknowledge that the restructuring of this sector, encompassing reforms in financing mechanisms, decentralization initiatives, and enhancements in RDI infrastructure, is imperative to ensure long-term benefits and foster a conducive environment for startup development (OECD RIO Report, 2015).

As previously emphasized, comprehensive country and regional analyses necessitate a foundation built upon evolutionary data. The Research and Innovation Observatory (RIO) report, as delineated earlier, is a product of the Organisation for Economic Co-operation and Development (OECD), encapsulating insights up until the year 2013. It is pertinent to note that this very report has been recurrently conducted by the OECD, with a subsequent iteration encompassing data up to 2017. This updated report serves to offer a more expansive vantage point for discerning evolutionary trends.

Regarding the economic landscape of Romania for the year 2017, discernible progress is evident, notably underscored by a commendable 6.9% augmentation in Gross Domestic Product (GDP). Within the realm of Research, Development, and Innovation (RDI) activities, a nuanced perspective emerges. Specifically, research expenditure has increased to constitute 0.48% of GDP, albeit marginally diminishing in comparison to the 0.49% allocation observed in 2015. A more detailed examination elucidates that, while there exists a modest upward trajectory in research expenditure within the business sector, with figures reaching 0.27% of GDP in 2016, this allocation still lingers significantly below the European Union (EU) average, which stands at 1.30% of GDP. This peculiarity underscores the imperative

need for the Romanian business sector to enhance its commitment to research investments, aligning more closely with EU benchmarks to foster robust RDI endeavors (Chioncel & del Rio, 2018).

Upon inception, several unresolved issues conspicuously manifest, consequently underscoring the discernible challenges prevalent within the purview of this report. Evidently, it becomes unequivocal that throughout the temporal expanse spanning 2014 to 2017, the Research, Development, and Innovation (RDI) infrastructure has remained remarkably static, lacking substantial transformation. Concurrently, the policies instituted to govern RDI activities continue to exhibit deficiencies in numerical strength, efficacy, engagement, and overall efficiency. Furthermore, despite witnessing an uptick in expenditure commensurate with the augmented Gross Domestic Product (GDP), the RDI sector remains entrenched in a state of underdevelopment and undercapitalization.

Drawing upon data culled from the European Commission's online repository, a comprehensive tableau encapsulating an array of research and innovation indicators has been meticulously assembled to elucidate the prevailing landscape:

Table 14. Spending level of 8 Indicators for RDI results in Romania, from 2014 to 2018

Indicators	**2014**	**2015**	**2016**	**2017**	**2018**
GDP per capita (euro per capita)	7550	8090	8650	9580	10510
New doctorate graduates (ISCED 6) per 1000 population aged 25-34 (%)	0.30	0.35	0.19	0.16	0.38
Innovative enterprises as a share of total number of enterprises (CIS data) (%)	12.80	N/A	10.20	N/A	N/A
GERD (as % of GDP)	0.38	0.49	0.48	0.50	0.50
R&D funded by GOV (% of GDP)	0.19	0.20	0.19	0.18	N/A
BERD (% of GDP) (Business enterprise expenditure of R&D)	0.16	0.21	0.27	0.29	0.30
Percentage of scientific publications among the top 10% most cited publications worldwide as % of total scientific publications of the country	3.35	3.50	4.22	N/A	N/A
Public-private co-publications per million population	17.08	17.86	18.07	21.7	19.15
Global Innovation Index	55	54	48	42	49

Source: Adapted by the author from online information available at https://rio.jrc.ec.europa.eu/stats/country-based-indicators (European Commission, 2018)

The previous table has been meticulously formulated by sourcing data from the comprehensive online database maintained by the European Commission (European Commission, 2018). In cases where data was regrettably unavailable, the notation "N/A" has been judiciously employed to signify this limitation. Despite the incremental advancements, these statistical representations underscore the substantial journey that Romania must undertake to establish itself as a formidable presence in the realm of Research and Development and Innovation (RDI). It is somewhat intriguing to note that the data gleaned from the European Commission database pertaining to research and innovation diverges from the information encapsulated within the OECD RIO Romania Report for the year 2017.

Drawing upon data from the European Commission's website, it is discerned that the "R&D funded by GOV (% of GDP)" for the year 2017 amounted to 0.18% of the Gross Domestic Product (GDP). In contrast, the OECD report for the same year reported a more substantial figure, indicating that research expenditure had expanded to encompass 0.48% of the GDP. Although these disparities between the two datasets are somewhat conspicuous, they collectively suggest a deceleration in innovation-related expenditure sourced from public channels, concomitant with an augmented emphasis on fostering innovation within the private sector.

Consequently, the RIO reports for the years 2014 and 2017 serve as compelling testament to the imperative for Romania to expedite policy development endeavors, bridging the gap to reach the European Union's average levels of progress in Research, Development, and Innovation (RDI). It is paramount not only to enhance RDI infrastructure but also to bolster competitiveness within the startup ecosystem, catalyzing their inception and evolution. Simultaneously, measures to decentralize resources and allocate stipulated proportions of the GDP for RDI should be accorded paramount significance, earning steadfast commitment from both local and national authorities.

As earlier elucidated, the robustness of educational and research sectors reverberates throughout a nation's economic landscape. In light of the exigency to accelerate the growth of startups, a dual-pronged strategy ought to be pursued in tandem by policymakers and private enterprises, augmenting both domains for collective benefit.

2.3.3. Innovation Outputs at the National Level in Romania

In 2015, the vast majority of companies operating in Romania, precisely 99.7%, comprised the formidable cohort of over 450,000 Small and Medium-sized Enterprises (SMEs). This SME sector also assumed responsibility for a substantial 67.5% share of total private sector employment. However, when considering the longevity of start-up enterprises in Romania, a rather disheartening pattern emerges. Start-ups within the Romanian entrepreneurial landscape seldom manage to surpass the critical threshold of a 5-year survival rate. Evidently, this 5-year survival rate experienced a marginal but discernible decline during the period spanning 2009 to 2014. Commencing with a 60% survival rate at the outset of 2009, it regrettably dwindled to a mere 40% by the close of 2014. It is worth noting that this downward trajectory can be partially ascribed to the overarching economic recession; nonetheless, it remains incumbent upon the prevailing dearth of supportive start-up infrastructure to account for a significant portion of this decline (European Commission, 2017). The aforementioned report underscores the imperative need for concerted efforts directed toward the enhancement of innovation. It is disconcerting to observe that while the European average for employment within high-growth innovation-intensive enterprises stands at 4.8%, Romania's corresponding figure languished at a mere 2.8% in the year 2014.

From 2011 onwards, the European Union (EU) has witnessed a commendable 8.8% upswing in innovation performance. In the context of the year 2019, the EU succeeded in surpassing the United States in terms of innovative performance. However, it is noteworthy that the EU still trails behind South Korea and Canada, which occupy the foremost and second positions, respectively, in the realm of innovation performance. Australia, securing the third rank, and Japan, positioned fourth, also outperform the EU in this regard.

To specify further, several countries excel in diverse facets of innovation, as indicated by various key indicators. Denmark distinguishes itself in terms of human resources-related innovative performance and fostering an innovation-friendly environment. Luxembourg earns accolades for the

attractiveness of its research systems, while France excels in providing substantial support and financing for innovation. Germany demonstrates exceptional commitment to innovation-related investments. Portugal emerges as a leader in nurturing small and medium-sized innovators, and Malta shines in the domain of intellectual assets and intellectual property rights (European Commission, 2023).

The data gleaned from the European Innovation Scoreboard provides valuable insights into the evolving patterns of startup activities and the innovation landscape within countries. In the context of key innovation indicators, Romania's performance falls considerably short of European averages. According to this scoreboard, Romania is classified as a modest innovator. This characterization of Romania's innovation endeavors remains consistent, persisting from 2015 through to 2019, as articulated in the report's assessment of Romania's innovation profile.

The European Innovation Scoreboard draws upon a plethora of indicators, which, though numerous, are indispensable for effectively gauging innovation outcomes and the innovative prowess of the European Union. Moreover, this comprehensive European scoreboard has engendered a supplementary regional scoreboard tailored to individual member states, an examination of which will follow in subsequent sections. At this juncture, it is pertinent to enumerate the 18 indicators featured in the Regional Innovation Scoreboard devised for European Union member states. These indicators include: “scientific co-publications, innovative SMEs collaborating with others, population with tertiary education, trademark applications, sales of new-to-market and new-to-firm innovations, public-private co-publications, product or process innovators, SMEs innovating in-house, Innovation Index, employment medium and high tech manufacturing and knowledge intensive services, marketing and organizational innovators, lifelong learning, R&D expenditure public sector, most cited publications, Non-R&D innovation expenditures, R&D expenditure business sector, EPO patent applications and design application” (European Commission, 2023); the data corresponding to the aforementioned indicators is traceable back to 2011, encompassing all European Union member states, coinciding with the inaugural release of this report.

According to data extracted from the 2015 European Innovation Scoreboard (EIS), Romania has experienced a declining trajectory in its innovation output. The innovation performance, which stood at 50% in 2008, has regressed to 34.5% in 2015. Concerning the principal innovation-related indicators as assessed by this report, Romania's status in 2015 can be succinctly characterized as follows: "venture capital investment (-23% as opposed to the EU average), sales share of new product innovations (-21%), non-R&D innovation expenditure (-17%), product/process innovations of SMEs (-17%), and innovative SMEs collaborating with others (-12%)" (European Commission, 2017). This phenomenon can be conceptualized as a cascading effect: the absence of financial investment in diverse spheres, notably the backing of startups, results in a dearth of innovative outcomes, ultimately leading to subdued sales figures. It is imperative to underscore that these innovation-related assessments culminate in the classification of nations into one of four distinct categories: "modest innovators," "moderate innovators," "strong innovators," and "innovation leaders." As previously emphasized, Romania falls within the category of "modest innovator." The European Innovation Scoreboard (EIS) meticulously delineates these categories based on four primary indicators, namely "framework conditions," "investments," "innovation activities," and "impacts," alongside ten specific dimensions encompassing "human resources," "attractive research systems," "innovation-friendly environment," "finance and support," "firm investments," "innovators," "linkages," "intellectual assets," "employment impacts," and "sales impacts" (Hollanders & European Commission, 2023). In the context of the 2019 European Innovation Scoreboard (EIS), Romania ranks at the lowest position among EU member states in terms of its innovation performance. In contrast, Sweden, Finland, and Denmark emerge as the top three innovation leaders within the European Union. Denmark, for instance, exhibits a country score of 141 (out of a maximum of 160 points, with 160 serving as the reference point against which scores are measured), a value consistent with its 2017 score. Finland boasts a country score of 146 in 2018, marking an impressive 11-point increment compared to its 2017 score. Similarly, Sweden maintains a country score of 148 in 2018, demonstrating no variation from its 2017 score (Hollanders & European Commission, 2023).

The subsequent graph will illustrate the trajectory of Romania's performance score as assessed by the European Innovation Scoreboard (EIS):

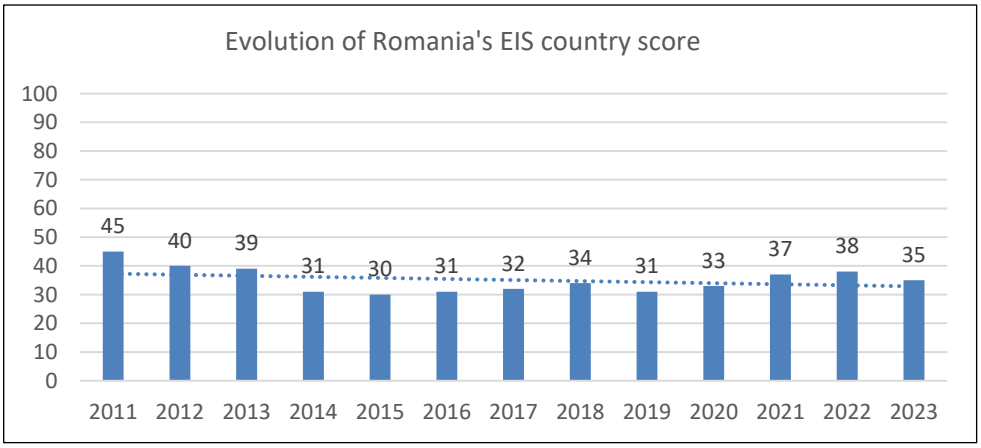

Figure 2. Evolution of Romania's EIS country score during 2011-2023 time-period on a 0-100 performance scale

Source: 2023 EIS Report (Hollanders & European Commission, 2023)

The data presented in Figure 2, denoting the "Romania EIS Country Score," has been derived from the comprehensive country profile delineated within the 2023 European Innovation Scoreboard (EIS) Report (Hollanders & European Commission, 2023). Given that Romania's score closely approximates 100, the data has been suitably represented. However, it is essential to note that, in this context, akin to the previous illustration depicting the top three countries according to the EIS country score for the year 2018, the score is measured against a maximum value of 160 points. This maximum threshold was achieved in 2018, and, as such, future reports may witness scores exceeding this benchmark. As for 2023 levels, one can notice the fact that Romania is witnessing above pandemic performance levels, pointing towards the overall attention aimed at start-ups. Even so, the recent momentum must not be wasted and as such, continuous promotion and improvements towards start-ups must always be on the agenda of decision makers.

This downward trajectory during the 2011-2019 period may be attributed, at least in part, to the ramifications of the economic crisis. It is intriguing, however, that the effects on innovation are most pronounced as the crisis abates. While these insights provide some illumination into

Romania's innovation-generating endeavors, it is essential to bear in mind that Romania occupies the lowest rank within the EU in terms of EIS ranking.

To offer a more precise analysis, we have delved into the evolution of the ten innovation dimensions utilizing EIS data. By juxtaposing Romania's relative performance with that of the EU in two distinct years, 2011 and 2023, we aim to discern the underlying causes contributing to Romania's modest innovation output scores.

Table 15. Evolution of 10 innovation dimensions in 2013 as compared to 2011, in Romania

Innovation dimensions/year	**2011**	**2018**	**2023**
Human resources	40.3	16.7	19.9
Attractive research systems	14.3	27.2	41
Innovation friendly environment	75.4	121.6	91.8
Finance and support	31.7	29.4	18
Firm investment	61.9	10.9	13.7
Innovators	42.5	0	4.6
Linkages	53.7	40.8	7.7
Intellectual assets	13.2	22.3	31.4
Employment impacts	18.7	48.4	10.9
Sales impact	84	63.5	70.5

Source: 2023 EIS Report (Hollanders & European Commission, 2023)

The table above has been based and adapted from information pertaining to the 2019 EIS (Hollanders & European Commission, 2023). In this context, the scores are also to be contextualized against a maximum attainable value of 160 points, which was reached in 2018. It is noteworthy that these values differ across countries due to variations in maximum attainable scores for the respective dimensions over the years. A discernible trend emerges upon scrutiny: most dimensions exhibit a decline in 2018 when contrasted with their 2011 counterparts. The exceptions to this trend are the "Attractive Research Systems," which experienced a notable increase of 12.9 points, the "Innovation-Friendly Environment," marked by a substantial uptick of 46.2 points, "Intellectual Assets," which grew by 9.1 points, and "Employment Impacts," showcasing a remarkable gain of 29.7 points.

Conversely, the "Innovators" dimension, critically linked to SMEs' internal innovation endeavors, SME-driven product and process innovation, and SME-oriented marketing and organizational innovation, witnessed a precipitous descent from a score of 42 in 2011 to a stark zero in 2018. This

dimension underscores SMEs' innovation efforts, and its regression implies that SME-driven innovation output in these domains has dwindled to a statistically insignificant level in 2018. It is imperative to emphasize that this does not signify a complete absence of such innovations in 2018; rather, it reflects the negligible statistical significance of their output.

Furthermore, it merits attention that Romania's performance in the "Innovation-Friendly Environment" dimension is relatively commendable within the European landscape. This dimension is profoundly influenced by broadband internet connectivity and connection speed. Romania, by virtue of its well-developed broadband infrastructure, garners a favorable position. Notably, in 2018, Romania secured the 5th rank in Europe for internet speed, as corroborated by the Statista.com website (Statista, 2019). It is our contention that while internet speed and connectivity indeed constitute vital components, they alone do not suffice to establish and endorse a business environment's overall friendliness. Nevertheless, factors such as interconnectivity among diverse stakeholders and accessibility to information hold substantial significance. These elements significantly influence a country's overall innovation output. Besides the "Innovation-Friendly Environment," the dimension that has experienced the most pronounced decline is the "Firm Investment" dimension. Its score plummeted precipitously from a baseline of 61.9 points to a mere 10.9 points, in relation to Romania's performance relative to that of its EU counterparts. What can also be noticed from the previous table refers to the fact that most innovation dimensions have never recovered from the all time highs (so far) manifested during the beginnings of the 2010's; the only dimensions that have managed to gain new heights in 2023 as compared to 2011 are "Intellectual assets" and "Attractive research systems".

2.3.4. The Interplay of Innovation and Regional Development

The preceding table also highlights the significance of result distribution. While these outcomes are attributed to Romania as a nation, it is imperative to acknowledge the heterogeneity of performances across different regions. The examination of regional performances concerning innovation outputs holds considerable importance. As previously indicated, in addition to

country-specific innovation scoreboards, a regional innovation scorecard has been established through the initiatives of the European Commission. As reiterated earlier, the list encompassing 18 indicators upon which the Regional Scoreboard 2019 is based comprises the following components (for ease of subsequent data visualization, corresponding abbreviations for each indicator will be provided in parentheses following their respective descriptions): "scientific co-publications (SCP), innovative SMEs collaborating with others (ICWO), population with tertiary education (TE), trademark applications (TA), sales of new-to-market and new-to-firm innovations (NMI), public-private co-publications (PPP), product or process innovators (PPI), SMEs innovating in-house (IHI), Innovation Index (II), employment medium and high tech manufacturing and knowledge intensive services (HTM), marketing and organizational innovators (MOI), lifelong learning (LL), R&D expenditure public sector (R&D P), most cited publications (MCP), Non-R&D innovation expenditures (Non-R&D), R&D expenditure business sector (R&D B), EPO patent applications (PA), and design application (DA)" (European Commission, 2023). In the context of regional advancements in innovation output, it is essential to initially establish a precise differentiation among the regions upon which the scoreboard is predicated. Thus, in accordance with this report, Romania is categorized into the following overarching regions: Western region (noted in the regional innovation scoreboard as RO42-West), Bucharest-Ilfov Region (RO32), Central Region (RO12), Southern-Muntenia Region (RO31), North-West Region (RO11), South-Eastern Region (RO22), South-Western Oltenia Region (RO41), North-Eastern Region (RO21) According to the NUTS nomenclature, which stands for the Nomenclature of Territorial Units for Statistics, Romania is delineated into eight discrete regions. It is noteworthy that all of these eight regions fall under the NUTS 2 classification, signifying that each of the aforementioned regions is classified at this specific hierarchical level, or, as according to EUROSTAT, are "basic regions for the application of regional policies" (EUROSTAT, 2018).

It is imperative to emphasize that in this context, the term "maximum value" denotes the highest values recorded during the study across diverse regions. It is crucial to clarify that these maximum values are not indicative of any predefined upper or lower threshold set by the research institution.

Consequently, the upper and lower bounds of the study may exhibit variations across different years for each of the delineated regions (European Commission, 2023).

In relation to the data available in Annex 1, it is pertinent to delineate two distinct approaches for calculating maximum and minimum values. Initially, maximum and minimum values are computed on a per-region basis, considering the time intervals spanning 2011, 2013, 2015, 2017, and 2019 (with data organized in biennial cycles, commencing in 2011). Subsequently, an additional set of maximum and minimum values is ascertained for each time period across all regions, on an annual basis. This dual approach is essential, as it accounts for the possibility that while a specific region may exhibit increments in its performance across the years in various indicators, other regions could surpass it. To facilitate a comprehensive understanding of the data, both the regional and the cross-regional maximum and minimum values are calculated. Moreover, Annex 1 serves the purpose of enhancing our comprehension of the trajectory of 18 key indicators by juxtaposing available data from the eight distinct regions, commencing with the year 2011. The results are then contextualized by comparing them to the EU benchmarks for the base year 2011. To facilitate the comprehension of this dataset, a table has been generated based on information from Annex 1.

The following table provides insights into the 2023 EU average for each specific indicator:

Table 16. European Innovation Scoreboard (EIS) average for 18 indicators for 2023

Indicator	**EU average in 2023**
Population with tertiary education	103.59
Lifelong learning	112.08
Scientific co-publications	129.61
Most cited publications	95.50
R&D expenditure business sector	110.76
R&D expenditure public sector	103.22
Non-R&D innovation expenditures	101.67
Product or process innovators	140.22
Marketing and organizational innovators	N/A
SMEs innovating in-house	139.74
Innovative SMEs collaborating with others	126.79
Public-private co-publications	129.61

Indicator	EU average in 2023
EPO patent applications	90.50
Trademark applications	109.93
Design application	79.31
Employment medium and high-tech manufacturing and knowledge intensive services	100
Sales of new-to-market and new-to-firm innovations	108.90
Innovation Index	108.46

Source: Adapted by the authors from the 2023 European Innovation Scoreboard (EIS) (Hollanders & European Commission, 2023)

The rationale behind the inclusion of the indicators within the preceding table is to enhance the lucidity and comprehensibility of the information and data proffered in Annex 1. Furthermore, it is imperative to underscore that each of the aforementioned indicators bears significant relevance to the augmentation of a country's startup ecosystem and entrepreneurial efficacy. In reference to the set of 18 innovation indicators, the incorporation of 18 distinct tables within Annex 1 is orchestrated with the specific intention of clearing the developmental history of these 18 indicators across the eight discrete regions of Romania. The 18 tables are:

- Table A 1. Evolution of "Population with tertiary education" (TE) indicator in Romania's 8 regions (NUTS2), and comparison of maximum and minimum levels, from 2011 to 2019
- Table A 2. Evolution of "Lifelong learning" indicator (LL) in Romania's 8 regions (NUTS2), and comparison of minimum and maximum levels, from 2011 to 2019
- Table A 3. Evolution of "Scientific co-publications" (SCP) indicator in Romania's 8 regions (NUTS2), and comparison of minimum and maximum levels, from 2011 to 2019
- Table A 4. Evolution of "Most cited publications" (MCP) indicator in Romania's regions (NUTS2), and comparison of minimum and maximum levels, from 2011 to 2019
- Table A 5. Evolution of "R&D expenditure public sector" (R&D P) indicator in Romania's 8 regions (NUTS2), and comparison of minimum and maximum values, from 2011 to 2019
- Table A 6. Evolution of the "R&D expenditure business sector" (R&D B) indicator in Romania's 8 regions (NUTS2), and comparison of minimum and maximum values, from 2011 to 2019

- Table A 7. Evolution of the "Non-R&D innovation expenditures" indicator in Romania's 8 regions (NUTS2), and comparison of minimum and maximum values, from 2011 to 2019
- Table A 8. Evolution of the "Private co-publications" indicator (PPI) in Romania's 8 regions (NUTS2), and comparison between minimum and maximum levels, from 2011 to 2019
- Table 9. Evolution of the "Marketing and organizational innovators" (MOI) indicator in Romania's regions (NUTS2), and comparison between minimum and maximum levels, from 2011 to 2019
- Table A 10. Evolution of the "SMEs innovating in-house" indicator (IHI) in Romania's 8 regions (NUTS2), and comparison between minimum and maximum levels, from 2011 to 2019
- Table A 11. Evolution of the "Innovative SMEs collaborating with others" (ICWO) indicator in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019
- Table A 12. Evolution of the "Private co-publications" indicator (PPP) in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019
- Table A 13. Evolution of the "EPO patent applications" (PA) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019
- Table A 14. Evolution of the "Trademark applications" (TA) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019
- Table A 15. Evolution of the "Design applications" (DA) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019
- Table A 16. Evolution of the "High-tech manufacturing" (HTM) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019
- Table A 17. Evolution of the "Sales of new-to-market and new-to-firm innovations" (NMI) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019

- Table A 18. Evolution of the " Innovation Index" (II) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019.

Annex 1 has been derived from the online database of the 2019 Regional Innovation Scoreboard (Regional Innovation Scoreboard (RIS), 2019). While Annex 1 is extensive in nature, it provides significant insights into the variations and achievements in innovation across the Romanian regions classified under NUTS 2. The dataset within Annex 1 utilizes 2011 as its reference year. Additionally, we have extracted from the aforementioned database the EU-28 regional profile average, particularly comparing the 2019 data on Romanian regional performance with that of EU regions for a comprehensive assessment.

As observed in Annex 1, the "population with tertiary education (TE)" indicator, denoting the proportion of individuals with tertiary education, prominently features as the highest-ranking metric in the list. Notably, the Bucharest-Ilfov region leads in this indicator, showcasing both the highest value and positive evolution over the years. In 2019, it reached a remarkable 157.81 points, signifying a substantial increase of 17.30 points compared to the base year of 2011. It is worth noting that this indicator surpasses the EU-28 profile, which stood at 108.20 points in 2019.

However, it is crucial to emphasize that despite Romania's regions exhibiting higher averages in the "population with tertiary education (TE)" indicator, their creative, innovative outputs, particularly in terms of start-up creation, remain relatively low in comparison to other European regions. This phenomenon can partly be attributed to migration trends toward the capital city of Bucharest, which serves as a primary beneficiary of talent migration from across the country.

The Western region, along with the North-West region, follows as the second and third most prolific regions in terms of tertiary education (TE). Both regions recorded an increase of 13.08 points in 2019 relative to their 2011 values. Interestingly, despite surpassing the EU-28 profile in this dimension, all regions lag behind when it comes to the "scientific co-publications (SCP)" indicator. This suggests that research and development (R&D) outputs associated with individuals holding tertiary degrees remain relatively insignificant. This assertion is further supported by the fact that, in the "most

cited publications (MCP)" indicator, all regions fall significantly below the EU-28 profile for 2019, with the Western region achieving the highest score of 55.44 points.

Regarding the "R&D expenditure public sector (R&D P)" indicator, the Bucharest-Ilfov region experienced the most significant decline. Over the 2011-2019 period, this indicator decreased by 42.11 points, reflecting a substantial reduction in public funding for R&D activities. While the initial decrease in 2011 could be linked to the economic crisis, post-recession, public support for R&D activities remained stagnant, resulting in a decrease from 126.33 points in 2011 to 84.22 points in 2019. This value notably falls below the EU-28 profile for 2019, which stands at 102.56. Notably, the South-Muntenia region was the exception, briefly regaining its 2011 values (17.35) in both 2015 and 2019. Nevertheless, the regional values for this indicator remain distant from the EU-28 profile.

The centralization of R&D activities within public institutions in Romania has adversely affected the private business sector, discouraging R&D-related endeavors and funding. This is evident in the "R&D expenditure business sector (R&D B)" indicator, which exhibits lower values than "R&D expenditure public sector (R&D P)." While the Bucharest-Ilfov region recorded the highest value for this indicator, reaching 64.86 points in 2019, it still falls significantly short of the EU-28 profile, which stands at 107.67. Despite reaching its maximum value in the Bucharest-Ilfov region, the growth since 2011 has been relatively modest, with only a 15.46-point increase. In contrast, the Central region experienced a more substantial growth rate, increasing by 30.77 points in 2019 compared to 2011, as did the Western region, with a growth of 30.23 points since 2011, reaching a value of 50.27 points in 2019.

The "Product or process innovators (PPI)" indicator, as presented in Annex 1, stands out as one of the most adversely affected metrics across the various regions of Romania. A notable decline is evident in the South-East region of the country, where this indicator has witnessed a substantial reduction, plummeting from 103.50 in 2011 to a mere 29.29 in 2019. This decline corresponds to a decrease of 74.29 points. In comparison, the EU-28 profile reports a value of 100.45. It is noteworthy that all regions in Romania

have experienced negative trends in the evolution of this indicator, with the values for 2019 lower than those recorded in 2011.

Similarly, the "Marketing and organizational innovators (MOI)" indicator faces a similar predicament, with all regions showing negative trends. Once again, the values for 2019 fall below the initial 2011 values in all eight instances.

Regarding the in-house innovation efforts of SMEs, the most significant endeavors are observed in the South-East region, where the indicator reached 31.40 in 2019, the highest level among all regions for that year. However, upon closer examination, it becomes evident that this region has experienced the sharpest decline in terms of the "SMEs innovating in-house (IHO)" indicator. It decreased by 71.45 points from its peak performance of 102.58 points registered in 2011. This indicator has exhibited a negative evolution in all regions since 2011.

The "innovation index (II)" indicator, while still falling significantly short of the EU-28 profile value of 104.71, has remained relatively stable in the Bucharest-Ilfov region. It transitioned from a value of 61.97 in 2011 to 54.08 in 2019, reflecting a decrease of 7.89 points. Notably, this indicator serves as a comprehensive manifestation of all preceding indicators and their respective values. Thus, given the consistently low scores observed in other indicators, a negative trend is discernible over the years.

It is imperative to highlight that even when calculating the yearly average across all regions and comparing it to the EU-28 profile, Romania continues to lag significantly behind, facing a considerable disadvantage.

2.3.5. Comparative Analysis of Startup Infrastructure and Innovation Performance Across the Eight Romanian Regions

To obtain a comprehensive overview of the overall regional competence, we have extended our analysis using the dataset presented in the preceding table, which was derived from the 2019 Regional Innovation Scoreboard online database. We systematically computed the average regional competence by aggregating the annual values for each region and subsequently dividing this cumulative sum by the total number of

indicators, which in this case, amounts to 18 (Regional Innovation Scoreboard (RIS), 2019). Consequently, the collective robustness of each region is succinctly encapsulated in the ensuing table:

Table 17. Average strength of the 8 Romanian regions from 2011 to 2019, on a 2-year basis

Region	Average strength 2011	Average strength 2013	Average strength 2015	Average strength 2017	Average strength 2019	Evolution
North-West	42.18	40.20	30.22	33.71	33.89	-8.30
Centre	40.70	36.49	27.40	30.74	31.06	-9.64
North-East	42.16	38.92	33.04	20.90	23.82	-18.34
South-East	43.25	36.43	31.59	25.61	24.08	-19.17
South-Muntenia	36.47	34.06	28.52	25.06	20.39	-16.07
Bucharest-Ilfov	65.65	65.46	55.64	55.83	59.83	-5.83
South-West Oltenia	31.82	26.99	16.59	15.47	16.21	-15.61
West	41.33	33.76	30.32	33.55	37.31	-4.02

Source: Own calculation based on 2019 Regional Innovation Scoreboard data (2019)

The most dynamically influential region in Romania for the year 2019 remains the Bucharest-Ilfov region, boasting an average score of 59.83 points. While the South-West Oltenia region appears as the least performing region when considering the average score, it is worth noting that the South-Eastern region has experienced the most pronounced decline since 2011, with a decrement of 19.17 points. Although the computation presented in the preceding table has been formulated by the author of this work, it is imperative to underscore that the deductions derived from the table align with the findings of the RIS 2019. The RIS 2019 corroborates the designation of the Bucharest-Ilfov region as the most high-performing among Romanian regions. In the broader context of EU-28 regions, the Bucharest-Ilfov region occupies the 200th position out of a total of 238 EU regions, further substantiating its relative strength (Regional Innovation Scoreboard (RIS), 2019). In contrast to the data compiled in preceding years, resulting in performance fluctuations across various temporal scopes, it is noteworthy that all Romanian regions have exhibited a decline in terms of innovation performance. Notably, the sole exception to this trend, where a similar situation is observed, is Slovenia.

The insights gleaned from the European Innovation Scoreboard and the Regional Innovation Scoreboard are consonant with the findings articulated in the 2019 Global Innovation Index report. According to the latter, Romania is positioned at the 54th rank among 130 economies worldwide. Romania's performance is quantified by an innovation index score of 45.51 points, denoting its level of innovativeness at the national level (Cornell University, INSEAD, and WIPO, 2019). The aforementioned report underscores that Romania's standing in Business Sophistication is situated at the 51st position, marked by a score of 33.6 points. This composite indicator comprises three distinct dimensions: knowledge workers, where Romania records a 2019 score of 40.4 points; innovation linkages, where the score stands at 19.2; and knowledge absorption, with Romania achieving a score of 41.1 points. Notably, the dimension of "knowledge creation" yields a particularly modest score of 10.5, representing the lowest among all dimensions within the country under the "Knowledge and technology outputs" category. This conspicuously low value underscores Romania's limited capacity for innovation and suggests an underdeveloped landscape in sectors conducive to innovation generation, including the startup sector.

In the context of this section focusing on regional innovation, it is crucial to reiterate the intrinsic interplay between innovation and startups, where each serves to catalyze the other's growth. Given the relatively low regional scores, it comes as no surprise that Romania's startup ecosystem and performance lag behind that of other European nations.

The preceding table underscores the discernible downward trajectory in the innovation efficiency of Romanian regions. Nonetheless, there are discernible signs of progress in the perception and cultivation of innovation, along with concerted efforts from the private sector to stimulate startup activity. To facilitate these developments, Romania has seen a proliferation of business facilitators - entities that encompass various resources, spaces, and clusters designed to foster business development, spanning startups, established enterprises, and traditional companies.

These business facilitators address a range of objectives, with many dedicated to research, development, and innovation (RDI) activities and the nurturing of startups. Moreover, they engage in public-private partnerships, knowledge sharing initiatives, and provide support to conventional

enterprises. This burgeoning landscape of business development entities is distributed geographically across various regions in Romania and takes on different forms, offering diverse resources and opportunities for business support, and as such, the following table will be used in order to better assess this landscape:

Table 18. Regional distribution of 7 business facilitator types for 2015 levels in Romania

Region	Business Accelerators	Technology transfer centers	Clusters	Hubs	Incubators	Industrial parks	S&T parks	TOTAL
Bucharest-Ilfov	4	11	10	8	6	2	1	42
Center	0	1	12	2	1	17	0	33
North-East	0	0	4	1	0	3	1	9
North-West	3	6	5	4	1	13	0	32
South	0	1	1	0	1	20	0	23
South-East	0	1	3	1	0	2	0	7
South-West	0	1	5	0	2	7	0	15
West	0	1	5	1	0	2	0	9
TOTAL	7	22	45	17	11	66	2	170

Source: Adapted by the author from the "Horizon 2020 Policy Support Facility" report by the European Commission (European Commission, 2017)

The table data presented herein has been derived from the "Horizon 2020 Policy Support Facility" report commissioned by the European Commission (European Commission, 2017); As indicated by the table title, the report under consideration draws upon data pertaining to Romanian regions for the year 2015. In this specific context, it is discernible that a significant proportion of support allocated to business-related activities and start-up development is concentrated within the Bucharest-Ilfov region, which, up until 2015, boasted a total of 42 business facilitators. Following closely behind is the Central region, with a notable count of 33 such facilitators. It is noteworthy that the term "incubators" encompasses a broad spectrum of incubator types, including but not limited to: "business incubators with mixed portfolio, technological business incubators, academic business incubators implementing or using the R&D activity in an university or public research institute, agricultural business incubators, social business incubators, business incubators specific to a certain sector, incubators for non-agricultural activities in rural areas" (Radauer & Roman,

2016). It is imperative to acknowledge that while the aforementioned table provides insights into the prospects of startup development, equal attention should be directed towards sources of financing, with particular emphasis on the pivotal role played by business angels as a primary reservoir for startup funding. This specific cohort assumes significance, particularly in light of the decline in startup seed investments in Romania, plummeting to zero in 2015 from a noteworthy sum of 1.8 million euros in 2014 (Radauer & Roman, 2016); the same report highlights the challenging landscape of investments sourced from business angels within Romania. Between 2014 and 2016, when considering the broader context of the EU-28, Romania found itself positioned at the bottom in terms of investments received from business angels. In 2015, the total investment from business angels amounted to a mere 1.3 million euros. It is worth noting that seed funding, which traditionally precedes the formal commencement of a startup, typically materializes after the initial conceptual deliberations regarding the overarching direction of prospective startup endeavors. Seed funding is frequently facilitated through participation in accelerator and incubator programs. The growth trajectory of this funding category is not particularly remarkable either. In 2018, funds stemming from business angels amounted to 2.9 million euros, a statistic elucidated by the European Business Angels Network (EBAN) in its market statistics report for the same year (EBAN, 2018). It is not a dearth of a business-angel network within Romania; rather, it is the outcomes of the startup sector and the prevailing market conditions that imbue the entire process of conceiving, establishing, and nurturing a startup with heightened challenges. Furthermore, it is imperative to underscore that the endeavors of clusters, hubs, incubators, accelerators, and other facilitative entities within the business landscape should pivot their focus towards enhancing both the quantity and quality of output, as well as the innovative concepts posited by startups. This emphasis should transcend mere numerical metrics related to startups seeking guidance, support, funding, or specialized expertise across diverse domains.

To further elucidate the imperative for enhancements at the Romanian level concerning the cultivation of knowledge transfer and the genesis of innovative enterprises, one can reference the Global Competitiveness Report. In the 2015 edition of this report, Romania's "State of cluster development" indicator was positioned at the 70th rank out of 144, underscoring the need for

substantive improvements in this domain (WEF, 2015). Despite the attainment of a score of 38.2 points in 2019, it is discernible that this particular indicator has experienced a decline. This deduction arises from the fact that, in 2019, Romania's ranking in relation to this indicator positioned it at the 109th place among the 141 scrutinized economies (WEF, 2019).

An alternative approach to presenting information involves assessing the efficacy of Romanian hubs in comparison to their European counterparts. In the case of Romania, as delineated in Table 16 titled "Regional Distribution of Business Facilitators in 2015," there are a total of 17 hubs dispersed across the eight regions of the country. Drawing upon a report initiated by Salido et al. in 2012, we find that European countries exhibited varying numbers of hubs, with the most notable and active hubs tallied as follows: 50 hubs in the United Kingdom, 22 in Sweden, 21 in the Netherlands, 31 hubs in Germany, 11 hubs in the Czech Republic, 9 hubs in Slovakia, 35 hubs in France, 38 hubs in Spain, and 23 hubs in Italy (Salido, et al., 2012). Nations with significantly smaller landmasses and populations than Romania have achieved the establishment of thriving and active business facilitators at a notably accelerated pace compared to Romania's progress.

As previously elucidated, startups play a pivotal role in regional development, primarily by enhancing the region's appeal in terms of innovation, creativity, structural attributes, and economic viability. Additionally, startups substantially contribute to the generation of new employment opportunities. The process of job creation through startups is contingent upon several factors, including the rate of new enterprise formation, the anticipated size of these nascent companies, their survival duration in the market, and the subsequent developmental trajectory of those that endure.

Chapter 3. Innovation, Startups, and Local Development in Oradea and Cluj-Napoca

The primary objective of the present study is to elucidate the intricate interplay among potential entrepreneurs, business founders, capital proprietors, and change agents who possess creative acumen. This investigation seeks to underscore their proficiency and capacity to cultivate enterprises predicated on innovative products and services. The ramifications of such inventive businesses extend beyond mere economic implications, potentially encompassing broader social, cultural, organizational, and environmental dimensions. The aptitude for divergent thinking and the generation of novel ideas and solutions to contemporary societal challenges are intricately linked to individuals' capacity to nurture and harness the boundless reservoir of creativity.

Amongst various business paradigms, startups are uniquely poised to facilitate the emergence of pioneering concepts, serve as influential benchmarks for a multitude of business models and categories, and exhibit remarkable adaptability to both internal and external factors. These factors encompass domain-specific dynamics as well as those originating from extraneous spheres that impinge upon the startup landscape. Recent years have borne witness to a burgeoning interest among organizations in fostering and stimulating creativity among their workforces. Entrepreneurs have come to recognize the substantial economic, social, and cultural advantages that this novel approach can confer. These benefits are manifest both internally, by shaping the work environment and the external recognition stemming from innovative ideation by employees, and externally, by influencing and nurturing the regions within which nascent businesses operate.

The traditional industrial business models of yesteryears are gradually yielding ground to models that prioritize product and service quality, distinctiveness, and the future implications of ongoing endeavors.

Innovation, as a pivotal driver, hinges not only on the inherent capacity for creativity but, crucially, on individuals' ability to cultivate their creative potential, with resultant outcomes leading to progress and concomitant socioeconomic growth.

Regarding the status of creativity in Romania, it is noteworthy that until 2016, there existed no specific legislation to regulate the initiatives of enterprising and creative young individuals. The formulation of a comprehensive policy framework to buttress the creative sector commenced as a concerted effort only post-2016. The rationale underpinning the necessity for such a framework is multifaceted. It seeks to establish a conducive environment for facilitating access to financial and non-financial support mechanisms, thereby incentivizing more structured collaboration between public and cultural institutions and the private sector. Additionally, this framework endeavors to underscore the latent economic and social potential inherent within the cultural and creative domains (National Institute for Research and Cultural Forming, 2016). In accordance with the findings presented in this report, the European Creative Business Network conducted an extensive analysis of approximately 200 creative hubs located across the European Union (EU) 27. This analysis was conducted within the framework of the EU's partnership programs focused on culture and creativity, with a specific aim to bolster the role of culture in driving socio-economic development within the six Eastern Partnership countries. The investigative process encompassed the administration of 100 surveys and the conduct of 12 in-depth interviews with representatives hailing from the creative community.

The discerned insights gleaned from this analysis shed light on the pivotal role of co-working spaces, which aspire to serve as nexus points uniting businesses, economies, and communities. A conspicuous symbiosis exists between the realm of startups and co-working spaces, thereby positing that an escalation in the prevalence of co-working spaces may potentially translate into a concomitant surge in the formation of startups.

With regard to the operational dynamics and working environments within these hubs and co-working spaces, a significant proportion has demonstrated their efficacy in enhancing the productivity, sociability, and overall efficiency of freelancers and founders. Beyond this, the physical

presence of individuals within these hubs and co-working spaces engenders tangible benefits for the local creative economy. This is achieved by instigating founders and freelancers to reinvest a portion of their earnings into the enhancement, evolution, and rejuvenation of the communal workspaces that they inhabit.

It is imperative to underscore that for hubs to function optimally, they frequently necessitate external support across various dimensions. Foremost among these dimensions are issues pertaining to management, the adaptation and diversification of the nature, quantity, and format of services offered by startups, as well as critical support in domains such as marketing and branding. Both legislative and financial support mechanisms are deemed indispensable. Remarkably, nearly half of these European hubs operate as non-profit entities, with over a quarter of them benefiting from partial governmental funding. A relatively modest fraction, less than 10 percent, operates within the auspices of university structures.

Hubs, by their very nature, engender multifaceted benefits to society, constituting value-added assets within the regions they inhabit. However, for these hubs to more effectively harness the potential of founders and their workforce, there is an exigent need for augmented support programs from local and national governments. The provision of assistance to hub activities serves as a reciprocal symbiosis, wherein the state stands to gain manifold advantages. Hubs effectively contribute to the alleviation of youth unemployment, facilitating connections between prospective employers and employees by providing a conducive platform wherein both parties can congregate and collaborate harmoniously. (European Commission, 2021). As delineated in a comprehensive report commissioned by the European Creative Business Network, which scrutinized a cohort of 200 creative hubs operating across the European Union, the overarching mission of a noteworthy 76% of these hubs is directed towards the facilitation and bolstering of the indigenous creative economy. Intriguingly, the report further underscores the nuanced organizational structures prevalent within this ecosystem, elucidating that 42% of the encompassed European hubs operate under the auspices of non-profit entities. In a parallel vein, 27% of these hubs receive partial funding from governmental sources, signifying a hybrid funding model. Furthermore, a distinct 7% of these hubs are situated

within the framework of university structures, emblematic of academic integration (culturepartnership.eu, 2019). From a broader vantage point, as expounded upon consistently within this discourse, conspicuous differentials emerge between Western and Eastern Europe. The salient metrics underscored hitherto exhibit markedly diminished magnitudes in Eastern Europe. Consequently, it is imperative that endeavors directed toward the cultivation of startups and the proliferation of regional hubs in this region transpire with heightened expeditiousness. Given the widespread prevalence of academic institutions across Europe, we posit that fostering augmented collaborations between universities and hub entities holds the potential to engender an augmented profusion of startups and creative enterprises.

Societal, municipal, and regional landscapes are in a perpetual state of flux. In terms of their developmental velocity, certain cities within Romania have demonstrated a propensity for more favorable positioning relative to others. Within this context, the disparities, both inter-regional and intra-regional, among various cities have become increasingly conspicuous in recent times. Present-day empirical investigations centered on entrepreneurship and commercial expansion predominantly underscore a positive correlation between entrepreneurship, characterized here as the cumulative count of startups, and economic advancement.

Metropolitan evolution stands out as one of the most consequential factors currently exerting influence on the growth trajectory of the Romanian business milieu. This influence is so pronounced that, in the Romanian context, an estimated 75% of revenue generation emanates from enterprises situated within the confines of the eight most expansive metropolitan regions. These regions encompass Bucharest, Brașov, Cluj-Napoca, Constanța, Craiova, Iași, Ploiești, and Timișoara (Ionescu-Heroiu, 2016). Each of these eight metropolitan areas boasts robust academic centers that are in a perpetual state of evolution. Strategic alignment in the trajectory of their development holds the potential for enduring advantages. As previously elucidated, collaborations forged between universities and the private sector can yield a multitude of benefits. These include pioneering technological advancements, the proliferation of nascent enterprises, mitigation of youth unemployment through enhanced employment

opportunities, curtailment of recruitment expenditures, and the retention of local talent, thereby reducing labor-related migration.

Although Cluj-Napoca has garnered momentum in recent years and has emerged as a vanguard in the maturation of the startup landscape, both quantitatively and qualitatively, fostering a spirit of competitiveness between diverse cities and regions, with a specific focus herein on Oradea and Cluj-Napoca, holds significant promise for the prospective development of the startup ecosystem. Over the course of this chapter, our endeavor has been to provide comprehensive insights encompassing all facets of the business milieu, coupled with forthcoming prospects, that serve as the crucible for the inception and evolution of startups. Subsequent to these comprehensive municipal appraisals, we shall conduct a comparative analysis between these two locales. This comparison shall encompass quantitative facets, as well as an evaluation of the future ramifications to be wrought by startups emanating from these two regions, thereby delineating the relative significance of startups originating therein.

3.1. Innovation and Startups in the North-West Region of Romania

The creative and innovative sectors occupy a prominent position in driving societal transformation and serve as principal catalysts for multifaceted development, encompassing economic, social, environmental, and managerial dimensions, thereby fostering the well-being of individuals and organizations alike. Empirical evidence unequivocally establishes that the creative sectors contribute significantly to "innovative and creative solutions for a large variety of societal challenges, employment and inclusion, boosting innovation in other business sectors, breathing new life into areas in decline or giving new impetus to urban planning and rural areas" (Directorate-General for Education, Youth, Sport and Culture (European Commission), 2018). Evident from this report is the potential for substantial advancements within the creative industries, and notably, the expeditious realization of such progress is attainable through the formulation and implementation of targeted public policies. It is imperative, however, that these policies are

underpinned by a robust collaboration between the private sector and legislative bodies in the public domain, harnessing their combined expertise and focused commitment to spearhead the emergence of novel enterprises and foster the development of startups.

Moreover, it is crucial to consider the granularity of policy implementation. While national policies, initiated by central governments and higher authorities, serve as an initial step in facilitating the establishment and sustenance of nascent businesses, it is incumbent upon regional and local authorities to shoulder the responsibility of attracting diverse sources of financial support, fostering conducive socio-economic and environmental conditions, charting strategic trajectories, and forging new collaborative alliances. Consequently, partnerships between universities, public entities, government-owned enterprises, and the private sector represent a pivotal component in expediting the genesis of innovative ventures.

Within the spectrum of policy opportunities, it is imperative to underscore the creation of "Regional Excellence Centers for Creative Industries" as a strategic imperative that stands to confer myriad benefits upon both enterprises and regions alike (Directorate-General for Education, Youth, Sport and Culture (European Commission), 2018). Furthermore, fostering collaboration among diverse regional, national, and supra-national Excellence Centers engenders an accelerated pace of innovation, facilitates the efficient dissemination of knowledge, and enhances resource consolidation. This collaborative milieu is conducive to cross-sectoral and multi-sectoral innovation, instigating numerous instances of co-creation and co-innovation across regions. Such endeavors redound to the benefit of a broader spectrum, encompassing individuals, enterprises, regions, and sectors.

It is imperative to underscore that apart from the pivotal role played by regional legislators in the genesis of new enterprises, there exists a critical imperative concerning the establishment, diffusion, preservation, and education stemming from these collaborative partnerships. This responsibility necessitates active engagement from all stakeholders involved in the entrepreneurial process, encompassing legislators, local governing bodies, representatives of the business sector, and founders. Hubs,

technology parks, and business accelerators emerge as pivotal instruments through which these stakeholders can effectuate a rejuvenation of regional prowess and competitiveness.

The focal point of this introductory chapter revolves around an in-depth analysis of the strengths, weaknesses, and prospective opportunities of Oradea, with particular emphasis on regional strengths. This analysis not only encompasses an exploration of noteworthy case studies but also undertakes a benchmark analysis, scrutinizing cities renowned for their historical prowess in talent attraction and business incubation.

An additional facet warranting discussion pertains to the life cycle of nascent enterprises within the creative sectors and startups. In most instances, such enterprises traverse a distinctive developmental trajectory encompassing successive stages: the seed stage, startup stage, growth stage, expansion stage, establishment stage, maturity stage, and exit stage (Directorate-General for Education, Youth, Sport and Culture (European Commission), 2018). Evaluating companies based on their developmental stages offers salient insights to both regulatory authorities and entrepreneurs. These delineated developmental trajectories are naturally followed by the majority of enterprises. Through each phase of a new company's emergence and the concurrent analysis of business models, stakeholders can glean invaluable insights and enhance their confidence in the future prospects of creative businesses. These universally applicable developmental pathways facilitate adept responses to both internal and external stimuli, the prescient anticipation of requisites, and the formulation of robust strategies for sustainable business expansion. Importantly, this universality transcends geographical boundaries, being relevant irrespective of city, region, or nation. It is imperative to underscore the increasingly pivotal roles played by knowledge and creativity in this context. As shown by authors such as Barrios and Strob (Barrios & Strobl, 2009), Jones (Jones, 2004) and Klenow and Rodriguez-Clare (Klenow & Rodriguez-Clare, 2005), knowledge can serve as an explanatory factor for disparities in the developmental statuses of nations. While the authors have concentrated their research on inter-country comparisons, it is reasonable to infer that regions within these countries are similarly influenced by the significance of

knowledge. Regions endowed with richer knowledge reservoirs and characterized by a greater prevalence of knowledge-intensive industries and sectors are poised to catalyze enhanced competitiveness and regional development.

Prior to delving into the intricacies of the North-West region, it is imperative to underscore the escalating importance of competitiveness in the contemporary landscape. Overlooking the creative industries could entail manifold repercussions for the burgeoning start-up sector. Given the existence of exemplary models in various regions and nations worldwide, a transition toward a creative regional economy characterized by the ascendancy of hubs, start-ups, and robust public-private partnerships may be more readily achieved. To realize this transformation, a nexus of collaboration, communication, and interaction among diverse stakeholders must be established.

Furthermore, it is crucial to recognize that innovation should not be perceived as an ultimate outcome of an enterprise's activities; rather, it should be regarded as the means by which a plethora of advantageous products, services, tools, and elements can be engendered. Every journey, no matter how ambitious, commences with a single step. Policymakers bear the onus of addressing several pivotal challenges, encompassing a deficiency in cognizance regarding the potential latent within the creative culture and sector, the recalibration of public policy priorities to accommodate long-term perspectives, and the facilitation of robust collaboration between the public and private spheres (CCS Ecosystems, 2020). Hence, armed with an understanding of the most prominent challenges, the task for policymakers is rendered somewhat more manageable, and should primarily center on: "increasing the regional impact of Knowledge and Innovation Communities (KIC), Boosting the innovation capacity of higher education, launch of new KICs" (European Commission, 2019). In light of these challenges, policymakers can proactively orient their efforts toward enhancing the Knowledge and Innovation Communities in the domains of climate, digital technology, sustainable energy, healthcare, raw materials, food production, manufacturing, and urban mobility (European Institute of Innvoation and Technology, 2019). Drawing from the foundational concept of specialization,

it is imperative to underscore that regions have the potential to specialize in multiple Knowledge and Innovation Communities (KICs), contingent upon the profiles, distinctive attributes, and industrial sectors of emerging enterprises within those regions. Furthermore, it is noteworthy that innovation within the business sector is not confined to a single modality but encompasses various dimensions, encompassing technological innovation, innovative business models, and creative innovation alike (European Commission, 2019). Significant attention must be devoted to the aforementioned enumeration, as it delineates the focal points wherein a substantial proportion of startups will invariably channel their endeavors. A more seamless transition from conventional regulatory societies to knowledge-based societies can be effectuated through the harmonious convergence of initiatives orchestrated by entrepreneurial pioneers and local governing bodies. This confluence represents the juncture where novel paradigms of business innovation, cultivated by these founders, intersect with the overarching goal of ameliorating the well-being of the broader populace.

Prior to delving into an exhaustive examination of the North-West region of Romania, it is imperative to acknowledge that certain nationwide policies have already been formulated with the overarching objective of augmenting the innovative and creative landscape within Romania and its constituent regions. Among the seminal documents emblematic of the government's evolving priorities and orientations in relation to innovation and strategic considerations, the National Research, Development, and Innovation Strategy for 2014-2020, promulgated in October 2014, emerges as a noteworthy precursor (The Romanian Government, 2014). Contained within this official government directive, specific directives pertaining to the realm of innovation and the creative sectors have been meticulously outlined. Furthermore, a policy indicative of the visionary objectives held by national authorities is encapsulated in the SMART City Guide of Romania, an initiative spearheaded by the Ministry of Communication, with the overarching aim of "stimulating the use of innovative technologies with a positive impact on the quality of the life of citizens, environmental protection, business development and sustainable development of local communities and society in general" (MCSI, 2016, p. 4).

3.1.1. Innovation Levels in Romania and the North-West Region

Beyond the considerations and implications regarding GDP and GDP per capita, it is of equal significance to delve into matters pertaining to the innovativeness of enterprises headquartered in the North-West region of the nation. In the year 2016, at the national level, the tally of recognized innovative companies stood at a mere 2925, marking a significant 50% reduction in comparison to the figures recorded in 2012. Among this total of 2925 innovative companies, the North-West Region accounted for 592 entities, constituting 20% of the overall count. Notably, a majority of these innovative firms were concentrated in the Bucharest-Ilfov Region, where 714 such entities were identified, reflecting a substantial decline from the 1186 recorded in 2012. Within a sample encompassing 4482 enterprises operating within the North-West Region, a mere 13.2% could be classified as innovative in the year 2016. Over the course of the last decade, the North-West Region witnessed a remarkable surge in the proportion of enterprises that had implemented product innovations, surging from a meager 6% in 2006 to 36% in 2012, and ultimately reaching 46% in 2016. Further granular examination unveils that over the years, considering two-year intervals commencing from 2002, the percentage share of innovative companies relative to the total number of firms at the national level can be delineated as follows:

Table 19. Share of innovative companies at Romanian national level from 2002 to 2018

Year	2002	2004	2006	2008	2010	2012	2014	2016	2018
Share of total (%)	17.0	19.9	21.1	33.3	30.8	20.7	12.8	10.2	14.6

Source: Adapted by the author from the Romanian National Institute of Statistics database (Romanian National Institute of Statistics, 2021)

Analyzing the data presented in Table 19, a consistent and overarching downward trajectory is evident at the national level, concerning the prominence of innovative companies within their respective sectors. Although regional variations are discernible, it is noteworthy that an upward shift is only perceptible commencing in 2018. Nonetheless, the levels recorded in 2016 remain considerably distant from the zenith observed

nationally in 2008 when the aggregate proportion of innovative companies reached 33.3%. Given the temporal remoteness of this figure, we must exercise caution and skepticism, particularly considering the potential alterations in methodologies, contextual frameworks, and contributing factors that may have transpired since the early 2000s. It is imperative to acknowledge that government expenditure on Research and Development (R&D) represented a modest 0.5% of GDP in 2018. Under the presumption of other variables remaining constant, this suggests that the proportion, influence, and imprint of innovative companies relative to the overall corporate landscape should experience an augmentation. Time will serve as the arbiter of whether policies crafted by local and national authorities will accord greater priority to R&D investment and advancements (Romanian National Institute of Statistics, 2021). For pre pandemic levels, we notice that during 2018 the share of innovative companies has reached 14.5%; during the 2016-2018 period, from a total of 4,198 innovative enterprises, 1,836 enterprises innovated solely in products.

The distribution of enterprises across various regions can be subjected to further scrutiny. Within the context of the North-West region, it becomes evident that a predominant proportion, exceeding 50%, of businesses is clustered within Cluj and Bihor counties. A more granular breakdown of this distribution is as follows: Within the tertiary (service) sectors, 66.7% of enterprises are situated in Bihor and Cluj County, while in the construction sector, 34% and 21.94% of businesses are respectively located in Cluj County and Bihor County. In the Information and Communication Technology (ITC) domain, a substantial 70% of businesses are situated in Cluj County. Furthermore, in the scientific, research, and development sector, approximately 49.96% of companies are concentrated within Cluj County (North-West Regional Development Agency, 2020).

3.1.2. Regional Innovation Scoreboard and the North-West Region of Romania

Concerning the Regional Innovation Scoreboard, this instrument can be characterized as "a regional extension of the European innovation scoreboard, assessing the innovation performance of European regions on a

limited number of indicators. The RIS 2019 covers 238 regions across 23 EU countries, Norway, Serbia and Switzerland" (European Commission, 2019). This tool has been developed with the primary objective of evaluating the innovation-related aspects of the different European Union regions. This assessment is achieved by scrutinizing 18 pre-established indicators, which encompass a range of key metrics and criteria; the 18 indicators are: "scientific co-publications (SCP), innovative SMEs collaborating with others (ICWO), population with tertiary education (TE), trademark applications (TA), sales of new-to-market and new-to-firm innovations (NMI), public-private co-publications (PPP), product or process innovators (PPI), SMEs innovating in-house (IHI), Innovation Index (II), employment medium and high tech manufacturing and knowledge intensive services (HTM), marketing and organizational innovators (MOI), lifelong learning (LL), R&D expenditure public sector (R&D P), most cited publications (MCP), Non-R&D innovation expenditures (Non-R&D), R&D expenditure business sector (R&D B), EPO patent applications (PA), and design application (DA)". With the exception of the Bucharest-Ilfov region, which is classified as a moderate innovator, all other regions in Romania are designated as modest innovators according to the nomenclature employed in the Regional Innovator Scoreboard (European Commission, 2023).

In the context of the Regional Innovation Scoreboard (RIS), which is a report commissioned by the European Commission to evaluate the innovative performance of EU-28 regions, the North-West Region of Romania attains the highest score at the national level with respect to "Innovative SMEs collaborating with other entities." It secures the third position, following the capital city and the South-East Region, in the category of "Sale of new-to-market and new-to-firm innovation." Conversely, the North-West Region occupies the lower ranks in terms of external innovations and the exploration of new markets on a national scale (North-West Regional Development Agency, 2020). In accordance with the categorization outlined in the Regional Innovation Scoreboard (RIS), regions are classified into four distinct groups, namely: Regional Innovation Leaders, Regional Strong Innovators, Regional Moderate Innovators, and Regional Modest Innovators.

It is imperative to emphasize, before delving into a comparative analysis of the EU-28 regional average scores and their correspondence with the performance of Romanian regions, that the maximum score in the study signifies the highest values achieved across various regions. It is essential to recognize that the study does not establish definitive upper or lower limits for scores or results. Instead, the upper and lower thresholds within the study may vary over time for each of the aforementioned regions due to the evolving advancements made in different regions to enhance their creative and innovative capabilities.

As previously mentioned, the averages for the 19 innovation indicators, pertaining to the year 2019, are as follows: Population with tertiary education - 108.20, Lifelong learning - 101.98, Scientific co-publications - 137.24, Most cited publications - 105.71, R&D expenditure in the business sector - 107.67, R&D expenditure in the public sector - 102.56, Non-R&D innovation expenditures - 98.05, Product or process innovators - 100.45, Marketing and organizational innovators - 90.79, SMEs engaged in in-house innovation - 100.04, Innovative SMEs collaborating with external entities - 106.26, Public-private co-publications - 104.78, EPO patent applications - 94.30, Trademark applications - 122.26, Design applications - 96.65, Employment in medium and high-tech manufacturing and knowledge-intensive services - 111.86, Sales of new-to-market and new-to-firm innovations - 102.06, and the Innovation Index - 104.71 (European Commission, 2023). It should be emphasized that the previously presented values represent averages. In the context of innovation performance, the most outstanding region within the EU-28, as of 2019, has been the Zurich region of Switzerland, which achieved a Regional Innovation Index of 160.1, as reported by the European Commission (European Commission, 2019); Following closely in second place is another Swiss region, Ticino, while the Helsinki-Uusimaa region of Finland secures the third position on the podium.

In the context of Romania, the indicator "population with tertiary education (TE)" stands out as one of the most developed and high-ranking metrics. It is noteworthy that this indicator attains its highest levels in the Bucharest-Ilfov region and exhibits a positive trajectory over the years under analysis, culminating in a maximum value of 157.81 points in 2019. This signifies an increase of 17.30 points compared to the base year of 2011.

Furthermore, it is important to highlight that this particular indicator surpasses the EU-28 average, which stood at 108.20 points in 2019.

Despite certain regions in Romania achieving higher averages in the "population with tertiary education (TE)" indicator, the creative, innovative output, and startup creation in these regions remain relatively low compared to other European counterparts. It is worth noting that the elevated score attributed to the Bucharest-Ilfov region can partially be explained by the migration trend towards the capital city of Bucharest, which serves as a primary destination for talent migration from across the country.

The Western region emerges as the second most prolific area in terms of TE, exhibiting an increase of 13.08 points in 2019 compared to 2011 values, a similar increase observed in the North-West region. An interesting aspect of this evolution in tertiary education (TE) is that, despite surpassing the EU-28 profile in 2019, all Romanian regions lag behind when it comes to the "scientific co-publications (SCP)" indicator. This suggests that research and development efforts stemming from individuals encompassed within this tertiary research indicator may be somewhat limited. This argument is further supported by the fact that, in terms of the "most cited publications (MCP)" indicator, all regions fall significantly below the EU-28 profile for 2019 (105.71 points), with the highest score in Romania achieved by the Western region at 55.44 points (European Commission, 2019). The subsequent table shall serve as a means to evaluate the Regional Innovation Index (RII) for the eight regions of Romania, commencing from the year 2011.

Table 20. Regional Innovation Index scores from 2011 to 2023 of the Romanian regions

Region	RII 2011	RII 2013	RII 2015	RII 2017	RII 2019	RII 2021	RII 2023
North-West	40.8	39.0	26.9	29.6	31.1	31.4	34.5
Center	39.4	35.5	24.3	27.1	28.6	26.5	25.7
North-East	41.5	38.2	29.7	19.2	22.5	20.9	35.8
South-East	42.7	35.7	28.8	23.6	23.1	17.4	18.9
South-Muntenia	36.1	33.9	26.2	22.7	19.3	18.0	23.0
Bucharest-Ilfov	62.0	60.5	48.4	48.3	54.1	56.9	59.5
South-West Oltenia	31.4	26.7	14.6	13.9	15.0	16.7	19.8
West	40.0	32.2	26.9	29.3	34.3	30.3	32.6

Source: Adapted from the 2019 Regional Innovation Scoreboard (European Commission, 2023)

Table 20 provides a comprehensive overview of the Regional Innovation Index (RII) for all eight regions of Romania. It is evident that none of the regions closely approaches the EU average RII. However, this does not imply a lack of creative or innovative potential. Rather, the data from the preceding table implies that these regions require a more substantial allocation of resources and efforts to foster innovation and creativity adequately. For 2023 level, we do notice that 7 out of the 8 Romanian regions have manage to grow their RII as compared to previous editions of the Regional Innovation Index.

The North-West region exhibited the second-best evolution in 2013 compared to 2011. This decrease was primarily attributed to the onset and progression of the economic crisis during that period. While this evolution is, indeed, negative, it is noteworthy that among all the regions, only the Bucharest-Ilfov and the North-West regions experienced a milder decline compared to other regions. The North-West region's decrease was -1.8 points, compared to -1.5 in the Bucharest-Ilfov region. However, when comparing these figures from 2013 to 2011 with the EU-28 (which saw an increase of 1.2 points during the same period), it becomes evident that Romanian regions lag significantly in terms of innovation.

A more pronounced decline occurred in 2015 (compared to 2013 figures) when the North-West region recorded a negative performance of -12.5. This signified a misallocation of innovative resources and, consequently, negative development during those years. Nevertheless, the North-West region managed to reverse this trend, displaying positive growth in 2017 and 2019 (2.7 points in 2017 and 1.8 points in 2019).

It is crucial to note that these figures must be assessed in comparison to the EU-28 average. Despite facing challenges during economic crises, various regions also demonstrated negative developments over the years. In the case of the North-West region, its evolution surpassed the EU-28 average in 2017 (2.7 points compared to 1.1). This highlights the importance of consistency in innovation efforts.

Innovation should not be viewed as a one-time occurrence, and the lack of sustained efforts may explain why, in 2019, the North-West region's growth (1.5 points) did not match that of the EU-28 average (2.7 points). These observations suggest a need for greater consistency, permanence, and planned efforts in the North-West region's innovation potential and output.

The Regional Innovation Index values for the North-West region and Romania as a whole have not rebounded to pre-crisis levels, despite various attempts and policies aimed at enhancing Romania's innovation performance. Nonetheless, positive RIS scores for different regions of the country may signify the groundwork for future endeavors in terms of creativity, innovation, and start-up development. While mentioning the Regional Innovation Index score is informative, delving into specific indicators is essential for a more detailed understanding of the North-West region. The following figure provides an overview of the indicator scores for the North-West region in 2019.

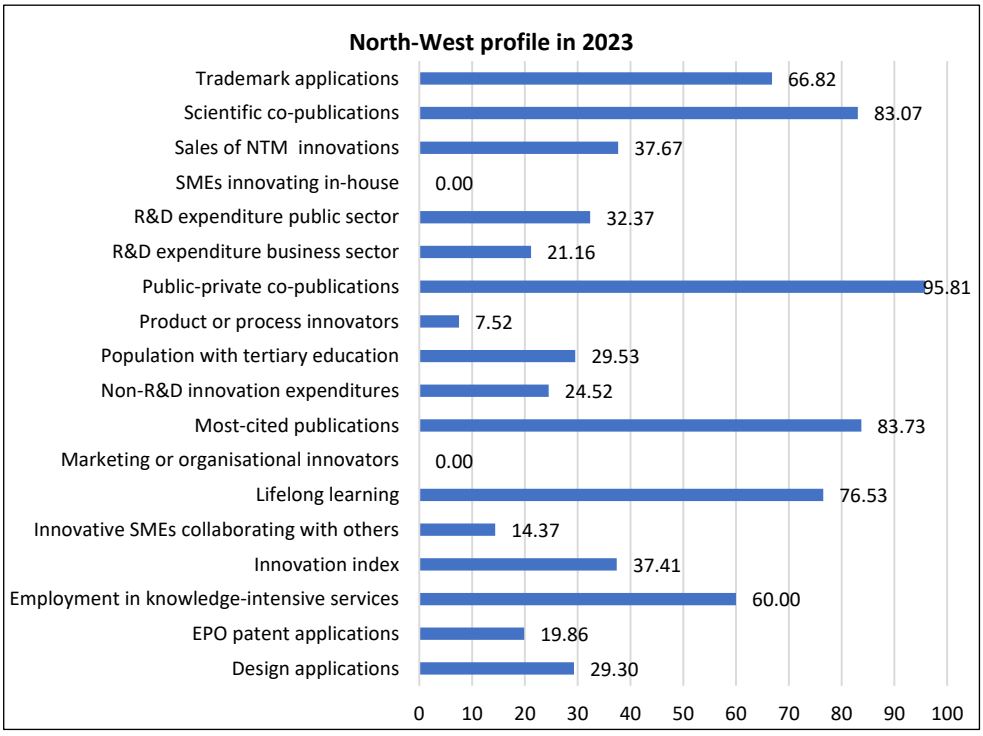

Figure 3. The profile of the North-West Romanian region in 2023

Source: Adapted by the author the 2023 Regional Innovation Scoreboard (European Commission, 2023)

The scores presented in Figure 3 have been structured on a scale ranging from 0 to 100, as none of the indicators surpassed this upper threshold in 2023. However, it is important to emphasize, as previously mentioned, that the Regional Innovation Index (RII) lacks definitive upper or lower

boundaries. In 2023, the highest-scoring indicator for the North-West region was the "public-private co-publications" indicator, with a value of 95.81.

For the year 2019, all indicators in the North-West region exhibited lower values compared to the EU average. Therefore, it would be advantageous to assess the North-West region's figures not in relation to other Romanian regions but in comparison to the EU average. This approach allows for an evaluation of the North-West region's relative performance against already developed regions within the EU-28, providing insights into best practices for regions in the process of development. It is somewhat surprising to observe a substantial gap between the scores for the "scientific co-publications" indicator (80.59 points) and the "lifelong learning" indicator (4.95 points) in the North-West region. This discrepancy may be partially explained by the concentration of scientific content creation among a limited group of individuals, professionals, or organizations. Over time, if the "lifelong learning" and "population with tertiary education" indicators do not experience growth, the "scientific co-publications" indicator may decline. Hence, concerted efforts are necessary to enhance these education-related indicators.

Simultaneously, concerted efforts should focus on improving the "R&D expenditure" indicators, encompassing both the public and private sectors. This strategy aims to cultivate a more favorable environment for individuals engaged in creative and innovative sectors, ultimately enhancing the viability and development prospects of start-ups and newly established businesses.

As previously stated, all indicator values for the North-West region of Romania in 2019 fall below the EU-28 average. These values will be highlighted in the ensuing table for clarity and further analysis:

Table 21. Difference between the North-West region and EU-28 average as regards the 18 innovation indicators for 2023 levels

Indicator	North-West region	EU-28 average	Difference between EU average and NW region values
Design applications	29.30	79.31	-50.01
EPO patent applications	19.86	90.50	-70.64
Employment medium and high-tech manufacturing & knowledge-intensive services	60.00	100.00	-40
Innovation index	37.41	108.47	-71.06

Indicator	North-West region	EU-28 average	Difference between EU average and NW region values
Innovative SMEs collaborating with others	14.37	126.79	-112.42
Lifelong learning	76.53	112.09	-35.56
Marketing or organizational innovators	N/A	N/A	N/A
Most-cited publications	83.73	95.50	-11.77
Non-R&D innovation expenditures	24.52	101.67	-77.15
Population with tertiary education	29.53	103.59	-74.06
Product or process innovators	7.52	126.65	-119.13
Public-private co-publications	95.81	129.61	-33.8
R&D expenditure business sector	21.16	110.77	-89.61
R&D expenditure public sector	32.37	103.23	-70.86
SMEs innovating in-house	N/A	N/A	N/A
Sales of new-to-market and new-to-firm innovations	37.67	108.90	-71.23
Scientific co-publications	83.07	142.63	-59.56
Trademark applications	66.82	109.93	-43.11

Source: Own calculations made by the authors through information taken from the 2023 Regional Innovation Scoreboard (European Commission, 2023)

The calculations presented in the above table were derived by subtracting the corresponding EU-28 average indicator values from those of the North-West region. It is essential to underscore that these values are not absolute, as they are subject to variations over time and across regions. Consequently, while they serve as representative reference points, they lack predetermined upper or lower limits. The primary purpose of the Regional Innovation Scoreboard (RIS) is not to establish fixed maximum or minimum values but rather to gauge regional innovation performance relative to the EU-28 average.

Negative values in the table signify the extent to which the North-West region deviates from the EU-28 average. Notably, the most substantial disparity is observed in the case of the "Product innovators," which has repercussions on long-term creative and innovative outcomes, as well as employment opportunities and incentives within creative industries. Furthermore, the negative performance across various business-related indicators, such as SMEs' in-house innovation, marketing or organizational innovation, and collaboration among innovative SMEs, underscores the

need for sustained efforts aimed at bridging the existing gap between the North-West region and the EU-28 average.

It is imperative to recognize that the overarching objective for both governmental authorities and businesses is not solely to narrow this disparity but rather to drive improvements across all the aforementioned indicators. Such enhancements yield increasing rewards and opportunities, consequently contributing to the reduction of this disparity. Furthermore, it is noteworthy that despite post-economic crisis advancements, the North-West region continues to grapple with achieving the same level of pre-crisis growth. This emphasizes the critical role of effective and mutually beneficial collaboration between the public and private sectors.

Additionally, local authorities and representatives of local businesses should engage in a targeted process to identify the most crucial indicators warranting prompt action. This entails specialization and prioritization of specific indicators, thus maximizing efforts for favorable outcomes. The elucidation of disparities between the North-West region and the EU-28 average is a crucial endeavor. Equally vital is the tracking of indicator evolutions over time, a task facilitated by the ensuing table.

Table 22. Values of the 18 innovation indicators during 2011-2019 in the North-West region

Indicator\Year	**2011**	**2013**	**2015**	**2017**	**2019**	**2023**
Design applications	27.87	49.5	35.19	79.62	51.00	29.30
EPO patent applications	10.27	11.44	15.81	12.39	14.83	19.86
Employment in knowledge-intensive services	19.72	30.67	37.05	68.07	62.60	60.00
Innovation index	40.83	39.02	26.88	29.61	31.06	37.41
Innovative SMEs collaborating with others	12.41	18.1	6.66	15.78	20.95	14.37
Lifelong learning	12.87	14.85	3.96	6.93	4.95	76.53
Marketing or organizational innovators	55.93	57.18	25.66	14.62	27.00	N/A
Most-cited publications	44.72	52.22	54.3	49.17	48.34	83.73
Non-R&D innovation expenditures	118.06	56.98	45.92	29.1	35.61	24.52
Population with tertiary education	38.4	38.4	38.4	53.39	51.48	29.53
Product or process innovators	41.67	34.47	6.25	6.67	15.97	7.52
Public-private co-publications	30.48	27.85	33.23	25.8	18.20	95.81
R&D expenditure business sector	18.19	23.39	27.86	21.76	20.03	21.16
R&D expenditure public sector	69.01	53.28	65.37	45.52	45.52	32.37

Indicator\Year	2011	2013	2015	2017	2019	2023
SMEs innovating in-house	46.24	39.21	5.2	7.29	17.99	N/A
Sales of N2M innovations	80.71	83.24	13.86	19.51	18.59	37.67
Scientific co-publications	53.45	59.49	66.37	75.36	80.59	83.07
Trademark applications	38.47	34.25	36.08	46	46.46	66.82

Source: Adapted by the author from the 2023 Regional Innovation Scoreboard (European Commission, 2023)

In addition to Table 22, the subsequent table is designed to present the historical evolution of these indicators over the years.

Table 23. Evolution of the 18 innovation indicators during 2011-2019 in the North-West region

Indicator\Year	Base year 2011	2013-2011	2015-2013	2017-2015	2019-2017	2023-2019
Design applications	27.87	21.63	-14.31	44.43	-29.8	-21.7
EPO patent applications	10.27	1.17	4.37	-3.42	2.44	5.03
Employment in knowledge-intensive services	19.72	10.95	6.38	31.02	-5.47	-2.6
Innovation index	40.83	-1.81	-12.14	2.73	1.45	6.35
Innovative SMEs collaborating with others	12.41	5.69	-11.44	9.12	5.17	-6.58
Lifelong learning	12.87	1.98	-10.89	2.97	-1.98	71.58
Marketing or organizational innovators	N/A	N/A	N/A	N/A	N/A	N/A
Most-cited publications	44.72	7.5	2.08	-5.13	-0.83	35.39
Non-R&D innovation expenditures	118.06	-61.08	-11.06	-16.82	6.51	-11.09
Population with tertiary education	38.4	0	0	14.99	-1.91	-21.95
Product or process innovators	41.67	-7.2	-28.22	0.42	9.3	-8.45
Public-private co-publications	30.48	-2.63	5.38	-7.43	-7.6	77.61
R&D expenditure business sector	18.19	5.2	4.47	-6.1	-1.73	1.13
R&D expenditure public sector	69.01	-15.73	12.09	-19.85	0	-13.15
SMEs innovating in-house	N/A	N/A	N/A	N/A	N/A	N/A

Indicator\Year	Base year 2011	2013-2011	2015-2013	2017-2015	2019-2017	2023-2019
Sales of N2M innovations	80.71	2.53	-69.38	5.65	-0.92	19.08
Scientific co-publications	53.45	6.04	6.88	8.99	5.23	2.48
Trademark applications	38.47	-4.22	1.83	9.92	0.46	20.36

Source: Adapted by the author from the 2023 Regional Innovation Scoreboard (European Commission, 2023)

The preceding tables serve a dual objective: firstly, to present the tangible values of the Regional Innovation Index throughout the years, and secondly, to accentuate disparities in the evolution and performance of these indicators over time. In the second table (Table 223, 2011 serves as the reference year for our computations. Negative values denote instances where the performance in a given year exhibited a decline compared to the preceding period or year. In the context of the North-West region, a straightforward tally reveals the following instances of negative evolution:

- In the transition from 2011 to 2013, a total of 7 indicators exhibited a negative trajectory, specifically: Innovation Index (-1.81), Non-R&D innovation expenditure (-61.08), Product or process innovation (-7.2), Public-private co-publications (-2.63), R&D expenditure in the public sector (-15.73), SMEs innovating in-house (-7.03), Trademark applications (-4.22).
- Advancing from 2013 to 2015, 9 indicators displayed a decline in performance, namely: Design applications (-14.31), Innovation index (-12.14), Innovative SMEs collaborating with others (-11.44), Lifelong Learning (-10.89), Marketing or organizational innovators (-31.52), Non-R&D innovation expenditure (-11.06), Product or Process innovation (-28.22), SMEs innovating in-house (-34.01), Sales of new to market innovations (-69.38).
- In the period from 2015 to 2017, 7 indicators experienced a negative shift, including: EPO patent applications (-3.42), Marketing and organizational innovators (-11.04), Most cited publications (-5.13), Non-R&D innovation expenditures (-16.82), Public-private co-publications (-7.43), R&D expenditure business sector (-6.1), R&D expenditure public sector (-19.85).

- From 2017 to 2019, 8 indicators witnessed a decrease in performance, these being: Design applications (-29.8), Employment in knowledge-intensive services (-5.47), Lifelong learning (-1.98), Most cited publications (-0.83), Population with tertiary education (-1.91), Public-private co-publications (-7.6), R&D expenditure business sector (-1.73), Sales of new to market innovations (-0.92).

A more elaborate visual representation of the aforementioned indicator's progression within the North-West region, commencing in 2011, is annexed as Figure 13, entitled "Evolution of the RIS Indicators of the North-West region in the 2011-2019 time frame".

Another observation derived from tables 22 and 23 pertains to the levels attained by specific indicators. Notably, in 2011, the "Non-R&D innovation expenditures" reached a value of 118.06, substantially surpassing the EU-28 average of 98.05 points for the same year. In this particular context, it is contended that innovation expenditure pertaining to research and development (R&D), encompassing both the public and private sectors, should ideally be higher, warranting greater contributions from companies. However, it is worth noting that this figure of 118.06 experienced the second most pronounced decline among all 18 indicators in subsequent years. It plummeted to 56.98 in 2013, signifying a substantial decrease of 61.08 points. The most notable reduction was observed in the "Sales of new to market innovations" indicator, which plummeted from 83.24 in 2013 to 13.86 in 2015, resulting in a staggering decline of 69.38 points.

A further scrutiny comparing the base year of 2011 to the most recent data available in 2019 reveals the following: Nine out of the 18 indicators exhibited a decline in 2019 compared to the base year of 2011. The indicators that experienced negative trends in 2019 relative to 2011 are as follows: Innovation index (-9.77), Lifelong Learning (-7.92), Marketing or organizational innovation (-28.93), Non-R&D innovation expenditures (-82.45, exhibiting the most substantial decline among all indicators), Product or process innovators (-25.70), Public-private co-publications (-12.28), R&D expenditure public sector (-23.49), SMEs innovating in-house (-28.25), and Sales of new to market innovations (-62.12).

The implications drawn from these calculations are clear: the innovation and creative infrastructure of the North-West region, although significantly

trailing the European average, necessitates a substantial improvement to unlock the region's potential. Over the eight-year span since the base year of 2011, all indicators associated with business performance have been severely impacted. Consequently, nine (half) of the 18 Regional Innovation Index indicators have not rebounded to surpass their 2011 values. Despite some degree of recovery in new business formation, an increase in foreign direct investments (FDIs) in terms of both quantity and value, and the implementation of specific policies aimed at revitalizing various business sectors, the collective efforts of enterprises operating in the North-West market have not yielded significant innovation-related impacts. While data for 2020 remains pending in relation to the Regional Innovation Index, it is evident that over the course of eight years, half of the indicators have displayed negative trajectories, necessitating urgent measures to revitalize the innovation landscape in the North-West region.

In an opposition to the EU-28 average of 94.3 points for the "EPO patent application", the North-West region (14.83 points for 2019) (European Commission, 2019), the North-West region and the entirety of Romania find themselves situated at the lower end of the spectrum, consistently achieving low scores across all recorded years. As evidenced by the North-West Regional Development Agency's research, spanning from 2013 to 2018, a total of 616 patent applications were diligently submitted to the National Office for Inventions and Trademarks (OSIM) by enterprises operating within the North-West region. This notable figure accounts for 11.5% of all patent applications submitted across the entire country of Romania.

Within the North-West region, Cluj emerges as the predominant contributor, boasting a substantial share of 66% among the total patent applications filed over the last six years. This remarkable concentration can be attributed to the presence of numerous universities and research institutions, primarily situated in the city of Cluj-Napoca.

Furthermore, the counties of Bihor and Maramureș have also made notable contributions in terms of patent applications, with Bihor County accounting for 67 patents and Maramureș for 53 patents submitted during the same six-year period (North-West Regional Development Agency, 2020). Moreover, spanning the period from 2014 to 2018, a noteworthy total of 182 patents were accorded to various organizations, enterprises, and ventures

operating within the North-West region. This particular tally accounts for a substantial 10% proportion of the overall 1835 patents granted across the entirety of Romania during the same timeframe.

It is worth emphasizing that the lion's share of these 182 patents awarded within the North-West region was concentrated in Cluj. In fact, a staggering 133 patents, constituting approximately 73% of the total patents granted within the region, were specifically allocated to endeavors based in Cluj.

3.1.3. The Prevalence of Innovation-Driven Activities Among Enterprises in the North-West Region

Patent applications hold significant importance in fostering the progress of enterprises. Concurrently, research and development (R&D) activities constitute a pivotal factor in the comprehensive innovation-driven advancement of both conventional and startup companies. At the national scale in Romania, governmental allocations for R&D expenditures amounted to 2,555.7 million Romanian Leu (RON) in the fiscal year 2014, signifying 0.38% of the country's Gross Domestic Product (GDP). Furthermore, by the conclusion of 2014, Romania had engaged a total of 42,963 individuals in R&D roles, with this cohort being distributed as 0.22% in the public sector and 0.16% in the private sector, respectively (Romanian National Institute of Statistics, 2015). Given the relatively modest allocation, which amounts to a mere 0.38% of the Gross Domestic Product (GDP) in Romania, dedicated to research and development (R&D) endeavors, the country's correspondingly lower innovation scores appear to be a predictable outcome. While it is acknowledged that this percentage equates to a substantial sum in millions of Romanian Leu (RON), it remains insufficient to adequately support and drive innovation-related R&D activities. Importantly, this inadequacy underscores a systemic concern regarding the dearth of commitment to R&D pursuits.

It is imperative to emphasize that the enhancement of research output should be a collaborative undertaking involving both public and private entities. The onus for augmenting R&D output does not rest solely on the government; rather, it necessitates concerted efforts from all stakeholders. However, without adequate support, conducive working conditions, and grants to facilitate R&D activities, private sector engagement, which may

initially harbor the intention to embark on R&D initiatives, could become disheartened and potentially defer or discontinue their involvement.

Furthermore, it is noteworthy that in 2019, despite an increase in GDP levels, government spending on R&D remained relatively stable at 0.48% of GDP, with a breakdown of 0.28% allocated to the private sector and 0.20% to the public sector. In monetary terms, this translates to 5,056.3 million RON allocated for government R&D efforts, with an estimated workforce of 43,973 individuals engaged in these activities (Romanian National Institute of Statistics, 2020).

Another significant implication concerning the national research and development (R&D) output pertains to the allocation of resources and the dissemination of research findings. This allocation tends to exhibit a pronounced concentration within specialized centers, leaving minimal room for the execution of R&D initiatives within less-developed regions or counties. An examination of pertinent statistical data lends credence to this observation.

Notably, during the timeframe spanning from 2010 to 2012, a mere 20.7% of enterprises at the national level in Romania qualified as innovative enterprises. This figure marks a notable decrease of 10.1% compared to the preceding 2008-2010 period. Additionally, within this same 2010-2012 timeframe, more than half of these enterprises engaged in in-house innovation activities. Furthermore, it becomes evident that a substantial majority of these innovation endeavors were predominantly concentrated in the Bucharest-Ilfov and South-East regions (Romanian National Institute of Statistics, 2014). The previous report underscores that among the cohort of innovative companies, which constituted 20.7% of the total enterprises during the period spanning 2010 to 2012, a preponderance of these enterprises primarily directed their innovation efforts toward product or process enhancements, accounting for 6.3% of the total innovative enterprises. In contrast, a substantial 18.8% of these enterprises were chiefly involved in the domain of process and marketing innovation. Intriguingly, a regional analysis reveals that within the North-West region, only 11.4% of small and medium-sized enterprises (SMEs) garnered recognition as innovative entities, positioning this region in third place at the national level.

Further scrutiny of the subsequent period, specifically 2014-2016, corroborates these trends. Out of the total count of active enterprises at the national level, a mere 2925 enterprises earned the distinction of being

categorized as innovative, constituting a mere 10.2% of the overall pool of extant firms. A more granular exploration into the typology of these innovative firms during the 2014-2016 interval reveals the following distribution: 3.3% of innovative firms were engaged in product innovation, 3.5% were dedicated to process innovations, 5.8% focused on organizational innovation, and 5.1% concentrated their efforts on marketing innovation (Romanian National Institute of Statistics, 2019). Concerning the allocation of these innovative enterprises across various business sectors during the 2014-2016 timeframe, the preeminent sectors characterized by innovation prowess were the Information Technology and Communication (IT&C) sector, representing 25.1% of business sector innovation, followed closely by the pharmaceutical sector at 24.2%, and the research and development sector, which contributed 20.4% to business sector innovation. The ensuing chart shall serve as a graphical representation to elucidate the geographic dispersion of innovative companies during the 2014-2016 interval:

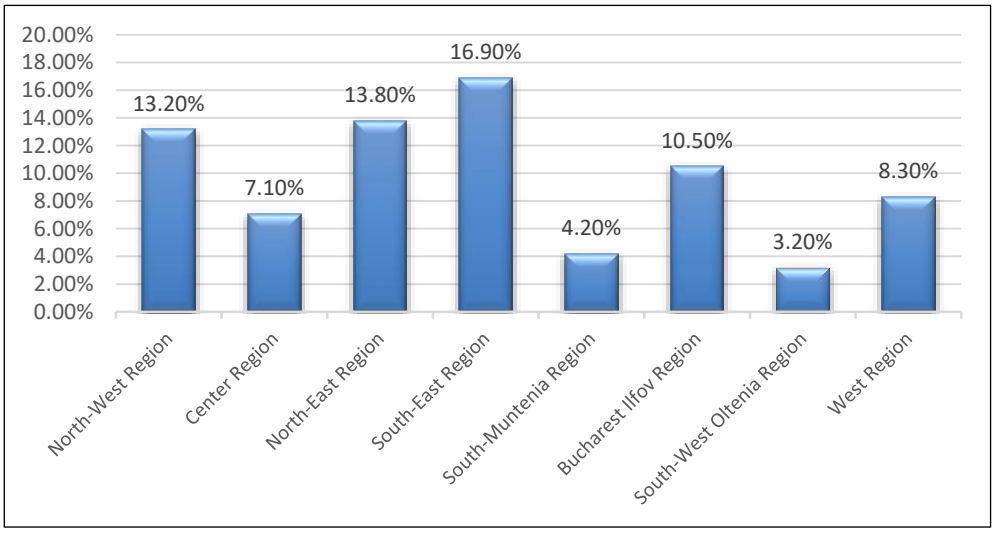

Figure 4. Share (%) of innovative companies of the 8 Romanian regions during 2014-2016

Source: Adapted by the author through information taken from the Romanian National Institute of Statistics database (Romanian National Institute of Statistics, 2019)

As elucidated in Figure 4, the regional landscape exhibits distinctive variations in the prevalence of innovative enterprises, with the South-East region claiming the foremost position, closely trailed by the North-East region. Interestingly, the North-West region has secured the third position,

surpassing the Bucharest-Ilfov region. It is worth acknowledging that these two regions diverge significantly in terms of their geographical expanse. However, as corroborated throughout this compendium, an analysis of Gross Domestic Product (GDP) and its historical trajectories underscores the sustained economic preeminence of the Bucharest-Ilfov region in comparison to the North-West region.

Within the context of this regional distribution, it is imperative to underscore that the South-East region, constituting 16.3% of the total, and the North-West region, comprising 13.6%, emerge as the pivotal epicenters of innovative Small and Medium-sized Enterprises (SMEs). Of particular interest is the North-West region, where the majority of innovative SMEs have engaged in pioneering ventures encompassing editorial activities (47.9%), the production of chemical substances and compounds (41.4%), and research and development initiatives (28.6%) (Romanian National Institute of Statistics, 2019). These levels of innovation performance find their roots, in part, in the robust presence of prestigious academic institutions within the North-West region, most notably Babes-Bolyai University in Cluj-Napoca and the University of Oradea. These institutions have catalyzed an upsurge in the enrollment of students and have fostered the growth of well-established research centers in the city of Cluj-Napoca.

For a more comprehensive elucidation of the dynamic evolution of the count of innovative enterprises across different regions of the nation, the subsequent table, drawing upon insights gleaned from Figure 4, offers a detailed perspective:

Table 24. Number of innovative enterprises engaged in product innovation throughout the 8 Romanian regions from 2006 to 2020

Region\Year	**2006**	**2008**	**2010**	**2012**	**2014**	**2016**	**2018**	**2020**
TOTAL	6013	5907	3763	1806	1840	1556	4198	2900
North-West Region	909	717	539	154	150	274	940	386
Center Region	808	934	443	276	224	164	429	409
North-East Region	862	791	461	194	99	186	436	357
South-East Region	1307	1154	663	545	440	336	313	99
South-Muntenia Region	573	642	439	168	132	77	201	169
Bucharest-Ilfov Region	990	1029	858	380	676	407	1691	1248
South-West Oltenia Region	235	227	151	25	44	49	81	68
West Region	329	413	209	64	75	63	107	164

Source: Adapted by the author through information taken from the Romanian National Institute of Statistics database (Romanian National Institute of Statistics, 2022)

The data presented in Table 24 encompasses a biennial period commencing in 2006, which accounts for the absence of information for the intermediate years, namely 2007, 2009, 2011, 2013, 2015, and 2017. A discernible trend is observed in the North-West region, marked by a fluctuation in the number of innovative enterprises. In part, the diminution witnessed in 2008 can be attributed to the reverberations of the global economic recession. Nevertheless, an optimistic trajectory emerges as the number of innovative enterprises exhibits an upward trajectory, culminating in 919 such establishments in 2018. Notably, with the exception of the Bucharest-Ilfov region, no other regions in 2018 managed to match or surpass the count of innovative enterprises reported in 2006. This temporal expanse encapsulates several noteworthy developments within the Romanian market, notwithstanding the economic crisis, as the overarching trend denotes a positive and ascendant trajectory.

Access to information concerning the quantity of innovative enterprises in a given region holds significance. Furthermore, data pertaining to the turnover generated by these enterprises, as a proportion of the overall sectorial turnover, assumes paramount importance as it serves as a pivotal indicator for the relative vigor of innovative enterprises. In an endeavor to facilitate the accessibility and comprehensibility of this information, the ensuing table has been presented:

Table 25. Turnover from innovation as % of total turnover by economic sector for the 8 Romanian regions from 2006 to 2018

Region\Year	2006	2008	2010	2012	2014	2016	2018
North-West Region	19.1	15.3	21.7	4.33	2.19	1.57	5.7
Center Region	13.4	17.5	12.6	5.02	5.99	6.64	9.08
North-East Region	20.3	9	8.1	2.84	2.42	1.81	4.42
South-East Region	31.5	11.2	12.2	2.86	3.9	1.5	2.59
South-Muntenia Region	25.6	23.8	24	5.75	21.7	20.6	18.7
Bucharest Ilfov Region	16.4	15.3	12.7	3.37	5.62	3.16	9.52
South-West Oltenia Region	21.1	9.4	14.9	0.9	0.66	0.25	4.7
West Region	10.1	8.9	9.4	3.37	4.92	1.24	5.63

Source: Adapted by the author through information taken from the Romanian National Institute of Statistics database (Romanian national Institute of Statistics, 2019)

The data presented in the aforementioned table is delineated over a biennial interval commencing in 2006, thus accounting for the absence of

information pertaining to the intermediary years, specifically 2007, 2009, 2011, 2013, 2015, and 2017.

This tabulation provides insights into the turnover ratios of innovative enterprises in relation to the overall turnover within the economic sector. Over the temporal expanse under consideration, the South-Muntenia region has consistently exhibited the highest mean turnover percentage relative to the total, with an average of 20.01%. Following this, the Central region is noted with an average of 10.03%, succeeded by the North-West region with an average of 9.98%. Noteworthy fluctuations in these percentages occur over the years. The South-Muntenia region displays the most substantial annual increments. However, it is imperative to underscore that this region concurrently experienced the second most significant decline subsequent to the repercussions of the economic downturn. The North-West region, on the other hand, recorded the most pronounced decrease during 2010, plummeting from 21.7% in 2010 to a level of 4.33% in 2012 (Romanian national Institute of Statistics, 2019). The most conspicuous disparity among the regions lies in their ability to recuperate and augment the proportion of turnover in relation to the total turnover. The solitary region that has, to a certain extent, succeeded in revitalizing this aspect is the South-Muntenia region, whereas other geographic areas within the nation continue to grapple with the challenge of attaining analogous double-digit increments as witnessed prior to the economic crisis. In this context, it is imperative to reiterate the paramount significance of concerted endeavors by both the private and public sectors. Such collaborative actions can engender synergistic effects that foster and bolster the overarching development process. As these collaborative efforts transpire, they have the potential not only to rejuvenate regional economic dynamics but also to serve as a catalytic force for reinvigorating the national economic landscape, setting it on a trajectory of sustained growth and prosperity.

3.1.4. Research and Development Investment and Its Impact on Businesses

The quantity of start-ups, while displaying a modest upswing over the years, continues to register relatively diminutive figures. This scenario is characterized by two prominent aspects: firstly, the limited availability of

pertinent data, and secondly, the scarcity of start-up enterprises. Romania's overall innovation capacity is situated at a relatively low level, and its prospective competitive prowess faces mounting impediments due to significant differentials in innovation and productivity. In the Romanian context, investments allocated to Research and Development (R&D) represent the most meager proportion in the European Union, accounting for a mere 0.5% of the Gross Domestic Product (GDP) (RoStartup, 2021).

In contrast to investments originating from the public sector, the private sector within Romania demonstrates a commendable commitment to Research and Development (R&D). Nevertheless, the aggregate expenditure within this domain remains notably constrained. Furthermore, interconnections and interactions, encompassing technological, academic, knowledge-based, and financial dimensions, between the academic sphere and the business realm exhibit marked deficiencies in their current state. Given that a significant proportion of R&D funding is predominantly directed towards the public sector, a substantial opportunity cost arises, representing a missed chance to cultivate incentives for collaborative endeavors bridging the realms of public and private sectors. This prevailing circumstance is elaborated upon in the Romanian Start-up Ecosystem Strategy White Paper, which sees barrier in the following manner: "regulatory barriers hamper academia-business links, which tend to occur on an ad-hoc basis. Pockets of innovation excellence exist across the country, as evidenced by regional disparities and development of heterogenous regional innovation systems. At national level, however, there is significant institutional vacuum in terms of innovation system management" (RoStartup, 2021).

With respect to the nexus between start-ups and critical socio-economic indicators, empirical findings suggest a robust association between the establishment and prevalence of start-up enterprises and unemployment rates across various nations. As delineated by several scholars, the existence of start-ups within a particular geographic region is subject to a multifaceted array of determinants. Specifically, the presence of start-up ventures is significantly modulated and guided by factors such as Gross Domestic Product (GDP), unemployment levels, and the trajectory of interest rates (Fritsch, et al., 2013). Subsequent sections will provide a comprehensive

elucidation of how these indicators intricately shape the prevalence of start-up enterprises within two pivotal regions. Of particular interest are two prominent macroeconomic phenomena: the dynamic interplay of periodic fluctuations, notably Gross Domestic Product (GDP) and unemployment rates, and their profound impact on the overarching framework within which nascent businesses germinate and flourish.

For the purpose of assessing regional vigor and its consequential influence on the cultivation of start-up ventures, an auspicious point of departure lies in the examination of time series data sourced from the National Institute of Statistics. These data sets meticulously document the aggregate expenditure devoted to research and development across distinct macro-regions, development regions, and counties, all delineated at current price levels. The subsequent visual representations in the form of charts aptly chronicle the trajectory of such expenditures, commencing from the inception of data collection in the year 1995.

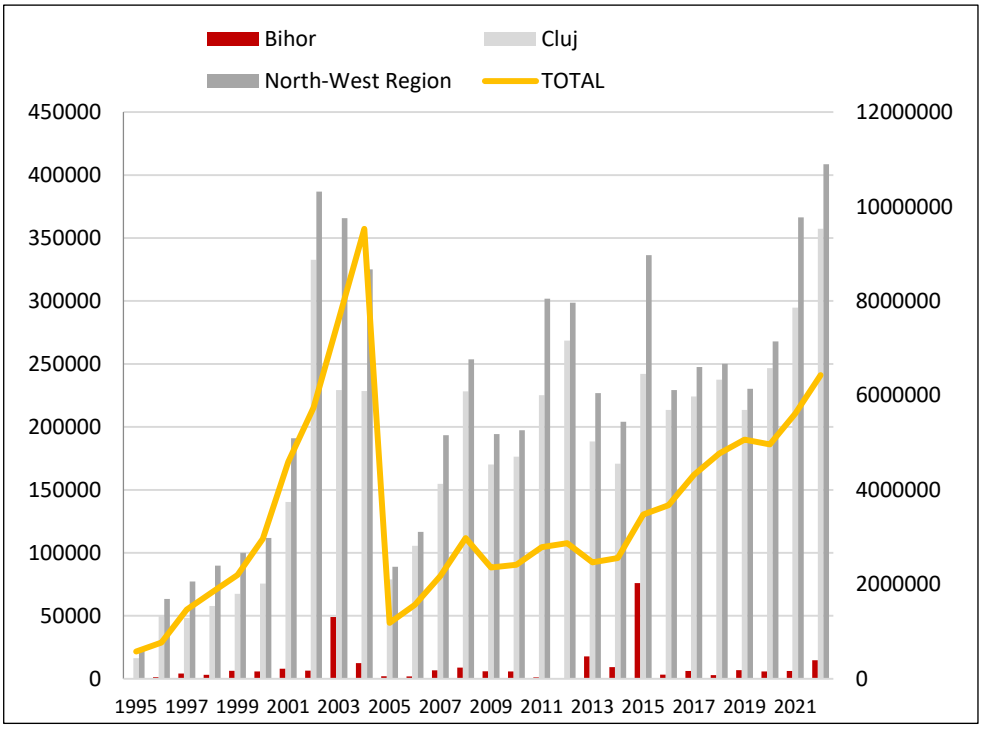

Figure 5. Total expenditure on R&D by regions during 1995-2022

Source: Adapted by the author through information taken from the Romanian National Institute of Statistics database (Romanian National Institute of Statistics, 2022)

The preceding chart effectively illustrates the longitudinal trajectory of this particular category of expenditure. While the data displayed on the left-hand side of the chart delineates the progression specific to the North-West region, as well as Bihor and Cluj counties, the numerical values on the right pertain to the cumulative nationwide totals. Notably, aside from accounting for disparities arising from currency conversions, a conspicuous inflection point is discernible, commencing in the year 2005.

For Bihor County, the zenith of Research and Development (R&D) expenditure was reached in 2015, marking a discernible culmination in financial commitment to R&D endeavors. Conversely, the developmental trajectory in Cluj County exhibited a relatively more stabilized ascent during its initial phases. However, it is imperative to underscore that heightened levels of financial investment do not inherently guarantee the triumphant fruition of such undertakings. Nonetheless, this category of expenditure unmistakably underscores the latent potential for the proliferation and advancement of start-up enterprises. Empirical research underscores the existence of a pronounced and intricate correlation between R&D expenditure and the unemployment rate (Teselios, 2015).

In the context of developmental significance, beyond their roles in employment generation and value addition, Small and Medium-sized Enterprises (SMEs) are profoundly shaped by Gross Domestic Product (GDP). Since 2009, SMEs have emerged as pivotal constituents that both drive and are propelled by economic expansion and the concomitant escalation of GDP.

In relation to the 2017 EU-28 average, the collective impact of all SMEs on GDP is pronounced, manifesting as a robust augmentation of 29%. Further granularity reveals that micro and small SMEs individually contribute to this phenomenon, yielding respective GDP elevations of 10.1% and 8.4% (European Commission, 2018). Within the context of Romania, the nuanced contribution of economic entities categorized as micro and small SMEs is conspicuous, with respective proportional GDP increments of 7.2% and 4.9%. Furthermore, when considering all SMEs operating at the Romanian level in 2017, their collective impact is underscored by a notable 16.1% surge in the nation's GDP. Turning to the distribution of high-growth enterprises across various economic sectors within the European Union for

the year 2017, discernible patterns emerge. This sectoral allocation is delineated as follows: "information and communication (17%), administrative and support service activities (15.3%), transport and storage (14%), professional, scientific and technical activities (12.7%), water supply; sewerage, waste management and remediation activities (10.7%), construction (10.5%), manufacturing (10.4%), wholesale and retail trade (10.1%), accommodation and food services (9.7%), electricity, gas, steam and air conditioning supply (7.6%)" (Eurostat, 2020). The percentages denoted herein signify the proportion of enterprises or SMEs operating within a specific sector, with a noteworthy 17%, exemplified by the Information and Communication sector, classified as high-growth entities. These enterprises are distinctly oriented toward endeavors that yield heightened levels of economic expansion. However, Romania's standing within the EU-28 landscape in 2017 was less favorable, ranking second to last. Romania accounted for a mere 2.85% share of high-growth enterprises. It is essential to underscore that not all companies or enterprises within specific sectors can or should be categorically deemed as innovative. Fostering the growth of start-ups and SMEs is intrinsically linked to the reduction of unemployment rates. As previously expounded within this comprehensive study, a reciprocal relationship exists between GDP expansion and unemployment fluctuations. This correlation holds true at both national and regional scales, a concept that aligns with the empirical findings articulated by Okun (Okun, 1988). Furthermore, this deduction aligns cohesively with the research outcomes elucidated by Anghelache et al. (Anghelache, et al., 2020). In the words of the authors, "there is a link with inverse effect, i.e. as the number of unemployed increases or the unemployment rate as a factor of influence, the recorded Gross Domestic Product also decreases" (Anghelache, et al., 2020); Consequently, the overall robustness of a nation or a particular region is contingent upon the capacity of these regions to attract and generate employment opportunities, leading to a concurrent enhancement in economic performance and regional development.

The rationale underpinning the comparison between the North-West region and the Bucharest-Ilfov region is fairly straightforward, as the latter represents the most developed region in Romania. Hence, conducting a benchmark analysis serves as a valuable method for elucidating the

distinctive characteristics of specific regions and for delineating the extent of disparity that exists between the chosen regions.

The ensuing table offers a comprehensive overview of the progression of both innovative and non-innovative enterprises within the regions of interest for this study, with a particular focus on the North-West Region:

Table 26. Number and share of innovative and non-innovative companies in the North-West region as compared to the Bucharest-Ilfov region from 2004 to 2020

Types of innovators	National/ regional level	2004	2006	2008	2010	2012	2014	2016	2018	2020
Total	TOTAL	26024	28488	29979	26330	28866	28380	28809	28776	27196
	North-West Region	3907	4288	4561	3986	4926	4393	4482	4461	4325
	Share	15.01%	15.05%	15.21%	15.14%	17.07%	15.48%	15.56%	15.50%	15.90%
	Bucharest-Ilfov Region	6007	6394	6669	6166	6397	6407	6801	6640	6133
	Share (%)	23.08%	22.44%	22.25%	23.42%	22.16%	22.58%	23.61%	23.07%	22.55%
Innovative SMEs	TOTAL	5171	6013	9986	8116	5968	3645	2925	4198	2900
	North-West Region	675	909	1260	1106	593	401	592	940	386
	Share (%)	13.05%	15.12%	12.62%	13.63%	9.94%	11.00%	20.24%	22.39%	13.31%
	Bucharest-Ilfov Region	1145	990	2388	2014	1186	1129	714	1691	1248
	Share (%)	22.14%	16.46%	23.91%	24.82%	19.87%	30.97%	24.41%	40.28%	43.03%
Non-innovative SMEs	TOTAL	20853	22475	19993	18214	22898	24735	25884	24578	24296
	North-West Region	3232	3379	3301	2880	4333	3992	3890	3521	3939
	Share (%)	15.50%	15.03%	16.51%	15.81%	18.92%	16.14%	15.03%	14.33%	16.21%
	Bucharest-Ilfov Region	4862	5404	4281	4152	5211	5278	6087	4949	4885
	Share (%)	23.32%	24.04%	21.41%	22.80%	22.76%	21.34%	23.52%	20.14%	20.10%

Source: Adapted by authors from information made available by the Romanian National Institute of Statistics (Romanian National Institute of Statistics, 2024)

The data presented in the aforementioned table encompasses a biennial timeframe commencing in 2002. Notably, it becomes evident from the preceding table that non-innovative enterprises have exhibited a more consistent growth trajectory within the context of Romania over the years. It is essential to elucidate that the computation of the proportion of innovative and non-innovative enterprises within the North-West and Bucharest-Ilfov

regions entails dividing the respective numbers of innovative and non-innovative enterprises by the total count of such enterprises across all regions in Romania.

It is discernible that, in the realm of innovative enterprises, the Bucharest-Ilfov region has registered the highest figures, reaching its zenith with 2388 innovative enterprises in the year 2008. In parallel, the North-West region also attained its apex with 1260 innovative enterprises during the same year. As previously emphasized, a nexus exists between the resilience and expansion of firms during economic crises and investments in innovation-related endeavors. Nonetheless, the figures depicted in the table above illustrate the decline in the numbers of innovative companies over the years characterized by economic downturns.

Table 27. Innovative enterprises, by types of innovators and by regions, from 2002 to 2020

Types of innovators	Regions	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020
Product innovation	**Total**	582	472	525	710	635	351	313	430	1836	1209
	North-West region	11	81	56	82	122	56	30	103	490	143
Process innovation	**Total**	413	1203	1169	1965	955	706	511	478	N/A	N/A
	North-West region	33	91	110	280	123	26	30	71	N/A	N/A
Only business process innovators	**Total**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1281	839
	North-West region	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	171	120
Product and process innovators	**Total**	2968	3461	4276	3073	2041	634	705	518	N/A	N/A
	North-West region	386	502	739	346	288	67	83	98	N/A	N/A
Product and business process innovators	**Total**	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	1007	702
	North-West region	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	273	104

Source: Adapted by the author through information taken from the Romanian National Institute of Statistics database (Romanian National Institute of Statistics, 2024)

The data presented in the table above encompasses a biennial timeframe commencing in 2006. This periodicity explains the absence of information for

the intervening years of 2007, 2009, 2011, 2013, 2015, and 2017. An evident reduction in the number of innovative enterprises within the North-West region is apparent from the provided data. Notably, the economic recession in 2008 accounts for this decline to some extent. Nevertheless, a favorable trend in the number of innovative enterprises emerges, with their count reaching 919 by 2018. It is noteworthy that, apart from the Bucharest-Ilfov region, no other region managed to match or exceed the number of innovative enterprises recorded in 2006 by 2018. Over this extensive period, the Romanian market exhibited numerous developments, despite the economic crisis, with an overall positive trajectory.

Throughout the years, the North-West region consistently lagged behind in terms of the total number of innovators. Remarkably, the region performed comparatively better in the categories of enterprises engaged in product and process innovation. It's worth noting that data on "business process innovators" and "product and business process innovators" is unavailable.

The table also highlights the maximum and minimum levels for each type of innovator (product innovation, process innovation, business process innovators, product and process innovators, product and business process innovators) from 2002 to 2018. For seven out of the nine years under consideration, most companies across all regions primarily embraced "product and process" innovations. In specific years, such as 2002, 2004, 2006, 2008, 2010, 2014, and 2016, the majority of companies fell under the category of "product or process innovators," with varying numbers. The year 2012 witnessed the highest number of companies (706) categorized as "process innovators" while in 2018, 1836 companies were classified as "product innovators". Unfortunately, data for the 2002-2016 period is absent for the categories of "only business process innovators" and "product and business process innovators."

A more comprehensive examination of the various innovator types is imperative to gain a nuanced understanding of the North-West region's dynamics in contrast to the total number of innovative firms. This granularity is particularly crucial considering that the North-West region typically receives lower allocations for innovative activities compared to other regions in the country. Future research endeavors should employ benchmark analyses with a focus on the Bucharest-Ilfov region as a reference

point to elucidate the substantial efforts required to expedite start-up development in the North-West region.

Regarding the total number of enterprises aspiring to achieve innovation, the peak was reached in 2006, with 6013 such enterprises or SMEs. Furthermore, within the category of innovative enterprises, the highest count was recorded in 2008. Notably, small enterprises contributed significantly to this figure, totaling 3738 in 2008.

As for the "only product innovator" type, the ensuing table will delineate its evolution:

Table 28. Comparison of "product innovation" companies between the North-West region and the total number of "product innovation" companies during 2002-2020

	Enterprise size	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020
TOTAL	**Total**	582	472	525	710	635	351	313	430	1836	1836
	Small	344	266	330	449	394	174	219	347	1332	853
	Medium	172	148	155	205	170	134	55	56	372	274
	Large	66	58	40	56	71	43	39	27	132	82
	Industry	357	315	291	431	424	197	148	162	1222	601
	Services	225	157	234	279	211	154	165	268	614	608
North-West region	**Total**	11	81	56	82	122	56	30	103	490	490
	Small	4	55	31	56	84	48	19	94	404	404
	Medium	4	12	20	22	28	5	6	5	64	64
	Large	3	14	5	4	10	3	5	4	22	22
	Industry	9	65	35	27	98	45	12	44	330	330
	Services	2	16	21	55	24	11	18	59	160	160

Source: Adapted by the author through information taken from the Romanian National Institute of Statistics database (Romanian National Institute of Statistics, 2024)

The table above reveals a striking transformation in the evolution of "product innovation" enterprises within the North-West region over the years. A notable illustration of this transformation pertains to the share of "product innovation" enterprises from the North-West region concerning the overall distribution. In the year 2002, "product innovation" enterprises in the North-West region exhibited the following segmentation between services and industry: 1.55% in the industry sector and 0.34% in services. During the same period in 2002, small-sized "product innovation" enterprises in the North-West region constituted 1.16% of the total "product innovation" enterprises. Additionally, medium-sized enterprises in the

North-West region accounted for 2.33% of the total, while large enterprises contributed 4.55% to the total count of "product innovation" enterprises. These "product innovation" enterprises represented 1.86% of the total across all regions. Evidently, 2002 did not stand out as a prolific year for "product innovation."

However, the intensity of this transformation becomes apparent when examining the 2018 figures. Regarding the three business size categories within the North-West region, their shares of the total "product innovation" enterprises are as follows: small-sized "product innovation" enterprises constitute 30.33%, medium-sized ones represent 17.20%, and large-sized "product innovation" enterprises account for 16.67%. Collectively, the industrial sector focused on "product innovation" within the North-West region has ascended to a 17.97% share in 2018, while services now encompass 8.71% of the total. At the 2018 level, the total number of "product innovation" enterprises in the North-West region constitutes 26.69% of the overall count of "product innovation" enterprises. It is noteworthy that small-sized enterprises have taken the lead in this paradigm shift. The consistent growth of "product innovation" enterprises in the North-West region, even during recessionary years, underscores the significance of investment in research and development (R&D) and innovation during economic downturns.

With regard to "process innovation" enterprises, the ensuing table will provide a comprehensive overview of their numerical evolution throughout the period from 2002 to 2018:

Table 29. Comparison of "process innovation" companies between the North-West region and the total number of "product innovation" companies during 2002-2020

	Enterprise size	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020
TOTAL	**Total**	413	1203	1169	1965	955	706	511	478	N/A	N/A
	Small	201	739	699	1324	638	445	353	273	N/A	N/A
	Medium	138	343	365	487	216	197	114	168	N/A	N/A
	Large	74	121	105	154	101	64	44	37	N/A	N/A
	Industry	315	780	692	1216	578	481	200	234	N/A	N/A
	Services	98	423	477	749	377	225	311	244	N/A	N/A
North-West region	**Total**	33	91	110	280	123	26	30	71	N/A	N/A
	Small	28	41	57	198	92	12	16	58	N/A	N/A
	Medium	3	35	44	65	20	10	6	11	N/A	N/A

	Enterprise size	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020
	Large	2	15	9	17	11	4	8	2	N/A	N/A
	Industry	20	49	71	158	92	24	15	70	N/A	N/A
	Services	13	42	39	122	31	2	15	1	N/A	N/A

Source: Adapted by the author through information taken from the Romanian National Institute of Statistics database (Romanian National Institute of Statistics, 2024)

The aforementioned table highlights a notable and substantial transformation in the evolution of "process innovation" enterprises within the North-West region over the years. A preliminary illustration of this transformation pertains to the share of "process innovation" enterprises from the North-West region concerning the overall distribution. In the year 2002, "process innovation" enterprises in the North-West region exhibited the following segmentation between services and industry: 4.84% in the industrial sector and 3.15% in services. During the same period in 2002, small-sized "process innovation" enterprises in the North-West region constituted 13.93% of the total "process innovation" enterprises. Additionally, medium-sized enterprises in the North-West region accounted for 2.17% of the total, while large enterprises contributed 2.70% to the total count of "process innovation" enterprises. These "process innovation" enterprises represented 7.99% of the total across all regions. However, data for the 2018 period is regrettably unavailable.

In respect to the three business size categories within the North-West region for 2017 levels, their shares of the total "process innovation" enterprises are as follows: small-sized "process innovation" enterprises constitute 21.25%, medium-sized ones represent 6.55%, and large-sized "process innovation" enterprises account for 5.41%. Collectively, the industrial sector focused on "process innovation" within the North-West region has ascended to a 14.64% share in 2018, while services now encompass a mere 0.21% of the total. At the 2017 level, the total number of "process innovation" enterprises in the North-West region constitutes 14.85% of the overall count of "process innovation" enterprises. It is noteworthy that small-sized enterprises have taken the lead in this transformation. In contrast to the previous type of innovator (product innovator), "process innovator" types have not experienced equivalent success during times of recession, exhibiting rather modest evolution during the most recent economic downturn.

Concerning "product and process innovation" enterprises, the ensuing table will provide a detailed overview of their numerical evolution throughout the period from 2002 to 2018:

Table 30. Size distribution of PPI types of innovation in the North-West region, during 2002-2018

	Enterprise size	2002	2004	2006	2008	2010	2012	2014	2016	2018	2020
TOTAL	**Total**	2968	3461	4276	3073	2041	634	705	518	N/A	N/A
	Small	1582	1829	2477	1907	1253	313	451	296	N/A	N/A
	Medium	232	1094	1297	788	526	164	143	137	N/A	N/A
	Large	519	538	502	378	262	157	111	85	N/A	N/A
	Industry	2229	2369	2781	2001	1303	375	494	369	N/A	N/A
	Services	739	1092	1495	1072	738	259	211	149	N/A	N/A
North-West region	**Total**	386	502	739	346	288	67	83	98	N/A	N/A
	Small	224	296	451	177	191	43	54	77	N/A	N/A
	Medium	89	143	214	125	66	10	20	12	N/A	N/A
	Large	73	63	74	44	31	14	9	9	N/A	N/A
	Industry	320	410	565	278	159	47	49	69	N/A	N/A
	Services	66	92	174	68	129	20	34	29	N/A	N/A

Source: Adapted by the author through information taken from the Romanian National Institute of Statistics database (Romanian National Institute of Statistics, 2024)

Evident from the preceding table is the discernible trajectory of the "product and process innovation" category within the North-West region over the course of several years. A primary illustration of this transformation pertains to the proportion of "product and process innovation" enterprises originating from the North-West region in relation to the overall distribution. In the year 2002, "product and process innovation" companies from the North-West region exhibited a distribution between services and industry, with 10.78% allocated to the industrial sector and 2.22% to services. During the same period in 2002, small-sized "product and process innovation" enterprises in the North-West region represented 14.16% of the total "product and process innovation" enterprises. Additionally, medium-sized enterprises in the North-West region accounted for a substantial 38.36% of the total, while large enterprises contributed 14.07% to the total count of "product and process innovation" enterprises. Collectively, "product and process innovation" enterprises constituted 13.01% of the overall tally across all regions. However, data for the 2018 period remains unavailable.

Regarding the three business size categories within the North-West region for 2017 levels, their shares of the total "product and process innovation" enterprises are as follows: small-sized "product and process innovation" enterprises constitute 26.01%, medium-sized ones represent 8.76%, and large-sized "product and process innovation" enterprises account for 10.59%. Overall, the industrial sector focused on "product and process innovation" within the North-West region has ascended to a 13.32% share in 2018, while services now encompass a 5.60% share. At the 2017 level, the total number of "product and process innovation" enterprises in the North-West region constitutes 18.92% of the overall count of "product and process innovation" enterprises. It is noteworthy that small-sized enterprises have taken the lead in this transformation.

In all the aforementioned cases encompassing various innovation types, small enterprises have emerged as prominent leaders. Simultaneously, besides numerical increments, the preceding tables underscore the favorable progression of small enterprises. In all three instances, small enterprises in the North-West region have experienced the most substantial increments, contrasting with medium and large enterprises, which have exhibited both modest and negative trends.

3.2. Business Establishment and Local Development in Bihor and Cluj Counties

Romania, the seventh most populous member state within the European Union, is demarcated into eight discrete regions. When examining the dispersion of urban centers, localities, and municipalities, there exists ample discourse and analytical potential. Nonetheless, it is of paramount significance to adopt a strategic perspective when scrutinizing these entities.

3.2.1. Bihor and Cluj Counties within the North-West Region of Romania

To conduct an exhaustive analysis of the North-West region, we advocate the adoption of a hierarchical approach, commencing with a national-level

examination, subsequently transitioning to a regional scrutiny, and culminating in a county-specific investigation. This methodical progression allows for a comprehensive understanding of the intricate interplay between macroeconomic factors at the national level, the nuanced dynamics shaping the North-West region, and the localized intricacies specific to individual counties within the region. To facilitate this endeavor, the ensuing table can be employed to delineate the circumstances prevailing in both Bihor and Cluj counties:

Table 31. Comparative representation of the number of territorial units (municipalities, cities, communes, localities) of the NW region of Romania (NUTS2) and of the counties (NUTS3) that make up this region for 2020 levels

	Municipalities	**Cities**	**Communes**	**Localities**
Romania	103	217	2861	13427
- North-West Region	15	28	403	1911
- Bihor	4	6	91	458
- Bistrita-Nasaud	1	3	58	249
- Cluj	5	1	75	434
- Maramures	2	11	63	247
- Satu Mare	2	4	59	234
- Salaj	1	3	57	289

Source: Adapted from the 2021-2027 North-West Regional Development Plan (North-West Regional Development Agency, 2020)

As illustrated in the preceding table, the North-West region comprises the following constituent counties: Bihor, Bistrita-Nasaud, Cluj, Maramures, Satu-Mare, and Salaj. As expounded within this compendium, when assessing its economic development, urban expansion, academic progression, and business advancement, Cluj County unmistakably emerges as a preeminent entity. Furthermore, its economic contributions conduce to an enhanced regional competitive milieu.

It is noteworthy that Bihor County encompasses four municipalities and encompasses six cities. Notably, within the ambit of Oradea, we discern a rapid and burgeoning development of its metropolitan environs. Additionally, it is imperative to emphasize that while Romania, as an entirety, attains a general urbanization index of 53.78%, Bihor County records an urbanization index of 48.90%. This positions it as the third-highest within the North-West region, trailing behind Cluj County, which boasts an

urbanization index of 65.16%, and Maramures County, with an urbanization index of 57.23% (North-West Regional Development Agency, 2020). Subsequently, the North-West region is further composed of the following entities: three business accelerators, six technology transfer centers, five business clusters, four hubs, one incubator, and thirteen industrial parks (European Commission, 2017).

The county of Bihor, with its administrative center in the city of Oradea, reported a population of 615,444 residents as of July 2020. Within this population, there were 173,944 individuals gainfully employed (Romanian National Institute of Statistics, 2020). Data sourced from the Regional Branch of the National Institute of Statistics indicates that as of the conclusion of November 2020, Bihor County boasted a total employment figure of 174,510 individuals. Furthermore, the gross average income for Bihor County during the same period stood at 4,476 Romanian Leu (RON) (Romanian National Institute of Statics, 2020) (roughly equivalent to 918.44 euros, calculated using the exchange rate of 4.8735 Romanian Leu (RON) for 1 euro as of November 30, 2020) (National Bank of Romania, 2020). The aforementioned report sourced from the National Institute of Statistics indicates that, as of the conclusion of November 2020, Bihor County exhibited an unemployment rate of 2.2% (Romanian National Institute of Statics, 2020). In this context, a discernible increment in the aggregate count of unemployed individuals is evident. Specifically, in comparison to the figures reported in October 2020, the 30th of November 2020 witnessed an upsurge, culminating in a total of 5833 unemployed persons. A more detailed breakdown of this cohort discloses that out of the aforementioned 5833 individuals, 2441 were male, while 3392 were female. This translates to an unemployment rate of 1.7% among the male population and 2.8% among the female population.

Regarding Cluj County, it is noteworthy that its administrative center is Cluj-Napoca. As of July 1st, 2020, Cluj County boasted a population of 737,992 residents and reported an unemployment rate of 1.6% for the month of December 2020. Furthermore, the Gross Domestic Product (GDP) for Cluj County in the year 2018 amounted to 470,856 million RON (Romanian National Institute of Statistics, 2019). In November 2020, Cluj County exhibited an average net income of 4,058 RON, positioning it as the second-highest county in the country in terms of income levels, trailing only the

municipality of Bucharest. The data elucidating this point is conveniently presented in the subsequent table, which serves as a visual aid for the comprehensive dissemination and accessibility of this information:

Table 32. Comparison of key figures (population, employment numbers, unemployment rate, and GDP) between Bihor and Cluj counties for 2023 levels

County	Population	Employed population	Unemployment rate (%)	GDP per capita (thousands of EURO)
Bihor	609367	184039	1.3	13.5
Cluj	737992	239000	1.6	22.8

Source: Adapted by the author from information taken from the Romanian National Institute of Statistics (Bihor County Directorate of Statistics, 2023), (Cluj County Directorate of Statistics, 2023)

Given its larger population, a lower unemployment rate, higher GDP figures, and a greater count of employed residents, Cluj County offers a more promising landscape for investment and development when compared to Bihor County.

In delving deeper into the examination of unemployment within Bihor and Cluj counties, it becomes imperative to first comprehend and evaluate the nationwide unemployment rate trends. Such an analysis is essential in order to gain insight into the comparative standing of Bihor and Cluj counties vis-à-vis other regions across Romania.

3.2.2. Macroeconomic Dimensions in Bihor and Cluj Counties

As presented earlier, a primary objective of this monograph is to ascertain the manner and magnitude through which two pivotal macroeconomic metrics, namely Gross Domestic Product (GDP) and the Unemployment Rate, exert their influence, whether directly or indirectly, upon the establishment and progression of startup enterprises. This inquiry is specifically directed towards the North-West region of Romania, with a particular focus on the municipalities of Oradea and Cluj-Napoca

3.2.1.1. Unemployment and Unemployment Rates in Bihor and Cluj Counties

The Unemployment Rate (hereafter denoted as UR), despite experiencing significant fluctuations over the years, has exhibited a consistent downward

trajectory. Specifically, it has diminished from 8.5% in January 2004 to 3.9% in January 2019. This decline can be attributed to a multifaceted array of factors, encompassing the proliferation of operational enterprises, enhanced labor force inclusion, improved labor conditions, and an increased influx of both Foreign Direct Investments (FDIs) and foreign corporations into the Romanian milieu. To illustrate, Bihor County recorded a total FDI influx of 876 million euros in 2019, while Cluj County, during the same period, attracted FDIs totaling 2059 million euros (Romanian National Bank, 2020).

Commencing from its zenith of 4.6% in the year 2000, constituting a cohort of 13.6 thousand individuals, the Unemployment Rate (UR) has steadily descended to a remarkable nadir of 1.3% in 2019, encompassing 3.4 thousand persons within its purview. This favorable trajectory mirrors the overarching developmental momentum within Bihor County, with Oradea emerging as the principal locus of this progression. As previously elucidated, a segment of this ascending trend can be ascribed to the amplified influx of Foreign Direct Investments (FDIs), a phenomenon not confined solely to Oradea but diffused across the entirety of Bihor County (Romanian National Bank, 2020). The transformation observed in Oradea and Bihor can be primarily attributed to factors encompassing political stability, a burgeoning populace of operational enterprises, and heightened levels of Foreign Direct Investments (FDIs). Scholars, including Delcea, have expounded upon the influence of augmented technology parks, the progressive trajectory of FDIs over time, sustained political stability, enhanced infrastructure, decentralized fiscal disbursement by local governing bodies, and the abatement of operational expenditures incurred by these authorities. Collectively, these elements have engendered a protracted decline in the Unemployment Rate (UR) throughout the years (Delcea, 2012). Although Delcea's analysis encompasses data from the period spanning 2005 to 2012, the author underscores notable advancements achieved within that timeframe, stating that “compulsory expenditure in total expenditure went down by almost 37%, the share of personnel expenses by over 54% and the share of operating expenses by over 44%, and the increased in the same period the share of expenditure on public services in total spending by about 52% and doubling the share of investment expenditure in total expenditure, we conclude that the expenditure policy of Oradea was greatly improved in the period 2005-2012”

(Delcea, 2012). Despite the authors' assertion that the unemployment rate should have decreased due to the improvements implemented in Bihor County between 2005 and 2012, it is imperative to acknowledge that the county was not immune to the effects of the economic crisis. It is equally noteworthy that the same local administration in Oradea remained in office even after 2012, persisting in their endeavors to promote further improvements and development.

Regarding the unemployment statistics for Cluj County, the subsequent table has been employed to emphasize the key discoveries.

Table 33. Evolution of unemployment (numbers) and of the unemployment rate (%) in Cluj County from 2000 to 2018

	Unemployment	**Unemployment rate %**
Year	**Total**	**Total**
2000	37765	11.3
2001	30933	9.4
2002	33157	10.0
2003	24822	7.6
2004	16305	5.1
2005	14373	4.4
2006	11200	3.4
2007	10203	3.0
2008	9998	2.9
2009	21725	6.3
2010	16858	4.9
2011	12714	3.8
2012	13309	3.8
2013	12307	3.5
2014	9938	2.8
2015	7981	2.3
2016	8020	2.2
2017	7460	2.0
2018	4720	1.3
2019	4483	1,2
2020	6108	1,6
2021	4442	1,3
2022	4322	1,2

Source: Adapted by the author from information taken from National Institute of Statistics (The Romanian National Institute of Statistics, 2024)

An intriguing observation that arises from the data presented in the preceding table is the realization that over the period spanning from 2000 to

2018, there have been a total of 14 years during which the unemployment figures exhibited a decline. Conversely, there were 15 instances in which the unemployment rate saw a decrease (with the unemployment rate remaining relatively stable between 2012 and 2013, showing a mere 0.3-point difference between these two years). This data underscores the county's commendable proficiency in workforce management and its capacity for generating new employment opportunities.

The consistent attraction of new businesses, enterprises, multinational corporations (MNCs), and startups has contributed to a consistent and sustained reduction in unemployment, concurrently fostering the development of a more skilled and well-prepared workforce. Additionally, it is worth noting that Cluj enjoys the advantage of hosting two of Romania's largest and most esteemed universities, namely Babes Bolyai University of Cluj-Napoca and the Technical University of Cluj-Napoca. Consequently, a portion of the students who acquire academic qualifications find it considerably easier to integrate into society and leverage the ample employment prospects offered by the city of Cluj-Napoca.

3.2.1.2. Evolution of Gross Domestic Product (GDP) in Bihor and Cluj Counties

Equally paramount in assessing the socio-economic dynamics of the Bihor and Cluj counties, alongside the unemployment rate and its historical trajectory, is an examination of their respective contributions to the Gross Domestic Product (GDP). To facilitate the transition from an unemployment-centric analysis to a focus on GDP, and to discern the concurrent evolutions of these two key indicators, the ensuing table is designed to scrutinize their trends over successive semesters, commencing in 2004.

Table 34. GDP evolution in Romania basis during the 2004–2022 time interval (GDP per capita (current US$))

Year	GDP
2004	3494.99
2005	4618.00
2006	5757.53
2007	8360.34
2008	10435.22
2009	8548.05

Year	GDP
2010	8397.81
2011	9560.16
2012	8930.73
2013	9497.21
2014	10031.34
2015	8976.95
2016	9404.38
2017	10727.97
2018	12494.42
2019	12958.00
2020	13047.46
2021	14946.62
2022	15786.80

Source: Adapted by the author from a press release of the Romanian National Institute of Statistics (The World Bank, 2024)

The information presented above suggests a discernible correlation between the presence and proliferation of start-up enterprises and two pivotal economic indicators: Gross Domestic Product (GDP) and the unemployment rate. Specifically, there appears to exist a positive relationship between high GDP levels and an augmentation in the number of start-ups, as well as an inverse relationship between start-up prevalence and the unemployment rate. A more comprehensive and nuanced examination of these interrelationships will be expounded upon in the concluding section of this monograph.

As elucidated in the preceding table, a robust yet inversely proportional association is discernible between the growth of GDP and fluctuations in the unemployment rate. This phenomenon is characterized by a reciprocal dynamic, wherein an escalation in unemployment coincides with a contraction in GDP growth. Importantly, this observed pattern mirrors the empirical findings posited by Okun and resonates both at the national and regional echelons (Okun, 1988). Furthermore, this deduction aligns with the research outcomes delineated by Anghelache et al. (Anghelache, et al., 2020). As elucidated by the authors, "there is a link with inverse effect, i.e. as the number of unemployed increases or the unemployment rate as a factor of influence, the recorded Gross Domestic Product also decreases" (Anghelache, et al., 2020); Henceforth, the overall strength of a nation or region hinges upon the absorptive capacities of its constituent areas. Specifically, the greater the number of countries or regions capable of

generating new employment opportunities and diminishing unemployment rates, the more favorable the overall economic performance and regional development shall be. This pertains not only to job creation in traditional enterprises but also encompasses start-ups and emerging ventures. An advantageous facet of fostering start-ups lies in its potential to expedite the reduction of youth unemployment, as younger individuals are inherently drawn to the dynamic landscape of start-up sectors. It is worth noting that founders of start-ups do not conform to a uniform template in terms of educational background, professional profile, aspirations, or income levels. Moreover, an expanded pool of students translates into a heightened source of talent for prospective employers and start-ups seeking to broaden their operations. This phenomenon aligns with and finds substantiation in the research conducted by Badulescu and Badulescu (Badulescu & Badulescu, 2013) and by Smith (Smith, 2010). The authors have elucidated a prevailing trajectory that universities should adopt with regard to the suitable methodologies for enhancing students' competencies, with the aim of augmenting their employability and bolstering their overall skill proficiencies. Furthermore, Smith has postulated that universities and educational institutions are inherently intertwined with this trajectory, as they play a pivotal role in its realization. Moreover, Smith has also stated that universities and learning centers are "more pro-active in providing postgraduates with the opportunity to develop the core competencies they need to succeed in a competitive job market" (Smith, 2010). A more comprehensive illustration of the ways in which universities can actively contribute to the reduction of unemployment levels is provided by the same authors. They conducted a study involving 110 doctoral students hailing from public universities in Romania, with the University of Oradea comprising the majority at 77 PhD students, representing 88% of the total sample. Additionally, the "Aurel Vlaicu" University of Arad contributed 6 PhD students, equivalent to 7% of the overall sample, while the "Petru Maior" University of Targu Mures had 5 doctoral students, constituting 6% of the total sample. The study unveiled the aspirations of these prospective graduates, particularly their keen interest in initiating entrepreneurial endeavors. Within the entire cohort, a noteworthy 63% of respondents affirmed their intention to embark on entrepreneurial ventures (Badulescu & Badulescu, 2013). Although a sample size of 110 individuals may initially appear modest, it is worth acknowledging its potential as a catalyst for a

"snowball" effect. The expansion of registered students and PhD graduates has the capacity to stimulate the establishment of additional start-ups and new business ventures, consequently contributing to heightened levels of employment. Given the perpetual diversification of business fields and sectors, exemplified by the emergence of domains such as fin-tech and bio-tech start-ups, collaborative initiatives among specialized universities can facilitate the development of novel products, services, and business sectors. This can be achieved through the implementation of technology and technology transfer laboratories, innovation hubs, and university-affiliated accelerator programs designed to foster creative industries.

Moreover, partnerships forged between different universities or faculties possess the potential to yield spill-over effects that benefit adjacent regions. Enhancements in the quality and performance of creative industries, driven by university initiatives within the city of Oradea and Bihor County, can ripple into advancements across economic, cultural, and social dimensions in neighboring counties. Detailed examples of such collaborative ventures will be expounded upon in subsequent sections.

It is imperative to recognize that the responsibility for reducing unemployment in a given region should not be disproportionately shouldered by universities alone. Policies specifically geared towards diversifying skill sets and augmenting the employability of the general population are imperative, transcending geographical boundaries and national contexts. In the case of Cluj-Napoca, a city endowed with a robust and thriving academic sector, the question that looms is whether it can sustain its current momentum or even accelerate its pace.

To gain a comprehensive perspective, it is equally crucial to comprehend the nationwide trajectory of GDP on a quarterly basis. The ensuing table endeavors to provide a more detailed examination of this evolution.

Table 35. GDP evolution (million RON- current prices) on a quarterly basis during 1995-2020 in Romania

Year/ Trimester	1st quarter	2nd quarter	3rd quarter	4th quarter
1995	1461.3	1672.2	2259.1	2218.0
1996	2031.4	2373.7	3472.9	3509.7
1997	4223.9	5286.4	7806.3	8183.5
1998	6822.7	8144.7	10819.8	11220.5
1999	9479.8	12382.3	15883.2	17381.1
2000	14621.4	18132.3	22823.1	25296.3

Year/ Trimester	1st quarter	2nd quarter	3rd quarter	4th quarter
2001	21074.0	26876.7	33063.4	36377.3
2002	27464.3	35274.2	42337.6	47195.4
2003	34454.0	43501.3	54157.8	59804.5
2004	43984.4	55098.7	68569.2	77036.0
2005	54939.6	63561.0	79289.7	89071.6
2006	64667.2	78622.6	93855.0	105617.8
2007	78903.6	97253.3	115153.7	134380.5
2008	101049.3	125089.2	149415.0	164281.1
2009	101545.8	124474.8	142724.8	162149.0
2010	103450.3	127161.6	148415.9	161308.5
2011	116301.2	136795.5	161316.8	172789.8
2012	119588.1	146537.8	170358.5	184784.3
2013	120758.7	146956.0	174157.3	189730.9
2014	129307.5	156422.8	184666.4	198479.7
2015	139671.2	162468.1	197664.2	212740.1
2016	144789.0	176125.4	205833.3	225368.7
2017	163310.8	194964.0	237244.3	256100.6
2018	181398.9	221319.4	267023.0	289317.3
2019	202555.4	247082.1	292199.8	321957.3
2020	219326.1	226768.8	288914.8	331770.8
2021	230158.6	273949.6	324381.8	360599.8
2022	270045.3	331832.7	388259.9	419646.0
2023	318557.1	377209.2	434981.3	N/A

Source: Adapted by the author from a press release of the Romanian National Institute of Statistics (Romanian National Institute of Statistics, 2021), (Romanian National Institute of Statistics, 2024)

The data presented in the aforementioned table are denominated in millions of RON at current price levels. A discernible overarching trend in the trajectory of Gross Domestic Product (GDP) evolution becomes apparent upon examination. While there were occasional contractions, notably between 2009 and 2010 attributable to the global economic crisis, the predominant trajectory has been characterized by positive momentum driven by economic expansion and development.

To conduct a more granular analysis of the precise influence on GDP fluctuations resulting from both annual and quarterly variances throughout the observed period, we conducted calculations that are delineated in Table A 19, titled "Discrepancies in Quarterly and Annual GDP Evolution During the 1995-2020 Timespan in Romania," presented in Annex 2.

Upon careful scrutiny of Table A 19, it becomes evident that the years 2009 and 2010 witnessed a deceleration in GDP growth, primarily attributed to the ramifications of the global economic crisis. Another pivotal juncture that significantly impeded GDP evolution occurred at the onset of 2020 with the outbreak of the pandemic. Although these instances were isolated, their repercussions on the overall economic well-being of the nation and the affected regions were notably burdensome. Nevertheless, it remains an open question whether the measures enacted by the government will effectively steer the economy toward heightened development, a determination that only the passage of time can ascertain.

The data pertaining to the Gross Domestic Product (GDP) trajectory of Bihor County exhibits consistency throughout the observed years. Specifically, in 2012, Bihor County made a significant contribution, constituting 20% of the total GDP within the North-West region (Timis County Agency For Employment, 2013); advancing to the year 2017, the Gross Domestic Product (GDP) of Bihor County had attained a value of 19.87 million RON. In comparison, during the same period, Cluj County's GDP had surged to an impressive 50 billion RON, thereby revealing a substantial divergence in economic output between the two counties, particularly when viewed through the lens of GDP.

Beyond the individual county contributions to regional GDP, it is noteworthy that the North-West region achieved a commendable ranking in 2018 regarding its economic prowess and proportional significance within the national GDP landscape. Specifically, the Bucharest-Ilfov region secured the top position, boasting a GDP of 251.35 billion RON, which constituted 26.6% of the total national GDP. Subsequently, the South-Muntenia region claimed the second spot with a GDP of 116.5 billion RON, representing 12.3% of the total national GDP. The North-West region, in third place, recorded a GDP of 111.55 billion RON, constituting 11.8% of the total national GDP (European Commission, 2021) (www.cursdeguvernare.ro, 2019); once again, we observe the persistent economic performance of Bihor County, as evidenced by its contribution to the North-West region's GDP, which amounted to 19.3% in the year 2018.

The subsequent figure visually delineates the trajectory of GDP growth in Bihor County, commencing from the year 2010:

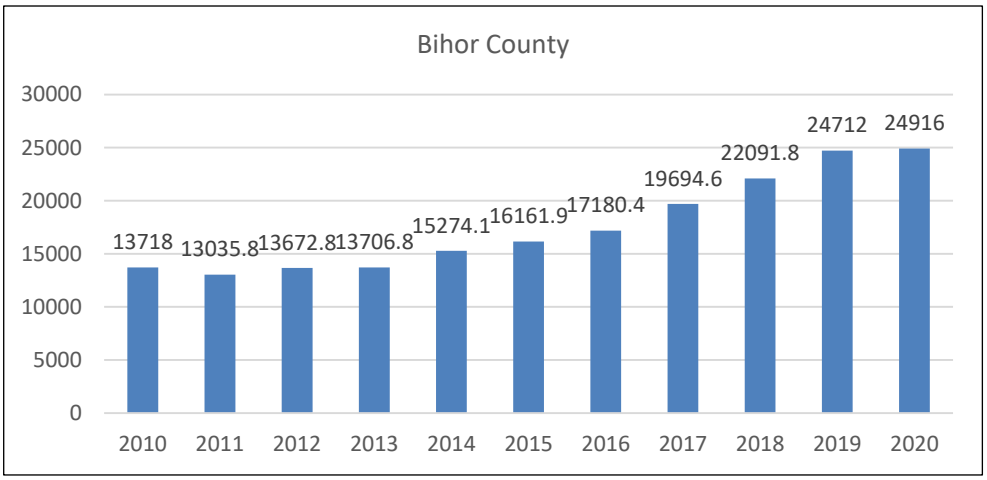

Figure 6. Evolution of GDP (million RON) in Bihor County from 2010 to 2017

Source: Adapted by the author from a press release of the Romanian National Institute of Statistics (National Institute of Statistics, 2024)

The values depicted in the aforementioned figure are denominated in millions of Romanian Leu (RON). It is discernible that there is a consistent and favorable upward trajectory in GDP levels over the years, including periods marked by economic downturns. To gain insight into the GDP evolution of Cluj County, we turn our attention to the subsequent figure:

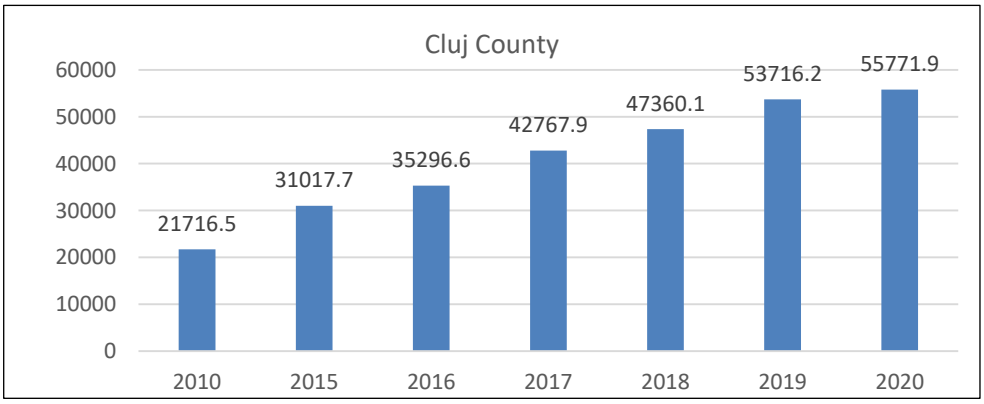

Figure 7. Evolution of GDP (million RON) in Cluj County from 2010 to 2017

Source: Adapted by the author from the National Institute of Statistics (The Romanian National Institute of Statistics, 2024)

Figure 7 illustrates the progressive trajectory of Cluj County's Gross Domestic Product (GDP) commencing in 2010. It is discernible that, throughout the entire period under consideration, inclusive of recessionary years, a consistent and favorable trend of economic development has persisted within the county. The GDP evolution unfolds as follows: an increase from 947.4 million RON in 2011 compared to 2010, and a notable growth to 7,002.9 million RON in 2017 in comparison to the preceding year, 2016. These two reference points, 2011 and 2017, have been selected to provide a comprehensive view of Cluj County's developmental journey from a relatively distant period to a more recent one. This sustained development aligns cohesively with the county's low unemployment rate and contributes to its overall prosperity and advancement.

In terms of GDP distribution within the North-West region, the breakdown is as follows: Bihor accounts for 19.65% of the regional GDP, Bistrita-Nasaud contributes 9.18%, Cluj leads with 38.84%, Salaj participates with 7.4%, Satu-Mare represents 10.59%, and Maramures encompasses 14.35%. From this enumeration, it becomes evident that Cluj assumes the highest share, closely followed by Bihor, securing the third position in the regional hierarchy is Maramures. Cluj's exceptional growth can be attributed to its robust industrial sector, a well-developed tourism industry, and a continuously improving academic and university center, factors that distinguish it from other counties and have propelled its accelerated development in recent years (North-West Regional Development Agency, 2020)

Despite a marginal decline observed in the evolution of Bihor County, which saw its GDP contribution decrease from 19.65% in the period spanning from 2012 to 2016 to 19.3% in 2018, it is essential to underscore the overarching positive developmental trajectory experienced by Bihor County over the years. This trajectory represents a remarkable resurgence following the repercussions of the economic crisis.

Of particular interest lies in the disparities discerned among various counties. Cluj County takes the lead in terms of its contribution to both regional and national GDP levels, commanding a significant share of 38.84%. The ensuing table is employed to meticulously examine the GDP trends across these counties:

Table 36. Evolution of the GDP per capita (RON) in the North-West region in the 2011–2020 time frame

	2012	2013	2014	2015	2016	2017	2018	2019	2020
TOTAL	30970.2	31598.0	33584.1	35946.7	38166.1	43465.7	49223.3	54851.1	55361.2
North-West region	26965.1	27296.9	29618.8	31568.1	34348.3	40567.0	45192.6	50974.1	51985.6

Source: Adapted by the author from the online database of the Romanian National Institute of Statistics (Romanian National Institute of Statistics, 2021)

In the context of the counties that are of paramount interest to our inquiry, namely Cluj County and Bihor County, it is notable that their economic trajectories exhibit a positive inclination, even amidst periods of economic adversity.

We posit that a more comprehensive inter-county collaboration could yield amplified benefits, including heightened regional development, augmented contributions to GDP levels, enhanced innovation output and influence, and an improved quality of life for the populace.

Furthermore, an integral metric for assessing the overall robustness of a region pertains to the GDP per capita. As previously elucidated, the North-West region has maintained its stability over the years. The forthcoming table shall explicate the evolution of GDP per capita across various regions of the nation throughout the years:

Table 37. Evolution of Regional GDP/Capita (expressed in RON per inhabitant) in the case of the Romanian regions during the 2000-2018 time interval

	2012	2013	2014	2015	2016	2017	2018	2019	2020
North-West	26965.1	27296.9	29618.8	31568.1	34348.3	40567.0	45192.6	50974.1	51985.6
Center	30043.0	29639.4	31385.3	33687.0	36360.1	41350.4	47199.1	51711	52629.5
North-East	19391.2	19698.7	20748.0	21983.0	23388.7	27341.1	31170.9	35092.8	36316.4
South-East	26648.4	28398.7	30205.4	30669.5	32010.9	35862.2	40853.8	44069	43413.4
Bucharest-Ilfov	71914.2	74107.3	76973.8	85790.1	89068.0	100571.5	111318.2	125759.2	126821.8
South-Muntenia	24046.3	25073.3	28564.9	28621.6	30589.8	33584.8	38442.7	41545.4	41698
South-West Oltenia	23437.7	23413.2	24060.8	26082.8	27504.6	32429.7	38131.3	42753.2	42591.4
West	33611.3	32794.4	34166.3	37530.2	40513.6	44812.3	50510	56376.3	55614.1

Source: Adapted by the author from Romanian National Institute of Statistics database (Romanian National Insititute of Statistics, 2024)

The data presented in the aforementioned table underscores that the highest GDP per capita is consistently observed within the Bucharest-Ilfov region, a trend that persists throughout the years.

Regarding the North-West region, albeit a significant proportion of this economic upsurge is concentrated in Cluj County, GDP per capita permeates the entire region. In this specific context, the reference is not to spillover-induced increments but rather a sustained economic growth derived from job creation, well-formulated policies, and an augmented regional presence of international conglomerates (multinational corporations). The data encapsulated in the preceding table is also graphically represented as follows:

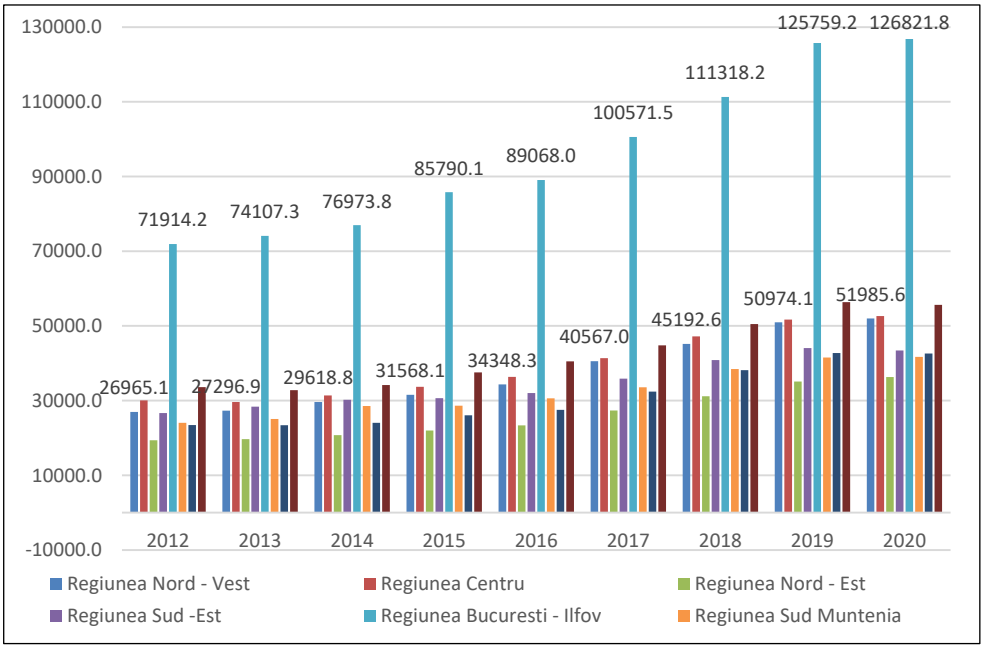

Figure 8. Evolution of the Per Capita GDP in the Romanian regions in the 2012-2020 time interval (expressed in RON)

Source: Adapted by the author from Romanian National Institute of Statistics database (Romanian National Insititute of Statistics, 2024)

In a broader context, as elucidated by both Table 37 and Figure 8, the North-West region of Romania is positioned as the fourth most economically robust area within the nation, as delineated by GDP per capita data for the year 2015. This region's distinctive competitive products encompass a spectrum of commodities, notably including electrical machinery and

equipment, wood products, textiles, footwear, as well as a range of animal and plant-based goods.

Regarding the primary economic sectors that underpin its economic landscape, services constitute the prevailing domain, comprising 72.5% of the regional economic activity. Among these, the trade sector commands a prominent share of 33.51%, with industry contributing 12.8% of the enterprises, construction sector claiming an 11.75% share, and agriculture contributing 2.9%. Notably, the North-West region boasts the second-largest concentration of information technology (IT) companies in Romania, trailing only Bucharest in this regard. Nevertheless, it is pivotal to underscore that investments in the industrial sector dominate the regional economic landscape, constituting the majority of total regional investment, surpassing the fifty percent mark (European Parliament, 2017).

Building upon the data elucidated in Table 25, supplementary insights pertaining to GDP per capita shall be expounded upon, facilitating a more comprehensive assessment of the contemporary standings of Bihor and Cluj counties relative to other counties across Romania.

Table 38. Regional GDP for Bihor and Cluj counties and the North-West region (in million RON), as compared to the Bucharest Ilfov region, from 2012 to 2021

Region/ Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Bihor	13672.8	13706.8	15274.1	16161.9	17180.9	19694.6	22091.8	24712	24916	27138.3
Cluj	26719.2	27427.7	29755.6	31017.7	35297.6	42767.9	47360.1	53716.2	55771.9	61432.5
North-West region	70032.6	70784.3	76675.5	81505.6	88380.9	104056.6	115562.6	130049.6	132190.5	146199.6
Bucharest-Ilfov region	164021.7	169181.6	175811.7	196157	6375.6	230794	257184.5	292159.7	294820	332240.6

Source: Adapted by the author through information taken from the Romanian National Institute of Statistics database (Romanian National Institute of Statistics, 2023)

The data presented in Table 38 underscores a consistent growth trajectory in both Bihor and Cluj counties over the years. However, it is notable that their progress is somewhat eclipsed by the dynamic evolution observed in the Bucharest-Ilfov region. In the case of Bihor, the growth from 2016 to 2017 amounted to 4279 RON per inhabitant, whereas in Cluj County, this growth was substantially more rapid, reaching 9815.8 RON per inhabitant. Notably, this growth in Cluj County during 2016-2017 exceeded

the countrywide average of 4962 RON per inhabitant, indicative of the robust performance and resilience of this county/region. While direct comparisons between Bihor and Cluj counties and other regions of the country may seem imprudent, it is important to reference the benchmarks set by the Bucharest-Ilfov region. The Bucharest-Ilfov region has consistently attracted substantial investments over the years, featuring a high concentration of headquarters for numerous Multinational Enterprises (MNEs). Understanding these "competitive" dynamics may prompt other regions, including the North-West region, to reevaluate and expedite the pace of innovation and new business establishment by actively courting companies seeking to establish their headquarters in the region.

Further analysis conducted over the years not only confirms the ongoing development within the region but also underscores its sustained growth. During the 2012-2017 period, the GDP of the North-West region surged by 67.41 percentage points, averaging an annual growth rate of 8.22%. Moreover, in real terms, between 2012 and 2017, the region's GDP recorded an average annual growth rate of 7.95%, with the most significant upturn transpiring in 2017 at 10.21%. Despite encompassing 14.3% of the country's territory and hosting 13.11% of the total national population, the North-West region contributed 12.23% to the formation of the national GDP in 2017, securing the second position at the Romanian national level. This substantial contribution amounted to 104,848 million RON, signifying a remarkable 36.8% increase when compared to data from 2014 (North-West Regional Development Agency, 2020).

3.2.3. Novel Business Creation in the North-West Region of Romania

With regards to the establishment of new enterprises, we advocate for a comparative analysis that juxtaposes the volumes of newly registered businesses, encompassing various legal structures such as Limited Liability Companies (LLCs), Corporations, family-owned enterprises, among others, within the jurisdictions of Bihor and Cluj counties. Subsequently, we will contrast the outcomes in these counties with the nationwide statistics concerning the inception of new businesses.

Table 39. Evolution of the number of newly registered companies from 2009 to 2022 for Bihor and Cluj counties (expressed in numbers and percentage points) as compared to national levels

Year	New registrations	National total
2009	3743	111832
2010	4250	119048
2011	4498	132069
2012	4526	125603
2013	4961	124816
2014	3767	101627
2015	4112	113167
2016	3784	105982
2017	5333	136699
2018	5745	135532
2019	4834	134220
2020	3167	109939
2021	5641	148294
2022	5347	152809
2023	6122	147026
2009	4515	111832
2010	4953	119048
2011	6093	132069
2012	6406	125603
2013	6158	124816
2014	5837	101627
2015	5942	113167
2016	5674	105982
2017	8532	136699
2018	7425	135532
2019	6537	134220
2020	5784	109939
2021	8622	148294
2022	9199	152809
2023	7921	147026

Source: Own calculations made by the authors from yearly reports from the National Trade Register Office (National Trade Register Office, 2024)

Table 39 presents comprehensive data pertaining to the registration of new companies, delineating three distinct scenarios: one for Bihor County, another for Cluj County, and the third portraying the national trend. While neither Bihor nor Cluj counties exhibit notably striking figures in terms of newly registered companies concerning the national aggregate, these counties have maintained a relatively consistent pattern over the years. In

the case of Bihor County, the average proportion of newly registered companies relative to the national total, from 2009 to 2019, stands at 3.69%, whereas Cluj County averages 5.07% over the same period. This persistent stability reflects the regions' resilience and latent potential.

Bihor County experienced three instances of declining new company registrations within a given year (2014, 2016, and 2019), resulting in reductions of -1194 or -24.07% in 2014 compared to 2013, -328 or -7.98% in 2016, and -911 or -15.86% in 2019. Conversely, Cluj County encountered five such occasions: 2013 (-248 or -3.87%), 2014 (-321 or -5.21%), 2016 (-268 or -4.51%), 2018 (-1107 or -12.97%), and 2019 (-888 or -11.96%). It is worth noting the overall positive performance of both counties over the 11-year period, with Bihor experiencing negative trends in only three years and Cluj facing declines in five years, while at the national level, the trend was negative in six of the 11 years.

The highest annual numbers of newly established companies for Bihor County were recorded in 2017, totaling 1549, and for Cluj County, 2858 were registered in the same year. Furthermore, as elucidated by Badulescu and colleagues, an empirical analysis highlights a positive yet weak correlation between the evolution of registered companies and GDP, where a mere 0.07% of GDP variation can be attributed to the fluctuations in the number of registered companies (Badulescu, et al., 2019); thus, the mere quantity of newly registered enterprises does not suffice to gauge the suitability of a region or city for fostering the growth and advancement of start-up enterprises. While the establishment of new businesses holds significance for regions and nations, a long-term strategic perspective dictates that the nature and specific areas of specialization of these nascent companies assume equal importance.

3.3. An Overview of Initiatives by Oradea and Cluj-Napoca in Fostering Startup Development

Innovation, as demonstrated, receives a degree of neglect within the Romanian landscape. Our analysis thus far has indicated that innovation, in the context of its implementation across various regions of the country,

primarily manifests within well-established enterprises. However, this should not be misconstrued to imply that innovation is exclusively the purview of fully matured firms. As indicated by our prior examination of the proportion of innovative enterprises relative to the total number of companies, there exists an unexplored space for innovative endeavors to be initiated and introduced to the market by emerging enterprises and start-up ventures. Consequently, drawing upon the research insights elucidated by scholars such as Brüderl and Schüssler (Brüderl & Schüssler, 1990), and Freeman et al. (Freeman, et al., 1983), we find ample scope for the integration of innovative activities among newly established companies and start-ups; Innovation possesses the potential to transpire at an accelerated pace within Small and Medium-sized Enterprises (SMEs) compared to their well-established counterparts. This phenomenon can be attributed to several factors, including the relatively less rigid administrative and legislative frameworks governing SMEs, their agility in adapting to both external and internal variables, and their inherent openness to market disruptions. This assertion applies universally to SMEs, regardless of their developmental stage, geographical location, or scale of operation.

It is imperative for business proprietors and policymakers to recognize the prevalence of biases that hinder the embrace of innovation. These biases assume various forms, ranging from the misconception that innovation is exclusive to large and firmly entrenched corporations to the erroneous belief that small enterprises, including start-ups, lack the requisite financial resources, knowledge, and expertise to innovate effectively. Effecting a paradigm shift is essential to fostering innovation optimally, a transformation that necessitates collaborative efforts among public authorities, regional and national entities, and the private sector.

As elucidated in the scholarship of Van de Ven and colleagues, start-up enterprises have progressively become influential contributors to the discourse on business innovation. The examination of start-ups can be approached and defined through multiple perspectives, including managerial, organizational, entrepreneurial, life cycle theory, and complexity theory (Van der Ven, et al., 1984); these same authors have been pioneers in advocating for a comprehensive examination of start-ups, urging scrutiny from entrepreneurial, organizational, and environmental vantage points.

Between 2014 and 2019, the registration of new companies at the national level experienced a notable increase of 26.25%. The most substantial surge transpired in 2017, marked by a national record of 22,999 new company registrations. However, it is worth noting that the North-West region, in contrast, witnessed a decline in these figures. Consequently, the year 2019 recorded a lower rate of new company creations in comparison to 2014 within this region (North-West Regional Development Agency, 2020). As per the aforementioned report, aspiring entrepreneurs face a myriad of challenges during the registration of new companies. These challenges encompass a scarcity of resources (encountered in 72.2% of cases), limited access to credit (28.2%), dearth of prompt-paying customers (38.1%), constrained access to well-trained personnel (46.3%), technological deficiencies (23.2%), and inadequacy of raw materials (14.6%).

To facilitate the establishment of new businesses, particularly those aiming to operate within innovative and creative sectors, substantial resources, policy initiatives, and concerted endeavors have been allocated to foster the development of clusters and hubs within the North-West region of the country. As of 2018, various clusters are operational within the North-West region, with a notable concentration in and around Cluj-Napoca. These clusters include the Cluj IT Cluster, Transylvania Energy Cluster, Transylvania Furniture Cluster, AgroTransylvania Cluster, and Aries T IT Cluster. Furthermore, additional clusters have emerged in both Bihor and Cluj counties, such as the Transylvania Creative Industries Cluster, CLEMS, HOLZBOX, ADMATECH, Romanian New Materials Cluster, Geothermal Cluster, and CLUSTHERM Transylvania (North-West Regional Development Agency, 2020).

While the quantity of these clusters may not rival their counterparts in other European regions, their activities hold significant importance for not only the two counties in question but also for broader regional development endeavors. Furthermore, the operations of these entities have fostered a robust collaboration between the public and private sectors, concurrently stimulating research, technological advancement, and knowledge dissemination. Additionally, they have facilitated interregional and interarea cooperation.

To provide context, it's worth noting that these clusters are typically situated within industrial parks. Within the North-West region, there are

presently 23 operational industrial parks, accommodating 178 companies and spanning across 764 hectares of land. The number and size of these industrial parks are subject to continuous growth and expansion efforts (North-West Regional Development Agency, 2020).

In terms of fostering creativity, the research conducted by Badulescu and Sava has made notable contributions to enhancing the perception of innovation within the urban landscape. Their work serves to underscore the creative prowess not only of Oradea but also of Cluj-Napoca (Badulescu & Sava, 2017). Their comprehensive studies and research endeavors provide valuable insights into the creative landscape of both Oradea and Cluj-Napoca:

Table 40. Yearly comparison between the number of local creative companies per thousand inhabitants in Oradea and in Cluj-Napoca from 2008 to 2017

City\Year	2010	2011	2012	2013	2014	2015	2016	2017
Cluj-Napoca	5	6	7	7	8	9	11	12
Oradea	3	4	4	4	4	5	5	6

Source: Adapted by the author from calculation made by Badulescu and Sava (Badulescu & Sava, 2017)

As depicted in Table 40, Cluj-Napoca outpaces Oradea in terms of the number of innovative and creative companies per one thousand inhabitants. This disparity was most pronounced in 2017 when Cluj-Napoca led Oradea by 6 companies per 1000 residents. It is noteworthy that, following the economic crisis, this disparity did not diminish. This underscores the pivotal role played by creative industries and enterprises in the local socio-economic landscape and advancement.

Investments directed toward creative industries during economic downturns yield increased employment opportunities, both during the crisis and in its aftermath. This, in turn, fosters the development of cities and regions. Regrettably, the overall picture regarding innovation efforts and performance in various Romanian regions suggests a somber reality. Regardless of the reference year, innovation tends to be relegated to a secondary priority. To illustrate this, Romania ranked last in terms of innovation within the EU 27 in 2020 (European Commission, 2020). To avert the recurrence of this situation, the implementation of specific policies is imperative to effect a paradigm shift. Furthermore, a synergistic alignment

between national and regional policies is essential to optimize the prospects of innovation success at both regional and national levels. Additionally, fostering collaborative engagement among local authorities spanning diverse counties would significantly enhance the likelihood of success. By advancing partnerships among various municipal administrations initially, and subsequently, between stakeholders in the private sector, it becomes feasible to amplify innovative outputs and footprints, accelerate the pace of innovation, and enhance its widespread dissemination manifold.

3.3.1. Startup Landscape in Oradea

Oradea, boasting a population of 221,413 residents as of January 1, 2020, ranks as the tenth most populous city in Romania. It holds the esteemed position of being the capital city of Bihor County (Romanian National Institute of Statistics, 2019) (Romanian National Institute of Statistics, 2020). The Oradea Metropolitan Area was officially established in May 2005, comprising a total of 12 distinct territorial units. It encompasses a vast geographical expanse, spanning over 806.96 square kilometers, which equivalently constitutes 10.70% of the total land area of Bihor County. The demographic landscape within the Oradea Metropolitan Area exhibits notable disparities, characterized by a markedly higher population density, quantified at 344 inhabitants per square kilometer. In contrast, the remaining regions of Bihor County register a substantially lower population density, averaging a mere 50.55 inhabitants per square kilometer.

Over the span of 2011 to 2018, a compelling demographic shift unfolded within the Oradea Metropolitan Area, signifying a noteworthy population surge of 32,068 individuals, signifying a percentage increase of 13.06%. Conversely, the adjacent regions of Bihor County witnessed a contrasting demographic trend, marked by a decline of 6,487 residents, translating to a reduction of 1.04% during the same time frame (North-West Regional Development Agency, 2020). In terms of its geographical expanse, Oradea ranks as the second-largest city within the North-West region, with the city of Cluj-Napoca occupying the foremost position in this regard (Bihor County Council, 2019).

In the year 2014, Oradea exhibited a business density of 46.75 enterprises per 1000 inhabitants, surpassing the regional average for the North-West region, which stood at 26.18 enterprises per 1000 inhabitants during the same period. Additionally, a substantial majority, accounting for 76.76% of trade sector revenues and 78.7% of services sector revenues at the county level, were attributed to enterprises based in Oradea (City Council of Oradea, 2019). From an economic perspective, Oradea has exhibited a consistent growth trajectory over the years. This enduring economic upswing can be attributed to heightened engagement from local authorities and a relatively stable regional political environment, fostering fruitful collaborations with the business sector.

The augmented visibility of Oradea has become particularly pronounced in recent years, owing to a multitude of initiatives undertaken by local authorities. These efforts have yielded sustained economic expansion and overall development in both the city itself and its environs. An investigation conducted by the online startup UrbanizeHub has positioned Oradea at the forefront of the nation's most efficient cities.

The proprietary research conducted by UrbanizeHub unveils compelling statistics. Due to the endeavors of public authorities, Oradea has committed over 240 million euros to capital investments and diverse projects over the past eight years. This translates to an investment of 1,225 euros per resident. Furthermore, in terms of European funds, the city has successfully secured 140.6 million euros during the 2017-2015 period, equating to an investment of 716 euros per inhabitant.

In a comparative context, considering capital investments, Oradea's accomplishments surpass those of Cluj-Napoca, which ranks eighth in the same category. Cluj-Napoca allocated 253 million euros, equivalent to 781 euros per resident, for capital investments. Regarding European funds, Oradea outperformed Cluj-Napoca by absorbing 140.6 million euros compared to Cluj-Napoca's 121.7 million euros. This translates to 716 euros per inhabitant for Oradea and 375 euros per inhabitant for Cluj-Napoca in terms of European fund utilization (UrbanizeHub, 2017).

In terms of its business infrastructure, the city of Oradea boasts the presence of four distinct industrial parks. The allocation of occupied land within these industrial parks is delineated as follows: Industrial Park I spans

across 83.5 hectares, Industrial Park II encompasses 22.22 hectares, Industrial Park III covers 17.8 hectares, and Industrial Park IV occupies 6.5 hectares. To provide context, it is noteworthy that since the inception of industrial and business parks in Oradea, they have collectively generated or attracted a total investment value of 387 million units of currency for the municipality (The City Hall of Oradea, 2020). Despite the presence of fully operational companies in all of Oradea's industrial parks, the management teams overseeing these four industrial parks are actively engaged in endeavors to attract and nurture startups, with the ultimate goal of fostering enhancements for the city of Oradea. To this end, as of March 12, 2021, the Oradea Local Development Agency, in collaboration with "Make IT In Oradea" (an NGO established through the joint efforts of the Oradea City Hall and the local technology community), has launched a startup competition. This competition is designed to identify and nurture startups, with no predefined limit on the number of projects or startups considered, all aimed at generating improvements in various facets of the city of Oradea—ranging from social and economic to cultural and technological.

It is noteworthy that a substantial budget of three hundred thousand euros per annum has been allocated to support this initiative. Startups that successfully progress from the incubation stage to the funding stage stand to be eligible for financial support totaling fifty thousand euros (Oradea Local Development Agency, 2021). Expertise derived from the management of industrial parks and insights from representatives of businesses operating within these industrial parks will be harnessed to guide and facilitate the growth of startups. While similar initiatives have been implemented elsewhere in Romania, they remain relatively novel within the context of Oradea. The progression of this initiative will be closely monitored, and its outcomes will be presented in forthcoming research. Such collaborative practices between established companies and startups are well-established in global business hubs, and the advantages they confer are manifold. Therefore, it is advisable to both sustain and expand such practices in Oradea to exert a more significant impact on the city and its environs.

The proliferation and enhancement of partnerships between the public and private sectors are on the rise. A case in point underscores the value-added by such collaborations. A recent undertaking initiated by the

University of Oradea, which successfully secured a 6.5 million euro grant through an EU-funded project, serves as a noteworthy example. This grant will be employed to establish a technology transfer center comprising four laboratories dedicated to the creation and advancement of innovative technologies. Beyond these laboratories, the technology center will encompass co-working spaces, conference facilities, lecture halls, and will be structured in accordance with a "smart campus" model (www.zf.ro, 2021). The primary beneficiaries of this project will be the students affiliated with the University of Oradea, who will play a central role in the operations of the research center. While the initial focus is predominantly on students within technical fields of study, subsequent projects have the potential to foster collaboration among students from diverse disciplines and faculties.

One salient area of interest underscored by local authorities in Oradea pertains to the augmentation of innovation, specifically the cultivation of "homegrown" innovation. Consequently, municipal representatives have expressed a commitment to augmenting the output of innovative products and services produced and developed locally by 45%. Furthermore, local authorities aspire to automate 80% of extant administrative processes. These processes encompass, but are not limited to, tax payments, methods for accessing information or addressing inquiries, enhancing communication channels between the local administration and the general populace, providing real-time updates on local transportation, and reducing energy expenditures by 30% (Municipality of Oradea, 2016). The precise timeline for the implementation of these transformations remains indeterminate; however, it is imperative to underscore that in the context of Oradea, policies designed to ameliorate social, economic, and environmental conditions persistently emerge.

Another endeavor aimed at amplifying the presence of creative industries within the city of Oradea encompasses the establishment of a dedicated business incubator tailored to creative and innovative sectors. The custodianship of this incubator will be assumed by the Oradea Local Development Agency, with the project's overall value amounting to 3.8 million euros, secured through European funding mechanisms (The City Hall of Oradea, 2018). It will be of keen interest to observe the evolution of projects within this incubator and the specific categories of start-ups it

fosters. It is imperative to reiterate that while such initiatives are in their nascent stages in Oradea, they represent a pivotal launching point, with the potential for heightened ubiquity and accelerated progression through collaborative efforts encompassing both public and private stakeholders. Additionally, the engagement of the local community and the city's younger generation assumes significance. This involvement not only expedites the dissemination of knowledge but also amplifies the benefits accrued by the local populace.

Regarding the actual count of start-ups within the Oradea landscape, a recent report by Oradea Tech Hub, as of 2020, has unveiled the presence of 22 start-ups hailing from 19 different countries. These 22 start-ups span 21 distinct industries, collectively employing 336 individuals, serving approximately 11.17 million users globally, and securing investments totaling 9 million USD (Oradea Tech Hub, 2020). Among the prominently visible start-ups that have established their presence in Oradea, accompanied by their respective domains of operation, the following noteworthy ventures merit mention: East-Tec and TypingDNA (active within the spheres of internet and cybersecurity), Appointfix and Fieldvibe (specialized in scheduling), Paymo (dedicated to project management), Bannersnack and Flipsnack (proficient in graphic design), Relevon (pioneering real-time text marketing), Cartloop (proferring shopping assistance), Keyticket (engaged in parking services and scheduling), Octavic (specializing in Industry 4.0 solutions), and Axosuits (pertaining to the biotech industry) (www.startupsnthecity.com, 2020).

The specific nomenclature of the aforementioned start-ups holds secondary significance within the context of this literature. Nevertheless, their pivotal role in advancing the welfare of urban areas, regions, and societies at large remains a subject of paramount importance. We contend that start-ups oriented toward the younger demographic constitute a matter of utmost significance. Substantive efforts have already been undertaken in this direction. Initiatives led by the iXperiment accelerator have been directed towards high schools in Oradea, as well as in Cluj and Bucharest. Notably, a total of 20 high schools within Bihor County have availed themselves of the programs and initiatives offered by the aforementioned accelerator. Through these carefully designed programs and activities, high

school students are afforded the opportunity to conceptualize, innovate, initiate, and refine their own entrepreneurial concepts and ventures (www.bihon.ro, 2018). Consequently, firsthand insights and practical knowledge from seasoned business professionals are directly conveyed to the younger generation without distortion or dilution. Within this framework, the primary recipients of these benefits are the educational institutions and their students. Over time, the potential for such projects to expand their reach and influence a wider demographic becomes increasingly tangible.

3.3.2. Startup Ecosystem in Cluj-Napoca

Among the total population of 737,992 inhabitants recorded as of July 1st, 2020, it is noteworthy that Cluj-Napoca, serving as both the largest urban center and the administrative capital of the county, accounts for a population of approximately 307,000 individuals (Romanian National Institute of Statistics, 2019) (populationstat.com, 2021). Cluj-Napoca prominently stands as one of Romania's largest and most esteemed hubs encompassing academia, culture, industry, and commerce. It not only boasts the distinction of being a paramount IT cluster within Romania, with a substantial workforce dedicated to IT and related domains (currently, 1 in 11 individuals in Cluj-Napoca is engaged in IT-related pursuits), but it also garners recognition as one of the European cities consistently achieving remarkable standards of living, demonstrating a persistent and commendable commitment to enhancing its quality of life over the years (European Commission, 2016); Furthermore, the city has adeptly facilitated the integration of a multitude of individuals hailing from various countries and cultural backgrounds. Consequently, Cluj-Napoca has witnessed a substantial surge in its international and expatriate population over the years. This deliberate commitment to integration and a welcoming stance towards international diversity ultimately culminated in the city's distinction as the European Youth Capital in the year 2015 (www.youthforum.orh, 2015). Owing to its unwavering commitment to sustained progress across various dimensions encompassing lifestyle, education, commerce, youth engagement, and innovative pursuits, the city

has consistently emerged as a prominent candidate vying for the esteemed designation of European Capital of Culture in the year 2021 (European Commission, 2016).

Similar to the situation observed in Oradea, the municipal authorities of Cluj-Napoca, represented by the city hall, have progressively exerted greater influence, wielded significant impact, and displayed heightened involvement throughout the years, thus serving as pivotal decision-making entities that have significantly contributed to the city's present stature. In the time span spanning from 2014 to 2020, the city hall successfully secured European Union (EU) investments totaling 68.7 million euros. Remarkably, during the subsequent financial period from 2021 to 2027, the city hall has set its sights on attracting a substantial EU funding allocation amounting to 2.6 billion euros. This substantial financial injection is earmarked for diverse projects aimed at effecting notable enhancements and advancements within the city (The City Hall of Cluj-Napoca, 2020). From a cultural vantage point, Cluj-Napoca has emerged as one of the most culturally vibrant and progressive cities in the nation, assuming a pioneering role in fostering cultural development and enrichment in contemporary times. The city has effectively positioned itself as "27th in the group of 40 ranked European cities with 250000 to 500000 inhabitants, mainly due to its 22nd position on Cultural Participation and Attractiveness;3rd spot on Openness, Tolerance and Trust, 4th position on New Jobs in Creative Sectors and is 9th as regards Creative Economy" (European Commission, 2019). Such rankings serve as potent catalysts, augmenting a city's allure and operating as a strategic promotional apparatus to magnetize fresh talent, novel financial resources, diverse cultural influences, and innovative ideation. Furthermore, they facilitate meticulous benchmark analyses, enabling comparative assessments among cities of analogous dimensions.

In quantifiable terms, the economy of Cluj-Napoca experienced a remarkable twofold augmentation over the decade spanning from 2008 to 2018. This economic surge precipitated multifaceted transformations within the city, ultimately catapulting Cluj-Napoca into an elite cadre of European urban centers. As of 2018, it secured a prestigious position among the top 50 most developed cities within the European Union. This group comprises cities characterized by a per capita GDP, adjusted for purchasing power

parity, falling within the bracket of 19,000 to 27,000 units (The City Hall of Cluj-Napoca, 2020). Concerning the industrial advancement of Cluj-Napoca, it mirrors the situation in Oradea in terms of quantity. Each city possesses a tally of four industrial parks. However, it is noteworthy that Cluj-Napoca surpasses Oradea in the dimensions of these industrial parks, boasting a greater volume and a more extensive array of active enterprises within each of these industrial zones (Cluj-Napoca City Council, 2020).

From a valuation standpoint, Cluj-Napoca significantly surpasses Oradea. In the year 2019, the cumulative investment injected into start-ups at the Cluj-Napoca level amounted to a substantial 3 million euros (startupsnthecity.com, 2020). Although this sum may not rival the scale of more substantial investments seen in Western European cities, it is imperative to acknowledge that the influx of talent into the city generates a greater exchange of ideas, both inbound and outbound. Consequently, this dynamic fosters investment opportunities and access to larger funding pools. Notably, there is a discernible proliferation of organizations dedicated to nurturing the creation and development of start-ups in Cluj-Napoca. Among these are accelerators such as Techcelerator, Spherik Accelerator, and Tech'n Trade, all committed to enhancing the prospects of start-up success. Furthermore, various organizations, including Cluj-Start-ups (facilitating events, workshops, and networking opportunities for founders and resource providers), ClujHub (hosting start-up-focused events), Silicon Forest (providing co-working spaces for start-ups and freelancers), and Transylvania Angel Network (facilitating collaboration between angel investors and mentoring for founders and start-ups), are instrumental in cultivating the start-up ecosystem and landscape in Cluj-Napoca (startupsnthecity.com, 2020).

From a quantitative standpoint, it is evident that Cluj-Napoca holds a distinct advantage and has surpassed Oradea in terms of numerical metrics. However, it is essential to underscore that this should not be framed as a competitive rivalry, nor should it be construed as such. In the context of the year 2018, Cluj-Napoca accommodated a noteworthy total of 1,235 IT companies operating within its municipal boundaries, thereby providing employment to 14,036 individuals. Remarkably, this IT workforce represented 8.7% of the city's overall labor force (www.humandirect.eu,

2018). To provide further context, it is noteworthy that within the timeframe spanning from 2011 to 2016, the quantity of start-up enterprises with a primary focus on Information Technology (IT) nearly experienced a twofold increase in magnitude, "growing from 1.806 in 2011 to 3.795 in 2016. In Cluj-Napoca, the share of IT startups has grown from 18.4% to 26.5% in the 6 years span" (www.humandirect.eu, 2018). The rationale behind this exponential growth in these figures can be attributed, in part, to the overarching stability prevalent in the city of Cluj-Napoca. This stability emanates from a dual perspective encompassing both the private and public sectors. However, it is imperative to acknowledge that the aforementioned statistics, while indicative of the city's robustness, come with a caveat. Official statistical records, to the best of our knowledge, do not include a comprehensive registry at either the national or regional/city levels that provides precise and definitive data pertaining to the actual count of start-up enterprises. Consequently, disparate and occasionally contradictory information may be derived from various sources with regard to these statistics. An article from authors Peilei and his colleagues (Peilei, et al., 2019) corroborates the aforementioned evaluation, affirming that the quantity of IT start-ups in Cluj-Napoca experienced a twofold increase during the period spanning from 2011 to 2016. In the same vein, the authors posit that the cumulative count of start-up enterprises in Cluj-Napoca amounted to a mere 40 in 2019. This numerical value signifies a constituent proportion of 15% within the broader spectrum of start-ups situated throughout Romania. Additionally, it is noteworthy that Cluj-Napoca accommodates 5 of the 11 extant incubators/accelerators operating within the confines of Romania (Peilei, et al., 2019). The evident divergence between the modest count of 40 start-ups and the considerably more substantial figure of 3,795 serves as a stark illustration of the formidable challenge posed by the absence of official registries dedicated to identifying start-up entities. This information gap compounds the difficulty of obtaining a comprehensive comprehension of these organizations. However, it is unequivocally evident that a sustained, future-oriented strategy prioritizing the cultivation of both the private enterprise sector and public administration has facilitated the harmonious integration of these two facets within the same urban domain.

A more comprehensive analysis, furnished by the Municipality of Cluj-Napoca, furnishes a more precise depiction of the city's start-up ecosystem. Over the course of the past eight years, encompassing the period from 2011 to 2019, a mere 3% of newly registered companies have successfully transitioned into the category of start-ups. This transition is contingent upon these companies achieving annual income growth rates of no less than 20% per annum within the initial three years following their establishment. This statistical representation equates to an average of 102 nascent start-ups annually within the city of Cluj-Napoca and a commensurate average of 129 start-ups per year within the broader metropolitan region of Cluj during the same eight-year timeframe (Interdisciplinary Center for Data Sciences, 2020). The dispersion of start-up enterprises within the Metropolitan Area of Cluj-Napoca encompasses a multifarious spectrum of sectors, denoted as follows: 107 start-ups specializing in Information Technology and Communication (IT&C), 73 dedicated to Creative Industries, 62 engaged in Hospitality Services, 32 vested in Health and Social Assistance, 86 oriented towards Business Support Services, 34 involved in Engineering and Research, 14 focusing on Financial Services, 97 operating within the Transport sector, 18 directed towards Real Estate, 12 engaged in Education-related ventures, 35 aligned with the Automotive Industry, and 15 contributing to the Pharmaceutical sector (Interdisciplinary Center for Data Sciences, 2020).

To comprehensively apprehend the expansive dimensions of the start-up ecosystem and milieu within Cluj-Napoca, the ensuing table will explicate a multitude of entities, occasions, initiatives, and prospects relevant to start-ups in the city of Cluj-Napoca:

Table 41. Start-up infrastructure in Cluj-Napoca

Initiate a new venture/ Start-up:	Startup weekend Cluj
	Startup Live Cluj
	NASA space apps challenge
Investment sources:	Gapminder
	TAN
	Risky business
	Start-up communities
	Cluj startups
	Startup grind Cluj
	FreshBlood health
	Product tank Cluj

	Romanian IT
	Today software magazine
	Fintech camp
	Proptech Romania
	Cluj.AI
	JS heroes' community
	Ready for startups
	Women in tech Cluj
	Cryptoland.Tech
	Cluj Y Tech
	PMI Institute
Support programs and idea generation:	Techcelerator
	Culturepreneurs
	Tech'NTrade Incubator
	Alpha Hub
	Orange Fab
	Smart-up Lab
	Spherik and KPMG Startup Grow Pad
Coworking spaces/hubs:	Cluj Hub
	Silicon Forest
	TechNTrade Club
	Cluj cowork
	CREIC
	ThatDevSpace
	Scout House
	The Guild Hall
Industry innovation focused clusters:	Cluj IT Cluster
	Transylvania IT Cluster
	Transylvania Digital Innovation Hub

Source: Adapted by the author from online information present at clujstartups.com (clujstartups.com, 2021)

The nomenclature of the aforementioned entities pales in significance when juxtaposed with their underlying objectives. Precisely tailored activities pursued by these entities have engendered a substantial surge in the proliferation of start-ups, founders, and, as elucidated earlier, the diversification of financing resources and options. Beyond the nomenclature of incubators, clusters, and start-ups lies the transformative impact they have imparted upon Cluj-Napoca's start-up landscape, a phenomenon that has already commenced and is poised to persistently magnetize new talents, both founders and investors, toward this city. This magnetic pull not only attracts fresh entrepreneurial minds but also galvanizes a vibrant ecosystem

where innovation thrives, knowledge sharing flourishes, and economic growth finds its epicenter.

It is worth noting that various sources addressing the same subject matter prefer divergent numerical representations. An official report from the Municipality of Cluj-Napoca delineates the following distribution of clusters (comprising 8 clusters) and companies/start-ups (without distinction between start-ups and fully established enterprises) in the city for the year 2019: TREC cluster (comprising 17 start-ups/companies), Agro Transylvania cluster (encompassing 53 start-ups/companies), Cluj IT cluster (encompassing 36 start-ups/companies), Mobilier Transylvania cluster (encompassing 44 start-ups/companies), iTEch Transylvania cluster (comprising 66 start-ups/companies), Transylvania Creative Industries cluster (comprising 40 companies/start-ups), Transylvania Taste cluster (comprising 24 companies), and Transylvania Lifestyle cluster (comprising 113 companies) (The City Hall of Cluj-Napoca, 2019).

Chapter 4. Econometric Modeling of the Impact of the Research and Development (R&D) Sector on Economic Growth: A Vector Error Correction Model (VECM) for Romania, the North-West Region, Cluj, and Bihor Counties

To explore the association between economic growth, denoted as Gross Domestic Product (GDP) expressed in current prices in million RON, and the total expenditure allocated to Research and Development (R&D), also expressed in current prices in million RON (EXP), as well as to examine the connection between economic growth, represented by GDP expressed in current prices in million RON, and the number of individuals employed within the R&D sector measured in full-time equivalent (EMP), within the context of Romania, specifically the North-West region encompassing Cluj County and Bihor County, this analysis adopts the Johansen cointegration test, the Vector Error Correction Model (VECM), and Granger causality. The dataset employed for this investigation is sourced from the Romanian National Institute of Statistics (Romanian National Institute of Statistics, 2021). Due to constraints related to data availability and accessibility, this research examines the timeframe spanning from 1995 to 2019. Table 42 provides a comprehensive overview of the descriptive statistics pertaining to the dataset in the context of Romania.

Table 42. The descriptive statistics of the variables - GDP, total expenditure on R&D (EXP) and individuals employed in the R&D sector (EMP)

Variables	Min	Max	Mean	Median	Std. Dev.	Skewness	Kurtosis
Romania							
GDP	7648.9	957554	411069.7	425691.1	310750.5	0.218027	-1.20984
EXP	577148	9528718	3278001	2786830	2086427	1.444748	2.458032
EMP	26171	60939	36003.36	32507	9916.696	1.735055	1.718173

Variables	Min	Max	Mean	Median	Std. Dev.	Skewness	Kurtosis
North-West region							
GDP	911.1	162865.8	49891.85	51229	41306.6	0.850533	0.707835
EXP	23113	386870	204135.4	204056	100169.5	0.007063	-0.85062
EMP	1757	3919	2451.16	2352	554.2362	1.402258	1.863705
Cluj County							
GDP	266.9	66861.55	18912.54	18265.7	16965.97	1.067688	1.144931
EXP	16400	332665	165766.9	176353	82750.57	-0.19194	-0.83136
EMP	1119	2436	1738.84	1790	388.459	-0.06118	-0.74113
Bihor County							
GDP	214.6	31106.52	10306.54	11807.1	7841.948	0.629216	0.397997
EXP	574	76026	10121.72	5956	16711.5	3.299811	11.14963
EMP	22	840	254.12	172	227.8661	0.964202	0.103342

Source: own contribution based on data provided by Romanian National Institute of Statistics

Based on the descriptive statistics, it is observed that the EXP and EMP variables exhibit negative skewness in the case of Cluj County, while in all other cases, these variables demonstrate positive skewness. In terms of kurtosis, the majority of variables display low kurtosis values, with the exception being the EXP variable in the context of Bihor County. To facilitate parameter interpretation and mitigate potential heteroscedasticity issues, the variables have been subjected to natural logarithm transformations. Consequently, the variables are denoted as follows: LGDP (natural logarithm of GDP), LEXP (natural logarithm of total R&D expenditure and economic growth), and LEMP (natural logarithm of the number of individuals employed in the R&D sector, measured in full-time equivalents).

4.1. Proposed Methodology and Research Hypotheses for Examining the Relationship Between Economic Growth and the R&D Sector

In the econometric examination of the time series data, we initiated our analysis with the presumption that the observed series exhibited stationarity. However, it is noteworthy that a substantial portion of time series data, as indicated in the existing literature, often fail to meet the stationarity criteria due to the dynamic nature of economic environments,

characterized by numerous fluctuations and transformations. Consequently, the assessment of stationarity assumptions assumes paramount significance in the analysis of these time series.

To investigate the relationships and causalities among the three selected variables within the contexts of Romania, the North-West region, as well as the specific counties of Cluj and Bihor, our analytical approach encompassed several sequential steps. Firstly, we conducted stationarity tests for all variables to ascertain their stationary or non-stationary nature. Subsequently, we proceeded to examine cointegration, aiming to identify potential long-term equilibrium relationships among the selected variables. Finally, the third step involved causality testing, intended to elucidate the directional causative links between these variables.

In light of these considerations and focusing on the three core variables, namely GDP, EXP, and EMP, we formulated and empirically examined six hypotheses within the contexts of Romania, the North-West region, Cluj County, and Bihor County:

H1a: There is a long-run equilibrium that characterizes the relationship between economic growth (GDP) and total expenditure on R&D (EXP).

H1b: There is a long-run equilibrium that characterizes the relationship between economic growth (GDP) and individuals employed in the R&D sector (EMP).

H2a: There is a unidirectional relationship between economic growth (GDP) and total expenditure on R&D (EXP).

H2b: There is a unidirectional relationship between economic growth (GDP) and individuals employed in the R&D sector (EMP).

H3a: There is a bidirectional relationship between economic growth (GDP) and total expenditure on R&D (EXP).

H3b: There is a bidirectional relationship between economic growth (GDP) and individuals employed in the R&D sector (EMP).

In the majority of cases, economic variables often exhibit non-stationary behavior. As such, the analytical process commences with an examination of the stationarity or unit root properties of the key variables under consideration, namely economic growth (GDP), total expenditure on research and development (EXP), and the number of individuals employed

in the research and development sector (EMP). To evaluate the stationarity of these variables, we employed the Augmented Dickey-Fuller (ADF) test (Dickey & Fuller, 1979).

To assess the stationarity of these variables using the Augmented Dickey-Fuller (ADF) test, we initiate the process with the following equation as our foundation (Mester, 2021):

$$\Delta Y_t = \delta Y_{t-1} + \sum_{j=1}^{k} \gamma_j \Delta Y_{t-j} + \alpha + \beta t + u_t$$

where:

$\Delta Yt\text{-}1$ is the variable that refers to the first difference with k lags;

ut is the variable that adjusts the autocorrelation error;

δ, γ, α and β are the initially estimated coefficients.

It is established that a series lacks stationarity when the coefficient δ equals 1, signifying the presence of a unit root. Consequently, the hypotheses can be formulated as follows:

H0: $\delta = 1$, there is a unit root

H1: $\delta < 1$, the time series is stationary.

The value for the test statistics is:

$$ADF_{calc} = \frac{\hat{\gamma} - 1}{\hat{\sigma}_\gamma}$$

To ascertain the hypothesis under examination, one can make a comparison between the computed Augmented Dickey-Fuller (ADF) statistic and a critical value obtained from tabulated data. When the calculated ADF statistic exhibits a more negative value than the corresponding tabulated critical value, it leads to the rejection of the null hypothesis positing the existence of a unit root. Alternatively, the p-value provides another criterion for assessment. If the p-value falls below the significance threshold of 0.05, it signifies the rejection of the null hypothesis, affirming that the time series in question is stationary.

Table 43. Unit root test results (ADF test) of the variables - GDP, total expenditure on R&D and individuals employed in the R&D sector

H_0: the series has a unit root H_1: the series is stationary		**Natural logarithm**		
		LGDP (p-value)	**LEXP (p-value)**	**LEMP (p-value)**
Romania	ADF (level)	-0.749787 (0.8692)	-2.741102 (0.2304)	-1.575771 (0.772)
	ADF (1st diff)	-1.705948 (0.0829)	-4.77894 (0.0046)	-3.85538 (0.0316)
	The order of integration	**I(1)**	**I(1)**	**I(1)**
North-West Region	ADF (level)	-1.225689 (0.9387)	-2.7756 (0.2191)	-2.054288 (0.5437)
	ADF (1st diff)	-3.194084 (0.0028)	-4.725654 (0.0052)	-5.065455 (0.0025)
	The order of integration	**I(1)**	**I(1)**	**I(1)**
Cluj County	ADF (level)	-1.242128 (0.9404)	-1.027430 (0.9148)	-0.344331 (0.5498)
	ADF (1st diff)	-3.081571 (0.0037)	-5.41810 (0.0000)	-6.259362 (0.0000)
	The order of integration	**I(1)**	**I(1)**	**I(1)**
Bihor County	ADF (level)	-1.149605 (0.9302)	-0.032236 (0.6620)	-1.285575 (0.1773)
	ADF (1st diff)	-3.112215 (0.0034)	-6.570357 (0.0000)	-7.556534 (0.0000)
	The order of integration	**I(1)**	**I(1)**	**I(1)**

Note: p-values are in () and the optimal lag length is determined based on Akaike, Schwarz and Hannan-Quinn info Criterion.

Source: own contribution using Eviews 9

The outcomes of the unit root tests, specifically the Augmented Dickey-Fuller (ADF) test, reveal that the null hypothesis is rejected at the 5% significance level for nearly all variables when first differenced. However, in the case of the natural logarithm of GDP (LGDP) variable in Romania, the null hypothesis is only rejected at the 10% significance level following first differencing. Consequently, it can be deduced that all variables possess a unit root. Since the time series become stationary after the first differencing, it is plausible to infer that these possess first-order integration, denoted as I(1). When time series exhibit non-stationarity at this level, the possibility of cointegration arises, signifying the existence of at least one linear combination among them that is stationary. In our context, where all

variables share the same order of integration, I(1) at the 10% significance level, the requisite condition for cointegration is satisfied.

To explore the presence of cointegration among the selected variables, we will employ the methodology proposed by Johansen and Juselius (Johansen & Juselius, 1990); following the prescribed methodology, we shall assess the null hypothesis of non-cointegration. In this process, we will employ two distinct tests: the Maximum Eigenvalue test and the LR (Likelihood Ratio) tests, specifically the Trace test (LRtr) (Johansen & Juselius, 1990), (Andrei & Bourbonnais, 2017). In the context of the Maximum Eigenvalue test, the following hypotheses are formulated:

H0: r cointegration relationship, against the alternative

H1: r+1 cointegration relationship, for r = 0, 1, ..., n–1.

The statistic is:

$$LR_{max}\left(r/n+1\right) = -T \cdot \log(1-\hat{\lambda})$$

where λ represents the Maximum Eigenvalue and T represents the sample volume.

As concerns the Trace test, we have the following hypotheses:

H0: r cointegrating relations, against the alternative

H1: n cointegrating relations, where n represents the number of variables.

The Trace statistic is:

$$\text{Trace} = -\text{T}\sum_{\text{i=r+1}}^{\text{k}} \log(1-\hat{\lambda}_{\text{r+1}})$$

Table 44. Unrestricted Cointegration Rank Test – Romania (total)

Series	Hypothesized No. of CE(s)		Trace statistic	Max-Eigen statistic	Critical Value (0.05)	
					Trace	Max-Eigen
LGDP/LEXP	None	H_0:r = 0	41.93**	34.66**	25.87	19.38
	At most 1	H_0:r ≤ 1	6.82	6.82	12.51	12.51
LGDP/LEMP	None	H_0:r = 0	43.96**	38.76**	20.26	15.89
	At most 1	H_0:r ≤ 1	5.20	5.20	9.16	9.16

Note: Lags interval (in first differences): 1 to 1. ** denotes significance (at 5% significance level); r denotes the number of cointegrated vectors.

Source: own calculations using Eviews 9

The outcomes of the analysis indicate the rejection of the null hypothesis, which posits the absence of a cointegration relationship among the variables. Instead, we accept the alternative hypothesis, which suggests the existence of at least one cointegration equation between LGDP and LEXP, as well as between LGDP and LEMP within the Romanian economy at a significance level of 5%. The utilization of the two employed cointegration tests underscores the presence of an error correction representation within the set of time series, signifying the mechanism of long-term adjustment.

Table 45. Unrestricted Cointegration Rank Test – North-West region

Variables	Hypothesized No. of CE(s)		Trace statistic	Max-Eigen statistic	Critical Value (0.05)	
					Trace	Max-Eigen
LGDP/LEXP	None	H_0:r = 0	30.73**	21.28**	25.87	19.38
	At most 1	H_0:r ≤ 1	9.45	9.45	12.51	12.51
LGDP/LEMP	None	H_0:r = 0	39.36**	33.16**	25.87	19.38
	At most 1	H_0:r ≤ 1	6.19	6.19	12.51	12.51

Note: Lags interval (in first differences): 1 to 1. ** denotes significance (at 5% significance level); r denotes the number of cointegrated vectors.

Source: own calculations using Eviews 9

The findings presented in the preceding table demonstrate the rejection of the null hypothesis, which posits the absence of a cointegration relationship among the variables. Instead, we accept the alternative hypothesis, indicating the existence of at least one cointegration equation between LGDP and LEXP, as well as between LGDP and LEMP within the North-West region, at a significance level of 5%.

Table 46. Unrestricted Cointegration Rank Test – Cluj County

Variables	Hypothesized No. of CE(s)		Trace statistic	Max-Eigen statistic	Critical Value (0.05)	
					Trace	Max-Eigen
LGDP/LEXP	None	H_0:r = 0	32.79**	22.68**	25.87	19.38
	At most 1	H_0:r ≤ 1	10.10	10.10	12.51	12.51
LGDP/LEMP	None	H_0:r = 0	37.10**	32.37**	25.87	19.38
	At most 1	H_0:r ≤ 1	4.72	4.72	12.51	12.51

Note: Lags interval (in first differences): 1 to 1. ** denotes significance (at 5% significance level); r denotes the number of cointegrated vectors.

Source: own calculations using Eviews 9

The outcomes delineated in Table 46 indicate the rejection of the null hypothesis, which postulates the absence of a cointegration association among the variables. Conversely, we embrace the alternative hypothesis, positing the existence of at least one cointegration equation between LGDP and LEXP, as well as between LGDP and LEMP within Cluj County, at a 5% significance level.

Table 47. Unrestricted Cointegration Rank Test – Bihor County

Variables	Hypothesized No. of CE(s)		Trace statistic	Max-Eigen statistic	Critical Value (0.05)	
					Trace	Max-Eigen
LGDP/LEXP	None	H_0:r = 0	29.53**	19.40**	25.87	19.38
	At most 1	H_0:r ≤ 1	10.13	10.13	12.51	12.51
LGDP/LEMP	None	H_0:r = 0	20.91**	18.70**	15.49	14.26
	At most 1	H_0:r ≤ 1	2.20	2.20	3.84	3.84

Note: Lags interval (in first differences): 1 to 1. ** denotes significance (at 5% significance level); r denotes the number of cointegrated vectors.

Source: own calculations using Eviews 9

The findings elucidated in Table 47 manifest the rejection of the null hypothesis, positing the absence of a cointegration linkage among the variables. Conversely, we substantiate the alternative hypothesis, affirming the existence of a minimum of one cointegration equation between LGDP and LEXP, as well as LGDP and LEMP within Bihor County, at a 5% significance level. As mentioned by Engle and Granger (Engle & Granger, 1987), in the presence of cointegration among time series, it signifies the presence of a long-term relationship that acts as a restraining force preventing the time series from diverging over time.

To ascertain the potential existence of a long-term equilibrium relationship among the LGDP, LEXP, and LEMP variables, we shall employ the Johansen cointegration test. Subsequent to obtaining results from the Johansen-Juselius cointegration tests, we can determine the suitable levels of appropriateness by employing the vector error correction model (VECM). Following the normalization of the cointegrating vector for the purpose of estimating the error correction model (ECM) within the dynamic structural framework, we have the following: (Andrei & Bourbonnais, 2017):

$$y_t = \alpha_1 + \beta_1 x_t + \varepsilon_t$$

where:

yt – is the dependent variable,
xt – is the independent variable,
$\alpha 1$, $\beta 1$ – the coefficients,
εt – the random variable.

The error correction term can be deduced from the preceding equation:

$$EC_t = y_t - \alpha_1 - \beta_1 x_t$$

Thus, the equation becomes:

$$\Delta y_t = a_0 + \delta EC_{t-1} + \sum a_{1j} \Delta y_{t-j} + \sum a_{2j} \Delta x_{t-j} + u_t$$

A negative and statistically significant coefficient of the error correction term (EC) signifies that any short-term association between the dependent and independent variables will establish a robust and stable long-term relationship between these variables (Greene, 2021).

4.2. Findings from VECM Analysis and Granger Causality in Assessing the Connection Between Economic Growth and the R&D Sector

4.2.1. Assessing the Relationship Between Total R&D Expenditure, R&D Workforce, and Economic Growth in Romania

Based on the outcomes derived from assessing the cointegration among the variables, it can be affirmed that there exist enduring associations among them. Consequently, to examine the connections between these variables, a Vector Error Correction Model (VECM) can be employed. Table 48 showcases the long-term relationship between economic growth (GDP) and total expenditure on R&D (EXP), as well as the relationship between

economic growth (GDP) and individuals employed in the R&D sector (EMP) based on one cointegrating vector in the context of Romania.

Table 48. VECM and Granger causality tests in the case of Romania

Causality direction	Error correction term (ECT) [t-statistics]	Short-run Coefficient [t-statistics]	Lag coefficient [t-statistics]	R-squared	F-statistic
LEXP → LGDP	-0.033254* (0.02409) [-1.38040]	-0.808825 (1.14492) [-0.70645]	-0.047059 (0.23446) [-0.20071]	0.103464	0.70897
LGDP → LEXP	-0.167179*** (0.02163) [-7.72974]	0.026066 (0.03171) [0.82210]	-0.279369** (0.15483) [-1.80437]	0.8788	45.92457***
LEMP → LGDP	-0.087048*** (0.03928) [-2.21624]	0.127068 (0.14881) [0.85387]	0.194846 (0.20177) [0.96568]	0.377201	3.835816
LGDP → LEMP	-0.125419*** (0.01629) [-7.70071]	-0.199625 (0.21109) [-0.94567]	-0.277216** (0.15235) [-1.81963]	0.867940	65.72308***

Note: *,**,*** denotes significance at 10%, 5% and 1% significance level.

Source: author's estimates using Eviews 9

Based on the findings presented in Table 48, it can be affirmed that the LGDP variable exerts a significant and enduring causal influence on the LEXP and LEMP variables in the long run. The estimated adjusted coefficients demonstrate statistical significance and relevance, with t-statistics values exceeding 1.708 at a 5% significance level. Furthermore, the negative sign of these coefficients signifies the presence of a long-term equilibrium in the relationship between LGDP and LEXP, as well as between LGDP and LEMP.

Similarly, concerning the long-term causal impact of the LEXP and LEMP variables on LGDP, negative values are observed, indicating a long-term equilibrium between these variables. Notably, the causal effect of LEXP on LGDP achieves significance only at a 10% significance level, where the t-statistics surpass 1.3160. In contrast, the causal effect of LEMP on LGDP exhibits significance at 5% and 1% significance levels.

The short-term coefficients reveal convergence from LGDP to LEXP and from LEMP to LGDP, but solely at the sample level. Therefore, it can be deduced that, at the sample level, an increase of 1 unit in Romania's GDP

leads to a corresponding increase of 0.026 units in total expenditure on R&D, and if the number of individuals employed in the R&D sector increases by 1 unit, GDP experiences a growth of 0.127 units. Nevertheless, the short-term causal outcomes for LGDP on LEMP and LEXP on LGDP indicate divergence and insignificance, thereby confirming hypotheses H1a and H1b.

Regarding the R-squared values, it is evident that the highest correlation intensity is observed in models with GDP as the independent variable. Consequently, it can be concluded that, at the sample level, GDP significantly influences both total expenditure on R&D and the number of individuals employed in the R&D sector. However, the reverse causal relationship, where GDP is the dependent variable, does not yield similar results. Furthermore, the findings suggest that GDP's influence on these two variables is notably greater than the influence of these variables on GDP itself.

Furthermore, the quality of the residuals, encompassing aspects such as normal distribution, autocorrelation, and homoscedasticity, was examined. In Table 49, the test values and associated probabilities for the three aforementioned error hypotheses are presented.

Table 49. The residual tests - Romania

Models based on causality direction	H_0 – the errors are homoscedastic ARCH LM (p-value)	H_0 – the errors are independent Breusch Godfrey LM (p-value)	H_0 – the errors are normally distributed Jarque-Bera (p-value)
LEXP → LGDP	18.95 (0.39)	6.92 (0.13)	0.36 (0.83)
LGDP → LEXP	18.95 (0.39)	6.92 (0.13)	0.24 (0.88)
LEMP → LGDP	23.15 (0.18)	4.37 (0.35)	0.73 (0.69)
LGDP → LEMP	21.91 (0.23)	6.69 (0.15)	0.23 (0.89)

Source: author's estimates using Eviews 9

As per the outcomes delineated in Table 49, it is discerned that the associated probabilities for the three conducted tests exceed the 5% threshold (p-value = 0.05). Consequently, the null hypothesis is accepted, affirming the accurate representation of residuals within all four estimated models. This

entails that the null hypothesis is endorsed for the trio of residual tests encompassing normal distribution, autocorrelation, and homoscedasticity. Hence, it validates the faithful depiction of residuals in the estimated models.

The findings of the cointegration test unveil the presence of a sustained, long-term equilibrium between Romania's total expenditure on R&D and its economic growth, as well as between the number of individuals employed in Romania's R&D sector and economic growth. The existence of enduring relationships between these variables—total expenditure, R&D employment, and economic growth—indicates causal interconnections, at least in one direction. To discern the causality within these relationships, the Granger causality test was employed. The long-term Granger causality from exogenous variables to the endogenous variable, along with the one-way short-term Granger causality, is elucidated in Figure 9 below.

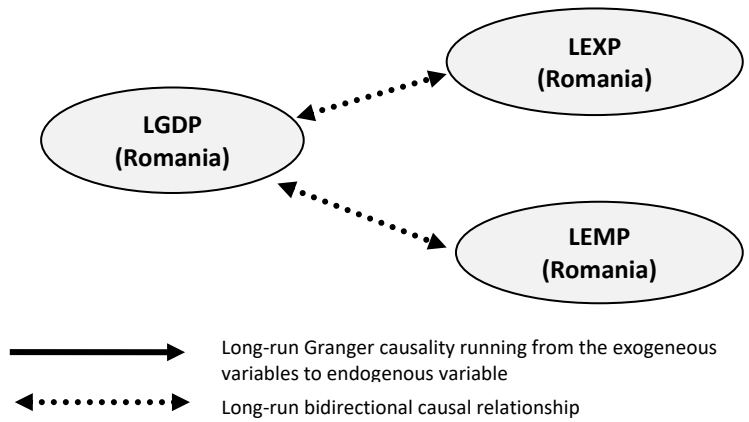

Figure 9. The Granger causality relationship between economic growth (GDP), total expenditure on R&D (EXP) and individuals employed in the R&D sector (EMP) in Romania

Source: Author's elaboration

The findings reveal the presence of a sustained bidirectional Granger causality in the long run between Romania's total expenditure on Research and Development (R&D) as well as the employment of individuals in the R&D sector, and the nation's economic growth. In essence, Romania's economic growth serves as a driving force for the development of the Romanian R&D sector, with national economic growth facilitating the long-

term advancement of both total R&D expenditure and the workforce in the R&D domain. This reciprocal relationship underscores the critical role that R&D activities play in fostering economic growth, as increased economic prosperity not only spurs investments in research and development but also leads to the expansion of the R&D workforce, thus creating a self-reinforcing cycle of innovation and economic advancement. Conversely, it can be asserted that over the long haul, Romania's total R&D spending and the number of individuals engaged in the R&D sector are instrumental in propelling the development of Romania's economic growth. These results lend support to hypotheses H1a, H1b, H3a, and H3b.

4.2.2. Analyzing the Connection Between Total R&D Expenditure, R&D Workforce, and Economic Growth in the North-West Region

The enduring association between economic growth, denoted as LGDP, and both the total expenditure on Research and Development (LEXP) and the workforce engaged in the Research and Development sector (LEMP) is expounded in Table 50, with all variables integrated into one cointegrating vector.

Table 50. VECM and Granger causality tests - North-West region

Causality direction	Error correction term (ECT) [t-statistics]	Short-run Coefficient [t-statistics]	Lag coefficient [t-statistics]	R-squared	F-statistic (p-value)
LEXP → LGDP	-0.379520*** (0.15310) [-2.47882]	0.977296* (0.68317) [1.43052]	0.114409 (0.19077) [0.59973]	0.258425	2.207051
LGDP → LEXP	-0.154448*** (0.03123) [-4.94476]	0.075447* (0.04519) [1.66960]	0.010461 (0.16797) [0.06228]	0.784537	23.06074**
LEMP → LGDP	-0.082582 (0.08076) [-1.02255]	0.432474* (0.25066) [1.72531]	0.057668 (0.19951) [0.28904]	0.155201	1.163521
LGDP → LEMP	-0.171025*** (0.03656) [-4.67796]	0.296493** (0.15868) [1.86846]	0.097376 (0.19937) [0.48843]	0.755873	19.60941**

Note: *,**,*** denotes significance at 10%, 5% and 1% significance level.

Source: authors' estimates using Eviews 9

Based on the outcomes presented in Table 51, it can be argued that the causal impact of LGDP on both LEXP and LEMP variables within the North-West region demonstrates long-term significance. The estimated adjusted coefficients bear statistical significance and relevance, as evidenced by t-statistics exceeding 1.708 for a 5% significance level and 2.060 for a 1% significance level. The negative coefficients signify the existence of a long-term equilibrium characterizing the relationship between LGDP and LEXP, as well as between LGDP and LEMP. Conversely, regarding the long-term causal influence of LEXP and LEMP on LGDP, negative values suggest the presence of a long-term equilibrium in these relationships. Notably, LEMP's causal impact on LGDP lacks long-term significance, with t-statistics falling below 1.3160. However, LEXP's causal effect on LGDP is significant at both 5% and 1% significance levels in the long run. These findings offer partial confirmation of hypotheses H1a and H1b.

In terms of short-run coefficients, there is evidence of convergence from LGDP to LEXP, LGDP to LEMP, LEMP to LGDP, and LEXP to LGDP. Consequently, an increase of 1 unit in GDP at the North-West region's level corresponds to a 0.07-unit increase in total expenditure on R&D and a 0.29-unit increase in the number of individuals employed in the R&D sector. Additionally, if total expenditure on R&D at the North-West region's level increases by 1 unit, GDP is expected to increase by 0.97 units, and a 1-unit increase in the number of individuals employed in the R&D sector corresponds to a 0.43-unit increase in GDP. These results confirm hypotheses H2a and H2b.

Regarding R-squared values, the strongest correlation is observed in models where GDP serves as the independent variable (R-squared = 0.78 for LEXP and R-squared = 0.75 for LEMP). This suggests that, at the sample level within the North-West region, GDP exerts a substantial influence on both total expenditure on R&D and the number of individuals employed in the R&D sector. Conversely, the influence of these two variables on GDP is comparatively weaker. The quality of residuals, including normal distribution, autocorrelation, and homoscedasticity, has also been assessed, with the test values and associated probabilities presented in Table 51.

Table 51. The residual tests – North-West region

Models based on causality direction	H_0 – the errors are homoscedastic (ARCH LM)	H_0 – the errors are independent (Breusch Godfrey LM)	H_0 – the errors are normally distributed (Jarque-Bera)
LEXP → LGDP	20.15 (0.32)	3.21 (0.52)	3.64 (0.16)
LGDP → LEXP	14.78 (0.67)	4.31 (0.36)	2.72 (0.25)
LEMP → LGDP	15.44 (0.63)	3.80 (0.43)	0.31 (0.85)
LGDP → LEMP	15.44 (0.63)	3.80 (0.43)	0.86 (0.64)

Source: author's estimates using Eviews 9

Based on the outcomes presented in Table 51, it is evident that the associated probabilities for the values of the three tests exceed the 5% threshold (p-value = 0.05). Consequently, the null hypothesis is accepted, affirming the correct representation of residuals in all three aspects: normal distribution, autocorrelation, and homoscedasticity.

The results obtained from the cointegration test indicate the presence of a long-term, stable equilibrium between the North-West region of Romania's total expenditure on R&D and its economic growth, as well as between the North-West region's individuals employed in the R&D sector and economic growth. These findings signify the existence of long-term relationships between the variables, encompassing both GDP and the two R&D sector variables (LEXP and LEMP). Such relationships suggest causal links in at least one direction. To ascertain causality, the Granger causality test has been employed. The results encompass long-term Granger causality originating from exogenous variables to the endogenous variable, as well as one-way short-term Granger causality, as depicted in Figure 10 below.

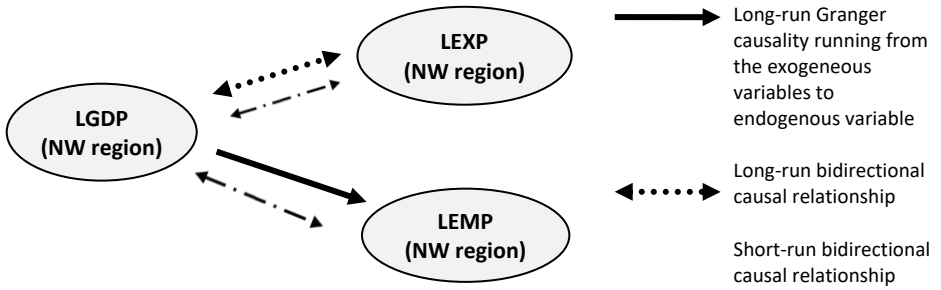

Figure 10. The Granger causality relationship between economic growth (GDP), total expenditure on R&D (EXP) and individuals employed in the R&D sector (EMP) in the North-West region of Romania

Source: Author's elaboration

The results indicate the existence of a long-run unidirectional Granger causality between total expenditure on R&D and economic growth in the North-West Region.

The impetus behind the economic growth within the North-West region of Romania instigates the advancement of total expenditure on R&D within the same regional context. In essence, regional economic growth serves as a catalyst for the long-term progression of total R&D expenditure. Furthermore, the analysis reveals compelling evidence of a sustained, reciprocal Granger causality between Romania's North-West region's total R&D expenditure and its economic growth. In the short-term perspective, a mutual causal interrelationship has been identified between Romania's North-West region's total R&D expenditure and economic growth, as well as between the region's workforce engaged in the R&D sector and economic growth. These outcomes substantiate hypotheses H1a, H2b (solely concerning GDP's influence on R&D sector employment), H3a, and H3b.

4.2.3. Investigating the Impact of Total R&D Expenditure and R&D Workforce on Economic Growth in Cluj County

The enduring association between economic growth, denoted by GDP, and the total expenditure on Research and Development (EXP), as well as the relationship between economic growth (GDP) and the workforce engaged in the Research and Development (R&D) sector (EMP), under the premise of a single cointegrating vector, is elucidated in Table 52 for Cluj County.

Table 52. VECM and Granger causality tests – Cluj County

Causality direction	Error correction term (ECT) [t-statistics]	Short-run Coefficient [t-statistics]	Lag coefficient [t-statistics]	R-squared	F-statistic (p-value)
LEXP → LGDP	-0.356394*** (0.17282) [-2.06217]	-0.617654 (0.63620) [-0.97084]	0.002464 (0.18649) [0.01321]	0.208146	1.664771
LGDP → LEXP	-0.174316*** (0.03193) [-5.45979]	0.100252*** (0.04414) [2.27124]	-0.063097 (0.15418) [-0.40926]	0.814659	27.83795**
LEMP → LGDP	-0.017190 (0.02962) [-0.58030]	-0.149273 (0.36549) [-0.40842]	-0.244889 (0.19993) [-1.22485]	0.176370	1.356203

Causality direction	Error correction term (ECT) [t-statistics]	Short-run Coefficient [t-statistics]	Lag coefficient [t-statistics]	R-squared	F-statistic (p-value)
LGDP → LEMP	-0.123516*** (0.03194) [-3.86685]	0.057552 (0.12196) [0.47191]	-0.044057 (0.22294) [-0.19762]	0.690300	14.11658**

Note: *,**,*** denotes significance at 10%, 5% and 1% significance level.

Source: author's estimates using Eviews 9

Based on the findings presented in Table 52, it is discernible that in the case of Cluj County, the causal influence of LGDP on LEXP and LEMP variables is indeed substantial within the long-term framework. The estimated adjusted coefficients hold statistical significance and pertinence, as indicated by t-statistic values surpassing 1.708 for a 5% significance level and 2.060 for a 1% significance level. Furthermore, the negative polarity of these coefficients underscores the presence of a long-term equilibrium characterizing the association between LGDP and LEXP, as well as between LGDP and LEMP. Similarly, the long-term causal influence of LEXP and LEMP on LGDP is marked by negative values, signifying a long-term equilibrium in their relationship. Nevertheless, in the case of LEMP's impact on LGDP, the causality lacks statistical significance in the long-term, given t-statistic values falling below 1.3160 at a 10% significance level. Conversely, the causality stemming from LEXP to LGDP is substantiated in the long-term at both 5% and 1% significance levels. Consequently, these outcomes provide partial affirmation of hypotheses H1a and H1b.

Conversely, the short-term coefficients illustrate a tendency towards convergence from LGDP to LEXP. Thus, it can be posited that a 1-unit increase in GDP at Cluj County's level would correspond to a 0.10-unit increase in total R&D expenditure at the same level. This result aligns with the H2a hypothesis. Regarding the coefficient of determination (R-squared), it is noteworthy that the most robust correlations are evident in models with GDP as the independent variable (R-squared = 0.81 for LEXP and R-squared = 0.69 for LEMP). Consequently, it is plausible to assert that, at the sample level within Cluj County, GDP exerts a considerable influence on both total R&D expenditure and the R&D workforce. Conversely, this assertion does not hold true when GDP is considered the dependent variable. Hence, according to the

findings, it is reasonable to contend that GDP exerts a more pronounced influence on these two variables than they reciprocally exert on GDP.

The quality of the residuals, encompassing aspects such as normal distribution, autocorrelation, and homoscedasticity, has also been verified. The outcomes of these tests are presented in Table 53.

Table 53. The residual tests - Cluj County

Models based on causality direction	H_0 – the errors are homoscedastic ARCH LM (p-value)	H_0 – the errors are independent Breusch Godfrey LM (p-value)	H_0 – the errors are normally distributed Jarque-Bera (p-value)
LEXP → LGDP	18.56 (0.41)	3.17 (0.52)	3.55 (0.16)
LGDP → LEXP	10.87 (0.89)	3.52 (0.47)	2.32 (0.31)
LEMP → LGDP	24.48 (0.13)	11.56 (0.02)	0.91 (0.63)
LGDP → LEMP	24.48 (0.13)	11.56 (0.02)	0.93 (0.62)

Source: author's estimates using Eviews 9

Based on the outcomes presented in Table 53, it is evident that the probabilities associated with the values of the first and third tests exceed the 5% threshold (p-value = 0.05), thus leading to the acceptance of the null hypothesis. However, concerning autocorrelation, the p-values surpass the 5% threshold (p-value = 0.05) solely in the cases of the first two models (LGDP and LEXP). Consequently, with respect to LGDP and LEXP variables, it can be affirmed that the null hypothesis is accepted for all three residual tests—namely, assessments pertaining to normal distribution, autocorrelation, and homoscedasticity—thereby substantiating the accurate representation of the residuals within the estimated models.

The results derived from the cointegration analysis indicate the presence of a long-term, stable equilibrium between Cluj County's total expenditure on R&D and economic growth, as well as between Cluj County's individuals employed in the R&D sector and economic growth. The existence of these enduring relationships between the two variables, namely total expenditure and R&D workforce, and economic growth, implies causal interrelations in at least one direction. To explore these causal associations, we have employed the Granger causality test. The ensuing analysis discloses both the

long-term Granger causality originating from exogenous variables to endogenous variables and the one-way short-term Granger causality, as depicted in Figure 11 below.

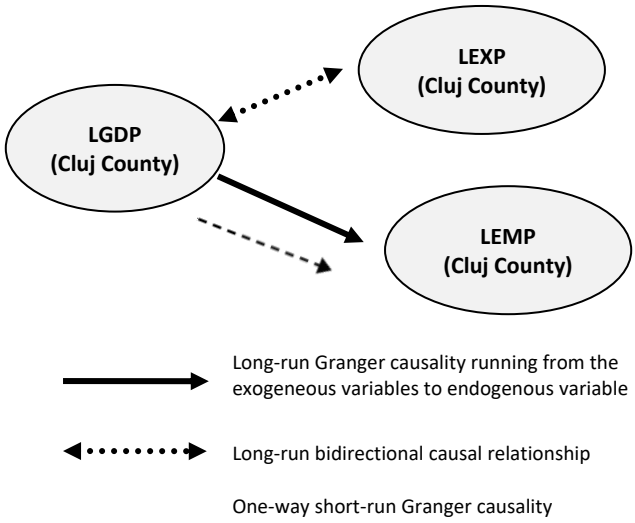

Figure 11. The Granger causality relationship between economic growth (GDP), total expenditure on R&D (EXP) and individuals employed in the R&D sector (EMP) in Cluj County

Source: Author's elaboration

The findings reveal the presence of a long-term bidirectional causal association between Cluj County's GDP and the total expenditure on R&D within the same county. Additionally, we have ascertained a unidirectional Granger causality in the long term, emanating from the individuals employed in Cluj County's R&D sector to the economic growth of the region. Consequently, it can be inferred that the economic growth of Cluj County acts as the impetus for Granger-causing the development of its R&D sector over the long haul, thereby fostering the enduring advancement of total R&D expenditure and R&D workforce within the region. However, the existence of a sustained influence stemming from the R&D workforce on economic growth remains ambiguous. In the short term, we have identified a unidirectional causal linkage originating from GDP to the R&D workforce. Thus, the results validate hypothesis H3a, while hypothesis H3b fails to garner substantiation.

4.2.4. Exploring the Relationship Between Total R&D Expenditure, R&D Workforce, and Economic Growth in Bihor County

The enduring equilibrium between economic growth (GDP) and the total expenditure on Research and Development (R&D) and, correspondingly, between economic growth (GDP) and the workforce employed within the R&D sector (EMP) for a single cointegrating vector is delineated in Table 54 for the context of Bihor County.

Table 54. VECM and Granger causality tests – Bihor County

Causality direction	Error correction term (ECT) [t-statistics]	Short-run Coefficient [t-statistics]	Lag coefficient [t-statistics]	R-squared	F-statistic (p-value)
LEXP → LGDP	-0.291603** (0.16014) [-1.82097]	1.471559 (2.06252) [0.71348]	-0.232624 (0.21727) [-1.07069]	0.269185	2.332785
LGDP → LEXP	-0.202300*** (0.04093) [-4.94266]	0.009816 (0.01683) [0.58316]	0.061515 (0.16837) [0.36535]	0.759353	19.98457**
LEMP → LGDP	-0.093784 (0.09027) [-1.03898]	0.181648 (1.05073) [0.17288]	-0.494472*** (0.19815) [-2.49547]	0.342664	3.301510
LGDP → LEMP	-0.175773*** (0.03675) [-4.78311]	0.029238 (0.03337) [0.87618]	0.039913 (0.17695) [0.22556]	0.751141	19.11613**

Note: *,**,*** denotes significant at 10%, 5% and 1% significance level.

Source: author's estimates using Eviews 9

Regarding Bihor County, it can be asserted that the causal influence of LGDP on the variables LEXP and LEMP holds significance in the long-term. The estimated adjusted coefficients exhibit statistical significance and relevance, supported by t-statistics values exceeding 1.708 for a 5% significance level and 2.060 for a 1% significance level. Furthermore, the negative sign of these coefficients signifies the presence of a long-term equilibrium in the relationship between LGDP and LEXP, as well as between LGDP and LEMP.

In the context of the long-term causal impact of LEXP and LEMP variables on LGDP, the observed negative values suggest the existence of a long-term equilibrium in their association. Conversely, concerning the causal influence of LEMP on LGDP, the significance of causality is lacking in

the long-term, as indicated by t-statistics values falling below 1.3160 at a 10% significance level. However, in the case of the causal impact of LEXP on LGDP, long-term causality holds significance at both 5% and 1% significance levels. Consequently, these results validate hypothesis H1a and partially confirm H1b.

The short-term coefficients reveal convergence from LGDP to LEXP, LGDP to LEMP, LEXP to LGDP, and LEMP to LGDP, but solely within the sample scope. Therefore, within the sample, it can be affirmed that an increase of 1 unit in GDP at the Bihor County level corresponds to an increase of 0.009 units in total R&D expenditure at the same level. Additionally, a rise of 1 unit in the number of individuals employed in the R&D sector leads to a 0.029 unit increase in GDP at the Bihor County level. Notably, the second hypotheses cannot be substantiated. With respect to R-squared, the highest degree of correlation is observed in models where GDP serves as the independent variable (R-squared = 0.75). Consequently, it can be posited that, within the sample, GDP exerts a substantial influence on both total R&D expenditure and the number of individuals employed in the R&D sector. This assertion may not hold if GDP were considered the dependent variable. In light of these findings, it can be inferred that GDP wields a greater influence on these two variables than they exert on GDP.

An evaluation of the residuals, including normal distribution, autocorrelation, and homoscedasticity, is also presented in Table 55, affirming the adherence to the three error hypotheses.

Table 55. The residual tests - Bihor County

Models based on causality direction	H_0 – the errors are homoscedastic (ARCH LM)	H_0 – the errors are independent (Breusch Godfrey LM)	H_0 – the errors are normally distributed (Jarque-Bera)
LEXP → LGDP	14.28 (0.71)	6.31 (0.17)	0.97 (0.61)
LGDP → LEXP	9.51 (0.94)	2.19 (0.70)	0.61 (0.73)
LEMP → LGDP	11.68 (0.86)	4.89 (0.29)	1.57 (0.45)
LGDP → LEMP	11.68 (0.86)	4.89 (0.29)	1.58 (0.45)

Source: author's estimates using Eviews 9

The outcomes showcased in Table 55 reveal that the associated probabilities linked to the values of the three tests—specifically, those gauging normal distribution, autocorrelation, and homoscedasticity—surpass the 5% threshold (p-value = 0.05). Consequently, the null hypothesis is accepted. In light of these results, it can be confidently affirmed that the null hypothesis is embraced for all three residual tests, thereby validating the accurate representation of the residuals within the four estimated models.

As concerns the cointegration, the test underscores the presence of a steady, long-term equilibrium between Bihor County's total expenditure on R&D and economic growth, as well as between the number of individuals employed in the R&D sector in Bihor County and economic growth. The existence of these enduring associations between the two variables, namely total expenditure and R&D sector employment, and economic growth signifies a causal relationship between these variables, potentially in at least one direction. To ascertain the directionality of this causality, the Granger causality test was deployed. The results pertaining to long-term Granger causality, extending from exogenous variables to endogenous variables, and one-way short-term Granger causality are visually depicted in Figure 12 below.

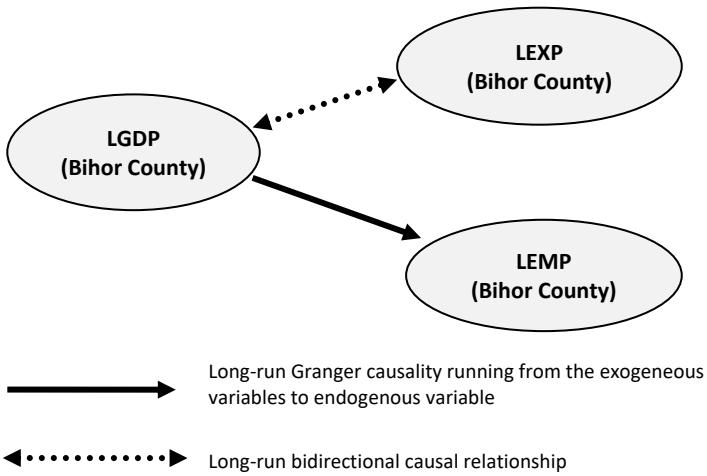

Figure 12. The Granger causality relationship between economic growth (GDP), total expenditure on R&D (EXP) and individuals employed in the R&D sector (EMP) in Bihor County

Source: Own elaboration

In the context of Bihor County, it is evident that a robust, long-term bidirectional Granger causality exists solely between GDP and the total expenditure on research and development, whereas concerning the number of individuals employed in the research and development sector, a unidirectional Granger causality stemming from GDP is observable in the long run. Consequently, the economic growth of Bihor County serves as the impetus behind the Granger-caused advancement of the county's research and development sector. Furthermore, it can be posited that the total expenditure on research and development within Bihor County acts as the catalyst for the Granger-induced development of Bihor County's GDP, albeit exclusively in the long term. These findings substantiate the validity of hypothesis H3a.

As revealed from preceding research, multiple hypotheses have been substantiated. It has become apparent that GDP wields a more pronounced influence on total expenditure in research and development and the workforce engaged in the research and development sector, as opposed to the reciprocal influence these variables exert on GDP, across the domains of Romania, Bihor County, and Cluj County. Consequently, one may infer that regions characterized by higher or more robust GDP levels tend to attract a greater influx of startups, thus cultivating a more favorable operational environment compared to regions where GDP levels remain lackluster. Simultaneously, it is imperative to recognize the profound influence these variables, namely total expenditure in research and development and the number of individuals employed in the research and development sector, hold over regional development. Already prosperous regions are poised to continue amassing additional resources, whether material or human, compared to less developed regions. It is of paramount importance to acknowledge that the relationships delineated throughout this chapter epitomize long-term dynamics. Therefore, these insights should serve as guiding principles for policymakers and the business sector alike. Decisions aimed at fostering GDP growth, augmenting total expenditure in research and development, and enhancing the workforce within the research and development sector should be made with a keen awareness of the enduring ramifications of present-day choices.

Conclusion

In recent years, startups have gained considerable prominence for multifarious reasons, all of which underscore our impetus for conducting an exhaustive examination of the potential advantages that cities, regions, and nations can derive from the presence and activities of startups. Notably, our study is founded on the premise that relatively scant attention has been dedicated to the analysis of methods by which the survival rates of startups can be bolstered, the facilitation of accelerated innovation, the establishment of effective communication channels (bridging academia and the startup sector, forging links between local governance and the startup sector, facilitating interactions between national authorities and the startup sector, fostering collaboration between the business environment and the startup sector, and facilitating dialogue between investors and the startup sector), elucidating the intricate interplay between Gross Domestic Product (GDP) and the startup sector, and discerning the correlations between the unemployment rate and the startup ecosystem. These considerations collectively serve as the driving forces compelling us to embark on an in-depth exploration of this subject matter. Additionally, our endeavor aims to disseminate knowledge and insights within regional and national contexts.

Drawing from the objectives delineated at the outset of this book, including the primary goal of elucidating the ways and extent to which two pivotal macroeconomic indicators, namely GDP and the unemployment rate, directly or indirectly influence the presence and development of startups within a specific region—namely, the North-West region of Romania, with a particular focus on the cities of Oradea and Cluj-Napoca—our study has successfully accomplished the following key objectives:

- *Impact Analysis*: We have conducted a comprehensive analysis to ascertain how startups can both exert influence upon and be influenced by regional development, primarily through the lens of these macroeconomic indicators.

- *Literature Synthesis*: Our study has meticulously synthesized and examined existing literature on entrepreneurship, startups, business creation, creativity, development, and the broader significance of these theoretical constructs.
- *Innovation Assessment*: We have provided empirical evidence regarding the role of innovative startups in catalyzing regional and local development, while also evaluating the levels of innovation within the North-West region of Romania.
- *Startup Ecosystem Specifics*: We have delved into the specific characteristics and dynamics of the startup landscapes in Oradea and Cluj-Napoca, offering valuable insights that can benefit not only the startup ecosystem but also stakeholders such as policymakers, academia, and the broader business community.
- *Knowledge Dissemination*: Throughout this book, we have sought to disseminate insights into the critical success factors for startups, which hold relevance for a diverse array of stakeholders engaged in the startup ecosystem, encompassing universities, enterprises, financial entities, legislators, not only in Oradea and Cluj-Napoca but across the entirety of the country.

In conclusion, this comprehensive study serves as a valuable repository of knowledge and insights, poised to catalyze informed decision-making and facilitate collaborative efforts among key players within the startup landscape, transcending geographical boundaries and embracing a broader national perspective.

The two major objectives of this book, alongside the auxiliary goals elucidated in its introductory section, have been rigorously expounded upon and effectively realized over the course of the four comprehensive chapters that constitute this work. As demonstrated in Chapter 1, titled "The Evolution of Business Creation: Theoretical Foundations and Historical Context," our scholarly inquiry embarked upon a nuanced exploration of the contemporary implications derived from scholarly literature encompassing the realms of business inception, business model formulation, and pertinent legislative frameworks.

Seamlessly building upon the foundational insights gleaned in the inaugural chapter, Chapter 2, aptly titled "Innovative Enterprises and Their Impacts on Local and Regional Development," adeptly marshaled empirical

evidence to scrutinize the trajectories of Romania's startup landscape. In tandem, this chapter conducted a rigorous appraisal of Romania's research, development, and innovation (RDI) landscape, discerning its inherent strengths, vulnerabilities, and opportunities, juxtaposed against analogous benchmarks established by the European Union and the United States.

Subsequently, the third chapter, denominated "Innovation, Startups, and Local Development in Oradea and Cluj-Napoca," executed its primary mission with unwavering precision. It delivered an exhaustive analysis of the startup ecosystem from a tripartite perspective. Firstly, it elucidated the North-West region of Romania through the prism of indicators germane to startups and innovation. This was followed by an intricate exposition of the unique characteristics and dynamics characterizing the cities of Oradea and Cluj-Napoca. Furthermore, this chapter meticulously probed into the innovation quotient of these two urban centers.

Lastly, the concluding chapter, "Econometric Modeling of the Impact of the Research and Development (R&D) Sector on Economic Growth: A Vector Error Correction Model (VECM) for Romania, the North-West Region, Cluj, and Bihor Counties," consummated its objectives by furnishing an exhaustive elucidation of causal relationships and conducting meticulous tests to identify the precise vectors governing the interplay between the designated variables.

In summation, this monograph, through its sequential chapters, has not only fulfilled its primary objectives but has also yielded a comprehensive tapestry of insights and analyses pertaining to the interlinkages between entrepreneurship, innovation, regional development, and economic growth within the context of Romania, with a focal examination of Oradea and Cluj-Napoca. These scholarly achievements serve as a foundational resource that advances academic inquiry and informs policymaking decisions while contributing to the ever-evolving body of knowledge in these critical domains.

As meticulously elucidated throughout *Chapter 1*, titled "*The Evolution of Business Creation: Theoretical Foundations and Historical Context*" the body of scholarly literature pertinent to the domains of entrepreneurship, innovation, and creativity stands as a rich and multifaceted tapestry. This literature frequently reveals a diversity of perspectives, with the pronouncements of various authors often appearing in discordance with one

another. Such disparities, however, should not deter decision-makers from the earnest pursuit of knowledge enhancement and the amelioration of extant conditions through the application of theoretical constructs.

Indeed, the ideas proffered by the myriad authors expounded upon in this treatise are imbued with practical applicability, and it bears noting that numerous theories, studies, and intellectual frameworks alluded to herein have withstood the test of time. Furthermore, irrespective of authorial provenance, it has become evident that there remains room for incremental advancements. Notably, the works of luminaries such as Smith and Schumpeter have underscored the contemporary economic milieu's propensity to foster cross-specialization, yielding heightened returns, augmented profits, and the proliferation of novel ideas.

Within the current entrepreneurial and startup landscape, a discernible shift toward social betterment is discernible. Nonetheless, the decisions engendered by entrepreneurs and startup founders remain firmly rooted in logical and rational paradigms. The advent of information technology (IT) and its concomitant infrastructure has reconfigured the paradigm underpinning the perception of competition and internationalism. Presently, enterprises may embark upon international forays from their inception, assuming dual roles as both international competitors and subjects of global competition.

Crucial tenets, prominently featured in the inaugural chapter, include the salient concepts of creativity and innovation. Echoing the insights advanced by Kaufman, it becomes evident that corporate innovation need not necessarily attain radical novelty to yield favorable outcomes. Incremental, or “small 'c'“ innovation, is oriented toward effecting marginal enhancements in the present milieu, thereby engendering short-term changes that culminate in pronounced long-term effects. Enterprises, as well as startups, should pivot their focus toward the integration of innovation at the organizational level, thus facilitating a bidirectional innovation process encompassing both top-down and bottom-up approaches.

It is paramount to recognize that innovation and creativity are not the exclusive purview of high-capital enterprises; rather, enterprises of modest means can harness the latent potential of their workforce, with innovation being actively fostered and championed by organizational leadership. This

precept holds true for startups as well. Pertaining to legislative matters, the legal framework can either impede or catalyze the emergence of startups, thus necessitating an ongoing dialogue between legislators and representatives of the business community.

Instituting regulatory frameworks tailored to the startup sector's unique needs, spanning the creation, maturation, and financing stages, represents a pivotal means by which legislators can attract and cultivate entrepreneurial talent while augmenting the number of business enterprises within a given geographic region. Additionally, legislators should contemplate promulgating legislation that not only encourages innovation but also fosters its normative integration.

Concomitantly, intellectual property (IP) considerations ought to occupy a central role within the purview of both startups and governmental entities, encompassing both local and national jurisdictions. Filing for internationally recognized and accredited patents holds the promise of substantial benefits, spanning the realms of finance and societal advancement.

As elucidated within the corpus of this treatise, startups flourish across a spectrum of industry sectors, exerting profound and far-reaching impacts on market dynamics, competitive landscapes, innovative output, and regional development. Despite variances among startups concerning their founding narratives, geographic loci of operation, and operational scopes, it becomes apparent that these nascent ventures share a constellation of common aspirations and objectives.

Prior subsections have elucidated critical facets of the operational conditions within which startups function, shedding light on the mechanisms by which overarching trends within the startup sector materialize. These insights have underscored the imperatives of formulating judicious policy frameworks underpinned by a synergy of public and private support mechanisms. Such initiatives are conceived with the dual objectives of catalyzing regional development and fostering an upsurge in innovative output. While a wealth of information has been amassed from diverse countries and sources, access to comprehensive data pertaining to the evolution of the Romanian startup ecosystem remains, to some extent, elusive. Estimations allude to the existence of approximately 1000 active startups within the Romanian landscape. However, it is essential to note that

authoritative figures officially corroborating this numerical assessment are conspicuously absent from the discourse (Koritar, 2018); it is noteworthy to underscore that the most substantial constraint inherent to the present study resides in the paucity of official data available concerning this sector.

Numerous ramifications pertaining to the operational dynamics of start-ups have been presented herein. Upon scrutinizing a multitude of ecosystem comparisons, notably within the EU context, a compelling inference arises: the activities of start-ups wield the potential to ameliorate regional disparities and engender enhanced regional performance. It is imperative to acknowledge that several countries, commensurate in scale and economic prowess to Romania, have embarked on proactive initiatives to fortify their start-up infrastructures. This consequently poses a gamut of challenges for the Romanian ecosystem, demanding concerted efforts to regain competitive footing.

A dissection of the evolution of innovation dimensions reveals a disquieting trend marked by sustained diminishment since 2011. This dwindling trajectory does not augur favorably for the entrepreneurial landscape. However, juxtaposing this with international benchmarks offers a glimmer of optimism. Notably, countries like Germany, despite being an economic juggernaut, exhibit relatively modest enterprise survival rates over a 5-year span (38.97%). The variance in survival probabilities among nations presents an auspicious perspective for Romanian enterprises and nascent start-ups. When amalgamated with the array of policy initiatives propagated by the Romanian Ministry of Research and Innovation, these favorable odds inch closer to tangibility.

The labor landscape in Romania predominantly leans on the agricultural sector, yet the burgeoning global fintech sphere, underscored by a staggering $22 billion valuation in 2015 with sustained growth, proffers opportunities for synergy. Policy considerations should explore how fintech-based start-ups and SMEs can invigorate the agricultural sector while bolstering national employment figures. By diversifying employment prospects and enhancing productivity, automation, knowledge diffusion, and working conditions, start-ups can precipitate a spectrum of benefits.

Recent developments from the private sector augur well for enhanced innovation output and the creation/proliferation of start-ups, infusing optimism for accelerated growth prospects. Policies must be attuned not

only to enhance domestic working conditions and resource availability but also to augment the allure of regions as magnets for external investment. Noteworthy is the fact that AI-focused start-ups in the United Kingdom garnered 55% of the total EU investment between 2011 and mid-2018. Such substantial injections of funding yield manifold positive ramifications for the regions in which these start-ups operate. Hence, attracting external sources of funding stands as a pivotal consideration for both public and private decision-makers.

As expounded in this compendium, the most dynamic start-up sectors and their evolution since 2010 are as follows: advanced manufacturing solutions, which have burgeoned by 107.9% since 2010; blockchain utilization and application, witnessing a remarkable upsurge of 101.5% over the same period; agriculture and novel food technology, reflecting an 88.8% growth since 2010; and artificial intelligence deployment and the harnessing of big data, demonstrating a 64.5% expansion since 2010 (Start-up Genome, 2019).

A deduction discernible from *Chapter 2*, titled "*Innovative Enterprises and Their Impact on Local and Regional Development*", pertains to the practical instantiation of theoretical constructs. A cadre of scholars has diligently delved into the quest for enhanced methodologies conducive to the realization of innovation, sustained corporate viability, and exponential growth. Syverson (Syverson, 2011), Foster, Haltiwanger, and Krizan (Foster, et al., 2001) and Bartelsman and Doms (Bartelsman & Doms, 2000) have elucidated the ramifications of firms' entry, evolution, and contraction processes on their profitability. These dynamics render enterprises more appealing to external stakeholders, thereby fostering a propensity for heightened migration toward regions where start-ups are active.

Of equal significance to our discourse, as underscored in the second chapter, is the observation that start-ups are increasingly emerging from the framework of Small and Medium-sized Enterprises (SMEs). The collective impact of both these entities is incontrovertible, substantiated by the substantial employment rates attributed to SMEs in the European Union (EU-28), where 66.6% of all employment in 2018 can be traced back to 99.8% of SMEs. Since 2009, SMEs have consistently constituted a pivotal element driving economic growth and bolstering GDP figures. Specifically, when considering the EU-28 average for 2017, the cumulative contribution of all

SMEs to GDP registered a significant 29% upsurge, with micro and small SMEs individually contributing 10.1% and 8.4% increments to the GDP, respectively (European Commission, 2018). To a certain extent, it is noteworthy that, in the case of France, the collective contribution of all Small and Medium-sized Enterprises (SMEs) to the Gross Domestic Product (GDP) has amounted to a 15.2% increase. In contrast, in Romania, micro and small SMEs have individually contributed 7.2% and 4.9%, respectively, to the GDP in 2017. When considering all SMEs at the 2017 Romanian level, their combined impact has resulted in a 16.1% increase in GDP.

To provide a broader context, it is imperative to underscore the significance of funding sources in both economic and regional development. In the year 2019, across the entire European landscape, a total of 4,175 fundraising investments and deals were documented. This distribution of investments is noteworthy: the United Kingdom led with 1,425 investments and deals, amassing a total value of 14.8 billion euros, constituting 44% of the overall European funding value. Following closely, Germany recorded 444 investments and deals, while France reported 425 investments and deals. Collectively, these three nations accounted for a substantial 54% of the total European funding (Teare & Kunthara, 2020). The available evidence unmistakably indicates a year-on-year increase in investment values, signifying ongoing opportunities and future potential for attracting additional funds from these investment sources.

In light of this, our forthcoming research endeavors will be directed towards the examination of official data concerning the generation of innovative start-ups by universities at the national level in Romania. To the best of our current knowledge, such comprehensive data is presently non-existent, hampering constructive research efforts aimed at evaluating the performance of universities in fostering innovative start-ups. Despite the presence of universities in various innovation clusters, comprehensive data regarding their activities and outputs remains conspicuously limited. It is imperative to underscore the critical importance of acquiring such data and inputs from universities. This data is essential for facilitating robust development, both in terms of innovation and regional progress. It serves as a catalyst for expediting market opportunities and leveraging the expertise within academic institutions, thereby contributing significantly to advancement on multiple fronts.

Chapter 3, titled *"Innovation, Startups, and Local Development in Oradea and Cluj-Napoca,"* has yielded a plethora of insights into the North-West regions, with a specific focus on the cities of Oradea and Cluj-Napoca. Since 2011, the European Union (EU) has exhibited an 8.8% increase in innovation performance. Notably, in 2019, the EU surpassed the United States in terms of innovative performance, although it still lags behind countries like South Korea and Canada. However, Romania's innovation landscape presents a contrasting picture. Here, research, development, and innovation are centralized, and the private sector's involvement in innovation endeavors is notably limited. Romania has witnessed a downward trajectory in innovation output, with innovation performance declining from 50% in 2008 to 34.5% in 2015. Over the period from 2011 to 2018, Romania experienced a disheartening 10.07% decrease in innovation performance. For the majority of the 18 indicators listed in the Regional Innovation Scoreboard, Romania's evolution since 2011 has been regrettably negative, thereby stalling the progress of innovation and the exploitation of benefits from research and development activities. All eight Romanian regions significantly lag behind their EU counterparts in terms of innovation. Despite Romania boasting seven business accelerators, 22 technology transfer centers, 45 clusters, 17 hubs, and 11 incubators, the efficacy of these entities must be safeguarded and nurtured to expedite more positive outcomes.

The discouraging outcomes can be attributed to several factors, including inadequate policy support, underdeveloped startup infrastructure, and insufficient emphasis on innovation-related activities and initiatives. This bleak scenario is reflected in the meager funding that the Romanian startup sector has managed to attract. While prominent European cities like London and Berlin have successfully attracted billions of euros from various funding sources, limited data availability, and data inconsistency have hindered efforts to ascertain precise figures for investments in startups via public or private channels. This data limitation stands out as one of the foremost challenges in the study of the startup sector. However, there has been some progress in recent years, particularly through reporting to organizations such as the OECD and the European Commission, although significant work remains to be done in terms of data collection in the startup sphere.

In 2018, the North-West region secured the second position in Romania in terms of its strength, trailing only the Bucharest-Ilfov region. This ranking

was based on key metrics including the total number of enterprises, turnover, and the employment of individuals in the creative and cultural sectors. These industries, in 2018, contributed significantly to the North-West region, accounting for 8.8% of the total number of active enterprises, generating 4.7% of the total turnover, and employing 6.5% of the workforce. These figures exceeded the EU28 average, which stood at 3.8% (North-West Regional Development Agency, 2019).

In terms of the overall strengths of the North-West region, as shown by Anghelache et al. (Anghelache, et al., 2020), the overall strength and vitality of a nation or region are dependent upon the absorptive capacities of its constituent areas. Specifically, the capacity to generate new employment opportunities and curtail unemployment rates significantly influences the overall economic performance and advancement of a nation or region. It is noteworthy that both Cluj and Bihor counties exhibit favorable indicators in terms of unemployment rates and Gross Domestic Product (GDP) levels. This augurs well for these counties, as they possess untapped potential to underpin economic growth, development, and the proliferation of high-performing startups.

Furthermore, as elucidated in the third chapter, an intricate analysis reveals the underlying factors that have propelled the North-West region, particularly Cluj and Bihor counties, towards notable potential and progressive development in recent years. Within this region, a robust ecosystem of business enablers has been established, as of 2015, encompassing seven accelerators, twenty-two technology transfer centers, forty-five clusters, seventeen hubs, eleven incubators, and sixty-six industrial parks. These instrumental entities collectively contribute to fostering an environment conducive to entrepreneurship, innovation, and economic advancement, positioning the region favorably for future growth and innovation-driven initiatives (European Commission, 2017). Undoubtedly, the numerical figures in this context have exhibited a consistent upward trajectory since 2015. This trend not only underscores the inherent potential within the North-West region but also underscores its sustained growth over time, thus indicating promising prospects for the future. It is worth noting that, in this specific scenario, the preponderance of support for business-related endeavors and startup cultivation has been concentrated in the Bucharest-Ilfov region. Up until 2015, this region boasted

a total of 42 business facilitators, followed closely by the central region with 33 such entities. Moreover, with regard to the North-West region, the presence of 23 operational industrial parks is a noteworthy development. These industrial parks currently accommodate 178 companies and enterprises, spanning across an extensive land area encompassing 764 hectares. It is pertinent to observe that both the quantity and scale of such industrial parks are poised for further expansion and development, indicative of the region's commitment to fostering economic growth and entrepreneurial activities (North-West Regional Development Agency, 2020).

When examining the regional landscape through the lens of the Regional Innovation Scoreboard, a notable disparity emerges between the indicators' values in the North-West region and the EU-28 average. The evolution of these indicators over the years has been presented, revealing that in 2019 compared to 2017, eight indicators displayed a negative trend. These indicators include Design applications (-29.8), Employment in knowledge-intensive services (-5.47), Lifelong learning (-1.98), Most cited publications (-0.83), Population with tertiary education (-1.91), Public-private co-publications (-7.6), R&D expenditure in the business sector (-1.73), and Sales of new-to-market innovations (-0.92). The implications drawn from these calculations are unequivocal: the innovation and creative infrastructure of the North-West region, despite its significant lag behind the European average, requires substantial enhancement to unlock its full potential.

The absence of official registries identifying companies as start-ups poses a substantial challenge and contributes to significant disparities in knowledge about these organizations. This challenge represents a central issue in the present study. In the case of Oradea, to the best of our knowledge, no comprehensive database exists enumerating the actual count of start-ups. In the case of Cluj-Napoca, reported figures tend to exhibit variations from source to source, leading to inconsistencies in the data and potentially misleading results. Over the past eight years (spanning from 2011 to 2019), a mere 3% of newly registered companies have successfully made the transition to start-ups. This transition is contingent upon achieving annual income growth rates of at least 20% per year within the first three years of registration. These percentages translate to an average of 102 new start-ups per year in the city of Cluj-Napoca and 129 start-ups per year in the

metropolitan region of Cluj over the aforementioned eight-year period (Interdisciplinary Center for Data Sciences, 2020).

Concerning creative and innovative enterprises, Cluj-Napoca demonstrates a lead over Oradea. The most substantial disparity materialized in 2017 when Cluj-Napoca outpaced Oradea by six companies per 1,000 inhabitants.

The contemporary trajectory of the entrepreneurial ecosystem underscores that valuable asset, including talent, expertise, information, and funding resources, tend to gravitate towards sizable and well-developed metropolitan areas. The exponential expansion of such metropolitan regions not only attracts Foreign Direct Investments (FDIs) but also fosters knowledge diffusion to neighboring areas, thus catalyzing the growth of emerging start-ups. The North-West region exhibits considerable potential to emerge as a prominent innovation hub in Eastern Europe, particularly given its relatively advanced standing in national comparisons. However, it is imperative to exercise prudence and recognize that the transformation of both the nation and the North-West region is an enduring process that cannot be realized overnight.

Enhancing collaboration among the public and private sectors, as well as engaging various stakeholders within the North-West region, assumes critical importance in fortifying the start-up infrastructure and ecosystem. The interplay between the presence and proliferation of start-ups, Gross Domestic Product (GDP, where higher GDP levels facilitate an increase in the number of start-ups), and unemployment rates suggests that, between the two cities under consideration, the one boasting a higher GDP and lower unemployment rates is likely to witness a surge in the number of start-ups.

Chapter 4 of this book, titled "*Econometric Modeling of the Impact of the Research and Development (R&D) Sector on Economic Growth: A Vector Error Correction Model (VECM) for Romania, the North-West Region, Cluj, and Bihor Counties*," has undertaken a meticulously designed analysis of several pivotal relationships. Specifically, this chapter has explored the associations between total R&D expenditure, the workforce engaged in R&D activities, and the economic growth dynamics across different geographical entities, namely Romania as a whole, the North-West region of Romania, Cluj County, and Bihor County. The analytical framework, underpinned by the

Johansen cointegration test, the VECM model, and Granger causality analysis, has yielded substantial insights.

Upon scrutiny of the descriptive statistics, it becomes apparent that the EXP and EMP variables exhibit negative skewness in the context of Cluj County, while in all other instances (Romania, the North-West region, and Bihor County), these variables display positive skewness. Furthermore, the kurtosis measure, as indicated, generally registers low values across most variables, with the exception of the EXP variable in Bihor County.

The results derived from Chapter 4, forged through the Johansen cointegration test, the VECM model, and Granger causality analysis, offer compelling evidence. They reject the null hypothesis positing the absence of cointegration relationships between variables, instead supporting the alternative hypothesis that implies the presence of at least one cointegration equation between LGDP and LEXP, as well as between LGDP and LEMP, in the Romanian economy, the North-West region, Cluj County, and Bihor County at a 5% significance level.

Numerous hypotheses have been subjected to rigorous testing, including those asserting the existence of long-run equilibriums and unidirectional or bidirectional causal relationships. The results affirm hypotheses H1a, H1b, H3a, and H3b in the context of the relationship between total R&D expenditure, R&D workforce, and economic growth in Romania. In the North-West region, hypotheses H1a, H3a, and H3b have been corroborated, while hypothesis H2b has been partially validated. Concerning Cluj County, hypotheses H2a and H3a have found support, with partial confirmation of hypotheses H1a and H1b. Lastly, in the case of Bihor County, hypotheses H1a and H3a have been upheld, while hypothesis H1b has received partial support.

At the sample level, the findings from Chapter 4 reveal essential relationships. An increase of 1 unit in GDP at the national level in Romania corresponds to a 0.026 unit increase in total R&D expenditure and a 0.127 unit increase in the number of individuals employed in the R&D sector. Short-term causal analyses indicate non-significant coefficients, signaling divergence in the short run.

Additionally, at the regional level, when GDP in Romania's North-West region rises by 1 unit, total R&D expenditure in the same region increases by 0.07 units, while the R&D workforce expands by 0.29 units. Similarly, an

increase of 1 unit in total R&D expenditure in the North-West region results in a substantial 0.97 unit increase in GDP, and a 1-unit augmentation in the R&D workforce contributes to a 0.43 unit surge in GDP.

Furthermore, at the county level, a 1-unit increase in GDP in Cluj County leads to a 0.10 unit increase in local R&D expenditure. In parallel, a 1-unit increment in GDP in Bihor County corresponds to a 0.009 unit increase in Bihor County's R&D expenditure and a 0.029 unit expansion of the R&D workforce.

Throughout this illuminating work, the book has effectively demonstrated the intrinsic utility of the start-up ecosystem within various regions. Beyond its technological and economic implications, this study underscores the broader significance of scrutinizing start-ups, spanning their inception, the cultivation of conducive environments, and strategies for augmenting their innovative prowess. This study also reveals the profound relevance of such research for diverse stakeholders and entities.

For the academic community, this book closes an existing gap in the study of start-ups from a regional perspective, enriching scholarly understanding and knowledge. Moreover, the study carries practical implications, advocating for knowledge exchange, tools, and resources, while emphasizing the importance of synergistic collaborations across sectors. Policymakers, whether at local, regional, or national levels, can leverage the insights provided in this book to foster symbiotic relationships between the business and public sectors, thereby promoting mutual growth and development.

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Annexes

Annex 1

Table A 1. Evolution of "Population with tertiary education" (TE) indicator in Romania's 8 regions (NUTS2), and comparison of maximum and minimum levels, from 2011 to 2019

REGION	TE 2011 relative to EU in 2011	TE in 2013 relative to EU 2011	TE in 2015 relative to EU 2011	TE in 2017 relative to EU 2011	TE in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	38.40	38.40	38.40	53.59	51.48	0.00	0.00	15.19	13.08	53.59	38.40
Centre	43.88	43.88	43.88	43.46	51.90	0.00	0.00	-0.42	8.02	51.90	43.46
North-East	19.83	19.83	19.83	6.33	17.30	0.00	0.00	-13.50	-2.53	19.83	6.33
South-East	13.92	13.92	13.92	23.63	9.70	0.00	0.00	9.70	-4.22	23.63	9.70
South-Muntenia	14.35	14.35	14.35	13.92	6.33	0.00	0.00	-0.42	-8.02	14.35	6.33
Bucharest-Ilfov	140.51	140.51	140.51	143.88	157.81	0.00	0.00	3.38	17.30	157.81	140.51
South-West Oltenia	41.35	41.35	41.35	38.82	30.80	0.00	0.00	-2.53	-10.55	41.35	30.80
West	29.96	29.96	29.96	37.55	43.04	0.00	0.00	7.59	13.08	43.04	29.96
Max. Out of all regions/ max. evolution	140.51	140.51	140.51	143.88	157.81	0.00	0.00	15.19	17.30		
Min. Out of all regions/ min. evolution	13.92	13.92	13.92	6.33	6.33	0.00	0.00	-13.50	-10.55		

Source: 2023 Regional Innovation Scoreboard (2023)

Table A 2. Evolution of "Lifelong learning" indicator (LL) in Romania's 8 regions (NUTS2), and comparison of minimum and maximum levels, from 2011 to 2019

REGION	LL in 2011 relative to EU in 2011	LL in 2013 relative to EU 2011	LL in 2015 relative to EU 2011	LL in 2017 relative to EU 2011	LL in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	12.87	14.85	3.96	6.93	4.95	1.98	-8.91	-5.94	-7.92	14.85	3.96
Centre	5.94	8.91	10.89	4.95	4.95	2.97	4.95	-0.99	-0.99	10.89	4.95
North-East	5.94	12.87	37.62	3.96	4.95	6.93	31.68	-1.98	-0.99	37.62	3.96
South-East	6.93	9.90	11.88	1.98	0.00	2.97	4.95	-4.95	-6.93	11.88	0.00
South-Muntenia	4.95	7.92	13.86	12.87	7.92	2.97	8.91	7.92	2.97	13.86	4.95
Bucharest-Ilfov	12.87	14.85	14.85	9.90	6.93	1.98	1.98	-2.97	-5.94	14.85	6.93
South-West Oltenia	0.99	0.99	4.95	3.96	0.99	0.00	3.96	2.97	0.00	4.95	0.99
West	10.89	8.91	2.97	10.89	4.95	-1.98	-7.92	0.00	-5.94	10.89	2.97
Max. Out of all regions/ max. evolution	12.87	14.85	37.62	12.87	7.92	6.93	31.68	7.92	2.97		
Min. Out of all regions/ min. evolution	0.99	0.99	2.97	1.98	0.00	-1.98	-8.91	-5.94	-7.92		
EU-28 profile in 2019 compared with EU 11				**101.98**							

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 3. Evolution of "Scientific co-publications" (SCP) indicator in Romania's 8 regions (NUTS2), and comparison of minimum and maximum levels, from 2011 to 2019

REGION	SCP in 2011 relative to EU 2011	SCP in 2013 relative to EU 2011	SCP in 2015 relative to EU 2011	SCP in 2017 relative to EU 2011	SCP in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	MAX 2011-2019 for region	MIN 2011-2019 for region
North-West	53.45	59.49	66.37	75.36	80.59	6.04	12.92	21.91	27.13	80.59	53.45
Centre	25.91	24.92	27.37	33.50	49.83	-0.99	1.46	7.59	23.92	49.83	24.92
North-East	39.83	41.52	44.88	51.59	52.85	1.68	5.05	11.76	13.02	52.85	39.83
South-East	19.84	20.53	23.97	26.68	26.06	0.69	4.13	6.85	6.22	26.68	19.84
South-Muntenia	11.77	14.56	15.27	14.79	14.92	2.79	3.50	3.02	3.15	15.27	11.77
Bucharest-Ilfov	87.84	95.60	106.12	115.34	120.54	7.76	18.28	27.50	32.69	120.54	87.84
South-West Oltenia	18.14	22.43	24.31	26.44	29.00	4.29	6.16	8.30	10.86	29.00	18.14
West	37.04	37.74	58.06	58.65	65.65	0.70	21.02	21.61	28.61	65.65	37.04
Max. Out of all regions/max. evolution	87.84	95.60	106.12	115.34	120.54	7.76	21.02	27.50	32.69		
Min. Out of all regions/min. evolution	11.77	14.56	15.27	14.79	14.92	-0.99	1.46	3.02	3.15		
EU-28 profile in 2019 compared with EU 11					**137.24**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 4. Evolution of "Most cited publications" (MCP) indicator in Romania's regions (NUTS2), and comparison of minimum and maximum levels, from 2011 to 2019

REGION	MCP in 2011 relative to EU 2011	MCP in 2013 relative to EU 2011	MCP in 2015 relative to EU 2011	MCP in 2017 relative to EU 2011	MCP in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	44.72	52.22	54.30	49.17	48.34	7.51	9.58	4.45	3.62	54.30	44.72
Centre	9.80	23.14	26.56	39.88	28.47	13.34	16.76	30.07	18.67	39.88	9.80
North-East	37.81	55.83	56.97	44.06	42.97	18.02	19.17	6.25	5.16	56.97	37.81
South-East	7.99	35.84	34.69	33.57	41.64	27.85	26.71	25.59	33.65	41.64	7.99
South-Muntenia	9.18	19.50	74.26	40.29	35.06	10.32	65.08	31.11	25.88	74.26	9.18
Bucharest-Ilfov	36.68	33.75	42.95	41.98	41.41	-2.92	6.27	5.30	4.73	42.95	33.75
South-West Oltenia	69.93	14.04	31.91	40.01	31.36	-55.89	-38.02	-29.92	-38.57	69.93	14.04
West	50.99	45.39	38.62	37.68	55.44	-5.60	-12.37	-13.31	4.45	55.44	37.68
Max. Out of all regions/max. evolution	69.93	55.83	74.26	49.17	55.44	27.85	65.08	31.11	33.65		
Min. Out of all regions/min. evolution	7.99	14.04	26.56	33.57	28.47	-55.89	-38.02	-29.92	-38.57		
EU-28 profile in 2019 compared with EU 11					**105.71**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 5. Evolution of "R&D expenditure public sector" (R&D P) indicator in Romania's 8 regions (NUTS2), and comparison of minimum and maximum values, from 2011 to 2019

REGION	R&D P in 2011 relative to EU 2011	R&D P in 2013 relative to EU 2011	R&D P in 2015 relative to EU 2011	R&D P in 2017 relative to EU 2011	R&D P in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	69.01	53.28	65.37	45.52	45.52	-15.72	-3.64	-23.49	-23.49	69.01	45.52
Centre	25.67	28.07	28.07	23.10	14.04	2.41	2.41	-2.56	-11.63	28.07	14.04
North-East	64.12	51.80	62.85	53.28	45.52	-12.32	-1.27	-10.84	-18.60	64.12	45.52
South-East	25.67	28.07	20.35	17.35	25.67	2.41	-5.32	-8.31	0.00	28.07	17.35
South-Muntenia	17.35	5.81	17.35	10.28	17.35	-11.54	0.00	-7.07	0.00	17.35	5.81
Bucharest-Ilfov	126.33	105.07	100.86	87.19	84.22	-21.26	-25.47	-39.15	-42.11	126.33	84.22
South-West Oltenia	40.33	38.48	25.67	36.57	36.57	-1.84	-14.66	-3.75	-3.75	40.33	25.67
West	50.29	43.84	47.15	38.48	34.59	-6.45	-3.14	-11.80	-15.70	50.29	34.59
Max. Out of all regions/max. evolution	126.33	105.07	100.86	87.19	84.22	2.41	2.41	-2.56	0.00		
Min. Out of all regions/min. evolution	17.35	5.81	17.35	10.28	14.04	-21.26	-25.47	-39.15	-42.11		
EU-28 profile in 2019 compared with EU 11					**102.56**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 6. Evolution of the "R&D expenditure business sector" (R&D B) indicator in Romania's 8 regions (NUTS2), and comparison of minimum and maximum values, from 2011 to 2019

REGION	R&D B in 2011 relative to EU 2011	R&D B in 2013 relative to EU 2011	R&D B in 2015 relative to EU 2011	R&D B in 2017 relative to EU 2011	R&D B in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	18.19	23.39	27.86	21.76	20.03	5.20	9.66	3.57	1.84	27.86	18.19
Centre	14.07	23.39	27.86	41.90	44.83	9.33	13.79	27.83	30.77	44.83	14.07
North-East	16.22	16.22	23.39	16.22	11.69	0.00	7.18	0.00	-4.53	23.39	11.69
South-East	23.39	18.19	5.79	1.62	1.62	-5.20	-17.60	-21.77	-21.77	23.39	1.62
South-Muntenia	46.70	50.27	56.81	47.62	50.27	3.56	10.10	0.91	3.56	56.81	46.70
Bucharest-Ilfov	49.40	51.97	48.51	42.90	64.86	2.57	-0.88	-6.50	15.46	64.86	42.90
South-West Oltenia	18.19	8.99	11.69	5.79	5.79	-9.20	-6.50	-12.40	-12.40	18.19	5.79
West	20.03	8.99	18.19	11.69	50.27	-11.04	-1.84	-8.34	30.23	50.27	8.99
Max. Out of all regions/max. evolution	49.40	51.97	56.81	47.62	64.86	9.33	13.79	27.83	30.77		
Min. Out of all regions/min. evolution	14.07	8.99	5.79	1.62	1.62	-11.04	-17.60	-21.77	-21.77		
EU-28 profile in 2019 compared with EU 11					**107.67**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 7. Evolution of the "Non-R&D innovation expenditures" indicator in Romania's 8 regions (NUTS2), and comparison of minimum and maximum values, from 2011 to 2019

REGION	Non-R&D in 2011 relative to EU 2011	Non-R&D in 2013 relative to EU 2011	Non-R&D in 2015 relative to EU 2011	Non-R&D in 2017 relative to EU 2011	Non-R&D in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	118.06	56.98	45.92	29.10	35.61	-61.08	-72.14	-88.96	-82.45	118.06	29.10
Centre	116.18	73.42	56.85	58.38	36.42	-42.76	-59.33	-57.81	-79.76	116.18	36.42
North-East	95.07	80.81	83.04	42.37	43.05	-14.26	-12.02	-52.70	-52.01	95.07	42.37
South-East	150.50	109.43	105.33	90.38	81.39	-41.07	-45.17	-60.12	-69.11	150.50	81.39
South-Muntenia	138.62	73.23	63.95	56.66	28.21	-65.39	-74.68	-81.96	-110.41	138.62	28.21
Bucharest-Ilfov	95.02	47.75	51.87	53.92	44.89	-47.27	-43.14	-41.10	-50.12	95.02	44.89
South-West Oltenia	113.41	38.12	15.54	16.18	12.72	-75.29	-97.86	-97.23	-100.69	113.41	12.72
West	102.16	58.61	41.20	74.44	35.74	-43.55	-60.97	-27.73	-66.42	102.16	35.74
Max. Out of all regions/max. evolution	150.50	109.43	105.33	90.38	81.39	-14.26	-12.02	-27.73	-50.12		
Min. Out of all regions/min. evolution	95.02	38.12	15.54	16.18	12.72	-75.29	-97.86	-97.23	-110.41		
EU-28 profile in 2019 compared with EU 11					**98.05**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 8. Evolution of the "Private co-publications" indicator (PPI) in Romania's 8 regions (NUTS2), and comparison between minimum and maximum levels, from 2011 to 2019

REGION	PPI in 2011 relative to EU 2011	PPI in 2013 relative to EU 2011	PPI in 2015 relative to EU 2011	PPI in 2015 relative to EU 2011	PPI in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	41.67	34.47	6.25	6.67	15.97	-7.20	-35.42	-35.00	-25.70	41.67	6.25
Centre	57.47	27.86	10.70	12.51	8.81	-29.61	-46.77	-44.96	-48.66	57.47	8.81
North-East	66.65	39.10	15.46	3.96	9.13	-27.54	-51.18	-62.68	-57.52	66.65	3.96
South-East	103.50	53.63	49.93	38.62	29.29	-49.87	-53.58	-64.89	-74.21	103.50	29.29
South-Muntenia	46.50	35.53	13.59	12.87	4.48	-10.97	-32.91	-33.63	-42.02	46.50	4.48
Bucharest-Ilfov	39.94	28.50	11.76	18.16	12.69	-11.44	-28.18	-21.78	-27.25	39.94	11.76
South-West Oltenia	26.82	22.31	0.76	0.00	6.40	-4.51	-26.06	-26.82	-20.42	26.82	0.00
West	35.95	16.92	3.17	5.51	4.48	-19.04	-32.78	-30.44	-31.47	35.95	3.17
Max. Out of all regions/max. evolution	103.50	53.63	49.93	38.62	29.29	-4.51	-26.06	-21.78	-20.42		
Min. Out of all regions/min. evolution	26.82	16.92	0.76	0.00	4.48	-49.87	-53.58	-64.89	-74.21		
EU-28 profile in 2019 compared with EU 11					**100.45**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 9. Evolution of the "Marketing and organizational innovators" (MOI) indicator in Romania's regions (NUTS2), and comparison between minimum and maximum levels, from 2011 to 2019

REGION	MOI in 2011 relative to EU 2011	MOI in 2013 relative to EU 2011	MOI in 2015 relative to EU 2011	MOI in 2017 relative to EU 2011	MOI in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	55.93	57.18	25.66	14.62	27.00	1.24	-30.27	-41.31	-28.94	57.18	14.62
Centre	57.99	47.71	42.92	20.44	9.44	-10.27	-15.07	-37.54	-48.55	57.99	9.44
North-East	98.21	96.83	77.52	28.61	24.46	-1.38	-20.69	-69.59	-73.74	98.21	24.46
South-East	71.25	65.55	76.32	16.95	20.05	-5.70	5.07	-54.30	-51.20	76.32	16.95
South-Muntenia	55.50	62.65	44.15	19.49	3.89	7.16	-11.34	-36.00	-51.61	62.65	3.89
Bucharest-Ilfov	80.70	72.08	36.65	25.25	15.02	-8.62	-44.05	-55.45	-65.68	80.70	15.02
South-West Oltenia	46.02	72.84	47.43	8.13	0.00	26.82	1.41	-37.89	-46.02	72.84	0.00
West	29.13	36.45	30.26	10.75	14.87	7.32	1.14	-18.38	-14.25	36.45	10.75
Max. Out of all regions/max. evolution	98.21	96.83	77.52	28.61	27.00	26.82	5.07	-18.38	-14.25		
Min. Out of all regions/min. evolution	29.13	36.45	25.66	8.13	0.00	-10.27	-44.05	-69.59	-73.74		
EU-28 profile in 2019 compared with EU 11					**90.79**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 10. Evolution of the "SMEs innovating in-house" indicator (IHI) in Romania's 8 regions (NUTS2), and comparison between minimum and maximum levels, from 2011 to 2019

REGION	IHI in 2011 relative to EU 2011	IHI in 2013 relative to EU 2011	IHI in 2015 relative to EU 2011	IHI in 2017 relative to EU 2011	IHI in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	46.24	39.21	5.20	7.29	17.99	-7.04	-41.04	-38.96	-28.26	46.24	5.20
Centre	63.95	31.76	11.48	11.35	10.13	-32.19	-52.48	-52.60	-53.82	63.95	10.13
North-East	74.47	44.42	17.59	4.18	8.86	-30.05	-56.88	-70.29	-65.62	74.47	4.18
South-East	102.85	60.77	53.79	41.49	31.40	-42.08	-49.06	-61.36	-71.45	102.85	31.40
South-Muntenia	47.67	40.40	14.06	13.62	3.85	-7.27	-33.61	-34.05	-43.82	47.67	3.85
Bucharest-Ilfov	41.80	32.48	11.72	19.48	12.35	-9.32	-30.08	-22.32	-29.45	41.80	11.72
South-West Oltenia	27.92	25.51	1.06	0.00	7.40	-2.41	-26.86	-27.92	-20.52	27.92	0.00
West	36.43	19.44	2.91	6.09	4.63	-16.98	-33.51	-30.34	-31.79	36.43	2.91
Max. Out of all regions/max. evolution	102.85	60.77	53.79	41.49	31.40	-2.41	-26.86	-22.32	-20.52		
Min. Out of all regions/min. evolution	27.92	19.44	1.06	0.00	3.85	-42.08	-56.88	-70.29	-71.45		
EU-28 profile in 2019 compared with EU 11					**100.04**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 11. Evolution of the "Innovative SMEs collaborating with others" (ICW0) indicator in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019

REGION	ICW0 in 2011 relative to EU 2011	ICW0 in 2013 relative to EU 2011	ICW0 in 2015 relative to EU 2011	ICW0 in 2017 relative to EU 2011	ICW0 in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	12.41	18.10	6.66	15.78	20.95	5.69	-5.74	3.38	8.54	20.95	6.66
Centre	26.23	15.31	5.97	12.24	3.24	-10.92	-20.26	-13.99	-22.99	26.23	3.24
North-East	26.40	33.94	10.06	1.44	14.21	7.54	-16.34	-24.96	-12.19	33.94	1.44
South-East	18.65	27.18	23.22	17.01	7.87	8.53	4.57	-1.65	-10.78	27.18	7.87
South-Muntenia	13.16	17.85	8.42	13.74	4.23	4.70	-4.74	0.59	-8.93	17.85	4.23
Bucharest-Ilfov	25.06	44.97	10.75	24.44	19.42	19.90	-14.32	-0.62	-5.64	44.97	10.75
South-West Oltenia	0.00	5.65	0.53	1.23	19.91	5.65	0.53	1.23	19.91	19.91	0.00
West	7.65	3.50	0.31	7.79	8.89	-4.15	-7.34	0.13	1.24	8.89	0.31
Max. Out of all regions/max. evolution	26.40	44.97	23.22	24.44	20.95	19.90	4.57	3.38	19.91		
Min. Out of all regions/min. evolution	0.00	3.50	0.31	1.23	3.24	-10.92	-20.26	-24.96	-22.99		
EU-28 profile in 2019 compared with EU 11					**106.26**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 12. Evolution of the "Private co-publications" indicator (PPP) in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019

REGION	PPP in 2011 relative to EU 2011	PPP in 2013 relative to EU 2011	PPP in 2015 relative to EU 2011	PPP in 2017 relative to EU 2011	PPP in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	30.48	27.85	33.23	25.80	18.20	-2.62	2.76	-4.68	-12.27	33.23	18.20
Centre	26.47	27.04	26.62	20.45	27.01	0.58	0.15	-6.01	0.55	27.04	20.45
North-East	32.98	22.32	24.14	17.34	11.46	-10.66	-8.84	-15.64	-21.52	32.98	11.46
South-East	26.79	21.68	16.85	0.00	13.19	-5.10	-9.94	-26.79	-13.60	26.79	0.00
South-Muntenia	24.83	15.59	8.77	17.92	11.90	-9.24	-16.07	-6.91	-12.93	24.83	8.77
Bucharest-Ilfov	102.15	121.98	97.58	89.84	82.97	19.83	-4.56	-12.31	-19.18	121.98	82.97
South-West Oltenia	21.16	32.59	10.80	0.00	0.00	11.43	-10.37	-21.16	-21.16	32.59	0.00
West	38.01	33.19	25.58	16.47	0.00	-4.82	-12.43	-21.54	-38.01	38.01	0.00
Max. Out of all regions/max. evolution	102.15	121.98	97.58	89.84	82.97	19.83	2.76	-4.68	0.55		
Min. Out of all regions/min. evolution	21.16	15.59	8.77	0.00	0.00	-10.66	-16.07	-26.79	-38.01		
EU-28 profile in 2019 compared with EU 11					**104.78**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 13. Evolution of the "EPO patent applications" (PA) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019

REGION	PA in 2011 relative to EU 2011	PA in 2013 relative to EU 2011	PA in 2015 relative to EU 2011	PA in 2017 relative to EU 2011	PA in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	10.27	11.44	15.81	12.39	14.83	1.16	5.53	2.11	4.55	15.81	10.27
Centre	11.24	9.13	13.77	11.87	14.35	-2.12	2.52	0.63	3.11	14.35	9.13
North-East	14.11	15.60	10.65	11.28	11.13	1.49	-3.46	-2.83	-2.98	15.60	10.65
South-East	9.57	9.91	7.76	7.70	10.03	0.34	-1.82	-1.87	0.46	10.03	7.70
South-Muntenia	10.21	11.65	9.42	12.18	13.12	1.44	-0.79	1.98	2.91	13.12	9.42
Bucharest-Ilfov	19.80	16.30	20.85	19.81	19.45	-3.50	1.05	0.01	-0.36	20.85	16.30
South-West Oltenia	9.04	11.44	11.59	16.53	9.69	2.40	2.56	7.49	0.65	16.53	9.04
West	10.21	12.54	13.00	12.23	17.88	2.33	2.79	2.03	7.67	17.88	10.21
Max. Out of all regions/max. evolution	19.80	16.30	20.85	19.81	19.45	2.40	5.53	7.49	7.67		
Min. Out of all regions/min. evolution	9.04	9.13	7.76	7.70	9.69	-3.50	-3.46	-2.83	-2.98		
EU-28 profile in 2019 compared with EU 11					**94.30**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 14. Evolution of the "Trademark applications" (TA) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019

REGION	TA in 2011 relative to EU 2011	TA in 2013 relative to EU 2011	TA in 2015 relative to EU 2011	TA in 2017 relative to EU 2011	TA in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	38.47	34.25	36.08	46.00	46.46	-4.22	-2.39	7.53	7.99	46.46	34.25
Centre	29.75	43.93	32.15	47.21	38.25	14.18	2.40	17.46	8.50	47.21	29.75
North-East	11.17	26.70	23.31	20.52	30.26	15.52	12.13	9.34	19.08	30.26	11.17
South-East	6.84	25.13	9.00	12.32	11.78	18.29	2.17	5.48	4.94	25.13	6.84
South-Muntenia	5.80	10.99	4.70	14.83	18.71	5.19	-1.10	9.02	12.90	18.71	4.70
Bucharest-Ilfov	38.88	90.16	46.88	58.98	72.99	51.29	8.00	20.10	34.12	90.16	38.88
South-West Oltenia	6.19	1.36	16.81	9.11	20.06	-4.83	10.62	2.92	13.86	20.06	1.36
West	17.14	23.96	17.34	29.16	38.02	6.82	0.20	12.02	20.88	38.02	17.14
Max. Out of all regions/max. evolution	38.88	90.16	46.88	58.98	72.99	51.29	12.13	20.10	34.12		
Min. Out of all regions/min. evolution	5.80	1.36	4.70	9.11	11.78	-4.83	-2.39	2.92	4.94		
EU-28 profile in 2019 compared with EU 11					**122.26**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 15. Evolution of the "Design applications" (DA) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019

REGION	DA in 2011 relative to EU 2011	DA in 2013 relative to EU 2011	DA in 2015 relative to EU 2011	DA in 2017 relative to EU 2011	DA in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	27.87	49.50	35.19	79.62	49.80	21.63	7.32	51.76	21.94	79.62	27.87
Centre	19.41	48.27	19.19	21.97	58.88	28.86	-0.22	2.56	39.47	58.88	19.19
North-East	16.33	23.16	20.10	10.73	30.88	6.83	3.77	-5.60	14.56	30.88	10.73
South-East	7.91	11.98	13.24	13.52	6.83	4.07	5.32	5.61	-1.08	13.52	6.83
South-Muntenia	11.28	16.45	18.06	16.61	21.11	5.17	6.78	5.34	9.83	21.11	11.28
Bucharest-Ilfov	35.95	43.41	55.28	37.38	86.37	7.46	19.33	1.43	50.42	86.37	35.95
South-West Oltenia	7.79	11.81	6.36	18.50	14.71	4.03	-1.43	10.71	6.92	18.50	6.36
West	19.25	9.72	32.90	19.42	35.30	-9.53	13.65	0.17	16.05	35.30	9.72
Max. Out of all regions/max. evolution	35.95	49.50	55.28	79.62	86.37	28.86	19.33	51.76	50.42		
Min. Out of all regions/min. evolution	7.79	9.72	6.36	10.73	6.83	-9.53	-1.43	-5.60	-1.08		
EU-28 profile in 2019 compared with EU 11					**96.65**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 16. Evolution of the "High-tech manufacturing" (HTM) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019

REGION	HTM in 2011 relative to EU 2011	HTM in 2013 relative to EU 2011	HTM in 2015 relative to EU 2011	HTM in 2017 relative to EU 2011	HTM in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	19.72	30.67	37.05	68.07	62.60	10.95	17.33	48.35	42.88	68.07	19.72
Centre	50.74	48.00	56.21	101.82	102.74	-2.74	5.47	51.09	52.00	102.74	48.00
North-East	4.21	2.39	9.69	14.25	14.25	-1.82	5.47	10.03	10.03	14.25	2.39
South-East	34.32	29.76	34.96	39.79	52.56	-4.56	0.64	5.47	18.25	52.56	29.76
South-Muntenia	67.16	75.37	81.75	79.02	84.49	8.21	14.60	11.86	17.33	84.49	67.16
Bucharest-Ilfov	100.91	113.68	122.81	136.49	157.47	12.77	21.89	35.58	56.56	157.47	100.91
South-West Oltenia	40.47	40.60	33.33	36.14	37.47	0.13	-7.15	-4.33	-3.00	40.60	33.33
West	113.74	134.67	141.05	183.02	209.47	20.93	27.31	69.28	95.73	209.47	113.74
Max. Out of all regions/max. evolution	113.74	134.67	141.05	183.02	209.47	20.93	27.31	69.28	95.73		
Min. Out of all regions/min. evolution	4.21	2.39	9.69	14.25	14.25	-4.56	-7.15	-4.33	-3.00		
EU-28 profile in 2019 compared with EU 11					**111.86**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 17. Evolution of the "Sales of new-to-market and new-to-firm innovations" (NMI) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019

REGION	NMI in 2011 relative to EU 2011	NMI in 2013 relative to EU 2011	NMI in 2015 relative to EU 2011	NMI in 2017 relative to EU 2011	NMI in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019 for region	Min 2011-2019 for region
North-West	80.71	83.24	13.86	19.51	18.59	2.53	-66.85	-61.20	-62.13	83.24	13.86
Centre	108.40	96.59	28.34	21.14	27.14	-11.81	-80.07	-87.27	-81.27	108.40	21.14
North-East	93.92	78.99	27.96	26.89	33.21	-14.93	-65.96	-67.04	-60.71	93.92	26.89
South-East	105.86	78.50	38.78	54.66	41.14	-27.36	-67.08	-51.20	-64.71	105.86	38.78
South-Muntenia	95.26	107.04	28.31	31.77	21.98	11.78	-66.95	-63.49	-73.28	107.04	21.98
Bucharest-Ilfov	85.94	64.69	33.20	31.80	23.42	-21.24	-52.74	-54.14	-62.52	85.94	23.42
South-West Oltenia	53.65	70.59	0.00	7.16	13.88	16.94	-53.65	-46.49	-39.77	70.59	0.00
West	95.12	51.67	16.26	14.70	14.00	-43.45	-78.86	-80.42	-81.12	95.12	14.00
Max. Out of all regions/max. evolution	108.40	107.04	38.78	54.66	41.14	16.94	-52.74	-46.49	-39.77		
Min. Out of all regions/min. evolution	53.65	51.67	0.00	7.16	13.88	-43.45	-80.07	-87.27	-81.27		
EU-28 profile in 2019 compared with EU 11					**102.06**						

Source: 2019 Regional Innovation Scoreboard (2023)

Table A 18. Evolution of the " Innovation Index" (II) indicator in in Romania's 8 regions (NUTS2), and comparison between minimum and maximum values, from 2011 to 2019

REGION	II in 2011 relative to EU 2011	II in 2013 relative to EU 2011	II in 2015 relative to EU 2011	II in 2017 relative to EU 2011	II in 2019 relative to EU 2011	Evolution in 2013 as opposed to 2011	Evolution in 2015 as opposed to 2011	Evolution in 2017 as opposed to 2011	Evolution in 2019 as opposed to 2011	Max 2011-2019	Min 2011-2019
North-West	40.83	39.02	26.88	29.61	31.06	-1.81	-13.95	-11.21	-9.76	40.83	26.88
Centre	39.40	35.48	24.32	27.15	28.58	-3.92	-15.08	-12.25	-10.82	39.40	24.32
North-East	41.54	38.17	29.74	19.21	22.52	-3.37	-11.80	-22.33	-19.02	41.54	19.21
South-East	42.68	35.72	28.75	23.62	23.14	-6.96	-13.93	-19.06	-19.54	42.68	23.14
South-Muntenia	36.11	33.93	26.23	22.68	19.29	-2.18	-9.89	-13.43	-16.82	36.11	19.29
Bucharest-Ilfov	61.97	60.50	48.38	48.30	54.08	-1.47	-13.59	-13.67	-7.89	61.97	48.30
South-West Oltenia	31.38	26.68	14.63	13.92	14.98	-4.69	-16.75	-17.46	-16.40	31.38	13.92
West	40.01	32.20	26.87	29.30	34.35	-7.81	-13.14	-10.72	-5.67	40.01	26.87
Max. Out of all regions/max. evolution	61.97	60.50	48.38	48.30	54.08	-1.47	-9.89	-10.72	-5.67		
Min. Out of all regions/min. evolution	31.38	26.68	14.63	13.92	14.98	-7.81	-16.75	-22.33	-19.54		
EU-28 profile in 2019 compared with EU 11					**104.71**						

Source: 2019 Regional Innovation Scoreboard (2023)

Annex 2

Table A 19. Differences as regards the quarterly and yearly evolutions of GDP during the 1995-2020 time-period in Romania

Year/Quarter	Q2-Q1	Q3-Q2	Q4-Q3
1995	210.9	586.9	-41.1
1996	342.3	1099.2	36.8
1997	1062.5	2519.9	377.2
1998	1322.0	2675.1	400.7
1999	2902.5	3500.9	1497.9
2000	3510.9	4690.8	2473.2
2001	5802.7	6186.7	3313.9
2002	7809.9	7063.4	4857.8
2003	9047.3	10656.5	5646.7
2004	11114.3	13470.5	8466.8
2005	8621.4	15728.7	9781.9
2006	13955.4	15232.4	11762.8
2007	18349.7	17900.4	19226.8
2008	24039.9	24325.8	14866.1
2009	22929.0	18250.0	19424.2
2010	23711.3	21254.3	12892.6
2011	20494.3	24521.3	11473
2012	26949.7	23820.7	14425.8
2013	26197.3	27201.3	15573.6
2014	27115.3	28243.6	13813.3
2015	22796.9	35196.1	15075.9
2016	31336.4	29707.9	19535.4
2017	31653.2	42280.3	18856.3
2018	39920.5	45703.6	22294.3
2019	44526.7	45117.7	29757.5
2020	7442.7	62146	42856
2021	43791	50432.2	36218
2022	61787.4	56427.2	31386.1
2023	58652.1	57772.1	N/A

Source: Own calculation made by the authors based on information taken from the Romanian National Institute of Statistics (2024)

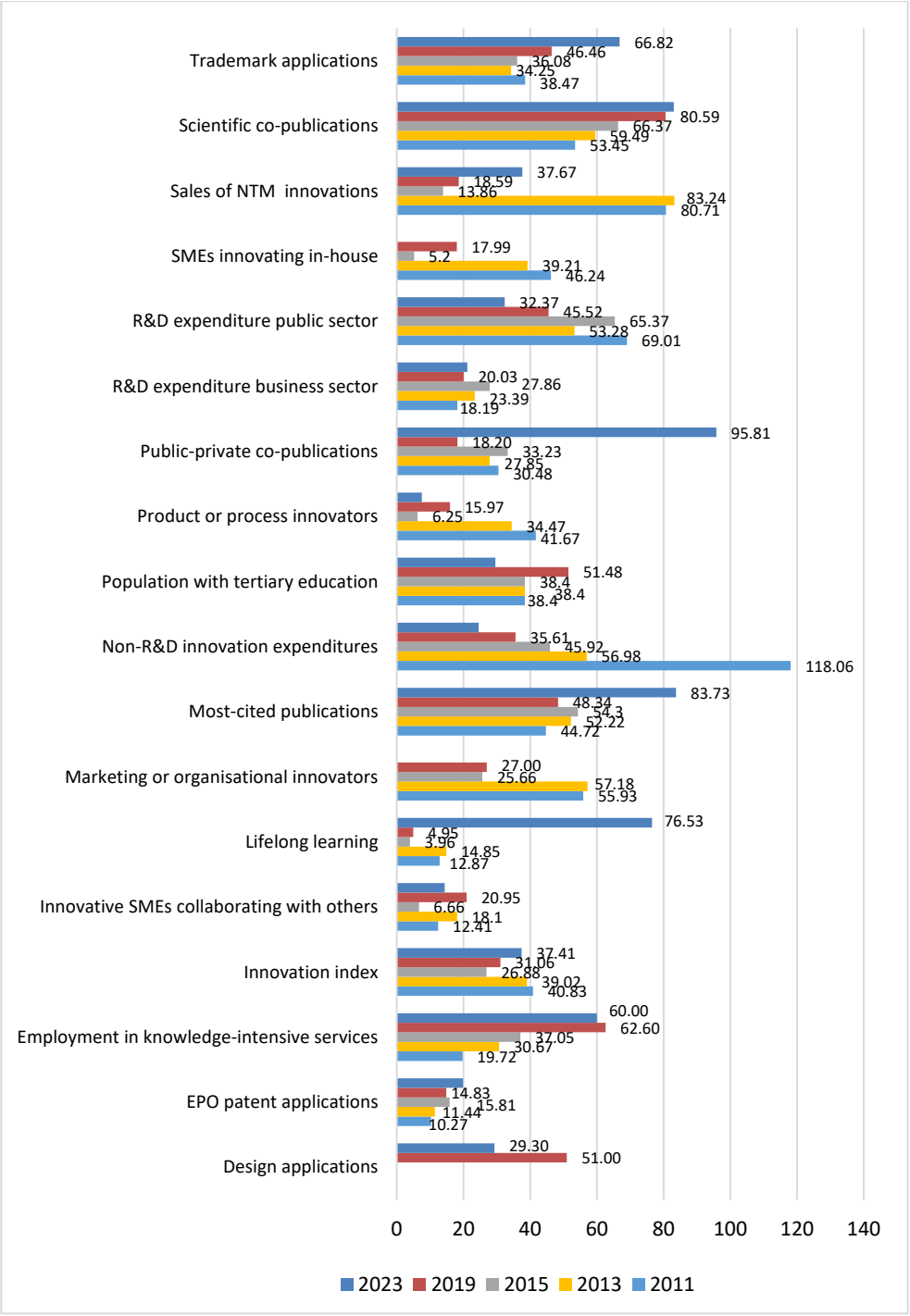

Figure 13. Evolution of the RIS indicators of the North-West region during 2011-2023

Source: Adapted by the author from the Regional Innovation Scoreboard (2023)

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