



Community Embeddedness as the Missing Mechanism of Entrepreneurial Ecosystem Resilience

Arif Efendi^{1*}

***Corresponding Mail:**

arif.bez@universitaskepanjen.ac.id

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Abstract

Regional innovation increasingly depends on the capacity of entrepreneurial ecosystems to absorb and recombine knowledge circulating across organizational and geographical boundaries, yet existing research offers limited explanation of how such mobility produces ecosystem renewal over time. This article develops a middle-range theory addressing this gap by distinguishing knowledge mobility from knowledge spillovers and explaining how mobile knowledge-bearing actors contribute to regional innovation regeneration. Through an integrative synthesis of Knowledge Spillover Theory of Entrepreneurship, entrepreneurial ecosystem theory, absorptive capacity, and evolutionary regional development, the study specifies a sequential mechanism linking knowledge mobility, knowledge recombination, entrepreneurial ecosystem renewal, and regional innovation regeneration, together with five theoretical propositions and key boundary conditions. The framework identifies entrepreneurial ecosystem renewal as the central intermediate mechanism through which mobile knowledge becomes sustained regional transformation, while regional absorptive capacity, cognitive proximity, institutional quality, and ecosystem openness condition this process. The theory shifts attention from static ecosystem configurations and firm-level spillover outcomes toward regenerative ecosystem dynamics and provides a foundation for longitudinal, multilevel, comparative regional, and social network research.

Keywords

knowledge mobility; knowledge recombination; entrepreneurial ecosystem renewal; regional innovation regeneration; knowledge spillover theory of entrepreneurship; regional absorptive capacity

¹ Department of Tourism, Faculty of Economics and Business, Universitas Kepanjen, Malang, Indonesia

1. Introduction

The capacity of regions to sustain long-term competitiveness increasingly depends not only on their ability to generate new knowledge but also on their capability to continuously regenerate their innovation systems. In recent decades, technological disruption, globalization of talent, and intensified interregional competition have accelerated the circulation of knowledge across organizational and geographical boundaries. Consequently, regional innovation is no longer determined solely by local research capacity or industrial specialization but also by the ability of regional actors to attract, absorb, recombine, and commercialize knowledge originating from external sources. This shift has moved scholarly attention from static innovation resources toward dynamic processes of regional renewal, where knowledge circulation becomes a critical driver of sustained entrepreneurial activity and industrial transformation (Balland et al., 2019; Boschma, 2015; Hassink et al., 2019).

Knowledge has become increasingly mobile through the movement of entrepreneurs, scientists, engineers, investors, and skilled professionals who carry not only technical expertise but also routines, social relationships, entrepreneurial experience, and market intelligence across organizations and regions. Unlike localized knowledge accumulation, these mobility processes enable continuous recombination of heterogeneous knowledge, thereby creating opportunities for new venture creation and regional diversification. Previous studies have demonstrated that labor mobility serves as an effective channel for transferring tacit knowledge and facilitating innovation beyond organizational boundaries (Agrawal et al., 2006; Almeida & Kogut, 1999; Breschi & Lissoni, 2009; Song et al., 2003). Nevertheless, despite growing evidence regarding the importance of knowledge mobility, its broader role in renewing entrepreneurial ecosystems remains insufficiently understood.

Parallel to this development, entrepreneurial ecosystem (EE) research has become one of the dominant perspectives for explaining regional entrepreneurial performance. Rather than emphasizing individual firms, the EE perspective conceptualizes entrepreneurship as an outcome emerging from the interaction among institutions, networks, culture, leadership, finance, universities, support organizations, and markets within a regional context (Acs et al., 2017; Spigel, 2017; Stam, 2015; Stam & van de Ven, 2021). Subsequent studies have further portrayed entrepreneurial ecosystems as adaptive and evolving systems whose performance depends on the quality of interactions among ecosystem actors rather than on isolated institutional resources (Roundy et al., 2018; Wurth et al., 2022). This perspective has substantially enriched our understanding of entrepreneurial development; however, much of the literature remains primarily concerned with identifying ecosystem components and performance conditions instead of explaining how ecosystems regenerate following the continuous inflow of external knowledge.

A complementary stream of research has developed around the Knowledge Spillover Theory of Entrepreneurship (KSTE), which argues that entrepreneurial opportunities emerge when knowledge created but not fully commercialized by incumbent organizations spills over to entrepreneurs who exploit it through new venture formation (Acs et al., 2009; D. B. Audretsch & Keilbach, 2008; D. B. Audretsch & Lehmann, 2005). Recent developments have extended this perspective by emphasizing knowledge collaboration, uncertainty, and innovation ecosystems as important contexts for entrepreneurial knowledge exploitation (D. Audretsch et al., 2026; D. B. Audretsch & Belitski, 2021, 2022, 2024). While KSTE effectively explains the origin of entrepreneurial opportunities, it largely focuses on knowledge spillovers rather than the broader dynamics through which knowledge mobility transforms regional entrepreneurial ecosystems over time.

Recent reviews indicate that entrepreneurial ecosystem research and knowledge spillover research have progressed largely in parallel despite sharing similar concerns regarding innovation, entrepreneurship, and regional development (Chaudhary et al., 2024; Hess et al., 2025; Wurth et al., 2022). Entrepreneurial ecosystem studies predominantly emphasize ecosystem structures, institutional configurations, and ecosystem performance, whereas knowledge spillover research concentrates on the mechanisms through which knowledge created in one organization benefits another. Consequently, limited attention has been

devoted to understanding how mobile knowledge continuously reshapes ecosystem relationships, stimulates knowledge recombination, and ultimately generates regional innovation regeneration. This omission becomes increasingly significant because regional competitiveness today depends less on isolated entrepreneurial success and more on the adaptive renewal capacity of entire entrepreneurial ecosystems.

Theoretically, existing perspectives remain insufficient for explaining this regenerative process. Entrepreneurial ecosystem theory provides a comprehensive understanding of ecosystem components but offers limited explanation regarding the mechanisms through which external knowledge continuously renews ecosystem capabilities (Alvedalen & Boschma, 2017; Mack & Mayer, 2016)). Conversely, the Knowledge Spillover Theory of Entrepreneurship explains entrepreneurial opportunity creation through unused knowledge but does not explicitly theorize how knowledge mobility restructures ecosystem interactions at the regional level. Similarly, evolutionary regional development research explains new path creation and regional diversification ((Boschma, 2015; Martin & Sunley, 2006; Tripp et al., 2018)), yet it provides only limited integration with entrepreneurial ecosystem dynamics. As a result, an important theoretical gap persists concerning the mechanism that connects knowledge mobility, ecosystem renewal, and regional innovation regeneration.

This paper addresses this gap by proposing a conceptual theory that positions knowledge mobility as the initiating mechanism of entrepreneurial ecosystem renewal, which subsequently enables regional innovation regeneration. Unlike previous studies that implicitly equate knowledge mobility with knowledge spillovers, this paper argues that mobility represents a broader process involving the movement of individuals, experience, social relationships, routines, and tacit knowledge across organizational and regional boundaries. Through these mobility processes, knowledge is recombined, entrepreneurial networks are renewed, and new opportunity structures emerge, thereby facilitating continuous ecosystem adaptation rather than merely increasing firm-level innovation (D. B. Audretsch & Belitski, 2024; Cuvero et al., 2023).

Accordingly, this paper makes three primary theoretical contributions. First, it extends the Knowledge Spillover Theory of Entrepreneurship by introducing knowledge mobility as a dynamic mechanism underlying entrepreneurial ecosystem renewal. Second, it contributes to entrepreneurial ecosystem theory by shifting the analytical focus from ecosystem structure toward ecosystem regeneration as a continuous evolutionary process. Third, it integrates insights from entrepreneurial ecosystem research, knowledge spillover theory, absorptive capacity, and evolutionary regional development into a middle-range conceptual theory explaining how regional innovation systems regenerate through sustained knowledge mobility. By developing this integrative perspective, the paper seeks to provide a more comprehensive explanation of regional innovation regeneration while offering a foundation for future empirical investigation across different regional contexts.

2. Theoretical Foundations and Integrative Gap

2.1 Knowledge Mobility as the Catalyst of Regional Innovation Regeneration

Knowledge has long been recognized as a strategic resource underpinning innovation and economic growth. Early studies on absorptive capacity argued that organizations differ in their ability to recognize, assimilate, and exploit external knowledge, making learning capabilities essential for innovation performance (Cohen & Levinthal, 1990). Building upon this foundation, research on knowledge spillovers demonstrated that valuable knowledge frequently extends beyond organizational boundaries, benefiting geographically proximate firms through informal interactions, labor mobility, and localized learning processes (Acs et al., 1994; Jaffe et al., 1993). These studies established that knowledge is rarely confined within the organization that creates it, providing an important basis for understanding entrepreneurial opportunity creation.

Subsequent scholarship shifted attention from the existence of knowledge spillovers toward the mechanisms through which knowledge actually travels across organizations and regions.

Labor mobility emerged as one of the most effective channels for transferring tacit knowledge because individuals carry technical expertise, routines, problem-solving capabilities, and social relationships when moving between firms or locations (Almeida & Kogut, 1999; Song et al., 2003). Beyond simple knowledge transfer, mobility enables the recombination of previously disconnected knowledge domains, allowing new combinations of ideas to emerge. Research further demonstrates that both enduring social relationships and previous employment ties continue to facilitate knowledge exchange even after workers relocate, thereby extending the influence of mobility beyond physical movement alone (Agrawal et al., 2006; Corredoira & Rosenkopf, 2010).

Another important advancement concerns the multidimensional nature of proximity. Knowledge transfer is influenced not only by geographical distance but also by cognitive, organizational, institutional, and social proximity among actors (Boschma, 2005). Excessively close relationships may generate knowledge lock-in, whereas excessive distance reduces communication effectiveness. Consequently, knowledge mobility contributes most effectively to innovation when actors maintain sufficient cognitive diversity while retaining enough shared understanding to absorb external knowledge (Nooteboom et al., 2007). Similarly, global pipelines connecting geographically dispersed actors complement localized interactions, enabling regions to combine external knowledge with locally embedded capabilities (Bathelt et al., 2004). These insights suggest that mobility should be viewed as a dynamic mechanism for knowledge recombination rather than merely a vehicle for information transmission.

Although the knowledge spillover literature has substantially advanced understanding of entrepreneurial opportunity creation, it primarily explains how unused or underexploited knowledge becomes commercialized through entrepreneurial activity (Acs et al., 2009; D. B. Audretsch & Keilbach, 2008). Recent extensions emphasize knowledge collaboration, uncertainty, and geographically distributed innovation networks (D. Audretsch et al., 2026; D. B. Audretsch & Belitski, 2022, 2024). However, these developments continue to focus predominantly on entrepreneurial outcomes at the firm or venture level. They provide only limited explanation of how repeated knowledge mobility reshapes ecosystem relationships, renews institutional interactions, and contributes to the long-term regeneration of regional innovation systems. This distinction is particularly important because knowledge mobility involves the movement of people, experiences, capabilities, and networks, whereas knowledge spillovers may occur without any movement of actors. As highlighted in the reference corpus for this study, conflating these two concepts risks obscuring the mechanisms through which ecosystem renewal actually occurs.

2.2 Entrepreneurial Ecosystems as Evolving Systems

The entrepreneurial ecosystem perspective emerged in response to the limitations of firm-centric explanations of entrepreneurship. Rather than attributing entrepreneurial success to isolated individuals or organizations, this perspective argues that entrepreneurial activity is embedded within an interconnected system of institutions, organizations, networks, culture, markets, universities, investors, and policy actors (Stam, 2015). Entrepreneurial outcomes therefore depend not only on the availability of resources but also on the quality of interactions among ecosystem participants that facilitate opportunity recognition, resource mobilization, and knowledge exchange (Spigel, 2017).

Over time, the entrepreneurial ecosystem literature has evolved from identifying ecosystem components toward understanding ecosystem dynamics. Mack & Mayer (2016) conceptualize ecosystems as evolutionary systems that continuously emerge, grow, transform, and decline in response to changing environmental conditions. Similarly, Roundy et al. (2018) argue that entrepreneurial ecosystems resemble complex adaptive systems characterized by nonlinear interactions, feedback loops, and continuous adaptation. More recently, Stam & van de Ven (2021) refined the ecosystem framework by distinguishing between ecosystem conditions, outputs, and outcomes, thereby emphasizing that ecosystem performance emerges through interactions among multiple complementary elements rather than through any single institutional factor.

Despite these theoretical advances, ecosystem research remains primarily concerned with explaining why some ecosystems perform better than others rather than how ecosystems renew themselves over time. Comprehensive reviews consistently observe that ecosystem research continues to prioritize ecosystem structure, measurement, governance, and comparative configurations while paying comparatively less attention to the underlying mechanisms of ecosystem evolution and regeneration (Alvedalen & Boschma, 2017; Brown & Mason, 2017; Leendertse et al., 2022; Wurth et al., 2022). Recent studies have also begun recognizing the multilayered and geographically distributed nature of entrepreneurial ecosystems, suggesting that ecosystem boundaries are increasingly permeable due to intensified knowledge exchange and collaboration across regions ((D. B. Audretsch & Belitski, 2024; Fuentes et al., 2024; Schrijvers et al., 2024). Nevertheless, existing research still lacks a coherent theoretical explanation of how external knowledge mobility systematically contributes to entrepreneurial ecosystem renewal.

2.3 Regional Innovation Regeneration and Evolutionary Path Development

The literature on regional innovation and evolutionary economic geography offers complementary insights into long-term regional transformation. Rather than viewing regional development as a linear accumulation of innovation capacity, this perspective emphasizes path dependence, industrial diversification, resilience, and new path creation (Martin & Sunley, 2006). Regional competitiveness depends on the capacity to adapt existing industrial structures while continuously generating new growth trajectories through knowledge recombination and diversification (Boschma, 2015).

Research on evolutionary regional development further demonstrates that new industrial paths frequently emerge through the attraction and absorption of knowledge originating outside the region (Trippel et al., 2018). External knowledge sources enable regions to diversify technologically while avoiding excessive dependence on existing industries. Likewise, theories of regional diversification emphasize the importance of related variety and knowledge complexity in generating new combinations of technological capabilities (Balland et al., 2019; Boschma et al., 2017). These studies indicate that regional regeneration is fundamentally a knowledge-driven evolutionary process.

However, the evolutionary regional development literature generally treats entrepreneurial activity as one of several regional outcomes rather than as the mechanism through which external knowledge becomes systematically transformed into ecosystem renewal. Consequently, although regional innovation research explains how regions diversify and adapt, it provides limited insight into the entrepreneurial processes that convert mobile knowledge into renewed ecosystem capabilities.

2.4 Integrative Theoretical Gap

Taken together, the three theoretical traditions provide complementary but incomplete explanations of regional innovation regeneration. Knowledge Spillover Theory of Entrepreneurship explains how underutilized knowledge generates entrepreneurial opportunities, yet it pays limited attention to ecosystem renewal mechanisms. Entrepreneurial ecosystem theory explains how regional actors interact to support entrepreneurship but provides only limited theorization of how continuous knowledge mobility transforms ecosystem structures over time. Meanwhile, evolutionary regional development explains regional diversification and resilience but does not explicitly identify the entrepreneurial processes linking external knowledge inflows to ecosystem regeneration.

This fragmentation reveals a significant theoretical opportunity. Rather than treating knowledge mobility as merely another source of innovation, this paper argues that it should be conceptualized as the initiating mechanism that activates knowledge recombination, renews entrepreneurial relationships, reshapes ecosystem interactions, and ultimately regenerates regional innovation systems. Such an integrative perspective directly addresses the conceptual distinction between knowledge mobility and knowledge spillover emphasized in the curated reference corpus while responding to recent calls for more process-oriented,

multilevel, and evolutionary theories of entrepreneurial ecosystems (D. B. Audretsch & Lehmann, 2026; Hess et al., 2025; Rizvi et al., 2025). This integrative gap forms the theoretical foundation for the middle-range theory developed in the following section.

Although previous studies have generated substantial insights into entrepreneurship and regional innovation, their theoretical explanations remain fragmented. The following conceptual positioning illustrates the unresolved integrative gap that motivates the proposed theory.

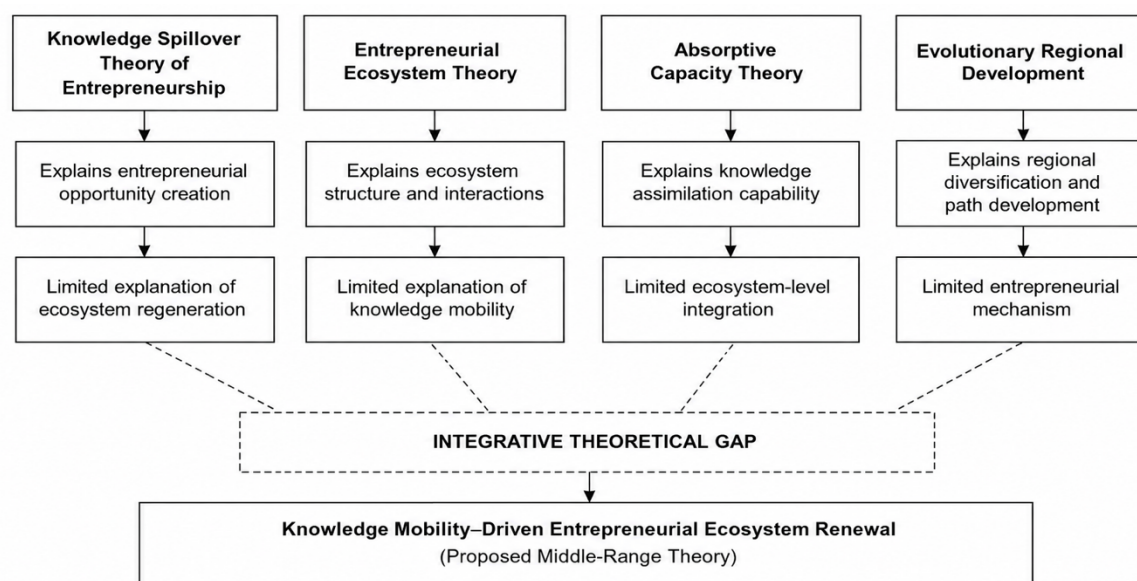


Figure 1. Theoretical Positioning of the Proposed Middle-Range Theory

Source: Developed by the author based on the synthesis of Knowledge Spillover Theory of Entrepreneurship, Entrepreneurial Ecosystem Theory, Absorptive Capacity Theory, and Evolutionary Regional Development literature.

Figure 1 demonstrates that existing theoretical perspectives explain complementary aspects of entrepreneurship, knowledge, and regional innovation but remain insufficiently integrated to explain ecosystem regeneration. The proposed middle-range theory addresses this fragmentation by positioning knowledge mobility as the initiating mechanism that connects knowledge recombination, entrepreneurial ecosystem renewal, and regional innovation regeneration within a unified explanatory framework.

3. Theory Development: Knowledge Mobility as the Mechanism of Entrepreneurial Ecosystem Renewal

3.1 Domain Specification

This paper develops a middle-range theory explaining how knowledge mobility contributes to regional innovation regeneration through the continuous renewal of entrepreneurial ecosystems. The proposed theory is situated at the regional ecosystem level, where entrepreneurial activities emerge from interactions among universities, firms, entrepreneurs, investors, public institutions, intermediaries, and skilled professionals. Accordingly, the primary unit of analysis is not the individual entrepreneur or the single firm but the entrepreneurial ecosystem as a dynamic knowledge system embedded within a regional context.

The domain of this theory differs from both the Knowledge Spillover Theory of Entrepreneurship (KSTE) and conventional entrepreneurial ecosystem research. KSTE primarily explains how uncommercialized knowledge generates entrepreneurial opportunities through spillover processes (Acs et al., 2009; D. B. Audretsch & Keilbach, 2008), whereas entrepreneurial ecosystem research focuses on ecosystem components and framework conditions supporting entrepreneurial activity (Stam, 2015; Stam & van de Ven,

2021). In contrast, the present theory seeks to explain how repeated knowledge mobility continuously reshapes ecosystem relationships, enabling ecosystem renewal and, ultimately, regional innovation regeneration.

The theory is particularly applicable to knowledge-intensive regions characterized by active labor mobility, university-industry collaboration, interregional entrepreneurial interaction, and continuous technological change. It is expected to be less applicable in regions where knowledge exchange is highly restricted, institutional barriers prevent mobility, or entrepreneurial activities remain weakly embedded in regional networks. Consequently, the explanatory power of the theory depends upon the existence of sufficient opportunities for knowledge circulation and organizational learning across ecosystem actors.

3.2 Core Constructs

The proposed theory consists of five interconnected constructs that collectively explain the regenerative dynamics of entrepreneurial ecosystems.

The first construct is knowledge mobility, defined as the movement of knowledge through the mobility of individuals, entrepreneurial experience, professional relationships, organizational routines, and problem-solving capabilities across organizational and regional boundaries. Unlike knowledge spillovers, which may occur without actor movement, knowledge mobility necessarily involves human movement that transfers tacit knowledge together with embedded social capital (Agrawal et al., 2006; Almeida & Kogut, 1999; Breschi & Lissoni, 2009). This distinction is explicitly emphasized in the curated reference corpus used for this article, which identifies knowledge mobility as a broader phenomenon than knowledge spillovers and positions it as the theoretical space for explaining ecosystem renewal.

The second construct is knowledge recombination, referring to the process through which heterogeneous knowledge originating from multiple actors is integrated into novel combinations that generate new technological, organizational, or entrepreneurial possibilities. Rather than merely accumulating external knowledge, ecosystem actors selectively combine diverse knowledge resources according to their absorptive capacity and cognitive proximity (Boschma, 2005; Cohen & Levinthal, 1990; Nooteboom et al., 2007). Knowledge recombination therefore represents the immediate outcome of knowledge mobility rather than knowledge transfer itself.

The third construct is entrepreneurial ecosystem renewal, conceptualized as the continuous adaptation of ecosystem relationships, institutional arrangements, collaborative networks, and entrepreneurial support structures resulting from ongoing knowledge recombination. Existing entrepreneurial ecosystem research generally treats ecosystems as evolving systems (Mack & Mayer, 2016; Roundy et al., 2018), yet it rarely specifies the mechanism responsible for their continuous regeneration. This paper argues that ecosystem renewal occurs because repeated knowledge mobility introduces novel ideas, capabilities, and relationships that gradually reshape the configuration of ecosystem interactions.

The fourth construct is regional absorptive capacity, representing the collective capability of ecosystem actors to recognize, assimilate, and utilize externally generated knowledge. Although absorptive capacity has traditionally been conceptualized at the organizational level (Cohen & Levinthal, 1990), this paper extends the concept to the ecosystem level by arguing that regional learning capacity emerges through the complementary interactions among universities, firms, entrepreneurs, and public institutions. Consequently, knowledge mobility alone cannot regenerate entrepreneurial ecosystems unless ecosystem actors possess sufficient absorptive capacity to transform incoming knowledge into entrepreneurial opportunities.

The final construct is regional innovation regeneration, defined as the sustained renewal of regional innovation capabilities through the emergence of new entrepreneurial activities, industrial diversification, technological recombination, and adaptive regional development. Rather than emphasizing short-term innovation outputs, regeneration captures the long-

term evolutionary capacity of regions to continuously generate new development trajectories (Balland et al., 2019; Boschma, 2015; Trippl et al., 2018). The proposed theory comprises five interrelated constructs that collectively define its conceptual domain. The following construct matrix summarizes their definitions, theoretical roles, and supporting literature.

Table 1. Conceptual Construct Matrix of the Proposed Middle-Range Theory

Construct & Conceptual Definition		Theoretical Role	Key References
Knowledge Mobility	Cross-organizational and cross-regional movement of knowledge embedded in people, professional experience, organizational routines, and relational networks.	Initiating mechanism introducing heterogeneous external knowledge into the regional entrepreneurial ecosystem.	Almeida & Kogut (1999); Agrawal et al. (2006); Breschi & Lissoni (2009)
Knowledge Recombination	Integration of heterogeneous knowledge into novel technological, organizational, and entrepreneurial combinations.	Transformative mechanism converting mobile knowledge into new entrepreneurial capabilities and innovation opportunities.	Cohen & Levinthal (1990); Boschma (2005); Nooteboom et al. (2007)
Entrepreneurial Ecosystem Renewal	Continuous adaptation of ecosystem relationships, institutional arrangements, collaborative networks, and complementary capabilities.	Central mediating mechanism linking knowledge recombination with regional innovation regeneration.	Mack & Mayer (2016); Roundy et al. (2018); Stam & van de Ven (2021)
Regional Absorptive Capacity	Collective capability of regional actors to recognize, assimilate, and utilize externally generated knowledge.	Boundary condition strengthening the transformation of knowledge mobility into knowledge recombination.	Cohen & Levinthal (1990); Audretsch & Belitski (2022)
Regional Innovation Regeneration	Sustained renewal of regional innovation capabilities through entrepreneurial adaptation, industrial diversification, and new development trajectories.	Ultimate theoretical outcome representing long-term regional innovation renewal.	Boschma (2015); Trippl et al. (2018); Balland et al. (2019)

Source: Developed by the author based on the synthesis of the conceptual foundations and literature review.

Table 1 synthesizes the five core constructs underpinning the proposed middle-range theory by integrating their conceptual definitions, theoretical roles, and foundational literature. Rather than functioning as isolated concepts, these constructs collectively explain how knowledge mobility initiates a sequential process of knowledge recombination, entrepreneurial ecosystem renewal, and regional innovation regeneration while clarifying the theoretical boundaries of the proposed framework.

3.3 Mechanism Development

The central proposition of this paper is that knowledge mobility does not directly regenerate regional innovation systems. Instead, its influence unfolds through a multistage mechanism involving knowledge recombination and entrepreneurial ecosystem renewal.

The mechanism begins when entrepreneurs, researchers, engineers, investors, and skilled professionals move across organizations or regions carrying tacit knowledge, professional routines, and relational capital. Because tacit knowledge is difficult to codify, its transfer largely depends on human mobility rather than on formal documentation alone (Almeida & Kogut, 1999; Song et al., 2003). These mobility processes expose ecosystem actors to diverse technological experiences, alternative institutional practices, and broader entrepreneurial perspectives.

However, the arrival of external knowledge does not automatically generate innovation. Ecosystem actors must first recombine incoming knowledge with existing regional capabilities. This recombination process depends on cognitive diversity, complementary expertise, and regional absorptive capacity (Boschma, 2005; Cohen & Levinthal, 1990; Nooteboom et al., 2007). Regions possessing richer institutional diversity and stronger collaborative networks are therefore more capable of transforming knowledge mobility into novel entrepreneurial opportunities.

Repeated knowledge recombination subsequently alters the structure of entrepreneurial ecosystems. New collaborations emerge between universities and firms, experienced entrepreneurs mentor new founders, investors develop broader knowledge networks, and intermediary organizations facilitate additional resource exchanges. These cumulative interactions gradually renew ecosystem relationships rather than simply increasing the number of entrepreneurial firms. In other words, entrepreneurial ecosystem renewal represents a systemic adaptation process driven by continuous inflows of mobile knowledge rather than isolated entrepreneurial success (Roundy et al., 2018; Stam & van de Ven, 2021; Wurth et al., 2022).

As ecosystem renewal accumulates over time, regions become increasingly capable of generating new industrial trajectories, technological diversification, and resilient innovation systems. Rather than reproducing existing industries, renewed ecosystems facilitate the continuous emergence of new entrepreneurial domains and adaptive regional development. This argument aligns with evolutionary regional development research emphasizing new path creation while extending it by identifying entrepreneurial ecosystem renewal as the missing intermediate mechanism connecting knowledge mobility with regional innovation regeneration (Boschma, 2015; Hassink et al., 2019; Trippel et al., 2018).

The proposed theory argues that regional innovation regeneration emerges through a sequential process rather than a direct effect. The following conceptual mechanism summarizes the causal logic developed throughout this section.

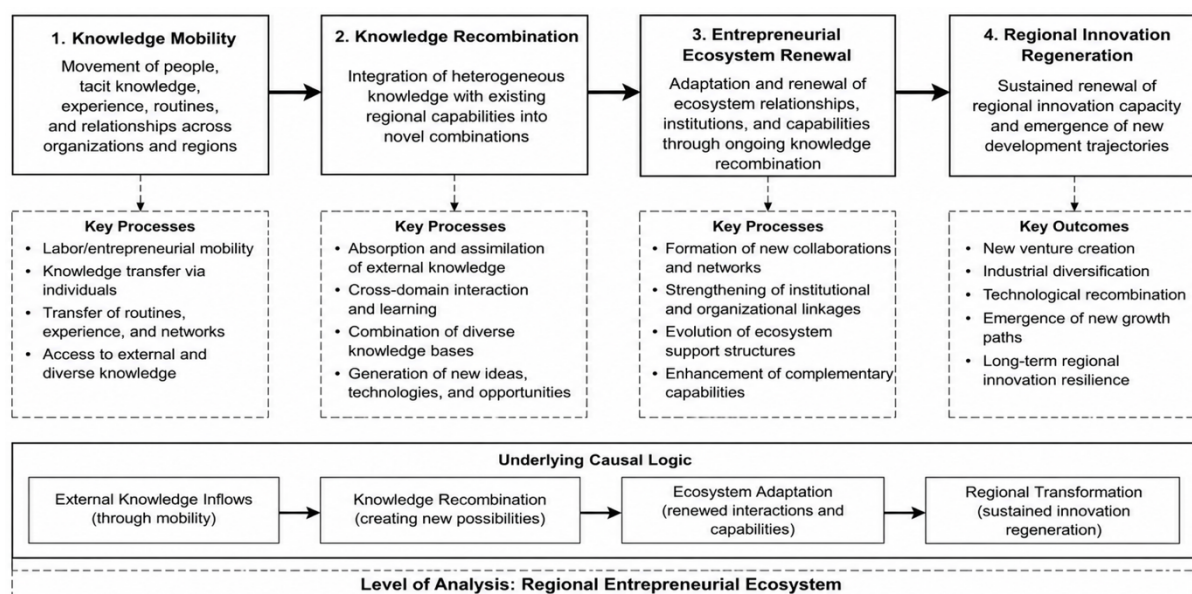


Figure 2. Mechanism of Knowledge Mobility–Driven Entrepreneurial Ecosystem Renewal

Source: Developed by the author based on the proposed middle-range theory.

Figure 2 illustrates the sequential causal mechanism proposed in this study. Knowledge mobility initiates the movement of heterogeneous knowledge resources that are subsequently recombined into new entrepreneurial capabilities. Continuous knowledge recombination renews entrepreneurial ecosystem relationships, which, in turn, enable regional innovation regeneration through sustained adaptation, industrial diversification, and the emergence of new regional development trajectories.

3.4 Boundary Conditions

The proposed mechanism is unlikely to operate uniformly across all regional contexts. Several boundary conditions determine whether knowledge mobility can successfully regenerate entrepreneurial ecosystems.

First, regional absorptive capacity influences the ability of ecosystem actors to recognize and utilize incoming knowledge. Regions possessing stronger research institutions, universities, innovation intermediaries, and collaborative firms are expected to benefit more substantially from knowledge mobility (Cohen & Levinthal, 1990).

Second, cognitive proximity affects knowledge recombination. Ecosystem actors require sufficient cognitive similarity to communicate effectively while maintaining enough diversity to stimulate innovation (Boschma, 2005; Nooteboom et al., 2007). Excessive similarity may create technological lock-in, whereas excessive diversity reduces learning efficiency.

Third, institutional quality shapes the effectiveness of ecosystem renewal. Regions characterized by supportive entrepreneurial policies, effective governance, and collaborative institutional environments provide stronger conditions for transforming mobile knowledge into entrepreneurial opportunities (D. B. Audretsch et al., 2023; Rinkinen et al., 2024).

Finally, ecosystem openness determines the intensity of external knowledge inflows. Entrepreneurial ecosystems that actively engage in global collaboration, university partnerships, and interregional networks are expected to experience stronger regenerative dynamics than relatively closed regional systems (D. B. Audretsch & Belitski, 2024; Cuvero et al., 2023).

3.5 Proposed Middle-Range Theory

Building upon these arguments, this paper advances a new middle-range theory of Knowledge Mobility–Driven Entrepreneurial Ecosystem Renewal. The theory posits that regional innovation regeneration is fundamentally an ecosystem-level evolutionary process initiated by the continuous mobility of knowledge-bearing actors. Unlike existing explanations that emphasize either entrepreneurial opportunities (Knowledge Spillover Theory of Entrepreneurship), ecosystem conditions (Entrepreneurial Ecosystem Theory), or regional diversification (Evolutionary Economic Geography), the proposed theory integrates these perspectives into a unified causal mechanism.

The theory therefore makes two important conceptual advances. First, it explicitly differentiates knowledge mobility from knowledge spillovers, arguing that actor mobility represents the mechanism through which tacit knowledge, relational capital, and entrepreneurial experience become available for ecosystem-wide recombination. Second, it identifies entrepreneurial ecosystem renewal as the previously under-theorized intermediate process linking knowledge mobility with regional innovation regeneration. Consequently, regional competitiveness is understood not merely as the outcome of accumulated knowledge but as the product of continuously renewed ecosystem interactions that enable knowledge recombination, entrepreneurial adaptation, and long-term regional transformation.

4. Propositions and Conceptual Model

The preceding section developed a conceptual mechanism explaining how knowledge mobility contributes to regional innovation regeneration through entrepreneurial ecosystem renewal. In accordance with theory-building research, the conceptual logic is formalized through a set of theoretical propositions. Rather than testing causal relationships empirically, these propositions specify the expected relationships among the core constructs and provide a foundation for future empirical investigation. Collectively, they articulate the proposed middle-range theory by explaining how, why, and under what conditions knowledge mobility facilitates the continuous regeneration of regional innovation systems.

4.1 Knowledge Mobility and Knowledge Recombination

The proposed theory begins by positioning knowledge mobility as the primary source of heterogeneous knowledge entering entrepreneurial ecosystems. Individuals moving across organizations and regions transfer tacit knowledge, technological expertise, entrepreneurial experience, organizational routines, and social relationships that are difficult to codify through formal communication channels (Agrawal et al., 2006; Almeida & Kogut, 1999; Song et al., 2003). Consequently, mobility expands the diversity of knowledge resources available within a regional ecosystem.

However, the value of mobile knowledge does not lie in its transfer alone. Innovation emerges because ecosystem actors combine externally acquired knowledge with locally embedded capabilities. This process of knowledge recombination creates novel technological combinations, entrepreneurial ideas, and collaborative opportunities that would not arise from isolated knowledge sources. Regions characterized by diverse knowledge inflows therefore possess greater opportunities for entrepreneurial experimentation and innovation than regions relying exclusively on endogenous knowledge (Boschma, 2005; Nooteboom et al., 2007; Rosenkopf & Almeida, 2003).

Unlike the traditional Knowledge Spillover Theory of Entrepreneurship, which emphasizes the commercialization of unused knowledge, the present theory argues that mobility creates value primarily by expanding opportunities for continuous knowledge recombination at the ecosystem level. Knowledge mobility therefore represents the initiating mechanism through which entrepreneurial ecosystems acquire new cognitive resources necessary for long-term renewal.

Proposition 1

Greater knowledge mobility within and across regional boundaries increases knowledge recombination by expanding the diversity of knowledge resources, experiences, and relational networks available to entrepreneurial ecosystem actors.

4.2 Knowledge Recombination and Entrepreneurial Ecosystem Renewal

Knowledge recombination is expected to influence entrepreneurial ecosystems not merely through innovation outputs but through the gradual renewal of ecosystem relationships. As diverse knowledge sources are repeatedly integrated, ecosystem actors establish new collaborative ties, develop complementary capabilities, and strengthen institutional interactions among universities, entrepreneurs, investors, established firms, and public organizations.

Entrepreneurial ecosystems evolve because these interactions continuously reshape the regional knowledge structure. Existing collaborations are replaced by new partnerships, entrepreneurial support organizations adapt their functions, investors acquire new technological expertise, and universities become increasingly integrated into entrepreneurial activities. These cumulative adjustments gradually transform ecosystem capabilities beyond the performance of individual firms (Mack & Mayer, 2016; Roundy et al., 2018; Stam & van de Ven, 2021).

Recent entrepreneurial ecosystem research increasingly recognizes ecosystems as adaptive systems characterized by continuous interaction and co-evolution (Fuentes et al., 2024; Wurth et al., 2022). Nevertheless, previous studies rarely specify the mechanism responsible for this adaptive capacity. The proposed theory identifies knowledge recombination as the principal process through which entrepreneurial ecosystem renewal occurs.

Proposition 2

Knowledge recombination positively contributes to entrepreneurial ecosystem renewal by strengthening collaborative relationships, institutional adaptation, and complementary capabilities among ecosystem participants.

4.3 Entrepreneurial Ecosystem Renewal and Regional Innovation Regeneration

Entrepreneurial ecosystem renewal represents the central mediating mechanism of the proposed theory. Rather than assuming that knowledge mobility directly produces regional innovation, the theory argues that regional innovation regeneration occurs only after entrepreneurial ecosystems have successfully renewed their internal relationships and institutional capacities.

Renewed ecosystems generate broader entrepreneurial opportunities through more effective knowledge circulation, stronger collaborative networks, improved resource mobilization, and enhanced institutional coordination. These ecosystem-level improvements facilitate industrial diversification, new venture creation, technological renewal, and the emergence of new regional development paths. Consequently, regional innovation regeneration should be understood as an evolutionary outcome of cumulative ecosystem renewal rather than as an immediate consequence of isolated entrepreneurial activities (Boschma, 2015; Trippl et al., 2018).

This argument extends evolutionary regional development research by explicitly incorporating entrepreneurial ecosystem dynamics into explanations of regional transformation. Instead of treating entrepreneurship merely as an outcome of regional evolution, the proposed theory positions entrepreneurial ecosystem renewal as the mechanism through which regional evolution becomes possible.

Proposition 3

Entrepreneurial ecosystem renewal positively influences regional innovation regeneration by facilitating continuous entrepreneurial adaptation, industrial diversification, and the emergence of new regional development trajectories.

4.4 Boundary Conditions of the Proposed Theory

Although knowledge mobility is expected to stimulate ecosystem renewal, its effectiveness depends upon several contextual conditions that determine whether mobile knowledge can be successfully transformed into entrepreneurial opportunities.

The first boundary condition is regional absorptive capacity. Ecosystem actors differ substantially in their ability to recognize, assimilate, and exploit externally generated knowledge (Cohen & Levinthal, 1990). Regions possessing stronger universities, research organizations, innovation intermediaries, and collaborative firms are therefore expected to convert knowledge mobility into ecosystem renewal more effectively than regions characterized by weak learning capabilities.

The second boundary condition concerns cognitive proximity. While knowledge diversity stimulates innovation, effective learning also requires sufficient shared understanding among collaborating actors. Excessively similar knowledge bases generate technological lock-in, whereas excessive cognitive distance limits communication and learning effectiveness (Boschma, 2005; Nooteboom et al., 2007). Entrepreneurial ecosystem renewal is therefore expected to be strongest under conditions of moderate cognitive proximity.

The third boundary condition is institutional quality. Entrepreneurial ecosystems supported by effective governance, collaborative public institutions, supportive innovation policies, and active university engagement provide more favorable environments for transforming knowledge mobility into entrepreneurial opportunities (D. B. Audretsch et al., 2023; Rinkinen et al., 2024). Institutional quality therefore amplifies the regenerative effects of knowledge mobility.

Finally, ecosystem openness determines the intensity of external knowledge inflows. Entrepreneurial ecosystems actively connected to national and international innovation networks, universities, investors, and entrepreneurial communities possess greater opportunities for acquiring heterogeneous knowledge than relatively isolated regional ecosystems (D. B. Audretsch & Belitski, 2024; Cuvero et al., 2023).

These arguments lead to two moderating propositions.

Proposition 4

Regional absorptive capacity positively moderates the relationship between knowledge mobility and knowledge recombination, such that the relationship becomes stronger in regions with greater collective learning capabilities.

Proposition 5

Institutional quality, cognitive proximity, and ecosystem openness strengthen the positive influence of entrepreneurial ecosystem renewal on regional innovation regeneration.

The proposed mechanism is contingent upon several contextual conditions that shape its explanatory strength. The following conceptual representation summarizes the boundary conditions under which the theory is expected to operate.

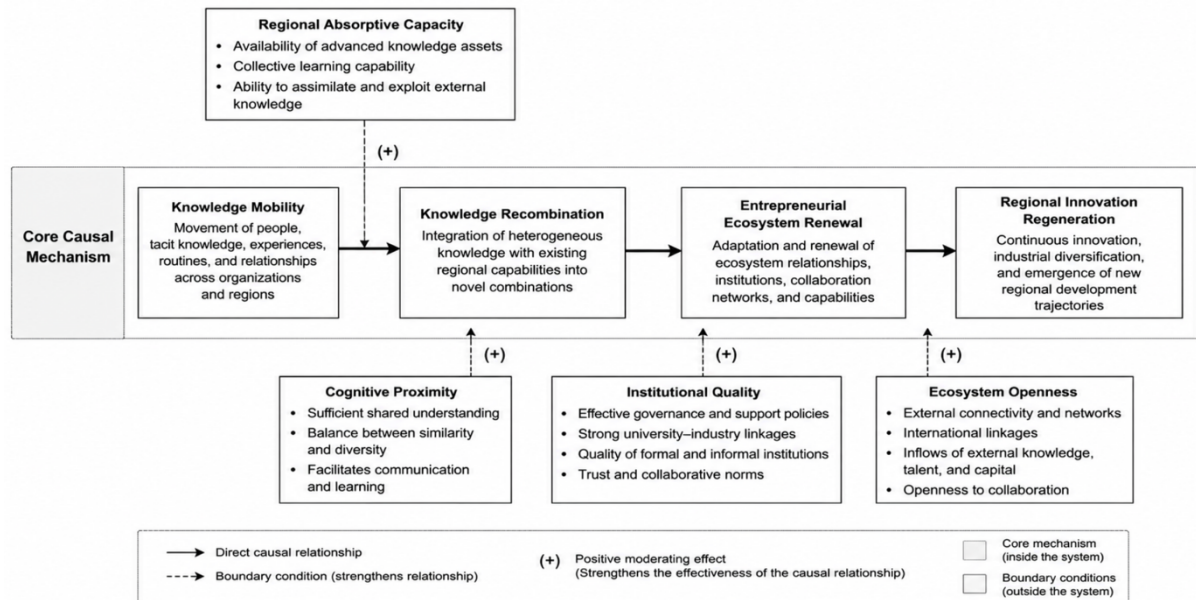


Figure 3. Boundary Conditions of the Proposed Middle-Range Theory

Source: Developed by the author based on the proposed middle-range theory and boundary conditions.

Figure 3 illustrates that the proposed mechanism is context dependent rather than universally applicable. Regional absorptive capacity strengthens the transformation of knowledge mobility into knowledge recombination, whereas cognitive proximity, institutional quality, and ecosystem openness reinforce the subsequent regenerative processes. Together, these boundary conditions define the domain within which the proposed middle-range theory is expected to provide the greatest explanatory power.

The proposed theory is formalized through five interconnected propositions that specify the expected causal relationships, underlying explanatory logic, and theoretical foundations guiding future empirical investigation.

Table 2. Proposition Matrix of the Proposed Middle-Range Theory

	Proposition & Proposed Relationship	Underlying Logic	Supporting Theory
P1	Knowledge Mobility → Knowledge Recombination	The mobility of individuals transfers tacit knowledge, experience, routines, and relational capital, enabling the recombination of heterogeneous knowledge into new entrepreneurial opportunities.	Knowledge Mobility; Knowledge Spillover Theory of Entrepreneurship (KSTE); Absorptive Capacity Theory
P2	Knowledge Recombination → Entrepreneurial Ecosystem Renewal	Recombined knowledge reshapes collaborative relationships, institutional interactions, and complementary capabilities, driving continuous ecosystem adaptation and renewal.	Entrepreneurial Ecosystem Theory; Complex Adaptive Systems

	Proposition & Proposed Relationship	Underlying Logic	Supporting Theory
P3	Entrepreneurial Ecosystem Renewal → Regional Innovation Regeneration	Renewed entrepreneurial ecosystems foster sustained entrepreneurial adaptation, industrial diversification, and the emergence of new regional development trajectories.	Evolutionary Regional Development; Entrepreneurial Ecosystem Theory
P4	Regional Absorptive Capacity moderates P1	Stronger regional learning capability enhances the transformation of mobile knowledge into knowledge recombination.	Absorptive Capacity Theory
P5	Institutional Quality, Cognitive Proximity, and Ecosystem Openness strengthen P3	Favorable institutional and ecosystem conditions reinforce the regenerative influence of entrepreneurial ecosystem renewal on regional innovation regeneration.	Proximity Theory; Entrepreneurial Ecosystem Theory

Source: Developed by the author based on the proposed middle-range theory and theoretical propositions developed in this study.

Table 2 consolidates the formal propositions underpinning the proposed middle-range theory by linking each causal relationship with its explanatory logic and theoretical foundation. Together, these propositions describe how knowledge mobility initiates a sequential regenerative process while clarifying the contextual conditions under which the proposed mechanism is expected to operate, thereby providing a coherent platform for future empirical validation across diverse regional entrepreneurial ecosystems.

The five propositions collectively constitute the formal representation of the proposed middle-range theory. Unlike prior studies that separately examine knowledge spillovers, entrepreneurial ecosystems, or regional diversification, the present framework integrates these perspectives into a coherent causal explanation of how regional innovation regeneration emerges through continuous knowledge mobility. The model therefore provides a theoretically grounded platform for future empirical research employing longitudinal, multilevel, comparative regional, or social network approaches to examine the regenerative dynamics of entrepreneurial ecosystems.

5. Discussion

5.1 Theoretical Implications

This study contributes to entrepreneurship and regional innovation literature by advancing a middle-range theory that explains how knowledge mobility drives regional innovation regeneration through entrepreneurial ecosystem renewal. While previous studies have extensively examined knowledge spillovers, entrepreneurial ecosystems, and regional innovation systems independently, the proposed theory integrates these streams into a coherent explanatory mechanism. Rather than treating entrepreneurial ecosystems as static regional attributes or viewing knowledge spillovers merely as sources of entrepreneurial opportunity, this study conceptualizes ecosystem renewal as a dynamic process continuously activated by the mobility and recombination of knowledge.

The first theoretical contribution extends the Knowledge Spillover Theory of Entrepreneurship (KSTE). Since its inception, KSTE has argued that entrepreneurial opportunities emerge when knowledge generated by incumbent organizations is commercialized by entrepreneurs through spillover processes ((Acs et al., 2009; D. B. Audretsch & Keilbach, 2008). Subsequent developments have expanded this perspective by emphasizing institutional contexts, uncertainty, and collaborative knowledge networks (D. B. Audretsch & Belitski, 2021, 2022; D. B. Audretsch & Lehmann, 2026). Nevertheless, KSTE continues to emphasize entrepreneurial opportunity creation at the firm level. The present

study extends this theoretical tradition by demonstrating that the long-term significance of knowledge lies not only in generating new ventures but also in continuously regenerating entrepreneurial ecosystems that sustain regional innovation over time.

More importantly, this paper distinguishes knowledge mobility from knowledge spillover, a distinction explicitly emphasized within the curated reference corpus used in this study. While knowledge spillovers refer to the diffusion of knowledge beyond organizational boundaries, they do not necessarily require the movement of individuals. In contrast, knowledge mobility involves the transfer of tacit knowledge, experience, routines, professional relationships, and entrepreneurial capabilities through the movement of people across organizations and regions. Consequently, knowledge mobility represents a broader and more dynamic mechanism through which entrepreneurial ecosystems continuously acquire new cognitive resources. This conceptual clarification addresses an important ambiguity within existing entrepreneurship literature and provides a more precise explanation of ecosystem regeneration.

The second contribution enriches entrepreneurial ecosystem theory. Existing ecosystem research has substantially improved understanding of ecosystem components, institutional arrangements, ecosystem governance, and entrepreneurial support conditions (Spigel, 2017; Stam & van de Ven, 2021; Wurth et al., 2022). However, much of this literature remains primarily structural, focusing on identifying ecosystem elements associated with successful entrepreneurial outcomes. Comparatively less attention has been devoted to explaining the mechanisms through which ecosystems continuously evolve following repeated inflows of external knowledge. The present theory addresses this limitation by identifying knowledge recombination as the mechanism that transforms knowledge mobility into entrepreneurial ecosystem renewal. Ecosystems are therefore conceptualized not as stable institutional configurations but as continuously adapting knowledge systems shaped by repeated interactions among mobile knowledge actors.

The third contribution advances the literature on regional innovation and evolutionary economic geography. Evolutionary approaches have convincingly demonstrated that regional competitiveness depends upon path diversification, resilience, and new industrial path creation (Boschma, 2015; Hassink et al., 2019; Trippel et al., 2018). However, existing explanations typically emphasize industrial evolution and regional diversification while providing limited theoretical attention to entrepreneurial ecosystem dynamics. By introducing entrepreneurial ecosystem renewal as the intermediate mechanism linking knowledge mobility to regional innovation regeneration, this paper provides a more comprehensive explanation of how regions continuously renew their innovation capabilities through entrepreneurial adaptation rather than solely through industrial restructuring.

Collectively, these theoretical contributions establish a new explanatory framework connecting four complementary theoretical traditions: Knowledge Spillover Theory of Entrepreneurship, Absorptive Capacity Theory, Entrepreneurial Ecosystem Theory, and Evolutionary Regional Development. Instead of replacing these theories, the proposed middle-range theory demonstrates how their respective explanatory strengths can be integrated into a unified mechanism describing the regeneration of regional innovation systems.

The discussion demonstrates that the proposed theory contributes beyond integrating existing perspectives. Its scholarly value lies in introducing new conceptual distinctions, explanatory mechanisms, and a coherent middle-range theoretical framework.

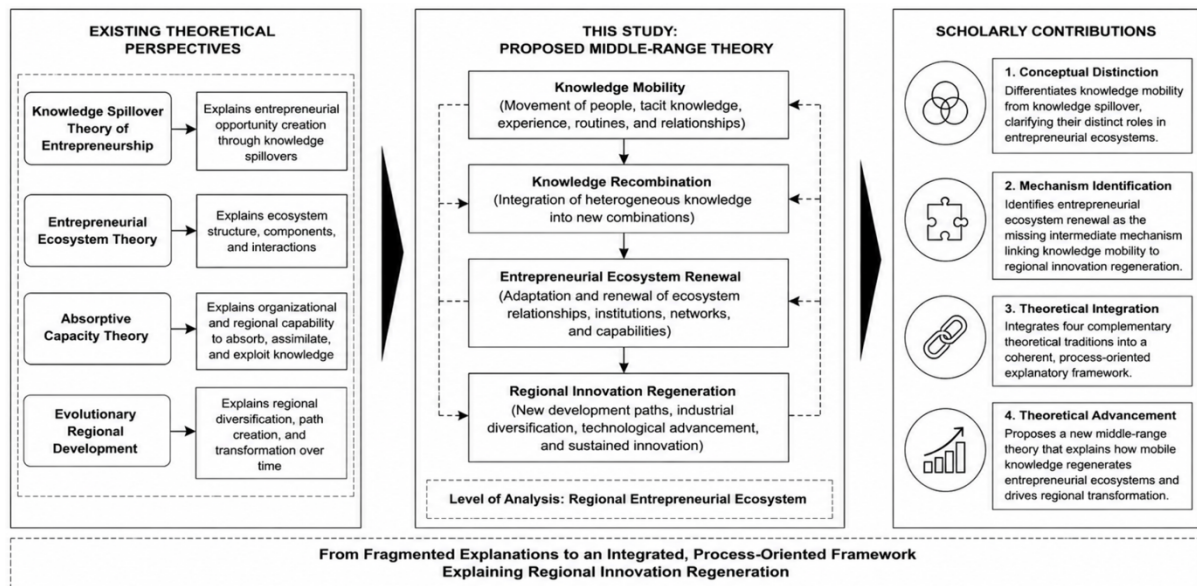


Figure 4. Scholarly Contribution of the Proposed Middle-Range Theory

Source: Developed by the author based on the theoretical synthesis and contributions proposes.

Figure 4 synthesizes the principal scholarly contributions of this study. Rather than replacing existing theories, the proposed middle-range theory integrates their complementary strengths into a unified explanatory framework. By distinguishing knowledge mobility from knowledge spillover and identifying entrepreneurial ecosystem renewal as the missing mechanism, the framework provides a more comprehensive explanation of regional innovation regeneration and establishes a foundation for future theory development and empirical research.

The proposed middle-range theory contributes to multiple streams of entrepreneurship and regional innovation research. The following matrix summarizes how the study extends existing theoretical perspectives and advances current knowledge.

Table 3. Theoretical Contributions and Advancements of the Proposed Middle-Range Theory

Existing Literature	Key Limitation	Contribution of This Study	Theoretical Advancement
Knowledge Spillover Theory of Entrepreneurship (KSTE)	Explains entrepreneurial opportunity creation but provides limited explanation of ecosystem-level regeneration.	Distinguishes knowledge mobility from knowledge spillover and positions mobility as the initiating mechanism of ecosystem renewal.	Extends KSTE from firm-level opportunity creation to ecosystem-level regeneration.
Entrepreneurial Ecosystem Theory	Primarily emphasizes ecosystem components, structures, and performance.	Identifies entrepreneurial ecosystem renewal as a dynamic regenerative mechanism driven by knowledge recombination.	Shifts ecosystem research from structural analysis toward process-oriented explanation.
Evolutionary Regional Development	Explains regional diversification but under-theorizes entrepreneurial mechanisms.	Introduces entrepreneurial ecosystem renewal as the missing link connecting external knowledge inflows with regional innovation regeneration.	Integrates entrepreneurial dynamics into regional evolutionary processes.

Existing Literature	Key Limitation	Contribution of This Study	Theoretical Advancement
Regional Innovation Literature	Explains innovation outcomes without a unified regenerative mechanism.	Develops a sequential mechanism linking Knowledge Mobility → Knowledge Recombination → Entrepreneurial Ecosystem Renewal → Regional Innovation Regeneration.	Proposes a coherent middle-range theory explaining sustained regional innovation regeneration.

Source: Developed by the author based on the theoretical synthesis and scholarly contributions proposes.

Table 3 synthesizes the principal scholarly contributions of the proposed middle-range theory by explicitly comparing existing theoretical perspectives with the conceptual advances introduced in this study. Rather than replacing prior theories, the framework integrates their complementary strengths while addressing previously unresolved explanatory gaps, thereby providing a more comprehensive process-oriented explanation of regional innovation regeneration through entrepreneurial ecosystem renewal.

5.2 Managerial Implications

The proposed theory also offers important implications for practitioners responsible for strengthening regional innovation ecosystems. The conceptual model suggests that regional competitiveness depends not merely on increasing research expenditures or encouraging entrepreneurial start-ups but on facilitating continuous knowledge mobility across organizational and geographical boundaries. Regional policymakers, universities, innovation agencies, and business associations should therefore regard the mobility of entrepreneurs, researchers, engineers, and skilled professionals as strategic assets that contribute to long-term ecosystem renewal rather than simply to labor market dynamics.

For universities, the theory emphasizes that their contribution extends beyond knowledge production. Universities function as knowledge circulation hubs by facilitating researcher mobility, collaborative research, technology commercialization, entrepreneurial education, and university-industry partnerships. Policies encouraging researcher exchanges, entrepreneurial fellowships, industrial placements, and interdisciplinary collaboration may therefore generate broader ecosystem renewal than conventional technology transfer activities alone (Rinkinen et al., 2024; Wagner et al., 2021).

Similarly, regional governments should prioritize policies that enhance ecosystem openness rather than focusing exclusively on attracting external investment. Programs supporting entrepreneurial migration, innovation networks, business accelerators, collaborative research platforms, and international partnerships can strengthen the circulation and recombination of knowledge across ecosystem actors. Such policies are expected to improve regional adaptive capacity and facilitate continuous innovation regeneration.

5.3 Policy Implications

The proposed theory has several implications for innovation and regional development policy. Traditional regional innovation policies frequently emphasize infrastructure development, research funding, and industrial specialization. Although these interventions remain important, they often assume that innovation capacity primarily depends upon localized resource accumulation (Tödtling & Trippl, 2005). The present study suggests that innovation policies should instead promote continuous knowledge circulation across regional boundaries.

First, regional innovation policy should support mechanisms facilitating knowledge mobility, including researcher exchange programs, entrepreneurial migration, cross-regional innovation partnerships, industrial internships, and university-industry mobility schemes. Such initiatives expand opportunities for knowledge recombination while reducing regional technological lock-in.

Second, policy interventions should strengthen regional absorptive capacity by investing in universities, innovation intermediaries, entrepreneurial education, and collaborative institutions capable of integrating externally generated knowledge into regional innovation systems. The effectiveness of knowledge mobility ultimately depends upon the collective learning capability of regional actors.

Finally, policymakers should recognize that ecosystem regeneration is a long-term evolutionary process rather than a short-term innovation outcome. Evaluating regional innovation solely through indicators such as patent counts or start-up formation may underestimate the importance of ecosystem adaptation. Complementary indicators reflecting knowledge mobility, collaborative network development, ecosystem connectivity, and institutional learning may provide more appropriate measures of regional innovation regeneration.

5.4 Limitations and Future Research Directions

Several limitations provide opportunities for future theoretical refinement and empirical investigation. First, the proposed framework is conceptual and therefore has not yet been empirically validated. Future studies should examine the proposed propositions using longitudinal regional datasets, multilevel analyses, comparative case studies, or social network approaches capable of capturing knowledge mobility over time.

Second, the theory assumes relatively active entrepreneurial ecosystems characterized by substantial knowledge circulation. Future research should investigate whether the proposed mechanism operates similarly in peripheral regions, developing economies, or institutionally constrained ecosystems where mobility opportunities remain limited.

Third, although the theory incorporates regional absorptive capacity, institutional quality, cognitive proximity, and ecosystem openness as boundary conditions, additional contextual factors may influence ecosystem regeneration. Digital entrepreneurial ecosystems, artificial intelligence, remote collaboration technologies, sustainability transitions, and geographically distributed entrepreneurial ecosystems represent promising directions for extending the proposed theory (D. B. Audretsch & Belitski, 2024; Hess et al., 2025; Leal et al., 2025).

Finally, future empirical research may examine whether different forms of knowledge mobility: including labor mobility, entrepreneurial migration, university-industry exchanges, investor mobility, and international talent circulation, generate distinct pathways of entrepreneurial ecosystem renewal. Investigating these heterogeneous mechanisms would further refine the explanatory power of the proposed middle-range theory while contributing to a deeper understanding of regional innovation regeneration.

6. Conclusion

This study set out to address a fundamental yet underexplored question in the entrepreneurship and regional innovation literature: how does knowledge mobility contribute to regional innovation regeneration through entrepreneurial ecosystem dynamics? Although previous studies have separately advanced the Knowledge Spillover Theory of Entrepreneurship (KSTE), entrepreneurial ecosystem theory, absorptive capacity, and evolutionary regional development, these perspectives have remained insufficiently integrated to explain the mechanisms through which the continuous movement of knowledge-bearing actors reshapes regional innovation systems over time. Responding to this theoretical fragmentation, this paper developed a middle-range conceptual theory that positions knowledge mobility as the initiating mechanism of entrepreneurial ecosystem renewal, ultimately enabling regional innovation regeneration.

The primary novelty of this study lies in its explicit differentiation between knowledge mobility and knowledge spillover. Whereas existing research has frequently treated these concepts interchangeably, this paper argues that knowledge mobility constitutes a broader

and more dynamic process involving the movement of individuals, tacit knowledge, professional relationships, organizational routines, and entrepreneurial experience across organizational and regional boundaries. This distinction provides an important conceptual refinement because it redirects scholarly attention from knowledge diffusion alone toward the regenerative processes through which entrepreneurial ecosystems continuously acquire, recombine, and transform external knowledge into new developmental trajectories.

Building on this conceptual distinction, the proposed framework advances current knowledge in several ways. First, it extends the Knowledge Spillover Theory of Entrepreneurship beyond venture creation by demonstrating that the long-term significance of knowledge mobility lies in its capacity to renew entrepreneurial ecosystems rather than merely generate entrepreneurial opportunities. Second, it enriches entrepreneurial ecosystem theory by shifting the analytical focus from ecosystem structures and components toward ecosystem renewal as an ongoing evolutionary process driven by knowledge recombination. Third, it contributes to evolutionary regional development by identifying entrepreneurial ecosystem renewal as the missing intermediate mechanism linking external knowledge inflows with regional innovation regeneration. Through the integration of these complementary theoretical traditions, the study offers a coherent explanatory model and a set of theoretically grounded propositions that provide a foundation for future empirical research.

Beyond its theoretical contributions, the proposed framework carries important managerial and policy implications. Regional governments, universities, innovation agencies, and entrepreneurial support organizations should recognize that sustainable regional competitiveness depends not only on generating new knowledge but also on facilitating the continuous mobility, recombination, and circulation of knowledge across ecosystem actors. Policies promoting talent mobility, university–industry collaboration, cross-regional partnerships, and ecosystem openness are therefore likely to strengthen the adaptive capacity and long-term resilience of regional innovation systems.

Several limitations should nevertheless be acknowledged. As a conceptual study, the proposed theory has not yet been empirically validated, and the causal relationships remain theoretically inferred rather than statistically tested. Furthermore, the framework has been developed primarily for knowledge-intensive entrepreneurial ecosystems and may require refinement when applied to peripheral regions, emerging economies, or institutional environments characterized by limited knowledge circulation. Future research should therefore empirically examine the proposed propositions using longitudinal, multilevel, comparative regional, and social network approaches while also exploring heterogeneous forms of knowledge mobility, such as entrepreneurial migration, university–industry exchanges, investor mobility, and digital knowledge networks. Additional studies may further investigate how emerging phenomena: including artificial intelligence, digitally connected entrepreneurial ecosystems, sustainability transitions, and geographically unbounded innovation ecosystems, reshape the regenerative mechanisms proposed in this paper.

In conclusion, this study advances a process-oriented perspective on regional innovation by demonstrating that the regenerative capacity of entrepreneurial ecosystems depends not simply on the existence of knowledge, but on the continuous mobility, recombination, and institutional integration of that knowledge across regional actors. By conceptualizing entrepreneurial ecosystem renewal as the critical mechanism linking knowledge mobility with regional innovation regeneration, the proposed middle-range theory provides a robust foundation for future scholarship while offering a new lens through which researchers, policymakers, and practitioners can better understand and foster sustainable regional innovation in increasingly dynamic and interconnected economies.

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