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# Economic Reconversion and New Path Creation in Peripheral Mining Regions: Proposing a Theoretical Framework

# Reconversão Económica e a Criação de Novas Trajetórias em Regiões Periféricas de Mineração: Propondo um Enquadramento Teórico

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## Abstract

Several regions around the world face the challenge of renewing their economies when the usual growth trajectory begins to weaken. In territories where a particular economic activity predominates - a lock-in, as in the case of mining regions it is considered essential to define new trajectories that allow for economic diversification following the closure of extraction activities. These regions are at a critical juncture to plan for future diversification. This article seeks, based on the literature of evolutionary economic geography (EEG), to expand the understanding of the relationship between mining in peripheral areas and regional diversification, highlighting the role of regional actors in creating new trajectories, whether related to mining or not. The search for a path creation model that considers social, environmental, and economic aspects is becoming increasingly important, both for civil society and for initiatives from national, international, and regulatory bodies. As such, the discussion about path development has gained significant prominence in political agendas and civil dialogues. The article presents a theoretical framework that cyclically integrates the creation of new trajectories, influenced by the actions of local agents, who also contribute to strengthening territorial resilience.

*Keywords:* evolutionary economic geography (EEG), mining, agency, path creation, resilience.

*JEL classifications:* O10, O13, B52, R11, D85, R12

**Resumo**

Regiões em todo o mundo enfrentam o desafio de renovar as suas economias quando a trajetória de crescimento habitual começa a enfraquecer. Nos territórios onde predomina uma determinada atividade económica - um *lock-in*, como é o caso de regiões mineiras é considerado fundamental definir novas trajetórias que permitam a diversificação económica após o encerramento das atividades de extração. Estas regiões estão perante um momento determinante para planear a diversificação futura. Este artigo tem como objetivo, a partir da literatura da geografia económica evolutiva (GEE), ampliar o entendimento sobre a temática que relaciona a mineração, em áreas periféricas, com a diversificação regional, destacando o papel dos atores regionais na criação de novas trajetórias, considerando recursos relacionados, ou não, com a mineração. A busca por um modelo de criação de trajetórias que leve em consideração os aspetos sociais, ambientais e económicos torna-se cada vez mais crucial, quer por parte da sociedade civil, quer por iniciativas de órgãos nacionais, internacionais e reguladores. Nesse sentido, a discussão sobre o desenvolvimento de novas trajetórias tem vindo a ganhar um espaço cada vez maior nas agendas políticas e nos diálogos no contexto da sociedade civil Apresentamos, assim, um quadro teórico que integra, de forma cíclica, a criação de novas trajetórias, influenciada pela atuação dos agentes locais, os quais também contribuem para fortalecer a resiliência territorial.

*Palavras-chave:* geografia económica evolutiva (GEE), mineração, agência, criação de trajetórias, resiliência.

*Código JEL:* O10, O13, B52, R11, D85, R12

## 1. INTRODUCTION

The transformation of mining towns and (former) mining areas remain a constant topic of discussion, as shifts in these territories—such as fluctuations in the global commodities market or the depletion of mineral resources—can rapidly turn a once-prosperous region into one in decline. The successful transition of mono-dependent resource communities toward a socioeconomically diversified, sustainable, and resilient model of development has thus become a critical concern for many mining areas (Breul & Atienza, 2022), particularly for the most vulnerable—cities reliant on unique industrial resources (Hayter, 2005).

Several studies highlight that peripheral regions rich in natural resources are significant contributors to global wealth. However, these regions often become highly dependent on their resources and are subject to the cyclical nature of commodity markets, experiencing both boom-and-bust periods (McElroy, 2018; Stihl, 2022), making them especially vulnerable during economic downturns. In resource-dependent regions, economic diversification has been widely recognized as a key strategy for reducing vulnerability and mitigating market fluctuations (Lashitew et al., 2020; Stihl, 2022). The literature on developing new pathways for regional industries (Carvalho & Vale, 2018; Grillitsch & Asheim, 2018; Grillitsch & Sotarauta, 2020) explores various approaches to achieving this transformation.

Despite the valuable insights provided by the literature on Evolutionary Economic Geography (EEG) regarding the creation of new industrial trajectories, this article emphasizes the need to understand how peripheral mining-based regions can address the challenges of economic reconversion through regional diversification. This process involves leveraging existing surplus resources, whether related or unrelated to mining activities, and recognizing the crucial role of both internal and external agents (Benner, 2022; Sotarauta & Suvinen, 2018).

Rooted in the EEG framework, this article builds on the literature which explores the development of industrial trajectories and asserts that contingent historical events can trigger transformative changes that drive development (Martin & Sunley, 2006). However, these changes occur within pre-existing institutional routines and industrial structures (Boschma & Frenken, 2006).

Regional structures can be modified through both related and unrelated diversification (Boschma et al., 2017; Montenegro et al., 2024), the introduction of new trajectories (Hassink et al., 2019), and a combination of internal and external regional approaches facilitated by actor-networks (Grillitsch

& Asheim, 2018). Additionally, different types of agencies (Grillitsch & Sotarauta, 2020) and the renewal of pre-existing economic structures (Chaminade et al., 2019; Hansen & Coenen, 2015) play a role in this transformation. By fostering new economic trajectories, regions can establish legitimacy through the active engagement of regional and non-regional actors. These actors participate in initiatives that leverage natural resources, infrastructure, and other regional assets, ultimately shaping innovative perspectives and expectations (Heiberg et al., 2020; Uyarra & Flanagan, 2022).

This article aims to propose a theoretical framework that outlines a sustainable, cyclical, and long-term model for fostering new development trajectories in peripheral regions, with a particular focus on mining. The goal is to support the restructuring and/or enhancement of regional resilience while guiding socio-economic reconfiguration by integrating the roles and actions of both local and non-local actors. Beyond this introduction, the article is structured as follows: Section 2 provides a literature review of key theoretical studies on EEG for the understanding of economic reconversion. Section 3 introduces the topic of economic reconversion in mining territories. The presentation and discussion of the theoretical framework is presented in the Section 4. Finally, Section 5 presents some reflections on the model's contribution to future research.

## 2. THEORETHICAL CONSIDERATIONS

### 2.1 The development of new trajectories in peripheral regions

The concept of periphery (or peripheral regions) has been explored by Vale et al. (2024) within the fields of Economic Geography, Urban and Regional Studies, and Development Studies (Eder, 2019; Massey, 1979; Smith et al., 2002; Willis, 2011). According to these authors, the periphery is understood as an expression of inequality and difference in relation to the core (major center). However, its application has varied widely across studies.

Vale et al. (2024) suggest that the specific relationships between the core and the periphery can be analyzed through factors such as access to political decision-making, international dependence, and cultural structure. Additionally, economic lag must be considered as a key dimension of peripheral conditions (Horner & Carmody, 2019; Pike et al., 2018).

However, as Vale et al. (2024) argue, the dichotomous core-periphery framework can obscure important sub-national differences, leading to misconceptions about territorial contexts. In other words, assessing economic transition possibilities by simply comparing dynamic urban centers and rural areas can be misleading. The periphery is often characterized by lower economic density and limited industrial diversification. In this sense, recent studies, such as that by Nilsen et al. (2023), advocate for a more nuanced perspective on peripheral regions and their resilience capacity, taking into account the diverse actors involved and their power dynamics.

Given this reality, the concept of the periphery remains linked to structural disadvantages compared to major centers, particularly in terms of access to resources necessary for the creation of sustainable long-term trajectories. However, an alternative perspective is offered by Grabher (2018:1785), who argues that the core and periphery are relationally and functionally interdependent. From this viewpoint, peripheral development depends—on the role of regional actors and their positions within broader and multiple types of networks (Bathelt & Glückler, 2011; Glückler et al., 2023; Hansen & Coenen, 2015; Yeung, 2021).

From this perspective, the periphery is not a fixed condition, whether in geographical or economic terms. Instead, its configuration is shaped by social, political, and economic interactions among different regions and their actors. A more nuanced concept of the periphery allows for a flexible understanding of dependence on local resources one that is subject to change over time and can be reconstructed through the formation of new connections and relationships among various agents (Vale et al., 2024).

The EEG literature suggests that both industrial and peripheral regions can achieve economic development by adopting new strategies—either by diversifying or branching out their activities or by leveraging existing knowledge. While some studies indicate that regional branching processes can impose limitations on certain actors (Binz et al., 2016; Hassink et al., 2019; MacKinnon et al., 2019; Uyarra & Flanagan, 2022), this broader discussion underscores the importance of examining

how regional conditions influence the development of new trajectories and long-term economic evolution (Boschma & Frenken, 2011; Hassink et al., 2019; Neffke et al., 2011).

Some scholars (Content & Frenken, 2016; Frenken & Boschma, 2007) explain regional development as a process driven by economic diversification, wherein new activities emerge from prior practices within a given territory. In this view, regional growth results from firms restructuring old practices, leading to new opportunities and an expanded range of products. However, studies caution that related diversification may lead to path exhaustion due to competition for critical resources, such as skilled labor. In such cases, investing in unrelated diversification, as suggested by Grillitsch et al. (2018), may offer greater advantages.

The debate is expanding beyond the renewal of trajectories through related diversification to include perspectives on extension, importation, and the creation of entirely new trajectories (Asheim, 2019; Isaksen et al., 2019). Establishing links with external actors—accessing extra-regional sources—can be crucial in this process, as it enables the integration of regional and international knowledge networks to foster entrepreneurial innovation (Tödtling & Grillitsch, 2015). This is particularly relevant for peripheral regions, which often have limited innovative firms and organizations engaged in knowledge creation and support (Martin & Martin, 2023).

For peripheral regions, where resource availability is often constrained, Carvalho & Vale (2018) highlight the importance of integrating various actors and their resources to create new relational and institutional environments. They emphasize that structural change is not driven solely by technological advancements but also by the establishment of institutional and market relationships (Content & Frenken, 2016).

In this context, the EEG literature contributes to differentiating and categorizing various types of industrial path development (Grillitsch et al., 2018; Isaksen, 2015; Martin & Sunley, 2006; Tödtling & Trippl, 2013). However, Isaksen et al. (2019) demonstrate that productive restructuring can be shaped by different types of agencies connected to various regions, identifying key trajectories such as extension, updating, diversification, and creation (Grillitsch et al., 2018; Neffke et al., 2011).

As explained by Isaksen (2015, p.587), "incremental innovations in products and processes within the existing industry and along dominant technological trajectories" may constitute a trajectory of extension. In this context, highly specialized areas serve as sources of learning, fostering knowledge exchange among actors within a specific field and reinforcing industrial development along established paths (Isaksen et al., 2019).

According to these authors, the updating of trajectories occurs through "major intra-trajectory changes, i.e. transitions from an existing regional industrial trajectory to a new direction" (Grillitsch et al., 2018, p.15). This transformation depends on the capabilities of firms and regional industries to drive economic diversification. Ultimately, the creation of entirely new trajectories arises from the combination of regional competencies and related or unrelated knowledge—whether sourced locally or externally. While the development of new trajectories represents an opportunity for economic advancement, it requires a careful assessment of the assets, resources, and competencies available in the region.

Diversification serves as a strategy to prevent regional stagnation by reducing over-concentration in specific activities and ensuring long-term competitiveness (Grillitsch et al., 2018). However, for this process to be effective, it must be driven by entrepreneurs committed to fostering innovation and enhancing regional competitiveness. Their efforts can, in turn, attract new entrepreneurs and stimulate the emergence of new industries and specializations, further reinforcing regional economic resilience.

## 2.2. The role of agency in new path creation

The concept of agency has recently gained prominence in Evolutionary Economic Geography (EEG) and innovation studies (Boschma et al., 2017; Frangenheim et al., 2019; Martin & Sunley, 2015; Strambach & Halkier, 2013). Building on the seminal work of Emirbayer & Mische (1998), recent contributions on agency emphasize the importance of considering not only past and present conditions but also future ideas and visions (Grillitsch & Sotarauta, 2020; Sotarauta & Suvinen, 2018; Steen, 2016).

Agency, rooted in intentional human action, has both intended and unintended consequences and plays a critical role in shaping regional development (Grillitsch et al., 2022). It can be exercised by

strong actors (e.g., innovative entrepreneurs) or weak actors (e.g., institutional entrepreneurs), though a combination of both is often required for successful path transformation (Hassink et al., 2019; Trippl et al., 2020).

However, not all agents possess the same capacity or power to influence outcomes through their actions; agency depends on an agent's position within society. Organizations, as institutionalized structures, do not inherently produce intentional, purposeful, and meaningful actions—these are initiated by individuals.

Traditionally, EEG literature has not extensively considered actors beyond firms in the development of new trajectories, such as universities and research institutes (Isaksen & Trippl, 2017; Subtil et al., 2023; Vallance, 2016), political actors, and the State (Dawley et al., 2015). However, Hassink et al. (2019) highlight the importance of analysing path development through four key pillars: multi-actor engagement, a multi-scalar perspective, expectations and future visions, and the interrelationships between different trajectories.

The multi-actor pillar emphasizes activities beyond the mere recombination of firm-level knowledge, shedding light on the complexity of how new industrial trajectories emerge and evolve over time. According to the authors, analysing multi-actor engagement broadens the role of agency in creating new trajectories, encompassing not just those actors who develop new ideas and products, but also other key industry participants (suppliers, collaborators, competitors, etc.), as well as actors from the public sector, research institutions, and potential customers (Simmie, 2012; Trippl et al., 2018).

The multi-scalar vision pillar, as proposed by Hassink et al. (2019), allows for an assessment of the importance of exogenous factors, particularly non-local flows of knowledge and innovative firms (Dawley, 2014; Dawley et al., 2015; Isaksen & Trippl, 2017; Varis et al., 2014), which are considered essential for the emergence of new trajectories. The authors stress the impact of institutional, national, and supranational environments—such as policies and regulations—on the economic reconfiguration of peripheral regions.

In line with the third pillar—expectations, visions, and conventions—Hassink et al. (2019) argue that agencies, seen as intertemporal actors engaged in continuous innovation activities, shape not only the past but also the future through their expectations and visions. This shift means that individual agents no longer develop isolated expectations but instead create shared ones within the collective, facilitating the emergence of new trajectories (Coenen et al., 2010).

Finally, the relationship between trajectories, the fourth pillar, underscores the interdependencies between multiple established trajectories, between established and emerging trajectories, and among different emerging trajectories. Empirical studies in EEG have shown how recombining existing knowledge and competencies from old trajectories with new ones can lead to economic diversification.

Recent research, such as that by Grillitsch & Sotarauta (2020), explores the interaction between path-dependent structures and the creation of opportunity spaces through agencies. These processes, influenced by agency, take into account not only past developments but also future perceptions to shape trajectories of regional development. The authors suggest that these opportunity spaces can generate regional advantages by fostering the conditions necessary for innovative entrepreneurship (Asheim et al., 2011; Tödtling et al., 2013).

The significance of understanding the role of agency in the creation of new trajectories, from a temporal and dynamic perspective, leads Grillitsch & Sotarauta (2020) to highlight the participation of different actors over time within a networked framework. This approach considers both regional and extra-regional social relations, the specific characteristics of each location, as well as the institutional integration of actors at regional, national, and global levels (MacKinnon et al., 2019; Sotarauta, 2016; Sotarauta et al., 2021; Sotarauta & Pulkkinen, 2011).

Despite the specific opportunity space an agent may create, establishing a more direct connection between structure and agency, it is crucial to consider regional conditions as they shape the encounters and experiences of agents, ultimately influencing the formation of agent-specific opportunity spaces. The region-specific opportunity space acknowledges that structural barriers and opportunities for generating new growth paths vary across regions (Grillitsch et al., 2018; Grillitsch & Asheim, 2018) due to factors such as industry structure, institutional configurations, and regional support for innovation and entrepreneurship systems.

Moreover, recent EEG-based studies have broadened the scope of actors considered in regional development. These include existing local actors, new entrants, and external actors—often with differing transformative potentials—whose presence or absence can lead to varying regional strategic directions. Neffke et al. (2018) argue that actor behavior is closely linked to the strengthening of regional industrial structures, which play a key role in shaping regional strategies. In this context, actors from outside the region can be associated with an expanded opportunity space (Neffke et al., 2018). This expanded space is essential for developing strategies that deviate from established regional trajectories and foster change. In light of this, the authors propose moving beyond conventional analytical frameworks and suggest that the creation of new trajectories relies on three core elements: Schumpeterian entrepreneurship, institutional entrepreneurship, and local leadership. These elements represent fundamentally different forms of transformative agency and together form a holistic, integrative structure known as the trinity of change agency, which is crucial for driving the creation of new trajectories in regional development.

Within this framework, some agents engage in both innovative entrepreneurship and locally-based leadership, contributing to outcomes even if the consequences are sometimes unintended. Conversely, some locally-based leaders (e.g., politicians or regional policymakers) may not directly introduce innovations but still influence regional development. A summary of the characteristics of the trinity of change agency is presented in Table 1.

**Table 1 - Fundamental types: Trinity of change agency**

| Type | Main feature |
|---|---|
| Innovative entrepreneurship | Driving force for change |
| Institutional entrepreneurship | Power that shapes rules and regions so that innovative entrepreneurs can emerge and succeed |
| Local leadership | People who truly influence others and guide the work of interactive development |

*Source:* Adapted from Grillitsch & Sotarauta (2020).

According to Grillitsch & Sotarauta (2020), the performance of agency should be studied with an understanding of its complexity and long-term evolutionary processes, along with the occurrence of structural change (Sotarauta & Suvinen, 2018). The authors emphasize that change does not occur abruptly; instead, it unfolds as a continuous process, with new transformations emerging within established structures, systems, and related institutions. In this context, local leadership plays a crucial role in managing conflicting discourses and visions about the region's future. It also facilitates relationships with actors across various governance levels, creating the conditions for entrepreneurs to drive the regional growth agenda.

Ultimately, agency and its regional performance enable the development of new trajectories by fostering arrangements of knowledge, technology, and social interactions. However, within this framework, it is important to highlight the role of regional resilience, which is directly linked to the structure of the actor network within the territory.

## 2.3 Regional resilience and new path creation

The concept of regional resilience has been explored by EEG researchers in light of significant global uncertainties, such as pandemics, wars, environmental crises, and other socio-economic factors that generate specific shocks. These shocks are handled differently depending on each region’s structure and capacity (Kurikka & Grillitsch, 2021). Some regions are able to recover and thrive after such shocks, while others remain locked in negative developmental trajectories. In general, these shocks can lead to lasting changes in regional development paths.

The concept of resilience is widely discussed across various disciplines, but it generally refers to a system’s ability to absorb shocks and return to a state of equilibrium. Table 2 summarizes three different approaches to the interpretation and/or definition of the term "resilience," compiled by Martin & Sunley (2015) from studies in other fields.

**Table 2 - Multiple perspectives about Resilience**

| Type of Resilience | Main interest |
|---|---|
| Engineering (sciences - physics) | Capacity of a system to return to or resume its assumed-stable balance or configuration after a shock or disturbance. The focus is over the resistance to shocks and stability close to equilibrium. (Fingleton et al., 2012; Holling, 1973; Martin & Sunley, 2015; Rose, 2004) |
| Ecological (ecologic sciences) | The scale of shock or perturbation that a system can undergo before becoming unstable and it is moved to another state or stable. The focus is on the behavior 'way from the balance' of the system (hysteresis[1]). (Martin & Sunley, 2015; Reggiani et al., 2002; Swanstrom, 2008; Zolli & Healy, 2012) |
| Adaptive or evolutionary (theory of complex adaptive systems) | The capacity of a system to undergo anticipatory or reactionary reorganization of form and/or function in order to minimize the impact of a destabilizing shock. The focus is on the system's adaptive capacity. (Martin, 2010; Martin & Sunley, 2006, 2015) |

*Source:* Based on Martin & Sunley (2015).

Boschma (2015) highlights that the literature on resilience examines the vulnerability of regions to the negative effects of specific shocks. He argues that specialized regions are less exposed to sectoral shocks due to the dominance of a primary industry in their economies. However, if these regions experience sudden changes in the dominant sector, significant damage to the regional economy is more likely to occur.

In contrast, Boschma (2015) points out that regions with a diverse range of economic activities are more susceptible to being impacted by a shock in a specific sector because of the broad variety of industries within their territory. Despite this, the likelihood that a shock will negatively affect the local economy is lower in diversified regions. As such, industrial diversity in a region helps reduce risks and facilitates better adaptation to sector-specific shocks (Davies & Tonts, 2010; Desrochers & Leppälä, 2011; Dissart, 2003; Essletzbichler, 2007).

In this context, resilience is closely linked to the concepts of related and unrelated varieties. It is associated with the type of region—specialized regions have a lower propensity to develop new trajectories due to their reliance on a single economic sector, even if other industries have emerged around it (Boschma, 2015). Consequently, regions characterized by specialization offer limited options for regional recombination, as there is minimal related variety among knowledge domains, and thus fewer opportunities for renewal and diversification.

Boschma (2015) notes that regions characterized by unrelated diversity may face risks due to the complexity of knowledge combinations, which can lead to high costs and failures caused by a lack of local support. In such cases, unrelated diversification is more likely to fail (Quatraro, 2010; Saviotti & Frenken, 2008). However, authors such as Boschma et al. (2013); Essletzbichler (2013); Neffke et al. (2011), and Neffke et al. (2018) argue that investing in unrelated activities can still be beneficial for increasing regional diversity.

Grabher (1993), in defining resilience within the context of a region's ability to foster new forms of growth, draws on an evolutionary approach by distinguishing between adaptation and adaptability. While adaptation refers to changes within established trajectories, adaptability involves the emergence of new trajectories, or deviations from existing ones. However, research by Neffke et al. (2011) and Kogler et al. (2013) suggests that pre-existing resources and capabilities often influence the development of new growth paths in regions, as these resources are repurposed and combined in innovative ways.

Pinto & Pereira (2014) propose understanding resilience from an evolutionary perspective, emphasizing the ability to adapt to both internal and external changes within a specific institutional context. Systems face various impacts, but the presence of territorial resilience characteristics

[1] The concept of 'hysteresis' originates from physics, where it refers to the elasticity threshold of an object (such as a spring) and its ability to return to its original state after being subjected to varying weights. In economics, hysteresis is used to describe the long-term effects of recessive shocks, particularly how significant recessions can lead to a permanent increase in the natural unemployment rate of an economy, or the level of unemployment that does not accelerate inflation (Martin, 2012).

enables the system to recover. In this sense, overcoming obstacles is achieved through the creation of new paths, leveraging the capacities developed by the system, rather than simply returning to the previous stability before the shock.

Thus, the concept of evolutionary resilience pertains to the equilibrium condition of the system, represented by an adaptive trajectory that indicates when the system has recovered from the shock. However, Pinto & Pereira (2014) argue that the quality of this recovery should be considered when analysing resilience, as relying solely on past trajectories may not suffice in the face of future uncertainties. Maintaining the previous state can, in fact, hinder the future evolution of the system. Pinto (2018) also highlights that the evolutionary economic approach to resilience has become as important as theories supporting long-term development, underlining the importance of a region's capacity to effectively deal with short-term impacts.

Returning to Boschma's studies (2015), he argues that specialized regions exhibit a combination of high adaptation and low adaptability when it comes to creating new growth trajectories. This dynamic is driven by their limited potential for recombination, which can result in a negative lock-in. To address this challenge and foster the development of new growth paths, Boschma suggests that these regions can leverage available and underutilized local resources and skills to diversify into related activities. Furthermore, establishing connections with industries and technologies from other regions can provide these regions with related resources, which can then be combined with their existing knowledge and experience (Boschma & Capone, 2014), thus promoting the upgrading or diversification of trajectories (Isaksen et al., 2019).

Boschma (2015) also sees regions as what Lawson (1999) terms 'sets of competencies emerging from social interaction' (p. 157), wherein regional actors form knowledge networks through relationships with local and external actors (Antonelli, 2000; Huggins & Thompson, 2013). Research by Simmie & Martin (2010) and Bristow & Healy (2013) demonstrates that the characteristic of regional resilience is influenced by the network structures within a region, particularly from the perspective of knowledge networks.

Boschma (2015) asserts that both internal and external structures of a region's knowledge networks play a key role in enhancing regional resilience, as they influence the region's sensitivity to shocks. Some network structures are more vulnerable to the removal of a link or node, while others are better equipped to develop new growth trajectories. In this context, certain network structures can facilitate more disruptive changes in the economic environment of a region. For example, network partners who establish close relationships across various dimensions contribute to high regional adaptability. This type of network promotes the presence of a strong interconnected core and a high degree of proximity among participants (e.g., cognitive and social proximity), leading to better control and efficiency in transmitting and coordinating information, while reducing the risk of opportunistic behavior. However, the disadvantage of such a local network is its low adaptability, which can result in limited opportunities for recombination and make the region vulnerable to negative impacts (Crespo et al., 2014).

Additionally, Boschma (2015) points out that the typical network state in which adaptation hampers adaptability is especially found in specialized regions, where local connectivity becomes so entrenched that fundamental renewal is not part of the entrepreneurial mindset and is even resisted by local network actors (Boschma & Frenken, 2011; Grabher, 1993). In these cases, an excess of cognitive proximity among local network partners can further entrench the region in a particular productive specialization, preventing the adoption of new growth paths (Herrigel, 1990, as cited in Boschma, 2015, p. 739).

In specialized regions, the ability to diversify into new directions is often constrained by the region's industrial structure (Boschma & Lambooy, 1999; Hassink, 2005; Martin & Sunley, 2006). While the specialized knowledge characteristic of these regions enables further innovations within their established trajectories, it also limits opportunities for diversification beyond their current development path. The costs associated with shifting to new paths may deter the region from pursuing diversification. The literature on economic diversification and resilience suggests that regions with industrial specialization are generally less equipped to cope with impacts and substantial changes arising from macro-level shifts, such as technological advances, legal regulations, and international market dynamics. Boschma (2015) clarifies that the more a region specializes, the more its institutional structure becomes tailored to the specific needs of the local industries. In specialized regions, gradual adjustments to local institutions are often easier to

accommodate due to path stabilization. However, this adaptation process can hinder the region's adaptability, as it may prevent the development of new institutions to support emerging industries. Consequently, regions may fall into institutional lock-in, where the institutional structure is entirely focused on supporting the needs of a few dominant industries.

A different approach to analysing the resilience of a territory posits that vulnerability is linked to sensitivity to a shock (Ferrão et all, 2023; Ferreira & Marques, 2024; Ferreira et al., 2022; Kurikka & Grillitsch, 2021; Martin & Sunley, 2015). The categorization proposed by the authors includes three distinct situations: resistance, robustness, and recoverability. Resistance refers to the immediate consequences of the shock on the region. Robustness pertains to the ability of regional actors to adjust and respond to the shock, while recoverability describes the extent and nature of recovery. This process-oriented approach to resilience facilitates the identification of different phases of recovery following the shock, raising important questions about how these adaptation processes actually unfold and the mechanisms at play.

The study of regional resilience emphasizes the importance of a multi-level understanding (Pinto, 2018). Kurikka and Grillitsch (2021) identify three types of linkages between agency and regional resilience in response to crises: the ability of individuals to anticipate and act proactively in the face of risk (akin to ecological systems), behavioural adaptation during the crisis, and the capacity of agents to strategically transform their patterns of behaviour over time, potentially reshaping the contexts in which they are embedded. These authors stress that by demonstrating its resilience, a region shows how it overcame the shock and adapted to its developmental trajectory—whether through adaptation or adaptability. The authors further emphasize that agency plays a crucial role in this process, as it reflects how individuals, groups, and organizations influence the outcome. Since human actions are intentional and produce noticeable effects (Gregory et al., 2009; Grillitsch & Sotarauta, 2020), agency is central to understanding how a region navigates and adapts to shocks.

## 3. FRAMING THE OBJECT: ECONOMIC TRANSITION IN MINING TERRITORIES

The imperative to diversify economic activities is indeed a major challenge for regions heavily dependent on depletable natural resources. It is not uncommon to witness deep, prolonged recessions in mining-dependent areas when their deposits are depleted or lose value due to technological advancements that reduce global demand. The literature on economic diversification in extractive regions highlights the importance of industrial transformations to sustain long-term economic viability. When faced with resource scarcity, declining commodity prices, or changing governmental policies, mining operations may become economically unfeasible and ultimately shut down (Lawrence & Suddaby, 2006). Therefore, discussions surrounding mining-dependent regions stress the need for economic diversification to mitigate the negative impacts of such shocks and ensure sustained economic progress at the local and regional levels (Breul & Atienza, 2022; Görmar et al., 2022; Mackinnon et al., 2009).

In this context, the process of mine closure has garnered significant attention, not only among the public but also within the communities directly affected, as it impacts regional development and results in long-lasting environmental, social, and economic consequences from mineral extraction. Both regulatory standards and political authorities have worked to secure resources that support alternative economic activities aimed at minimizing the damage caused by mine closures (Breul, 2022; Görmar et al., 2022).

As a result, several studies have examined the process of economic transition in peripheral regions post-mining, redefining these regions along new developmental trajectories. For instance, Bole et al. (2023) utilize EEG concepts to emphasize that the economic structure of a given region can undergo transformation through diversification, whether related or unrelated. Boschma et al. (2017) explore the creation of new trajectories, while Hassink et al. (2019) investigate the importation of trajectories from outside the region. Grillitsch & Asheim (2018) focus on the renewal of existing economic structures, as also supported by studies from Chaminade et al. (2019) and Hansen & Coenen (2015).

For authors like Marais et al. (2021), North (1990, 2005), and Assche et al. (2014, 2015), the institutional context plays a crucial role in explaining economic change in mining regions. They argue that such changes occur gradually due to path dependence and lock-in effects. North (2005) defines "path dependence" as the influence that historical experiences have on current choices, meaning that institutions restrict future options and the organizations operating within a given territory are influenced by the institutions in place, often prioritizing the maintenance of existing systems. In simple terms, path dependence suggests that local institutions tend to lock in existing patterns, with stakeholders making decisions that perpetuate the status quo and limit diversification efforts (North, 2005, p. 21).

According to Görmar et al. (2022), the lasting effects of mining at the regional and local levels shape various aspects, including economic and industrial structures, skills and competencies, cultural identity, and the physical land and urban landscapes of these regions. Consequently, mine closure is a significant issue, as it influences uneven development at the local and regional levels, leading to profound economic, social, and environmental consequences.

Studies by Görmar et al. (2022) and Stihl (2022) underscore the importance of effectively utilizing the natural, economic, and cultural resources left behind by mining activities, along with the role of local agents in shaping new trajectories. These agents can play a crucial role in fostering change (Grillitsch & Sotarauta, 2020) and overcoming the economic consequences of mining, such as obsolete institutions, path dependencies, and cognitive entrapments. However, mining regions exhibit distinct patterns of local agency. Factors such as global demand and resource prices, external companies with headquarters outside the region, and strong resource-based industrial specialization create powerful path dependencies. In this context, dominant actors often resist change to protect their vested interests, hindering the region's ability to diversify.

Several authors argue that local actors can play a significant role in exercising agency both within and beyond territorial boundaries, mobilizing regional and extra-regional capacities, networks, and resources. These actors actively engage in changing and overcoming the constraining factors to development in their localities (Breul & Atienza, 2022; Görmar et al., 2022; Stihl, 2022). According to the literature, agency is distributed among a variety of local and external actors, and in many cases, these different forms of agency collaborate in the regional development process (Bækkelund, 2021; Grillitsch & Sotarauta, 2020).

Görmar et al. (2022) emphasize that the local government's role in exercising institutional agency—sometimes even assuming leadership roles—can be crucial for stimulating development in mining territories (Breul, 2022; Sotarauta & Suvinen, 2018). In some cases, local governments may engage in innovative entrepreneurship. However, the dual role of the state, where it both acts as a regional development agent and simultaneously places limits on local agency, creates tensions. The state may act as a local actor in some cases but as a higher-level actor (national) in others, leading to conflicts due to the scalar organization of power and sectoral interests related to mining and regional development (Birch et al., 2010; Mackinnon et al., 2009).

The potential for change in each region depends on the heterogeneous transformative capabilities of local agents, the stimulating or inhibiting institutional environment (Grillitsch, 2019; Morgan, 2016; Sotarauta et al., 2021), and the economic structures related to diversification, or lack thereof (Boschma et al., 2017). In other words, the capacity to diversify economic activities and create new growth trajectories in mining regions depends on how local agents can leverage the natural, economic, and cultural legacies of mining activity (Görmar et al., 2022).

Therefore, the transformative capacity of regions varies according to the diverse capabilities of local agents, the nature of the institutional environment, and the degree of economic diversification present. The ability to create new development trajectories depends on local agents' skills to utilize mining legacies and other resources to diversify the region's economy.

Görmar et al., (2022) and Stihl (2022) emphasize the role of specific agents of change whose actions aim to break from existing regional development trajectories. These agents are critical in overcoming the negative consequences—whether material, economic, or institutional—left by mining activities, path dependencies, and cognitive entrapments (Grillitsch et al., 2019).

Mining regions often develop a strong regional identity, which can foster cultural development but may also result in cognitive imprisonment among local actors (Breul, 2022; Dale, 2002; Görmar & Harfst, 2019). The social and cultural fabric shaped by the labor-intensive nature of mining has created a shared worldview among local actors, often limiting external perspectives and reinforcing

an inward-looking mindset (Breul & Atienza, 2022; Fitjar & Rodríguez-Pose, 2011). This cognitive limitation, alongside the high degree of specialization in mining regions, can restrict the potential for diversification. The scarcity of resources, particularly skills and labor, limits the ability of new industries to emerge, as they must compete for the same finite resources (Breul & Nguyen, 2022).

To overcome these challenges, local or regional actors in less diversified and peripheral regions must maintain strong external linkages. These connections can help prevent cognitive blockages (Crevoisier, 2001) and enable the diversity and complementarity of actors, which in turn can lead to the creation of new combinations of capabilities and new path development. This process of diversifying away from dominant industries is vital for regional resilience and long-term economic health (Breul, 2022; Breul & Atienza, 2022; Görmar et al., 2022; Stihl, 2022).

Bole et al. (2023) further suggest that the capacity for agency can drive positive change in development, but not arbitrarily. Instead, it is rooted in the specific mining assets embedded in local structures, which can persist even decades after mine closures. These assets provide a foundation from which new trajectories can be built, supporting the region's adaptation to changing economic conditions.

In conclusion, local development and economic diversification in mining regions can be shaped by various forms of agency and interrelations among actors. Both local and external agents can draw on a range of existing resources to identify strategies that foster the creation of new development trajectories, helping regions to transition from a dependence on mining to more diversified and resilient economic structures.

## 4. PROPOSING A THEORETICAL FRAMEWORK

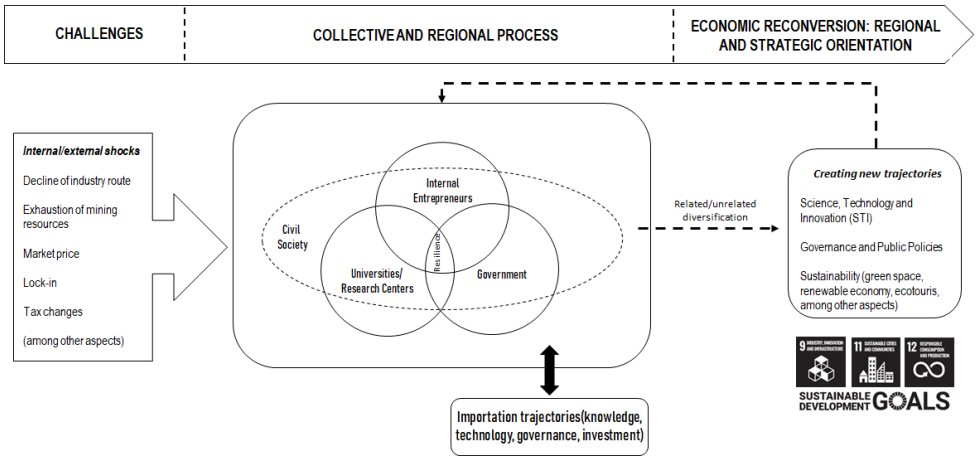
Based on evolutionary concepts, a theoretical model is proposed with the aim of to deepen the understanding of the factors driving the results of actions taken by various internal and external actors in defining the development strategy and new trajectories in peripheral industrial territories (Boschma, 2015) the importance of agency and its role in enhancing regional resilience is emphasized. Building on this, two key propositions are formulated for empirical analysis:

**P1:** Agency plays a crucial role in the diversification process, with ongoing long-term interaction among actors contributing to greater or lesser regional resilience (Bækkelund, 2021; Bole et al., 2023; Grillitsch & Sotarauta, 2020; Hassink et al., 2019; Jolly et al., 2020; Martin, 2010; Martin & Martin, 2023; Sotarauta, 2018; Stihl, 2022).

**P2:** The potential to create new paths through diversification, both related and unrelated, exists even in peripheral regions, provided there is interaction with external actors (importation of paths) that create opportunities for new economic activities (Carvalho & Vale, 2018; Grillitsch & Sotarauta, 2020; Hassink, 2010; Jolly et al., 2020; Kurikka & Grillitsch, 2021; MacKinnon et al., 2019; Pike et al., 2010; Pinto & Santos, 2014).

As shown in Figure 1, the proposed theoretical model aims to identify the challenges faced by peripheral regions, particularly those reliant on mineral extraction. In these regions, events such as internal, external, or hybrid shocks drive changes in the productive structure, altering the dynamics of the territory. As a result, socio-economic reconversion can be facilitated by collaboration between internal and external actors, who play a pivotal role in promoting long-term sustainable development. Furthermore, assessing the level of resilience is crucial, taking into account the socio-economic and institutional characteristics that shape the creation of new development trajectories. The various actors—both internal and external—offer opportunities while also setting the boundaries for what is possible in each region (Benner, 2022; Carayannis & Campbell, 2022; Grillitsch & Sotarauta, 2020), with the capacity for resilience being rooted in the structure and actions taken by these actors (Grillitsch & Sotarauta, 2020; Martin & Sunley, 2015; Stihl, 2022).

**Figure 1: Theoretical framework - economic reconversion in peripheral mining territories**




*Source:* own elaboration.

The literature on productive reconversion and the creation of new economic trajectories emphasizes that peripheral regions often suffer from a less diversified local knowledge base, which impedes the development of combinatorial knowledge dynamics and limits the emergence of productive alternatives (Květoň & Kadlec, 2018). This lack of variety in innovative industries and firms makes these regions more vulnerable to both exogenous and endogenous shocks, rendering them less resilient compared to more central regions (Bristow & Healy, 2018).

Given the challenges faced by peripheral areas—especially in mining-dependent regions—internal and/or external shocks can serve as catalysts for the creation of new economic trajectories. Such events—whether endogenous, exogenous, or a combination of both—like mine closures, the shutdown of local factories, or even global financial crises, can provoke shifts in the productive structure and open up specific opportunities. The actors and agencies involved in these regions play a critical role in offering these opportunities while also setting limits based on the region's characteristics. They determine the region's resilience capacity (Grillitsch & Sotarauta, 2020; Martin & Sunley, 2015; Stihl, 2022).

Some studies have specifically examined the role of agency in mining regions (Görmar et al., 2022; Stihl, 2022). In mining towns, where the economy often hinges on a single company, agency is typically focused on preserving traditional economic and political power within the community. This is referred to as reproductive agency, as opposed to transformative agency, which seeks to create new development trajectories. Reproductive agency attempts to maintain existing structures rather than foster change (Bækkelund, 2021).

Nevertheless, research suggests that local agencies in mining regions can still drive change by reshaping local and regional institutional arrangements through both internal and external interactions (Breul & Atienza, 2022; Martin & Martin, 2023). These interactions can enable the creation of new growth trajectories, often involving heterogeneous actors who mobilize and anchor distributed resources, with exogenous factors acting as an impetus for change (Carvalho & Vale, 2018). This type of agency is crucial for fostering regional diversification and driving new economic directions.

The literature further highlights that the transformation of mining regions often depends on the interplay between agents and local assets, which may be altered, destroyed, or leveraged through agency practices (Bole et al., 2023; Trippl et al., 2020). Assets in this context are defined as non-replicable, territory-specific endowments, encompassing industrial assets (such as company skills), human assets (skills and knowledge), institutional endowments (rules, norms, and routines), and natural resources (MacKinnon et al., 2019). These assets serve as both constraints and opportunities, shaping the paths for diversification and economic renewal in mining regions.

Other studies, such as Benner (2022), argue that path transformation is not a distinct form of path development, but rather a gradual and recurring process resulting from the interaction between agency and regional assets. This transformation is not linear; it is a time-consuming process characterized by pre-transformation activities, asset modification or transformative actions, and, ultimately, consolidation activities (Baumgartinger-Seiringer et al., 2020).

For new trajectories to be created and sustained in the long term, several key elements must be in place. These include the active participation and integration of both local and non-local actors, the capacity of regional infrastructure, access to skills and knowledge, supportive public policies, and other factors that are essential for transforming mining towns into environments conducive to the emergence of innovative economic opportunities.

Experts in the field acknowledge that creating and developing new trajectories in mining regions remains a significant challenge, as there is no standardized method for achieving this transformation. It is generally believed, however, that adopting best practices aligned with international experiences can help integrate alternatives that address the needs of all stakeholders, while considering the unique realities of each affected location. The approaches proposed in this article provide a guiding framework grounded in diverse experiences, enabling each region to pursue economic reconversion in a more sustainable and context-sensitive manner.

## 5. CONCLUSION

This article proposed a theoretical framework for analysing the creation of new trajectories in peripheral territories, particularly mining areas, through different types of agencies and its interaction with local resources. This framework focuses on understanding how specific practices of actors—through their roles and relationships—enable the transformation and utilization of local resources, ultimately guiding economic reconversion in regions that were once primarily dependent on mining activities (Görmar et al., 2022; Stihl, 2022).

The literature review highlights that the creation and development of new trajectories in mining territories presents a significant challenge, as no standardized approach currently exists. The approaches outlined by various authors aim to offer a guiding path based on diverse experiences, helping regions pursue economic reconversion in a more sustainable manner.

Building on the key insights from EEG and the proposed theoretical framework, this investigation contributes to: (i) the ongoing debate on the interaction between agency and mining assets in the creation and development of new economic trajectories; (ii) the discussion on transforming mono-industrial regions into more diversified, resilient, and sustainable socioeconomic environments, aligned with the Sustainable Development Goals (SDGs); and (iii) providing support for the formulation of public policies and territorial planning in anticipation of mine closures.

Ultimately, we believe that the model presented here can serve as a valuable tool for future research into the creation of new trajectories in peripheral regions, not just for mining but for other forms of industrialization as well. This framework could prove useful for public managers, research institutions, consultants, and entrepreneurs who see the potential for sustainable, long-term action in these regions. In essence, it offers a tool for those engaged in regional economic development and innovation ecosystem building.

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