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Towards an evolutionary framework to regional traps

R. Boschma, *Utrecht University, Department of Human Geography and Planning, Utrecht, the Netherlands; University of Stavanger, UiS Business School, Stavanger, Norway*

Abstract

The paper builds and analyses a new dataset about agricultural innovation in Operational Groups (OGs), multi-actor arrangements including farms, industrial firms, consultants, and research institutes and financed by the European Innovation Partnership for Agricultural Productivity and Sustainability (EIP-AGRI) to foster innovation. We focus on the 173 OGs established in Southern Italy (Apulia, Basilicata, Calabria, Campania, and Sicily), analysing their innovation goals, activities, and outcomes based on projects information from the Innovarurale website. After web-scraping the Innovarurale website, we classify innovations and their expected effects using definitions from the Oslo Manual and categories from the Community Innovation Survey (CIS), and code them into binary variables, coding the OGs projects web-scraped from the Innovarurale database. Our findings reveal regional disparities, with Campania showing higher diversification and a focus on green innovation, while Apulia leans towards service innovation and Sicily demonstrates strengths in product quality and flexibility. However, the limited focus on training in all regions raises concerns about long-term competitiveness. This study contributes to tackling the challenges posed by collecting comprehensive data about innovation to assess the outcomes of agricultural policy programmes such as the EIP-AGRI.

JEL Classification:

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1. Introduction

There is increasing awareness that development traps not only occur at the national but also at the sub-national scale. In their seminal contribution, Iammarino et al. (2020) introduced the trap concept to the regional level in Europe. In their definition, regions are trapped when showing persistent low levels of economic growth (Diemer et al. 2022). Their study provided novel and valuable insights to the literature on regional traps but paid little attention to the role of history and path dependencies in assessing the development prospects of regions. Their economic output-based indicator of regional development traps also makes it harder to determine whether being trapped actually matters for economic development. Furthermore, their development trap indicator does not really pick up that regions may end up in different types of regional development traps.

Balland and Boschma (2024) proposed an evolutionary approach to regional development traps to address these challenges. Their evolutionary approach accounts for self-reinforcing dynamics that make regions follow specific trajectories that might enhance but also limit their capacity to develop activities. It builds on the relatedness/complexity framework (Balland et al. 2019; Pinheiro et al. 2022a) and distinguishes between three ideal types of regional traps. This is especially relevant for Smart Specialization policy in places that are trapped, or run the risk of falling into a trap.

The paper is structured as follows. To start with, we outline the literature on regional development traps. Then, we present the main features of the regional trap concept proposed by Balland and Boschma (2024). We discuss briefly possible implications for further research and regional policy, in particular Smart Specialization policy.

2. Regional development traps

For decades, scholars have contributed to the concept of traps. There is a big literature on poverty traps that refer to countries with low-income levels that cannot escape from a low economic growth path (Redding 1996; Barrett and Swallow 2006). The middle-income trap literature (Kharas and Kohli, 2011; Glawe and Wagner 2016; Bresser-Pereira et al. 2020) describes the state-of-affairs of emerging countries that developed but got stuck at some stage from which it is hard to escape. These countries cannot compete anymore with low-income countries in labor-intensive industries because of rising labor among other costs, but they are also short of capabilities to build knowledge-intensive industries.

To date, few comparative studies have addressed regional traps at the sub-national level. The club convergence literature focused on the persistence of regional economic polarization in which groups of regions do not converge (Quah 1996). This literature is grounded in neoclassical and endogenous growth theories, in which regions are perceived to be stuck in their own club, resulting in growing income disparities between rich and poor regions. Iammarino et al. (2020) proposed the concept of regional development traps, based on persistent low growth rates in a combined indicator including Gross Regional Product per capita, productivity and employment to population ratio. Their trap indicator measures if a region's growth is structurally lower compared to the average of a set of other regions as well as their own past performance. Trapped regions involve low-income areas that experienced sustained growth for some time but then got stuck, similar to the middle-income trap. But they also concern old industrial regions that used to be prosperous but experienced a prolonged decline of their principal activities. In their study

on European regions, they found that human capital and innovation capacity did not increase the risk of regions of falling into a development trap, in contrast to factors such as high shares of non-market services, high dependency ratios and low quality of government. Following a similar approach, Çınar (2023a,b) found that related variety and complexity in their economic structures lowered the risk of regions in Turkey to fall into a regional development trap.

Rodríguez-Pose et al. (2023) stated this may have socio-political implications for regions that find themselves trapped. They showed that this has led to the growing rise of discontent in regions in Europe, as reflected in support for Eurosceptic parties in national political elections. Their study suggests a strong connection between being stuck in a development trap and support for parties that oppose European integration. The growing rise in discontent is concentrated in regions that are economically stuck, that lack economic opportunities to a large extent, while the local provision of basic services is deteriorating. Their study suggests that the longer and more intense this period of economic stagnation is, the stronger this support for Eurosceptic parties becomes.

Iammarino et al. (2020) generated novel and key insights on regional traps. However, their influential study focused little attention on the role of history and path dependency. It looked at the economic well-being of regions, but paid little attention to the future development prospects of regions (Diemer et al. 2022). Moreover, their economic output-based definition of regional development traps makes it hard to assess the economic implications of trapped regions, as this is already part of their definition. What would be interesting to understand though is whether trapped regions, as compared to non-trapped regions, or the intensity of being trapped has consequences for their economic development. This implies we need a definition of regional development traps that does not build on economic output indicators. Finally, their regional development trap concept did not differentiate between various types of traps. However, regions follow specific trajectories in terms of the capabilities they accumulate, and the techno-economic structures and institutions they build over time (Storper 1997; Boschma 2004). This is likely to affect not only the intensity but, above all, the nature of the trap they might end up in.

3. In search for evolutionary approaches to regional development traps

To tackle these issues, Balland and Boschma (2024) looked for inspiration in evolutionary thinking. They argue that evolutionary theory might be well positioned to take up these challenges. In particular, they follow the idea that self-reinforcing dynamics make regions follow distinct techno-economic and institutional trajectories (Arthur 1994; Rigby and Essletzbichler 1997; Storper 1997; Boschma and Lambooy 1999a; Martin and Sunley 2006) that may enhance, but also limit their capacity to develop growth paths.

A relevant literature in evolutionary theory is the work on (technological) lock-in by David (1985) and Arthur (1994), among others. They made the claim that economies might get stuck in certain technologies due to increasing returns. Arthur (1990, 1994) built on Myrdal's concept of cumulative causation (1957) to extend the concept of lock-in to regional development (Boschma and Lambooy 1999a; Martin 2010). In economic geography, (negative) lock-in has been associated almost exclusively with the lack of adaptability of old industrial regions (Grabher 1993; Martin and Sunley 2006; Pike et al. 2009; Hassink 2007, 2010; Crespo et al. 2014; Evenhuis 2017). Grabher (1993) distinguished between cognitive, economic and institutional lock-in to explain how old industrial areas might become trapped in a process of structural economic decline. Boschma and Lambooy (1999b) made the argument that regions may become subject to institutional lock-in and fail to adapt, because of a weak ability to implement

institutional change. Lee and Malerba (2017) used the concept of lock-in to highlight the inability of incumbent leaders to respond to transformations in technology, demand, and institutions.
Another body of literature has addressed middle-income traps from an evolutionary perspective. Here, the middle-income trap is associated with path dependencies and institutional inertia at the country level (Lee 2013; Vivarelli 2016; Agénor 2017). Doner and Schneider (2016) refer to the poor ability of countries that are stuck in a middle-income trap to implement institutional change and undertake public interventions to move into new growth paths. Aghion and Bircan (2017) focused on institutional structures in middle-income countries that may block the development of knowledge-intensive industries.

Another evolutionary branch claims that diversification opportunities depend on local capabilities at the sub-national scale (Neffke et al. 2011; Kogler et al. 2013; Rigby 2015; Boschma 2017; Montresor and Quatraro 2017; Hidalgo et al. 2018). Over time, regions accumulate a specific set of capabilities in people, activities, networks and institutions. These local capabilities condition which activities are more likely to develop, and which activities are less likely to grow and prosper. As a consequence, diversification opportunities differ widely across regions (Balland et al. 2019).
Pinheiro et al. (2022a) used such an evolutionary framework and blended it with the economic complexity framework of Hidalgo and Hausmann (2009) to identify the diversification potentials of regions of varying income levels. They observed that low-income regions have those potentials primarily in low-complex activities and thus face serious constrains to climb the economic ladder, which contrasts with high-income regions that have opportunities primarily in high-complex activities. This comes close to what other studies observed at the country level (Petralia et al. 2017; Hartmann et al., 2016; Hartmann et al. 2020). Based on these observations, Pinheiro et al. (2022a) suggested that regions may be trapped in a 'low complex' economy because they lack the ability to diversify into high-complex activities. They also observed a category of medium-complex regions that lack good options in complex and non-complex activities (see Alshamsi et al. 2018, Hartmann et al. 2020 and Pinheiro et al. 2022b for similar findings at the country level). Such regions have not anymore their opportunity space in low-complex activities only, but it remains hard for them to move in complex activities, as they lack capabilities.

4. Toward an evolutionary conceptualization of regional traps

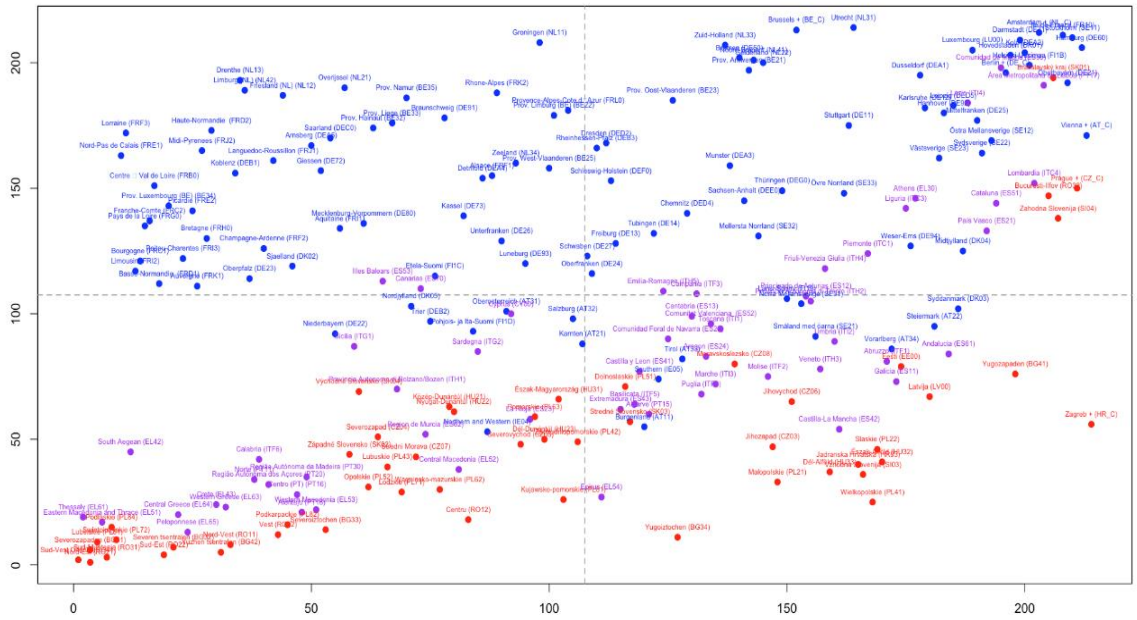
Balland et al. (2019) proposed an evolutionary framework building on the notions of relatedness and complexity to determine whether regions have opportunities to diversify into complex activities, and if so, in which activities. In that context, relatedness refers to the costs of developing an activity, after Hidalgo et al. (2007). The more related local capabilities are to the capabilities that are required to develop a new activity, the less costly to develop it. Complexity refers to the potential economic benefits of diversification. Complex activities combine many capabilities which makes it hard for regions to develop them. The higher the level of complexity of local activities, the lower the number of regions that can master and produce them, the higher the potential economic benefits. Activities that are easier to learn will diffuse more widely, meaning they also have lower economic value (Fleming and Sorenson 2001; Hidalgo and Hausmann 2009). Studies tend to confirm this pattern (Balland and Rigby 2017; Balland et al. 2020; Mewes and Broekel 2022; Rigby et al., 2022). Bachtrögler-Unger et al. (2023) adopted this framework to determine which regions in Europe are best placed to contribute to new Twin Transition technologies (i.e. digital and green technologies).

The Balland et al. (2019) framework is useful to identify demonstrate that regions have different sets of diversification opportunities available to them. Because regions follow distinct paths, this makes it is crucial to differentiate between different types of traps. Balland and Boschma (2024) identified three types of regional traps, based on the average complexity of local activities and the average relatedness density to any activity in a region (Balland et al. 2019). Average complexity refers to the economic complexity level of all local activities. The average relatedness density represents the ability of a region to adapt and diversify: the higher, the more opportunities to develop activities.

Balland and Boschma (2024) made a distinction between three ideal types of regional traps: (1) regions combining a low average relatedness density and a low average complexity are stuck in a 'structural trap'. Such low-complex economies have little to no diversification opportunities, and therefore are likely to stagnate. (2) regions characterized by high average complexity and low average relatedness density are perceived to find themselves in a 'low relatedness' trap. Their past success in complex activities does not enhance their ability to adapt and move into something new: they have little to no capabilities to move into other complex activities, nor into low-complex activities; (3) regions with a high average relatedness density combined with a low average complexity are stuck in a 'low complexity gap'. They have diversification opportunities, but most likely in low complex activities only, in line with Pinheiro et al. (2022a).

Using industry data, Balland and Boschma (2024) applied this framework to determine which EU regions are trapped, and what kinds of traps they have fallen into. Following their framework, we show in Figure 1 the geographical distribution of regional traps across Northern, Southern and Eastern Europe. The three colors represent the Northern (blue), Eastern (red) and Southern (purple) part of Europe. The average complexity and relatedness density scores of all European regions are shown on the Y-axis and X-axis respectively in terms of rankings for the period 2011-2019. Almost all regions in Northern Europe are not being trapped in any of the three types, or they are stuck in a 'low relatedness density' trap. This is in contrast to regions in Eastern Europe that are almost all caught in a 'structural trap' or a 'low complexity trap'. The exceptions in Eastern Europe are four capital regions (Bratislava, Prague, Bucharest and Ljubljana) that did not find themselves trapped (data for the Warsaw and the Budapest regions were missing). Southern Europe is similar to Eastern Europe in two ways: most regions are stuck in a 'structural trap' or in a 'low complexity trap', and there are no regions in both parts of Europe that are stuck in a 'low relatedness density trap'. Southern Europe is different from Eastern Europe, because it has much more regions that are not trapped, most notably capital regions like Lisboa, Madrid, Rome and Athens, but also regions like Lombardy, Catalonia, Basque Country, Liguria and Piemonte.

Figure 1. Regional traps across regions in Northern (blue), Eastern (red) and Southern Europe (purple) (rankings)



Balland and Boschma (2024) showed there is a lot of stability in their regional development trap indicator over time. By far, most regions remained caught in the same trap, and only few regions managed to escape from a trap. This is in line with the essence of a trap which is supposed to be a structural feature: regions face severe constraints to overcome a development trap. Balland and Boschma (2024) also performed an econometric analysis to test whether trapped regions grow to a lesser extent in terms of employment and wage growth. Their analyses confirmed this: the more trapped a region is, as embodied in a lower score on a combined indicator of average relatedness density and complexity in a region, the lower the relative employment and wage growth of the region. So, being trapped had a negative impact on regional employment and wage growth in Europe. This negative relationship between being trapped and economic development at the regional level was confirmed by another analysis in Balland and Boschma (2024). They also showed that their development trap indicator explained well whether regions are stuck or not in the economic output-based development trap, as defined by Iammarino et al. (2020).

5. Conclusions

Development traps not only occur at the national but also at the sub-national scale. The seminal study by Iammarino et al. (2020) proposed the concept of regional development traps. Their study has generated novel and valuable insights in the conceptualization and measurement of development traps. However, their study did not incorporate the role of history and path dependency which are key concepts in evolutionary economic geography (Boschma and Frenken 2006; Martin and Sunley 2006). We discussed the Balland and Boschma framework (2024) that proposed an alternative, evolutionary view on regional development traps. Their definition accounts for self-reinforcing dynamics that make regions follow specific trajectories that may favour but also limit their capacity to adapt and develop new and complex

growth paths.
Balland and Boschma (2024) took up a number of remaining challenges, inspired by the seminal work of Iammarino et al. (2020). Instead of defining regional development traps in terms of persistent and prolonged low levels of economic growth (Iammarino et al. 2020; Diemer et al. 2022), Balland and Boschma (2024) defined regional development traps in terms of future development prospects of regions. Building on insights from the relatedness/complexity literature (Hidalgo et al. 2018; Balland and Boschma 2019), their definition centres around the ability of regions to adapt and diversify into activities which might be considered crucial for their long-term economic development.

Doing so, Balland and Boschma (2024) left behind an economic output-based indicator of regional development traps which makes it hard to determine the economic implications of regions being trapped. This allowed them to test whether the level or intensity of being trapped has consequences for the economic development of regions. They indeed found a negative relationship between being trapped and relative employment and wage growth of regions. Their regional trap indicator also predicted well whether regions are stuck in the economic output-based regional development indicator of Iammarino et al. (2020).

Balland and Boschma (2024) also made a distinction between different types of regional traps. Regions follow distinct paths, embodied in the capabilities and complexity levels of their techno-economic and institutional structures and their opportunity set that is available to them in order to adapt and diversify. This affects the intensity but also the nature of the trap in which regions are caught. This paper showed that many regions in Eastern Europe but also in Southern Europe find themselves in a 'structural trap', implying their economies consist of low-complex activities with little opportunities to adapt and diversify. Regions that are caught in a 'low relatedness density trap' are mainly located in peripheral parts in Northern Europe. They are characterized by a limited set of opportunities to move in high- and low-complex industries. Often, regions in Eastern and Southern Europe have fallen into a 'low complexity trap'.

Their low-complex economies provide opportunities to adapt and diversify but primarily in low-complex industries.
These insights on regional traps, and in what kind of traps regions find themselves in, have important implications for Smart Specialization policy. Regions may have few opportunities to diversify which applies to regions caught in a 'structural trap' or a 'low relatedness trap'. And regions might have opportunities only in low-complex but not in high-complex activities which applies to regions stuck in a 'low complexity trap'. The first thing to do is to identify which of these traps apply to particular regions. And the second thing to do is to rethink of how policy practices can avoid and overcome them.

In line with current Smart Specialization policy, it is crucial to take regional capabilities as point of departure. These capabilities condition which opportunities are more feasible to develop, and which societal challenges to take up, and in particular how (Alshamsi et al. 2018; Balland et al. 2019; D'Adda et al. 2020; Marrocu et al. 2022). Identifying such local opportunity sets can assist policy makers to guide their priority-setting (Foray 2015). Policy should aim to promote the exploitation of opportunities where low-hanging fruits exist. Although regions stuck in a 'low relatedness trap' have little opportunities, these regions might still have a few low-hanging fruits that could be targeted (Boschma 2024).
For regions in a 'low complexity trap', several policy options might be considered. One option is to exploit further local opportunities in other low-complex activities, such as low-complex green technologies (Van den Berge et al. 2020; Bachtrögler-Unger et al. 2023).
But perhaps the best policy option is to target the few opportunities that these regions might still have to move into more complex activities. However, when such low-hanging fruits in more complex activities

are completely missing, they might consider another policy objective, and that is to support leap-frogging (Boschma 2024).

This latter policy might be a good second-best option also for regions caught in a 'structural trap'. It involves a high-risk strategy, as local capabilities are not of immediate relevance, and it might require strong local institutional capacities. It includes strengthening local capabilities in education, research, companies and institutions, and supporting the active participation of institutional entrepreneurs that mobilize resources, promote collective action, and try to induce institutional change (Garud et al. 2002; Battilana et al. 2009; Sotarauta and Pulkkinen 2011; Sotarauta 2018). Developing such new growth paths also involves the promotion of inter-regional connections (Iacobucci and Guzzini 2016; Zhu et al. 2017; Balland and Boschma 2021; Uhlbach et al. 2022) and the attraction of migrants and multinational firms (Neffke et al. 2018; Caviggioli et al. 2020; Cortinovis et al. 2020; Miguelez and Morrison 2022). Such policy remains high-risk though: it may create cathedrals in the desert in a region, with no significant spillovers to other local activities that lack the absorptive capacity, and it will not solve easily another structural bottleneck that concerns the fundamental weakness of local institutions (Boschma 2024).

It goes without saying that further research on regional development traps is needed, as a few open questions remain. First, the regional trap indicator focuses almost entirely on the opportunity sets of that are available to regions to determine whether regions are trapped or not. This means local capabilities are the prime focus of attention, but little attention is paid to the external connectivity that can give regions access to additional capabilities that might influence their ability to adapt and develop new growth paths (Balland and Boschma 2021; Bachtrögler-Unger et al. 2023). Accordingly, regions can also be trapped in an inward-looking state if such connections are lacking. In other words, this might affect the extent to which regions are trapped and could thus be made part of the definition of regional development traps.

Second, another open question is to test which factors might be held responsible for why regions get trapped in the first place, and in what kind of trap.

But perhaps even more interesting is to study those regions that managed to escape from a development trap, as compared to regions that remained trapped. In-depth analyses of successful cases might throw important light on this outstanding issue. Third, an evolutionary approach to regional development traps should also incorporate the role of institutions and the need for institutional reforms (Gong et al. 2022). Evolutionary approaches to the middle-income traps have actually done that, such as Lee (2013), Doner and Schneider (2016) and Aghion and Bircan (2017).

Part of that research agenda should study the role of agents of change, including institutional entrepreneurs and public policy makers (Sotarauta and Pulkkinen 2011; Hassink et al. 2019), in avoiding regional traps, or how to overcome them.

This could be one of the key factors that explains why some regions manage to escape a trap, while other regions fail to do so. This remains to be tested, including the question what types of regional settings might enhance the success of agents of change (MacKinnon et al. 2019).

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