Innovation without regional development? The complex interplay of innovation, institutions and development

1. Introduction

Over the past few decades regional development theories have become dominated by the notion that innovation is the most important factor explaining territorial inequalities (Eder 2019, Pike et al 2016, Scott 2000). In economic geography this idea was partly attributable to the new regionalism, which tends to explain uneven development primarily in terms of *endogenous* regional characteristics (Moulaert and Sekia 2003). From this perspective, the level of development of a territory is explained by the capability of the regional agents to innovate and to create conditions for the embedding of foreign investment, especially in unique or complex economic activities (Coe and Yeung 2019). This tendency has also shaped regional development policy, where instruments to improve innovation in firms have become ever more dominant (Foray et al 2017, Hassink and Marques 2015).

Although this framework is useful in understanding the performance of growing regions, we argue that it does not provide adequate theoretical tools to understand regions where GDP and productivity growth have stagnated or declined. Regional development is the product of a combination of factors (Iammarino et al 2019, Grillitsch et al 2021) which cannot be reduced to endogenous dynamics such as innovation at the firm level or the predominance of specific institutional arrangements (Shearmur 2016). In other words, innovation is not enough, neither as a concept to understand underdevelopment, nor as a policy tool that can change regional fortunes. This paper will contribute to this debate in three ways. First, by scrutinising the limitations of endogenous approaches to regional development. The central concern of our contribution here is to draw attention to the importance of formal elements within innovation

systems (such as organisational capabilities within firms and formal institutions). We argue that these elements have received less attention in this literature but that understanding their impact is fundamental to avoid culturally deterministic explanations of regional (under)development and to help design more effective policies. Second, the paper explores the complex interplay between innovation, institutions and regional development (Fratesi 2017, Farole et al 2011). Third, the paper distils the policy implications of the foregoing analysis by highlighting alternatives to current models of innovation-based, export-led development.

Among other things the paper builds on the work of authors such as Shearmur (2016), who argues that local innovation and local development are not the same thing, and the work of Morgan and Sayer (1988), who distinguished between development *in* a region from development *of* a region. In the contribution by Shearmur (2016), the author argued that growth in Canadian regions is essentially the result of the presence of manufacturing. When firms innovate, but the economy is specialised in services, the outcome is stagnation or decline. According to Shearmur (2016) this is largely due to a disconnect between where the innovation happens and where its value-added is appropriated, a disconnection which seems to happen, in Canadian regions, without the presence of manufacturing. From a different perspective, Iammarino et al (2019) have shown that the factors which explain regional inequalities in Europe are complex and interconnected. The same authors also demonstrated that various European regions have now entered a middle-income trap, despite their previous industrial strengths, and despite the fact that many of them retain a small core of innovative firms, which are no longer generating economic growth (Iammarino et al 2020).

The paper is structured as follows. Section 2 introduces some key concepts of regional innovation. Section 3 explores the intricate connection between innovation, institutions and

growth. The final section distils the main theoretical and policy implications of the analysis. The arguments developed in this paper are informed by our previous empirical research on innovation in LDRs, and the stated aim of re-examining the dynamic interaction between formal and informal social dynamics. It also aims to draw attention to the need for collaboration between different geographical scales in the design and implementation of regional policy to deal with the structural problems that stymie lagging regions.

2. Regional Innovation Systems: reflections on the state-of-the-art

The concept of innovation systems was used to demonstrate that the interactions between a variety of organisations within a country, and the institutional framing of these interactions, influenced innovation dynamics and economic outcomes (Lundvall 2010). One of the most important contributions made by these authors was the notion that innovation is a non-linear, systemic activity, involving multiple feedback loops among a wide range of agents. Later, researchers working from a territorial perspective observed that even when organisations and institutions are generated, managed or funded at the national level, innovation dynamics and outputs are not equally distributed through space (Cooke and Morgan 1998, Morgan 1997). It was argued that in some territories the physical proximity between private firms, universities (and or research centres), and myriad other supporting institutions facilitated the emergence of unique local dynamics that supported the generation and dissemination of knowledge externalities. Case studies of successful regions (Saxenian 1994), together with quantitative analysis (Rodríguez-Pose and Crescenzi 2008), suggested that it was the characteristics of the system that distinguished the most successful regions, by making the whole greater than the sum of its parts.

The findings on the localised nature of innovation systems were informed by a variety of concepts and approaches, dating back to the literature on industrial districts (which in turn

draws on the work of Marshall in the 19th century), and were summarised by Moulaert and Sekia (2003) as territorial innovation systems. Out of these, the concept of regional innovation systems (RIS) has been one of the most influential and one that is still common currency in research and policy circles (Doloreux and Gomez 2017, Isaksen et al 2018). It is based on a stylised distinction between two sub-systems: one which generates knowledge and one which exploits knowledge (see Figure 1). The system is framed by an institutional setting, which includes cultural and social dynamics that may hinder or encourage innovation dynamics. Some authors also emphasise the role of public entities, such as regional development or innovation agencies, that can provide support to the organisations in both sub-systems (Tödtling and Trippl 2005).

The concept of RIS, and similar approaches, has been critiqued and improved over the past decade on a variety of fronts (Isaksen et al 2018). The debate that is most relevant to this paper is the one which reflects on its applicability to less developed regions (LDRs). We are particularly concerned with those regions that are economically poorer relative to the national or international averages, rather than with regions that are wealthy (when measured in terms of GDP per capita) but have less developed innovation systems. The latter situation is common for instance in the periphery of European Nordic countries, or in resource-rich regions (Isaksen and Karlsen 2013). We are also particularly focusing on European LDRs, particularly in Southern Europe and Central and Eastern European countries, though some of our arguments would also be pertinent to regions in North Americaor in other developed nations.

The seminal paper by Tödtling and Trippl (2005) was one of the first to highlight the distinctive characteristics of innovation systems in LDRs, by arguing that peripheral, old industrial and metropolitan regions exhibit different type of RIS deficiencies. More recently,

Trippl et al (2016) updated this categorisation to argue that regions can be classified according to how they perform in two dimensions: organisational thickness/thinness and institutional thickness/thinness. The former refers to the presence (or absence) of organisations (public, private, research and third sector) that can generate critical mass. The latter to the existence of formal and informal institutions that can sustain innovation dynamics and knowledge externalities.

Other relevant academic contributions includes work that has sought to demonstrate that innovation is not exclusive to core regions (Camagni and Capello 2013, Eder 2019, Fritsch and Wyrwich 2021, Rodríguez-Pose and Fitjar 2013). Their goal is to a certain extent related to ours because it seeks to challenge the view that core regions hold a monopoly on creativity and that this fact explains why they are wealthy. In contrast, the findings of these researchers help us understand how individuals and organisations located in the periphery can mobilise their internal resources, and access external knowledge, to improve innovation outputs despite the lack of local critical mass.

Nonetheless, these contributions are still primarily focused on explaining when and where innovation happens in the periphery, but not on whether this is sufficient to generate regional development. Also, though they provide interesting case studies that counter narratives about the dominance of specific places, one still needs to consider that innovation, particularly that which involves complex knowledge, and high value-added economic activities, is concentrated (and increasingly so) in a small number of cities or regions (Balland et al 2020, Balland and Rigby 2017). As such, rather than adapting the concept of territorial innovation to capture the characteristics of LDRs (Tödtling and Trippl 2005), we argue that they are an inappropriate heuristic tool to explain regional inequalities, unless combined with an analysis of other factors.

The inadequacy of this heuristic is partly due to its reliance on *correlational* theorising, which is based on measuring the impact of individual variables (e.g. firm level innovation, or scale of interaction between universities and private sector) on outcomes (e.g. regional GDP per capita), while considering all other variables as independent attributes that need to be held constant (Furnari et al 2020). This form of theorising is of course useful to identify significant relevant causal relationships. Nonetheless it fails to consider the complex interactions between variables, and the multiple paths that can lead to a specific outcome (Furnari et al 2020), that can be achieved through c*onfigurational* theorising. Importantly for this paper, the latter approach also argues that explanations for different outcomes cannot be symmetric i.e. the factors that explain, for example, regional decline are not the opposite of those that explain regional growth, but rather a specific set of variables interacting to generate this trend. As will be explained in the next section, it is necessary to examine the specific socio-economic dynamics of lagging regions if one wants to explain their fates, and also recognise that improving only one specific variable (firm level innovation) will not be sufficient to change an entire regional context.

3. Firm capabilities and the fragmentation of formal and informal networks

As Trippl et al (2016) have argued, the RIS concept is still fundamentally concerned with the quantity of organisations that are present in the region, and with the links between them (Trippl et al, 2016). However, we argue that the most important dimension is *quality* not quantity, particularly in terms of the internal capabilities of firms (Bell 2009, Cimoli et al 2009), of Universities (Bonaccorsi 2017), and the *quality* of the institutional context (Rodríguez-Pose and Di Cataldo 2015). These phenomena cannot be explained by looking only at thickness or thinness of the systems. This is of course not a denial that systems matter, but rather that the nature and content of the system is shaped by the characteristics and

strategic intent of the organisations that create and maintain it, and the institutional environment that frames their actions (Giuliani 2007, Marques 2017).

Shifting the debate away from quantity towards quality, means putting more emphasis on organisational capabilities (what we call here the nodes in the networks) and how variations in these capabilities are key to understanding innovation outcomes. There are several indicators suggesting that firms located in European LDRs tend to have less complex organisational capabilities. An example is provided by a recent evaluation of regional innovation performance by Camagni and Capello (2013) and Capello and Lenzi (2015, 2017). Drawing on a wide range of indicators, the authors divided European regions into five macro-areas: a European science-based area, an applied science area, a smart technological application area, a smart and creative diversification area, and an imitative innovation area. Most peripheral regions of Southern Europe (SE) and Central and Eastern Europe (CEE) fall into the last two categories. Those that belong to the smart and creative diversification group are characterised by limited application of local knowledge and high levels of tacit knowledge and skills embodied in human capital. In turn, imitative innovation regions, primarily located in CEE countries, are characterised by the capacity to attract foreign direct investment and limited local knowledge.

The goal of this taxonomy was to demonstrate that innovation potential exists in LDRs, even if its nature is different to the potential in more advanced territories. In this sense, it echoes the arguments made for example by authors working on knowledge bases (Asheim et al 2011, Marques 2019), who have also tried to demonstrate how competitiveness can be built on different types of knowledge and innovation activities. Nonetheless, it also has another implication: though there is recognisable innovative potential everywhere, firms in those regions with the lowest innovation performance are more likely to have limited

organisational capabilities. This means that if these regions were to upgrade their economic specialisation, it would not be sufficient to improve the functioning of their innovation systems, or the quality of supporting institutions, but firms themselves would have to be capable of developing internal competencies that would allow them to perform more complex tasks (Cimoli et al 2009). A similar argument was developed by Radosevic (2018), based on the observation that innovation in European LDRs is primarily about the acquisition of new machinery, rather than R&D.

Furthermore, not only are firms in LDRs characterised by having organisational capabilities of a lower level of complexity, but the highest capabilities are also concentrated in a smaller number of firms, when compared to more advanced regions. This has been shown by various case studies: economic sectors in peripheral regions tend to host a small core of technologically advanced firms, capable of participating in competitive global value chains and of sourcing knowledge in other locations, when it is not available within the region (Rodríguez-Pose and Fitjar 2013, Lorentzen 2007, Marques 2017). 'Behind' these firms, lie a small but significant number of organisations with catching-up trajectories, followed by a long-tail of low productivity, low competitiveness firms (Hausemer et al 2019, Marques 2017). As argued by Eder (2019), "it might be more accurate to speak of innovative firms located in the periphery rather than of innovative peripheral regions" (Eder 2019, pp. 126).

In terms of quantitative analyses, data on firm-level productivity gaps are not easily obtainable, mostly due to privacy concerns. Nonetheless, a recent project by the OECD has concluded that there are significant differences in labour productivity and multi-factor productivity for top and bottom-performing firms in 10 selected countries (Berlingieri et al 2017). In their own words, "in 2011, on average across countries, firms in the top decile of the distribution can produce more than six times as much value added per worker as firms in

the bottom decile of the same country's manufacturing sector, and nine times in services." (Berlingieri et al 2017, pp. 27). Though the authors did not correlate these data with GDP, they did find that the highest heterogeneity was found in Chile, Indonesia and Hungary.

In turn, Aiello and Ricotta (2016) analysed productivity heterogeneity across 7 European countries, and find that in the model which contains only firm characteristics and regional characteristics, the former are responsible for 85% of total factor productivity (TFP) variance, and regional characteristics for 15%. When they add a national dummy to the model, regions account for only 5% of variability. This does not mean that regional differences are not relevant since for instance in Spain, which exhibits significant inter-regional disparities in this indicator, regional characteristics account for 9% of variation (Aiello and Ricotta 2016). Though these results are not easily triangulated with our analysis, partly because they are designed to answer a different set of questions, they do show that productivity heterogeneity at the firm level is to a great extent caused by the characteristics of the firms themselves, rather than regional features.

Once we establish that firm capabilities should be more prominent in our analyses that still leaves the main question to be discussed in this section: what is the impact of this finding on system characteristics? The first impact is the fragmentation of formal networks. Contrary to what is observed in more advanced territories, informal networks, which may extend to all co-located firms through personal and family connections, are not necessarily leveraged for formal collaboration (Giuliani 2007, Rabellotti and Schmitz 1999). Formal networks tend instead to be closed to a small group of trusted collaborators (Giuliani 2007, Marques 2017). This is partly the result of perceived differences in organisational capabilities, a perception which is particularly relevant for the firms with the highest capabilities, since it limits the number of local partners which they consider as viable to enter formal technological

development networks (Maghssudipour et al 2021). The literature on trust refers to this selection bias by pointing out that cognitive cues and expectations are important both for the formation of ties and for their endurance (Grillitsch and Nilsson 2019). Due to limited options locally, the most advanced firms will also tend to establish links with organisations located elsewhere in the country or internationally, both through value chains and as collaborators in technological or other projects (Rodríguez-Pose and Fitjar 2013, Lorentzen 2007, Marques 2017).

This lack of overlap between formal and informal networks is important because, though informal networks can be useful in disseminating some types of information, they do not facilitate the type of interactive learning between firms which allows them to share more advanced knowledge (Lundvall 2010), and in particular the type of tacit knowledge which is essential to develop more complex organisational capabilities (Cimoli et al 2009). This network fragmentation helps to explain why higher capabilities tend to remain concentrated in a small number of firms and do not disseminate more widely. The separation between formal and informal networks is also relevant from the perspective of value chain management at the local level. Value chains have distinct governance modes (Pietrobelli and Rabellotti 2011), whether they are governed by multinational corporations or by domestic firms. In a context of network closure and fragmentation it is more likely that lead firms, even when they are locally-owned organisations subcontracting locally, will manage their value chains through arms-length relationships, thereby limiting opportunities for interactive learning and for the dissemination of complex knowledge (Cimoli et al 2009, Marques 2019, Pietrobelli and Rabellotti 2011).

Importantly, the RIS concept is not confined to firms. Though we will not develop these points extensively in this paper, it is necessary to recognise the contribution of higher

education institutions and the public sector to the development of innovation capabilities and the characteristics of innovation systems (Marques et al, 2019). Equally within these organisations there are usually capability shortcomings in LDRs. As Bonaccorsi (2017) has demonstrated, universities in less developed European regions tend to generate lower quality research, when compared to their counterparts in advanced regions. Additionally, when universities in LDRs have high quality departments, they are usually in scientific or technological areas which are not relevant for local economic structures, which further undermines their potential contribution to regional development. These disconnections are furthermore compounded by the frailties of the innovation eco-system in these contexts, which includes the lack of supporting institutions that can fund the various stages of scientific and technological development, and the financial instruments necessary to finance start-ups and high-risk economic ventures (Huggins and Kitagawa 2012; Marques et al 2019).

In relation to the public sector, recent indexes have shown that there is significant variation in subnational institutional quality across Europe (Charron et al 2018). Using these data, various authors have been able to demonstrate that the sub-national quality of governance has an impact on innovation (measured as patent outputs) (Rodríguez-Pose and Di Cataldo 2015), returns on infrastructure investment (Rodríguez-Pose and Garcilazo 2015) or even the inclusiveness of job growth (Di Cataldo and Rodríguez-Pose 2017). Additionally, a different strand of literature has demonstrated how formal institutions and political processes have a significant impact on the inclusiveness of development (Hickey et al 2014). In turn, this inclusiveness is key to the development of innovation potential, because it means that the highest possible number of people will have access to quality public services, including education and other skills that are essential for the creation of innovation capabilities.

What then are the consequences of identifying weaknesses at the organisational levels (for firms, universities and the public sector) rather than focusing on the system? It is true that in a system the whole is greater than the sum of its parts, and therefore the dynamics that it generates cannot be reduced to the individual characteristics of its constituent organisations. Nonetheless, the nature and contents of a system cannot be separated from the strategic intent of the organisations that create it and maintain it (Rabellotti and Schmitz 1999). Innovation systems can be used, for instance, to reinforce the power of multinational corporations over their suppliers, or to co-opt universities and other public agencies to support R&D efforts that would otherwise be supported by private entities (Rabellotti and Schmitz 1999, Christopherson and Clark 2007). Even without the presence of large firms, such systems can be highly heterogeneous and dominated by the local firms (or other organisations) with the highest capabilities (Giuliani 2007, Marques 2017). At the extreme, strong local systems, involving thick public-private relationships, can be the bedrock of corrupt or even criminal practices that undermine innovation dynamics and investment practices, not to mention their overall implications for the quality of life of citizens (Farole et al 2011).

4. Dynamic relationship between formal and informal institutions

The second fundamental element that has not been adequately discussed in the regional innovation literature, is the dynamic interaction between formal and informal institutions. RIS research tends to prioritise the study of informal institutions that facilitate the exchange of knowledge. Among others, they refer to the importance of openness to new ideas, an innovation or entrepreneurial culture and, crucially, of interpersonal trust (Moulaert and Sekia 2003). The latter is particularly important because it is seen as the lubricant for social relationships, both formal and informal. We would argue that informal institutions are given predominance in the RIS concept primarily for two reasons. Firstly, research has indicated

that they vary within territories that share the same formal institutions, with significant impacts on innovation outputs (Crescenzi et al 2013, Helliwell and Putnam 1995). This would suggest that informal institutions are indeed the decisive factor in explaining territorial disparities, since they are the changing variable, at least within national contexts where formal institutions are (in theory and depending on degrees of decentralisation) the same for the whole territory. Secondly, formal institutions are often determined at the national level, albeit with important contributions by subnational levels of government, especially in federal countries such as the USA or Germany. Since the RIS concept tends to be concerned with smaller territorial units it would make sense to focus on informal institutions, which are more likely to be determined by community dynamics (Farole et al 2011) that do not necessarily correspond to administrative units with legal, administrative or financial autonomy.

Nonetheless, despite the validity of these arguments, we argue that the focus on informal institutions is also due to the bias towards core-centric theoretical models that privilege the experiences of advanced regions in more developed countries. Because these regions are located in national contexts where formal institutions function reasonably well, the concepts do not question their contribution to the emergence of informal settings, because the failures of formal institutions are not as evident. In contrast, in countries where formal institutions are more dysfunctional, their negative impact on innovation dynamics can be made more visible and therefore could lead to different types of research questions.

Echoing other research (Farole et al 2011), we argue that the interaction between formal and informal institutions is important to explain why there are significant subnational variations in innovation systems and quality of governance. These variations are important, even if national factors explain a significant part of the differences in quality of governance within Europe (Charron et al 2018). The key to understanding this interaction is the distinction

between *de jure* and *de facto* institutions. The first refers to institutions as they are written in law and the second to how they are applied in practice. According to Farole et al (2011) this can be explained by the interaction between societal rules and community dynamics. Societal rules are, at least in theory, the same for a whole territory, whereas the latter can materialise at the local (or regional) level. As the authors argue, a community is not necessarily local, though in this paper we are primarily concerned with those that are. Community dynamics shape how formal institutions are interpreted and applied, and thereby influence the provision of public services. This can happen for instance through nepotism, which ensures that public jobs or policy instruments are distributed according to family and personal connections and which is likely to have an impact on the quality of public services and their overall impact.

One way to understand why this is relevant in the context of RIS is by re-examining the concept of interpersonal trust. Research on the impact of trust on territorial innovation tends to focus on the enabling factors that sustain high-trust communities (Cooke et al 2004, Grillitsch and Nilsson 2019). In these contexts, repeated positive interactions create further reinforcements and generate a virtuous circle. However, a relatively neglected dimension from the theoretical literature on trust is the dynamic interaction between enabling factors and coercion (Grillitsch and Nilsson 2019). This interaction means that trust relationships are sustained not only by positive previous experiences but also by the knowledge that any opportunistic behaviour can be quickly punished. When this coercive aspect is acknowledged, it is usually in the context of informal rule-enforcement, with the assumption being that a break in trust leads to an agent being shunned by the community. But this of course implies the previous existence of high levels of trust, which would mean that individuals quickly share information about any wrongdoing. In contrast, opportunistic behaviour in low trust environments does not get reported, and there are therefore no informal mechanisms to deal with it (Marques 2017). It is precisely in these contexts that

formal institutions, particularly the justice system, would be necessary to ensure the application of basic rules and standards of behaviour (Farole et al 2011).

The existence of a dynamic relationship between interpersonal trust and well-functioning formal institutions is shown by the strong positive correlation between trust in others (interpersonal trust) and trust in various formal institutions. This has been demonstrated by the work of Murtin et al (2018) and is also evident in the data presented in tables 1 and 2. These tables, using data from the 9th round of the European Social Survey, show that there are positive and significant correlations between interpersonal trust and trust in various formal institutions at the institutional level (table 1) and national level (table 2). Though these correlations do not assume causality, they are indicative of how both sets of perceptions are closely linked, which according to our argument is justified by some of the contributions to the study of interpersonal trust.

It is true that as argued by Farole et al (2011), informal mechanisms to control opportunistic behaviour are faster and as such more efficient at enforcing high trust levels. In contrast, formal mechanisms tend to be slower and are far more resource intensive. Nevertheless, in a situation where the former are not functioning properly, the latter might be the only solution to break a negative lock-in in matters of interpersonal trust. We are not suggesting that there is a linear or direct relationship between formal and informal institutions or that trust can be legislated. Rather, we are arguing that it is possible to create a formal institutional environment that is more conducive to the emergence of trust-based relationships, and since formal institutions are the only ones that can be changed by public policy, they should be the priority for policymakers.

Table 1 – Correlation between interpersonal trust and trust in several formal institutions at the individual level

		Trust in country's parliament	**Trust in the legal system**	**Trust in the police**	**Trust in politicians**	**Trust in political parties**
Interpersonal trust	Correlation coefficient	,380**	,376**	,307**	,369**	,366**
	N	35064	35237	35655	35208	35099

Data source: ESS Round 9: European Social Survey Round 9 Data (2018)

Table 2 - Correlation between interpersonal trust and trust in several formal institutions at the country level

		Trust in country's parliament	**Trust in the legal system**	**Trust in the police**	**Trust in politicians**	**Trust in political parties**
Interpersonal trust	Correlation coefficient	,863**	,949**	,868**	,883**	,868**
	N	19	19	19	19	19

Data source: ESS Round 9: European Social Survey Round 9 Data (2018)

Another way to illustrate the dynamic relationship between formal and informal institutions is the practice in human resource hiring for universities, and in particular the tendency in some contexts for what is sometimes called ‘endogamic hiring’ or inbreeding (Altbach et al 2015). This practice refers to the hiring by universities of their own graduates, and it ranges from the promotion and mentoring of students that are identified as talented, to outright nepotism. This topic is relevant in this context due to the importance of universities for innovation systems and because the processes which regulate hiring are likely to influence academic loyalties (for instance, to hierarchical superiors rather than to disciplinary standards or policy goals), knowledge diversity and openness to external ideas (Altbach et al 2015). This in turn affects

the willingness and desire of academics to engage with external partners and to be an active part of a regional innovation system.

The influence of 'endogamic hiring' on university culture is strong and resistant to change (Vaira 2017, Triossi and Romero-Medina 2006). Even when new reforms are introduced by central governments, the system can adapt and simply shift its practices to maintain similar practices, as demonstrated for the cases of Italy and Spain (Vaira 2017, Triossi and Romero-Medina 2006). Nevertheless, formal changes do open up opportunities for new practices. Analysing the case of Italy, Grilli and Allesina (2017) find that after the introduction of a law in 2010 "preventing departments from hiring relatives of their faculty" (Grilli and Allesina 2017, pp. 7603), nepotism fell in Italian universities. Of course, this covers only one aspect of 'endogamic hiring', and it does not show that other forms of 'inbreeding' have been eliminated. Similarly, in Spain, Pascual-Fuster (2019) demonstrated that when a university department banned the hiring of its own graduates, its recruitment shifted radically. According to this analysis, new recruits are more productive in terms of research outputs, with similar levels of teaching quality. Though this was a decision made at the university level, it was encouraged by legislative reforms at the national level and it had an impact on the culture of the university (Pascual-Fuster, 2019).

What both examples show is that legal reforms are not a guarantee that informal cultures change and adapt in the direction intended by the legislators, but that they can nevertheless have some positive incremental effects and even induce behavioural change. Recent research appears to corroborate these claims, by arguing that relative improvements in the quality of government can generate significant dividends in terms of economic growth, even if the region has overall lower quality of governance (Rodríguez-Pose and Ketterer 2019). More importantly, as argued in the introduction, paying attention to the dynamic interaction of

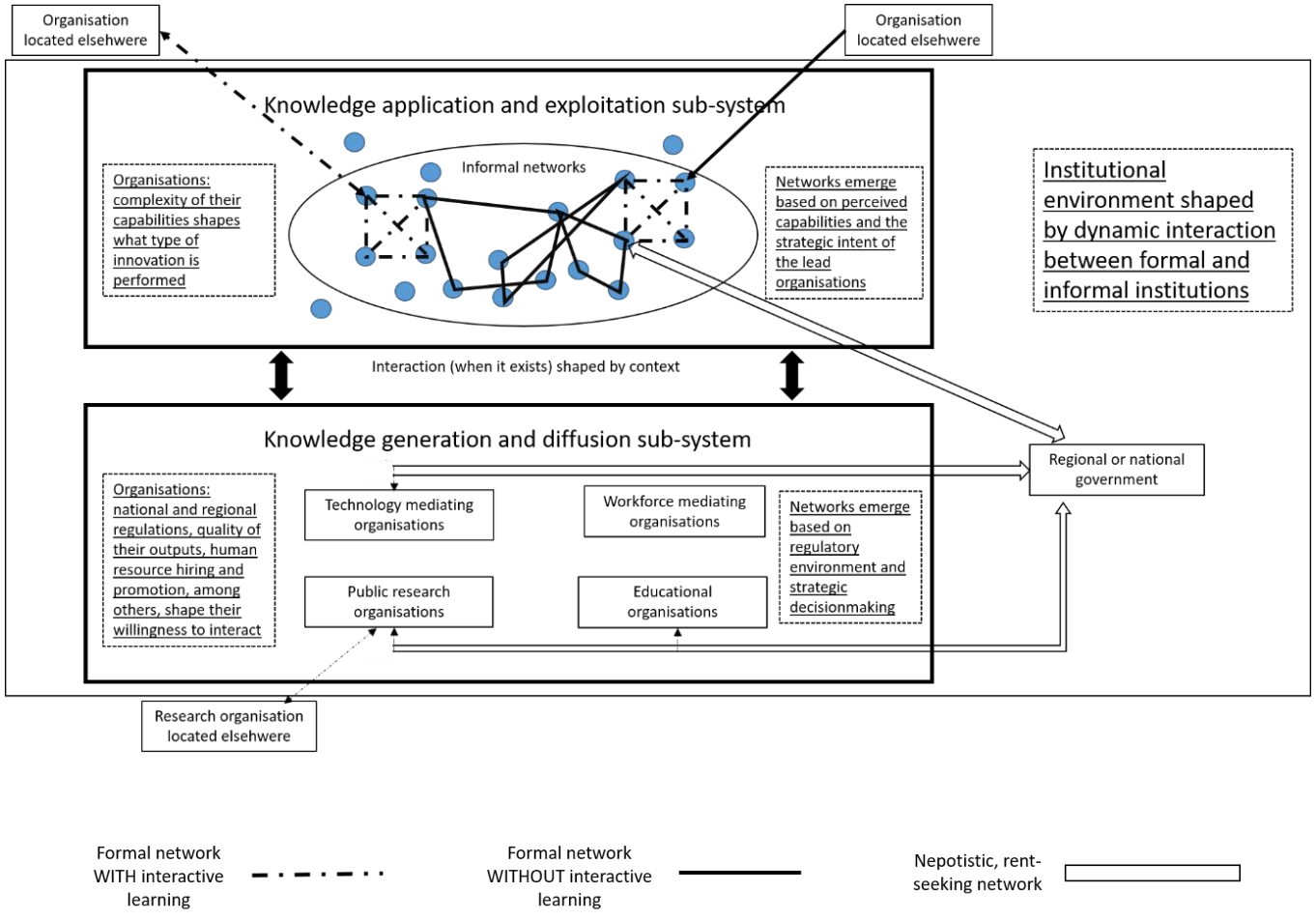
formal and informal institutions allow us to avoid culturally deterministic interpretations of innovation performance, which feeds the assumption that some countries or regions are doomed to perform poorly in these matters.

So far this paper has discussed how the characteristics of organisations shape the functioning of territorial innovation systems, and how these shortcomings prevent the emergence of positive externalities at system level. The paper has also argued that the institutional dimension of RIS is only partially understood due to the emphasis on informal institutions. These sympathetic critiques are not meant to advocate for the creation of new concepts, but rather to build on existing ones. Taking the standard RIS concept as a guide, they would expand it in significant ways.

Figure 1 summarises some of the points made above by providing an example of an idealised RIS, building on the work of Tödtling and Trippl (2005) discussed in section 2. First, it shows that within the two sub-systems that form a RIS (knowledge generation and knowledge application sub-systems), one must account for the characteristics of the organisations and how they shape the networks which emerge. Firm level innovation is conditioned by their organisational capabilities which also create expectations about who they engage with and to what purpose. For other organisations, their quality and internal dynamics, and the regulatory regime in which they operate, have a similar impact both in their innovation activities and in how they engage with other actors. Second, within the knowledge exploitation sub-system (primarily the private sector), Figure 1 illustrates the different type of networks that can co-exist with and without overlapping. In this example, there are comprehensive informal networks covering almost all firms (blue circles – those outside are not connected formally or informally to other firms). Within them, there are several formal networks restricted to a small number of firms, and only some providing

opportunities for collaboration and interactive learning. Firms also have relationships with organisations located elsewhere, and these can also be distinguished between those with and without interactive learning.

Figure 1 – Updated regional innovation system model which includes multiple type of possible relationships based on organisational capabilities and types of network



Adapted from: Tödtling and Trippl (2005)

Within the knowledge generation sub-system, we mostly emphasise the different types of network with external partners. The authors do not assume the existence of formal collaborative relationships, such as triple-helix interactions, and suggest that these are in fact dependent on various internal (to the organisation) and external factors. We also account for the fact that some of the interactions within the system, and to actors outside the system, may have very little to do with knowledge generation and diffusion and may instead be dominated by nepotism and/or rent-seeking (these types of relationships also exist between firms and public policy organisations). Although this figure is not comprehensive, it does serve as an illustration of the foregoing points.

5. Innovation, development and regional policy

Building on the arguments of the previous two sections, we now pose a more fundamental question: does innovation necessarily lead to regional development, or do specific regional conditions have to be in place for that to happen? According to the literature there are a number of mechanisms through which innovation leads to regional development, with possibly the most common being through the emergence of knowledge externalities. This is an argument which runs from Alfred Marshall´s industrial district remarks to the variants that have emerged since then, and which is relevant both for economic geography and geographical economics (Moulaert and Sekia 2003). The core argument is that due to the existence of formal or informal networks between co-located firms (and other organisations), investments in knowledge and innovation in one organisation spill over to competitors creating mutually reinforcing systemic effects. (Moulaert and Sekia 2003, Storper 1997). These effects lead to an overall higher degree of competitiveness, which in turn allows a local sector and its value chain to grow and to generate jobs (Saxenian 1994).

This mechanism however depends on the manifestation of a set of conditions. One of these conditions is that networks have to be relatively open and inclusive, which as we have seen, is not always the case in LDRs. If there is network fragmentation, this prevents the emergence of system-wide knowledge externalities (Giuliani 2007, Maghssudipour et al 2021). Another condition is that the economic specialisation in the region has to be emergent, particularly if it can generate new products and services with high value-added. This means that it is either a sector of activity which did not exist previously in the region or worldwide, and therefore has the potential to grow and attract investment; or that it uses an emergent technology, with the potential to generate new specialisations and sectors of activity (Binz and Truffer 2016, Fornahl et al 2012). If in contrast the economy is specialised in mature economic sectors, then innovation is more likely to be incremental and focused on process or organisational innovation, which can help sustain the competitiveness of firms, though usually at the expense of employing fewer people (Hassink 2007).

Another important route to regional development happens through a very important mechanism that has not been sufficiently discussed, in our opinion: when innovation leads to structural economic change, as shown by McMillan et al (2104). Even though the authors are discussing national level processes, we argue that their results can be relevant at the sub-national level. McMillan et al (2014) analysed changes in three sets of countries (in Africa, Latin American and East Asian), according to two variables: productivity growth in core sectors of economic activity within each country, and structural change, which happens when the employment structure shifts towards higher-value added activities. The classic example of the latter is when countries change from being predominantly agricultural to having a larger share of their population employed in manufacturing.

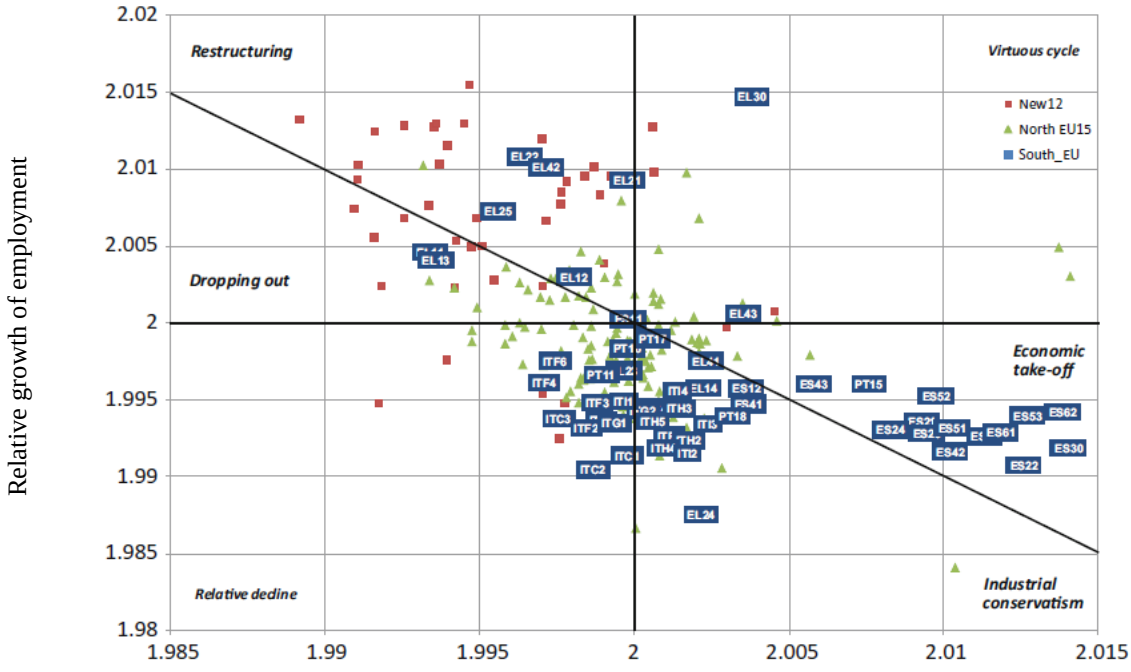
The authors found that in two of the macro regions studied (Latin American and East Asia) the core sectors of economic activity had experienced productivity growth, which in turn had generated a labour surplus. This is because productivity growth happens in part through technological improvements or organisational innovations, which lead to higher outputs at the firm level for the same, or lower, levels of employment. The difference between the two country blocs was that in East Asia this labour surplus had been absorbed by new sectors with similar or higher levels of value added, which led to structural change and higher aggregate growth for the whole economy. In contrast, in Latin America the excess labour was absorbed by sectors with lower productivity levels (such as agriculture) or by the informal economy, which explain why productivity growth in core sectors did not lead to higher national productivity and growth for this set of countries. Though the relationship between the paths of individual sectors and their regional context has not been widely discussed, the recent contributions by Frangenheim et al (2020) and Breul et al (2021) demonstrate that in order to understand the development trajectories of regions, it is necessary to analyse the linkages between different industries. The emergence of a new path can for example have a negative impact on existing industries, if they are competing for the same scarce resources (Breul et al 2021).

Our argument in this paper is that similar processes occur in some LDRs, especially when their firms are primarily engaged in technology adoption and process innovation, which leads to productivity growth at the firm level (and potentially at the sectoral level), but does not lead to new specialisations. When this happens, the result is not necessarily higher regional productivity, but rather the release of labour surplus to less productive sectors, or the out-migration of labour, especially of highly skilled labour which moves to core areas where it can access higher paying jobs in more advanced sectors. This latter point has been

demonstrated recently by Charlot et al (2015), who argued that innovation in core European regions has a pull effect on resources (including human resources) from the rest of Europe.

The work of Fratesi (2017) provides some evidence that these processes have indeed happened within Europe. As shown in Figure 2, the author analysed the growth patterns of European regions between 1995 and 2006 taking into account productivity growth (vertical axis) and employment growth (horizontal axis). The diagonal line shows average GVA growth for the EU. The combination of these three variables allows one to place each region according to their relative employment growth (positive if it is to the right of the line intersecting the horizontal axis at 2), productivity growth (positive if it is above the line intersecting the vertical line at 2) and GVA growth (higher than the the European average, if above the sloped line).

Figure 2 - Growth patterns of European regions 1995–2006 (EU27 ¼ 100) (logarithmic scale used to improve readability)



Relative growth of employment

Source: (Fratesi 2017, pp. 64)

As the data show, only a small number of regions, mostly in northern Europe and some in the new member states, have witnessed productivity growth, employment growth and above-average GDP growth. If one looks at the European periphery two results stand out: in CEE countries, many regions have been witnessing productivity growth but employment decline, which likely helps to explain why they are categorised as low-income regions (EC 2017). In turn, Southern European regions were overwhelmingly below average in terms of productivity growth, though a lot of them did witness employment growth in the years measured, and this helps to explain why they are low-growth regions. Furthermore, as shown by Fratesi and Rodríguez-Pose (2016), this growth was sustained by limited exposure to trade, which in the long-term can lead to slower employment growth even in periods of economic expansion.

In simple terms, regions in CEE states have had productivity growth, but are not generating new sectors of economic activity, whereas Southern European regions generated employment, but mostly in low-productivity sectors. However, as demonstrated by the analysis of Camagni and Capello (2013), this would not be an accurate picture of these regions,since they all in fact exhibit some form of innovation potential. Our hypothesis is that there is no simple connection between innovation and regional development, considering how many factors mediate this causal effect, from organisational capabilities, network types to the institutional environment.

The work of Iammarino et al (2019, 2020) on the sources of regional development and regional stagnation is illustrative of these processes. According to these authors, sub-national development is explained by the combination of various factors: the effects of agglomeration economies, knowledge externalities, labour mobility, physical connectivity and the power of centralisation versus diffusion. These dynamics refer both to the internal characteristics of regions but also their interaction, indicating that, as argued by Massey (1995) three decades ago, drawing on a different theoretical framework, the fortunes of regions cannot be separated from each other. As mentioned previously in this paper, recent data corroborates this dynamic perspective on the interrelationship of regional development and under-development (Charlot et al 2015), by showing how human capital and other knowledge resources flow to wealthier European regions. In other words, innovation is not merely something which some regions possess but not others: it is part of a process unfolding at various geographical scales and which builds upon, and reinforces, current inequalities (Clark 2020). Even when firms or other agents in LDRs are innovative, it is not certain that value-added will be appropriated within the region (Shearmur 2016).

This understanding has important consequences for research agendas around innovation and regional development, because it requires that those looking at the former make explicit efforts to link it to the latter (assuming of course that they are ultimately concerned with development, which is not necessarily the case when the lens is for example organisational innovation, or creativity in peripheral areas). It also has fundamental implications for regional policy. Recent approaches that draw on capacious notions of innovation (Coenen and Morgan 2020) have some potential to address some of these shortcomings, because they draw attention to social or environmental dimensions of socio-economic change. They also include a wider set of actors, such as the public sector, or third sector organisations, which can be crucial for regional development strategies that are not aimed exclusively at increasing

exports through competitive advantage. The re-emergence of industrial policy (Bailey et al 2019; Mazzucato 2018) is also a welcome sign, because it shifts the research and policy lens towards issues such as investment, employment creation, and wellbeing.

Nonetheless two aspects merit greater attention than they have received to date: one is the fundamental role of the nation-state. Though many authors and policy makers see the emphasis on regions or subnational territories as potentially empowering, because they are meant to give LDRs a greater say in their own policy strategies (Barca 2009), this emphasis also encourages forms of territorial competition where some regions (those will less resources), will always be at a disadvantage in a zero-sum game which reinforces the status-quo, with a few exceptions (Bristow 2005, Clark 2020). By making explicit that regional fates are intimately linked with national policies and strategies (Crescenzi et al 2020), one can seek to avoid a race-to-the-bottom among territories of the same country, and utilise the regulatory and policy tools that governments have at their disposal to strive towards regional convergence, even if one accepts that regional inequality cannot be fully eradicated. The nation state is also necessary to address the interrelationship between formal and informal institutions that the two previous sections discussed, since formal rules and regulations often emanate at this scale (Farole et al 2011).

A second crucial aspect is that by understanding regional development as a collective endeavour that should involve all geographical scales, individual nations but hopefully also at the international level, then it would be possible to consider alternative approaches to development, which move away from trying to develop competitive, export economies in every region. The public sector, through its health or education activities for instance, in coordination with organisations in a few key economic sectors such as utilities, can implement training and employment programmes that could lead to higher incomes for

workers in essential services (Coenen and Morgan 2020), many of which are currently underpaid and with precarious employment situations. Organisations such as Universities, rather than being enlisted into races towards scientific excellence and knowledge commercialisation, could be encouraged (and compensated) to focus on training human capital for local needs, or on adopting a developmental role in their engagement with regions (Kohoutek et al 2017).

For rural or remote areas that are unlikely to become innovation hubs, countries could recognise their contribution to the preservation of ecosystems and environmental well-being, with fiscal transfers and support for employment in conservation activities and public goods. Strategies to develop them through investments in so-called green-tech could be a part of this strategy (Morales and Sariego-Kluge 2021), as long as outcomes are not measured according to a simple cost-benefit yardstick, but rather as a part of a coordinated development strategy that has social, economic and environmental aims. Overall, with these approaches the aim should not be to return to an era of top-down, government interventions aimed at LDRs, but rather a coordination between nation-state and regional actors as suggested in recent research on experimental governance and territorial development (Morgan, 2018).

6. Conclusions

This paper has argued that in less developed regions (LDRs) innovation at the firm level does not automatically translate into regional development (Shearmur 2016). We developed this argument by focusing first on a sympathetic critique of territorial innovation models (Moulaert and Sekia 2003), and by emphasising the need to study the interaction between formal and informal dynamics (Farole et al 2011, Maghssudipour et al 2021, Marques 2017). Second, we discussed how recent research in the field of regional development (Iammarino et al 2019, 2020), shows that development is the result of multiple socio-economic dynamics. It

also shows that regional fates are interdependent, and that innovation is part of this interdependency, since it builds upon and reinforces current spatial inequalities (Clark 2020, Massey 1995). Finally, the paper has distilled some of the theoretical and policy implications of these arguments, namely in terms of the importance of the nation-state, and of recognising that debates about territorial cohesion should not be dominated solely by an economic rationale.

These arguments would benefit from future research that adds further empirical grounding to the claims made in this paper, with a view to improving or building concepts that are better at explaining the fate of LDRs in Europe and elsewhere. This implies a shift in research questions and methodological approaches. From an epistemological perspective, focusing on success stories, means studying events that produced certain outcomes, and to a certain extent assuming that those same events will lead to similar results in other contexts (Eder 2019, Hassink and Marques 2015). However, we argue that in regions whose economies have been stagnant or in decline, it is necessary to search for the reasons as to why certain dynamics fail to materialise: collaborations that are not initiated, engagements that are difficult to produce, policies that do not have the intended results. This presupposes an epistemological effort to find the flaws and fissures in the system, rather than searching for what works.

From a policy perspective, this paper argues that the biggest challenge is that of achieving coordination across territorial scales. Place-based policies are supposed to be genuinely attuned to the granular contexts of LDRs, by building on local knowledge and the strengths (both explicit and latent) of regional actors (Barca 2009, Morgan 2018). However, it must also be recognised that in LDRs there is often a fragile (or low quality) institutional environment (Charron et al 2018), which means that engaging local actors may lead to a reinforcement of rent-seeking or corruption networks. Even if the latter is not the case,

engaging with actors operating away from the technological frontier, or with organisations that have limited capabilities, can lead to policies that merely reinforce current institutional arrangements. Coordination across scales could help overcome this limitation, by providing learning opportunities forpolicy-makers at all levels of the multilevel polity. This is even more relevant when, as we argued in the previous section, some measures of regional development are only attainable with the involvement of the nation-state, and international organisations like the EU.

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