RIERC Regional Innovation and Entrepeneurship Research Center

WORKING PAPER SERIES

2018-003

The relevance of quantity and quality entrepreneurship for regional performance: The moderating role of the entrepreneurial ecosystem

László Szerb
Faculty of Business and Economics, University of Pécs
Esteban Lafuente
Department of Management, Universitat Politècnica de Catalunya (Barcelona Tech)
Krisztina Horváth
Faculty of Business and Economics, University of Pécs
Balázs Páger
Centre for Economic and Regional Studies, Hungarian Academy of Sciences

Regional Innovation and Entrepreneurship Research Center
Faculty of Business and Economics
University of Pécs

H-7622, Pécs Rákóczi str. 80.

Phone: +36-72-501-599/63190
E-mail: rierc.center@ktk.pte.hu
Web: http://hu.rierc.ktk.pte.hu/

The relevance of quantity and quality entrepreneurship for regional performance: The moderating role of the entrepreneurial ecosystem

László Szerb
Faculty of Business and Economics, University of Pécs
Pécs, Rákóczi 80, H-7622, Hungary
E-mail: szerb@ktk.pte.hu

Esteban Lafuente
Department of Management, Universitat Politècnica de Catalunya (Barcelona Tech)
EPSEB, Av. Gregorio Marañón, 44-50, E-08028 Barcelona, Spain
E-mail: esteban.lafuente@upc.edu

Krisztina Horváth
Faculty of Business and Economics, University of Pécs
Pécs, Rákóczi 80, H-7622, Hungary
E-mail: horvathk@ktk.pte.hu

Balázs Páger
Centre for Economic and Regional Studies, Hungarian Academy of Sciences
H-7621 Pécs, Papnövelde utca 22. Hungary
E-mail: pagerb@rkk.hu

Abstract:
This study analyses how the entrepreneurial ecosystem and different types of entrepreneurship—i.e., quantity (Kirznerian) and quality (Schumpeterian) entrepreneurship—impact regional performance, in terms of gross value added per worker and employment growth. By analysing 121 European Union regions between 2012 and 2014, we find that an enhanced entrepreneurial ecosystem yields to superior regional performance. The results reveal a heterogeneous effect of quantity- and quality-based entrepreneurship on regional performance: quantity (Kirznerian) entrepreneurship negatively impacts regional performance, while this effect turns positive in case of quality (Schumpeterian) entrepreneurship. The findings also suggest that regions with a healthy entrepreneurial ecosystem have a greater capacity to materialize the effects of high regional business formation rates, regardless of their quality level (Kirznerian entrepreneurship), while regions with weak entrepreneurial ecosystem may rely on Schumpeterian entrepreneurs—who channel new and more innovative resources to the economy—to compensate the absence of entrepreneurship policy-support instruments and increase their economic outcomes.

Acknowledgements:
This study was financed by the Financial and Institutional Reforms for an Entrepreneurial Society (FIRES) that has received funding from the EU's Horizon 2020 research and innovation programme under grant agreement No. 649378.
We would like to thank to Zoltan J. Acs and the participants of the workshop on ‚Evolution and Co-Evolution of Regional Innovation Processes', Heilbronn, June 29, 2017 and of the FIRES annual conference, 4-6 October, Athens for useful comments.

1. Introduction

While entrepreneurship has long been believed to be a major determinant of economic outcomes, even latest empirical studies provide mixed and unconvincing evidence about the ultimate relationship between entrepreneurship and various economic performance metrics (Acs, Estrin, Mickiewicz, & Szerb, 2017; Acs & Varga, 2005; Nightingale & Coad, 2014). Moreover, results vary according to the selection of performance measure chosen (growth, development, prosperity, productivity), the definition and the measure of entrepreneurship (single level/multidimensional, quality/quantity), the analysed geographic unit (country, macro-regional, micro-regional, city level), and the modelling strategy.

A consistent finding of many studies is that both entrepreneurship, measured by activity, and the effect of entrepreneurship on performance vary over development level (Acs, 2006). Entrepreneurship is found to positively and significantly influence territorial performance in developed economies; however, results are less convincing if we include less developed territories (Van Stel, Carree, & Thurik, 2005).

Not all types of entrepreneurship are equally important (Grilo & Thurik, 2008). Wide range of measures like self-employment rates or the Global Entrepreneurship Monitor (GEM) TEA (total early-phased entrepreneurial activity) are found to moderately influence economic growth while innovation-related or high growth start-ups show much stronger impact on economic growth (Wong, Ho, & Autio, 2005). Minniti and Lévesque (2010) propose a model where research-based, Schumpeterian entrepreneurship spurs growth in developed territories, while imitative, Kirznerian entrepreneurship is more important in less developed economies. Scholars propose that national level research is not appropriate and the spillover effects of entrepreneurship can be more effectively captured at sub-national levels (Acs & Armington, 2004; Feldman, 2001). Yet, the proof for the overall effect of entrepreneurship on economic growth at regional level has not been found yet (Müller, 2016).

Many studies claim that intermediate linkages (Carree & Thurik, 2006; Wennekers & Thurik, 1999), or contextual factors (Welter, 2011; Zahra, Wright, & Abdelgawad, 2014) play an important role in the transmission mechanism. Acs, Braunerhjelm, Audretsch, and Carlsson (2009) and Braunerhjelm, Acs, Audretsch, and Carlsson (2010) identify knowledge diffusion as the key mechanism that links entrepreneurship and growth.

Research on the entrepreneurial ecosystem (EE) portrays entrepreneurship as the combination of the above mentioned perspectives: the emergence of productive entrepreneurship as a result of interconnected actors and factors within a focal territory (Acs, Autio, & Szerb, 2014). The EE approach differentiates between environmental, ecosystem

elements and outcome measures. Local development depends on how the EE supports the rise of high growth firms (Alvedalen & Boschma, 2017; Mason & Brown, 2014; Stam, 2015).

In this context, the Global Entrepreneurship Index (GEI) has emerged as a relevant measure of the EE at the territorial level by measuring the entrepreneurship system as the complex interactions between entrepreneurial attitudes, abilities and aspirations (Acs, Autio, & Szerb, 2014). Within the framework of the knowledge spillover theory, Lafuente, Szerb, and Acs (2016) found that GEI is an important driver of national economic growth. Results are less convincing when GEI is applied in the traditional production function framework where GEI is proved to be important only for developing countries (Acs et al., 2017).

Entrepreneurship has been often invoked as a valid mechanism to boost territorial economic performance. Empirical papers mostly investigated this connection at the country or regional level, thus ignoring potential regional research across countries. Our paper attempts to shed light on the determinants of regional economic growth by connecting the entrepreneurial ecosystem and the entrepreneurial activity in 121 European Union regions. More concretely, we study the impact of the entrepreneurship system, the Kirznerian and the Schumpeterian start-ups on employment growth and GVA per worker. Instead of conventional entrepreneurship ratios (TEA), we propose new measures in line with the Kirznerian and the neo-Schumpeterian approach (Aghion, 2017; Aghion & Howitt 1992; Kirzner, 1973).

2. Entrepreneurial ecosystem and the Regional Entrepreneurship and Development Index (REDI)

It has been widely acknowledged that not all types of entrepreneurship—in fact only a fraction of start-ups—are good for national prosperity and that the institutional context regulates the quality of entrepreneurial ventures (Baumol, 1996; Boettke & Coyne, 2009). In this sense, EE scholars opened a new entrepreneurship research direction by examining the systemic connections behind the emergence of high impact ventures. Initially, EE targeted practitioners, local policy makers and stakeholders and not the academic audience (Feld, 2012; Foster et al., 2013). The need for rigorous research, theory-based concept creation, solid methodology, and proper measurement have recently emerged (Alvedalen & Boschma, 2017; Spigel, 2017; Stam, 2015).

There are three distinctive features of the EE research. First, while most conceptual approaches view the entrepreneurial environment as a bundle of different components, EE adopts a multi-context perspective by highlighting the self-reinforcing forces, close relationships, interdependencies, supporting effects, and forward and backward linkages

among the components. Second, EE clearly differentiates the entrepreneurial environment (ecosystem) and the entrepreneurial outputs. Out of different types of entrepreneurial outputs the EE focuses on those opportunity recognition activities that result in high impact, high ambitious start-ups[1] and neglects potentially marginal, non-growth, self-employment initiations. Finally, the performance of the EE depends on the interaction between the entrepreneur, the organisations and the institutions (Alvedalen & Boschma, 2017), being the entrepreneur the most important agent playing multiple roles in the ecosystem—as leader, mentor, and investor—and founding a potentially high impact venture.

Among the many EE research directions, the GEI is probably the most useful approach by providing theoretical base, and a novel methodology to measure the EE at country level (Acs et al., 2014; Acs & Szerb, 2009). According to Acs et al. (2014, p. 119), the EE or the system of entrepreneurship (SE) '*…is the dynamic, institutionally embedded interaction between entrepreneurial attitudes, ability, and aspirations, by individuals, which drives the allocation of resources through the creation and operation of new ventures*'. In this study, we proposed a modified version of GEI—that is, the REDI—to measure the entrepreneurial performance of 125 EU regions. The REDI ultimately seeks to explain regional development. Following the EE, the adjustment process referred to changes in the institutional variables to reflect the regional forces of agglomeration, connectivity and clustering (Szerb et al., 2017).

The REDI index incorporates three sub-indices, 14 different pillars, 28 variables (14 institutional and 14 individual), 44 indicators and 60 sub-indicators. A valid criticism of many EE models is that component collection is ad-hoc. For creating REDI, the sub-indicator selection was based on 1) a thorough review of theoretical and empirical literature to find sub-indicators that connect best to the entrepreneurial phenomenon, 2) the potential of sub-indicators to assign clear benchmarks to evaluate performance, 3) their capabilities to connect to economic development, and 4) the availability of data over the period 2007-2014. A drawback of the REDI sub-indicators is that some important EE attributes are missing. While the market, the regulatory, the human capital and education, the cultural, the network, the knowledge creation and dissemination, the infrastructure and the finance dimensions are mostly captured; there is no indicator on supporting services and mentoring, leadership, and the effect of universities is partially involved in the educational variables. The structure of the REDI index and the assigned EE attributes are depicted in Table 1.[2]

[1] Startups can be autonomous or employee initiated, intrapreneurial (Stam & Spigel, in press).

[2] The detailed description of the REDI components is presented in Szerb et al. (2017).

Table 1. The structure of the Regional Entrepreneurship and Development Index

	Sub-indexes	Pillars	Variables (*ind.*/inst.)	Entrepreneurship attributes
REGIONAL ENTREPRENEURSHIP INDEX	ATTITUDES SUB-INDEX	Opportunity Perception	*Opportunity Recognition*	**Market and Regulation**
			Market Agglomeration	
		Startup Skills	*Skill Perception*	**Human capital/education**
			Quality of Education	
		Risk Acceptance	*Risk Perception*	**Cultural, Regulation**
			Business Risk	
		Networking	*Know Entrepreneur*	**Networks**
			Social Capital	
		Cultural Support	*Carrier Status*	**Cultural**
			Open Society	
	ABILITIES SUB-INDEX	Opportunity Startup	*Opportunity Motivation*	**Regulation**
			Business Environment	
		Technology Adoption	*Technology Level*	**Knowledge creation/dissemination**
			Absorptive Capacity	
		Human Capital	*Educational Level*	**Human capital/education**
			Education and Training	
		Competition	*Competitors*	**Infrastructure**
			Business Strategy	
	ASPIRATION SUB-INDEX	Product Innovation	*New Product*	**Knowledge creation/dissemination**
			Technology Transfer	
		Process Innovation	*New Technology*	**Knowledge creation/dissemination**
			Technology Development	
		High Growth	*Gazelle*	**Infrastructure and Finance**
			Clustering	
		Globalization	*Export*	**Market**
			Connectivity	
		Financing	*Informal Investment*	**Finance**
			Financial Institutions	

Source: Szerb et al. (2017, p. 13).

While EE scholars have primarily focused on the interrelation between system components, the identification and description of the nature of these connections have been largely sidelined. System components can have (weighted) an additive—the effect of the individual components depends on their weight—or a multiplicative—that is, a combined, interrelated impact on the system performance—influence on the overall system performance. The additive and multiplicative connections of the elements vary at different levels of the

REDI. Indicator and variable calculations are case-dependent. Most indicators are calculated as the average of sub-indicators and most variables are calculated as the average of the indicators assuming *additive* effects.[3] Notable exceptions include the computation of the Freedom indicator that is the result of the multiplication of the Business freedom and the Property rights sub-indices. Each pillar is created as the product of an individual-level and an institutional level variable implying common, *multiplicative* effects.

The most important advantage of REDI relies in its capacity to show how resource allocation can be optimized along the 14 pillars to improve the REDI score and, ultimately, the regional entrepreneurship system performance. To achieve optimization we equalize the marginal effect of each additional input over the 14 pillars and the 125 regions by using the Average Pillar Adjustment (APA) method. Underlying the APA method is the assumption that the normalized average pillar values are different, ranging from 0.36 (Finance) to 0.65 (Product innovation). In our model, the average pillar values reflect the difficulty to reach average pillar performance in reverse order, so that it is about 1.8 times more difficult to reach average performance in Finance compared to Product innovation. This implies that for the same additional input unit we experience 1.8 times larger improvement in Product innovation as compared to Finance. APA corrects this distortion by equalizing pillar averages to the level of the average of the 14 pillars (0.49) and holding all the pillar values in the original [0,1] range. A potential drawback of this approach is that pillar values are only equalized over their averages, and that marginal effects are not necessarily the same if we improve non-average pillars. Monetary differences are also neglected, that is, pillar improvements are computed in natural input units as we cannot estimate the monetary value of input units.

The key idea of REDI is that system performance at region level is 'co-produced' by its constituent elements, meaning that the 14 pillars are interrelated and all support the functioning of the EE, that is, the 14 pillars act as complements for each other. This implies that all pillars should be positively correlated with each other and they should also be positively correlated with the REDI score. These two preconditions are essential for the pillar-based policy intervention to improve the REDI and the whole EE.

In the proposed EE approach, the combination of pillar components determines whether the system of a particular region functions well or not. For each region this means

[3] For example, in the Quality of education institutional variable there are four sub-indicators: three of them comes from the PISA survey (low achievers in reading, math and science) and one is the creative class sub-indicator. The PISA indicator is calculated as the average of the three PISA sub-indicators.

that, after equalizing the averages of all pillars, the value of each pillar is penalized by linking it to the score of the 'bottleneck' pillar with the weakest performance. The penalty is higher if differences are higher, and pillar components are only partially substitutable with each other. An improvement in the weakest pillar would yield to a significant increase in the focal sub-index and, ultimately, the overall REDI score. On contrary, improving a high performing pillar would enhance the value of the pillar itself, and in this case the increase in the REDI index will be smaller. A system with a homogeneous pillar configuration (no weak pillar) evidences that the EE is efficiently channelling and utilizing the region's resources.[4]

Some EE scholars argue that each ecosystem is unique in terms of the configuration and the combination of its many components. Therefore, local administrations should not replicate successful policies adopted by other regions; but rather follow a distinctive development strategy based on their own strengths and weaknesses (Mason & Brown, 2014; Spigel 2017). The REDI adopts a partially different view by assuming that a one-size fits all measure of EE is useful but entrepreneurship policy should be tailor-made by identifying local bottlenecks and narrow (or eliminate) gaps that prevent a given region from fully exploiting its entrepreneurial potential. The REDI complements other case-preferred EE approaches by taking a wider, bird-eye and not a microscopic view of the regional EE. To alleviate system failures, this entrepreneurship policy reflects well the traditional economic view linked to relaxing market failures and to the innovation system approach to improve the weak part of the innovation systems components (Stam, 2015).

3. Measuring Entrepreneurial Outputs

EE scholars maintain that local development can be enhanced by improving the ecosystem; however, this effect may well be moderated by entrepreneurial outputs. While several competing definitions of entrepreneurship reflecting the multifaceted nature of entrepreneurship exist (Acs et al., 2014; Wennekers & Thurik, 1999), we narrow to those entrepreneurship definitions that are centred around opportunity utilization via the creation of new ventures (Vivarelli, 2013). In this sense, entrepreneurial activity refers to the process of recognizing and exploiting valuable business opportunities (Kirzner, 1997; Shane, 2009). Although opportunity exploitation can be linked to intrapreneurship or employee-initiated entrepreneurship, in this paper we concentrate on autonomous start-ups.

The importance of regional entrepreneurial activity has long been recognised;

[4] For more details about the calculation methodology, see Appendix 1.

however, the direction and magnitude of its economic impact has been debated (Audretsch & Fritsch, 2002; Feldman, 2001; Lee, Florida, & Acs, 2004). Various factors have been proposed to explain the dissimilar findings in prior research, including differences in development, industry composition, the inclusion of contextual factors, and the measurement of entrepreneurial activity (Audretsch, Falck, Feldman, & Heblich, 2012; Fritsch & Storey, 2014).

The previous section dealt with the contextual, ecosystem elements, while this section focuses on the activity perspective. Entrepreneurial firms are not homogeneous, and from the novelty of opportunity recognition perspective, start-ups can be grouped into a large number that merely copy existing ideas, a small proportion that introduce minor innovations, and a very few Schumpeterian new firms with breakthrough innovative ideas (Baumol, 2010).

The territorial contribution of start-ups varies according to their typology (Hessels, Van Gelderen, & Thurik, 2008; Nightingale & Coad, 2014). Contrary to the conventional view that emphasises the need for increasing the quantity of entrepreneurial firms, recent research shows that only a small proportion of start-ups and young businesses are responsible for economic growth, job creation or increased productivity (Acs, Åstebro, Audretsch, & Robinson, 2016; Mueller, 2007; Stam, Hartog, Van Stel, & Thurik, 2011; Stam, 2015).

Different types of start-ups coexist in economies, and their overall effect also depends on their composition (Vivarelli, 2013). Moreover, the relationship between the number of businesses and their quality is inverse (Fritsch & Schroeter, 2009), which calls for a careful policy application to boost the intensity of start-ups (Acs et al., 2016; Shane, 2009). The uneven, unknown distribution of start-ups and their potential substitution effects makes irrational to develop a combined, one-size-fits-all entrepreneurship measure (Marcotte, 2013; Vivarelli, 2013). Moreover, entrepreneurial activity measures should be concept based; however, most of them are ad hoc, assuming presumable effects (Marcotte, 2013). This is particularly true for one of the most popular activity measure: the GEM's TEA ratio. The popularity of GEM based measures is due to the consistent and rigorous data collection that includes multiple years, many countries, regions and different levels of development. Yet, the TEA simultaneously includes the 'speculative' nascent businesses with young firms with less than 3.5 years (Stam & Van Stel, 2011)[5], opportunity and necessity start-ups, marginal and high growth potential ventures. Also, the TEA is negatively correlated with GDP per capita,

[5] The TEA rate is the ratio of 18-64-year-old adult population who is in an active phase of startup (nascent) or owns and manages a startup aged less than 42 month.

which suggests that development is linked to low levels of entrepreneurial activity (SAB Foundation, Allan Grey Orbis Foundation, The Global Entrepreneurship and Development Institute, The Global Entrepreneurship Network South Africa, & SEA Africa, 2017).

Despite its widely recognised weaknesses (Baumol, Litan, & Shramm, 2007), TEA still dominates the GEM reports. Out of the many alternative GEM-based entrepreneurship measures (Levie, Autio, Acs, & Hart, 2014; Marcotte, 2013) the opportunity and necessity entrepreneurship rates (Acs, 2006; Reynolds et al., 2005) and the high aspiration or high growth entrepreneurship rates (Stam & Van Stel, 2011; Wong et al., 2005) report a better (but still limited) capacity to explain territorial development outcomes. The limited explanatory power of the GEM-based indices may well result from its generalist approach that includes all types of start-ups in the analysis, regardless the type of new venture. Thus, GEM variables measure the overall magnitude of entrepreneurial activity but they fail to capture the role of competition on entrepreneurship dynamics (Boettke & Coyne, 2003; Kirzner, 1973).

This calls for developing new entrepreneurship measures that accurately capture the direct and indirect impact of quantity and quality entrepreneurial outcomes (Acs et al., 2014). Direct effects—e.g., increased output and employment—are likely observable in the short run, while indirect effects—e.g., superior productivity and innovation—will become evident in the long-term (Acs, 2006; Wennekers & Thurik, 1999).

New business entry intensifies competition by challenging the market position of established firms (Fritsch & Mueller, 2004; Kirzner, 1973). In a scenario of high entry rates, incumbent firms may either downgrade/terminate their operation or adapt to the new market conditions. If the overall output remains unchanged the increased competition may lead to high churning—high entry and exit rates at the same time—and the total employment effect could be negative (Fritsch & Mueller, 2004; Vivarelli, 2013). Innovation has been invoked as a way to enhance the positive effects of competition (Aghion, 2017; Aghion & Howitt, 1992). Innovation leads to create new markets and/or new product/service solutions, thus increasing competitiveness by stimulating growth and productivity (Fritsch & Mueller, 2004).

Given the lack of entrepreneurial outputs within the EU regional context, we need to develop new entrepreneurial activity indicators that reflect the level of competition and innovation among new and incumbent ventures. We therefore propose a quality- and a quantity-related measure. The proposed measures use GEM regional data during 2012-2014. We excluded the ‘speculative’ nascent businesses and we used a different temporal horizon to split the analysed businesses (baby businesses and established ventures).

The first suggested measure reflects exclusively quantity characteristics of businesses

and it is calculated as the number of start-ups divided by the number of incumbent businesses. We call it as Kirznerian entrepreneurship (equation 1):

$$\text{Kirznerian entrepreneurship}_i = \frac{\text{Number of new businesses}_i}{\text{Number of incumbent businesses}_i} \quad (1)$$

where, for each region (i = 1, …, m), the number of new businesses refers to those firms with less than 18 months of market experience; and the number of incumbent businesses includes the number of businesses with more than 18 months of market experience.

This entrepreneurship measure is based on the relative start-up rate. More concretely, this variable shows the importance of start-ups compared to incumbent firms, and thus, it measures the competitive pressure of start-ups on established ventures. From the entrepreneurial point of view, a high ratio could indicate that more people see good profit opportunities in the region where they live, while a low ratio may signal missing entrepreneurial opportunities. The main features of this Kirznerian-oriented entrepreneurship variable are opportunity alertness and profit exploitation (Kirzner, 1973). Although it includes different types of businesses including necessity and low growth potential start-ups, this measure corrects for competitive effects. This 'imperfect' indicator helps to evaluate the possibility of a one-size fits all activity measure as well as the associated uniform entrepreneurship policy focused on increased start-up rates.

The second variable approaches start-up rates from a quality perspective, and measures the relative innovativeness of new firms compared to that of incumbent ventures. Business innovativeness is calculated from the average of three GEM-based variables: 1) the newness of the product (how many customers consider the product of the firm new or unfamiliar), 2) the newness of technology (whether the firm uses old, new or the latest available technology), and 3) operating in a high impact sector (whether the firm operates in a low tech/low impact, medium/high or high-impact, technological sector).

To compute a realistic picture of the regional innovation capacity of start-up/incumbent businesses, for each innovation variable we used the weighted arithmetic average of firms. After calculating the innovativeness of both new and incumbent businesses, our Schumpeterian entrepreneurship measure was computed as follows (equation 2):

$$\text{Schumpeterian entrepreneurship}_i = \frac{\text{Innovativeness of new businesses}_i}{\text{Innovativeness of incumbent businesses}_i} \quad (2)$$

where, for each region (i = 1, …, m), the innovativeness of new businesses is the innovation level of firms with less than 18 months of market experience, while the innovativeness of incumbent businesses refers to the innovation level of businesses with over 18 months of market experience.

This quality measure shows the innovativeness of start-ups compared to that of incumbent businesses. This variable also captures the competitive pressure of innovative new businesses over existing businesses, that is, it measures what Schumpeter called 'creative destruction' (Schumpeter, 1934). We, therefore, name this indicator Schumpeterian entrepreneurship.

4. Research framework and hypotheses

After the review of the most important determinants of territorial performance, our conceptual model is based on the following assumptions. First, contrary to the view that promotes commitment to the autarchy of institutional contexts or entrepreneurial actors, we argue that a holistic approach should be adopted based on the EE literature that recognizes the complementary and organic relationship between these two concepts should be adopted. As a complex measure, we assume that REDI captures the overall performance of the regional EE by taking into account the sub-national diversity (Acs & Armington, 2004). We propose that the EE is conducive to territorial performance and, thus, we hypothesise:

H1: There is a positive relationship between the entrepreneurial ecosystem and regional performance.

We differentiated quality- and quantity-based start-up measures seeking to capture the importance of competition between businesses at different stages of the life cycle. Recent empirical findings underpin the need for incorporating the effects of market competition on territorial economic performance. For example, Fritsch and Changoluisa (2017) find that new firms, irrespectively to their innovation and technology level, contribute to higher productivity of established businesses operating in the region. The authors consider four potential effects of business entry on the productivity of established firms (output market competition, input market competition, knowledge spillover from new to established firms, and provision of better inputs), and their results indicate that only output and input market competition have a significant positive effect. Therefore, start-ups and incumbent businesses complement each other, regardless of the industry sectors where these businesses operate.

However, the effect of Kirznerian entrepreneurship—characterised by opportunity

alertness and profit exploitation—and Schumpeterian entrepreneurship—that is, creative destruction—on territorial performance must be distinguished. First, as Kirznerian entrepreneurship is based on increases in the quantity of businesses, higher business density may be detrimental to economic performance due to excessive competition and lower available profit in the region. On contrary, innovative businesses are more competitive and, therefore, they can create new profit opportunities and break into market niches within and/or outside the region (e.g., via internationalization). Thus, the following hypotheses emerge:

H2: Kirznerian entrepreneurship has a negative effect on regional performance.

H3: Schumpeterian entrepreneurship has a positive effect on regional performance.

Nevertheless, the scope and quality of entrepreneurial activity are not independent from the environment within which businesses operate. In particular, EE takes a significant part in shaping quantity- and quality-related business structures, and they are the hotbed of start-ups (Acs et al., 2016). The regional environmental context conditions the outcome of Kirznerian and Schumpeterian business dynamics in different ways. In the case of Kirznerian entrepreneurship, it seems logical that entrepreneurial opportunity recognition and exploitation yield better results in a healthy, supportive EE. Also, higher REDI value points to more favourable conditions for high quality, innovative start-ups; while lower REDI suggests a less supportive context, which may lead to low quality, less innovative start-ups.

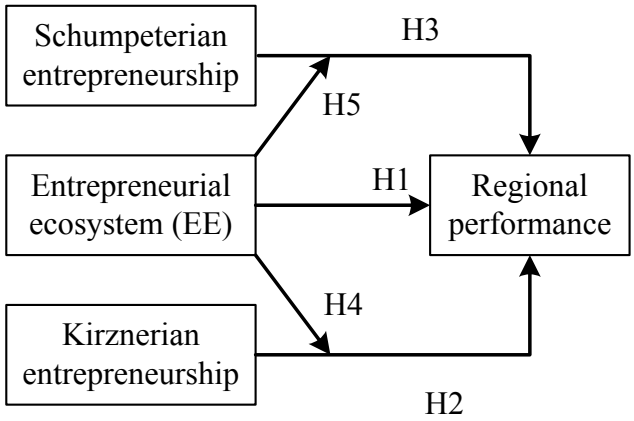
The contextualized effect of Schumpeterian entrepreneurship also depends on the innovativeness of start-ups and existing businesses. Aghion, Bloom, Blundell, Griffith, and Howitt (2005) reveal that innovation can stem not only from increased business entry rates, but also from the response of incumbent businesses to the new ones. This reaction is conditioned by their distance to the existing technological frontier. Therefore, as a reaction to new entry, ‘frontier firms’ likely make additional efforts to innovate (‘escape competition effect’), while ‘laggard firms’ that are far from the frontier face further difficulties and they have no incentives to introduce further improvements (‘discouragement effect’). These two effects suggest an inverse U-shaped effect of competition over innovation and, indirectly, over economic growth (Aghion et al., 2005; Aghion, Blundell, Griffith, Howitt, & Prantl, 2009). Thus, we complement our previous assumptions, and formulate the following hypotheses:

H4: The entrepreneurial ecosystem moderates the negative relationship between Kirznerian entrepreneurship and regional performance.

H5: The entrepreneurial ecosystem moderates the positive relationship between Schumpeterian entrepreneurship and regional performance.

Figure 1 presents the proposed research framework and hypotheses

Figure 1. Research framework



5. Data, variable definition and method

The data used in this study come from three sources. First, regional figures related to gross value added (GVA) per worker, GDP per capita, unemployment, and population density were obtained from Eurostat. Second, information on business formation rates was collected from the Global Entrepreneurship Monitor (GEM) databases. Third, the variables measuring the quality of the entrepreneurial ecosystem across European regions were gathered from the Regional Entrepreneurship and Development Index (REDI) databases. With the support of the European Union ('Financial and Institutional Reforms to build an Entrepreneurial Society' (FIRES), Horizon 2020 project), the latest REDI index was created by researchers from the University of Pécs (Hungary) with the objective of scrutinizing and understanding the entrepreneurial ecosystem in Europe (Szerb et al., 2017).

The unit of analysis is the region and the final sample includes information for 121 EU regions (NUTS 1 and NUTS 2). For all variables, values refer to averages between 2012 and 2014. Note that the representativeness of the sample is ensured insofar as it includes 24 European countries: Austria (3 regions), Belgium (3 regions), Croatia (3 regions), Czech Republic (1 region), Denmark (5 regions), Estonia (1 region), Finland (5 regions), France (8 regions), Germany (16 regions), Greece (3 regions), Hungary (7 regions), Ireland (2 regions), Italy (4 regions), Latvia (1 region), Lithuania (1 region), Netherlands (4 regions), Poland (6 regions), Portugal (3 regions), Romania (4 regions), Slovak Republic (4 regions), Slovenia (2 regions), Spain (15 regions), Sweden (8 regions), and the United Kingdom (12 regions). The list of the study regions is presented in Appendix 2.

This study measures territorial performance via two variables. First, we use the rate of gross value added (GVA) per worker, which represents the total value of goods and services produced by workers of industry sectors in a focal economy. Second, we employ the employment growth rate.[6]

The measurement of the regional entrepreneurial ecosystem is critical for this study. Above the complexity that most EE measures embrace, REDI is a suitable option in the context of our analysis (see section 2). REDI can range from the potential values of 0 to 100. The higher the regional REDI score, the better the quality of the entrepreneurial ecosystem is.

We use data from the GEM databases to create the variables related to Kirznerian (quantity) and Schumpeterian (quality) entrepreneurship. From the GEM databases it is possible to identify the exact start-up year for the surveyed entrepreneurs, and distinguish businesses created in the same year of the survey (firms with less than 6 months of market experience) from firms created in years prior to the survey. In this study, we define new businesses as those firms with less than 18 months of market experience.

We control for various economic and demographic factors in the different model specifications. First, we include two variables related to urbanization. Urbanization economies are a type of agglomeration externality that helps firms to capitalize on mostly financial advantages such as increased local demand and access to cheaper production factors (Bottazzi & Gragnolati, 2015), knowledge spillovers (Glaeser, Kallal, Scheinkman, & Shleifer, 1992), and more efficient regional innovation systems. Additionally, location in large or densely populated cities may prove itself critical to access skilled labour resources (Meliciani & Savona, 2015). In our study, we follow the practice by Meliciani and Savona (2015) and assess the role of urbanization by introducing regional population density and a dummy for regions with a capital city. Finally, we include the Gross Domestic Product (GDP) per capita as an indicator of regional economic development (Lafuente et al., 2016). Descriptive statistics are presented in Table 2 and the associated correlation matrix is in Appendix 4.

Table 2. Descriptive statistics for the study variables

	Mean	Std. dev.	Q1	Q3
GVA per worker	60.19	22.70	41.74	75.83
Employment growth rate	–0.0010	0.0197	–0.0163	0.0099
REDI score	44.57	14.84	33.20	55.90
Kirznerian entrepreneurship	0.1738	0.0924	0.1080	0.2250
Schumpeterian entrepreneurship	2.0308	1.4573	1.4230	2.1410

[6] We calculated the real GDP per capita growth rates but results proved to be inconclusive. See Appendix 3.

Capital city (dummy)	0.1901	0.3940	0.0000	0.0000
Population density	349.80	907.56	73.37	285.83
Unemployment rate	0.1085	0.0652	0.0650	0.1307
GDP per capita	25.96	9.15	19.60	30.35

Monetary values (GVA per worker and GDP per capita) are expressed in thousands of euro. Number of observations: 121 regions.

We employ OLS regression models to estimate the effect of the entrepreneurial ecosystem and the type of entrepreneurship on territorial performance. The full model used in this study has the following form:

$$\begin{aligned}\text{Performance}_i &= b_0 + b_1\text{REDI}_i + b_2\text{Kirznerian entrepreneurship}_i \\ &+ b_3\text{Schumpeterian entrepreneurship}_i + b_{12}\text{REDI}_i \text{ ī Kirznerian entrepreneurship}_i \\ &+ b_{13}\text{REDI}_i \text{ ī Schumpeterian entrepreneurship}_i + b_4\text{Control variables}_i + e_i\end{aligned} \quad (3)$$

In equation (3) performance refers to the GVA per worker and the employment growth rate at the regional level, b_j are parameter estimates estimated for the independent variables (j), and e is the normally distributed error term that varies across regions.

In a second stage we propose a cluster analysis (Everitt, 1980) to further evaluate regions' performance, given their differences in terms of the quality of their entrepreneurial ecosystem and of their entrepreneurial activity (quantity and quality). The variables included in the cluster model are the analysed regional performance metrics (GVA per worker and employment growth), the REDI score, and the variables linked to the quantity (Kirznerian) and quality (Schumpeterian) regional entrepreneurial activity. This complementary analysis seeks to identify specific patterns among European regions.

To attain the second stage analysis we apply a non-hierarchical cluster analysis (K-means) using the aforementioned variables as inputs. However, the efficient optimization of the within-cluster homogeneity and between-cluster heterogeneity implies that the number of clusters has to be specified prior to the estimation. This represents the main pitfall of non-hierarchical cluster analysis, because in many research fields (including social sciences) cluster analyses are often exploratory. Consequently, we conducted two robustness checks to corroborate the number of clusters and the validity of our analysis. First, we computed the Calinski and Harabasz (1974) statistic. This index is obtained as $CH(k) = \frac{B(k)/k - 1}{W(k)/n - k}$, where B($k$) and W($k$) are the between and within-cluster sums of squares, with k clusters. Since the

between cluster difference should be high, and the within cluster difference should be low, a largest CH(k) value indicates the best clustering. From our data, the number of clusters that maximizes the CH(k) index is 5 (*pseudo-F value*: 488.35). Therefore, the final non-hierarchical cluster asks for a five-way division. Second, a discriminant analysis further validates the cluster analysis. Results from the discriminant analysis presented in Appendix 5 indicate that our approach to cluster is appropriate.

6. Results and analysis

6.1 Regression results

The findings for the effect of the entrepreneurial ecosystem and different types of entrepreneurship (Kirznerian and Schumpeterian) on regional performance (GVA per worker and employment growth) are presented in this section. In Tables 3 and 4, model 1 shows the results for the baseline model estimating regional performance as a linear function of the analysed types of entrepreneurship (Kirznerian and Schumpeterian). Specification 2 considers the potentially differentiating effect of low and high quality EE, while model 3 reports the results for the full model that includes interaction terms between the quality of the regional entrepreneurial ecosystem (REDI) and the analysed types of entrepreneurship.

To evaluate the threat of collinearity, we computed the average variance inflation factor (VIF) for all variables. The only VIF values that exceed 10—a generally accepted rule of thumb for assessing collinearity—were observed for the interaction terms between the REDI and the entrepreneurship variables (Kirznerian and Schumpeterian). By construction these terms are correlated and—even if computationally correct—this explains the VIF results (Greene, 2003). We also computed VIFs for the variables used in models 1 and 2, and the resulting average VIF is 1.44 (range: 1.07-2.47) and 1.46 (range: 1.08-2.11), respectively. The results for this diagnostic test do not raise collinearity concerns.

Concerning the results of the study, from models 1 and 2 in Tables 3 and 4 we observe that the variable linked to the entrepreneurial ecosystem (REDI) consistently positively impacts territorial GVA per worker, and explain employment growth only among high-REDI regions. This result is consistent with prior studies emphasizing that a healthy entrepreneurial ecosystem is conducive to territorial performance (see e.g., Acs et al., 2014; Lafuente et al., 2016). Therefore, we support our first hypothesis (**H1**) that proposes a positive relationship between the regional entrepreneurial ecosystem and territorial performance only when the GVA per worker is the regional outcome.

In case of Kirznerian entrepreneurship capturing quantity entrepreneurship at regional

level, results in Table 3 show that this variable has a negative impact on regional GVA per worker, while this relationship turns not significant in the employment growth model (Table 5). We therefore confirm our second hypothesis (**H2**) that states that Kirznerian entrepreneurship negatively impacts regional performance when the dependent variable is the GVA per worker, while we find no support for this hypothesis for the model using employment growth as dependent variable. Additionally, results in Tables 3 and 4 show how the effect of the Schumpeterian entrepreneurship variable is positive and significant when employment growth is the analysed regional outcome. Thus, we partially support our hypothesis 3 (**H3**) that proposes a positively relationship between Schumpeterian entrepreneurship and regional performance.

The results in model 3 of Table 3 show that the interaction term between the REDI levels and Kirznerian entrepreneurship is significant only in regions with an underdeveloped entrepreneurial ecosystem. That is, creating more businesses is not always enough neither to increase the economic output of industrial activities, nor to improve regional employment levels. Regions with high rates of new businesses are exposed to a quality threat associated with low rates of quality entrepreneurship; however, our results suggest that the regional entrepreneurial ecosystem contribute to alleviate this threat. A healthy entrepreneurial ecosystem facilitates the efficient allocation of entrepreneurial resources to the economy. This is a necessary condition for effective entrepreneurship, and regions with superior entrepreneurial ecosystems may have a greater capacity to exploit the entrepreneurial outcome of individual efforts. Thus, the entrepreneurial ecosystem creates the conditions to materialize the effects of high business formation rates, regardless of their quality level (Kirznerian entrepreneurship). This complementary effect helps explaining the positive finding for the parameter of the interaction term between the REDI score and the Kirznerian entrepreneurship variable. Consequently, we partially support hypothesis 4 (**H4**) that states that the regional entrepreneurship system moderates the negative relationship between Kirznerian entrepreneurship and regional performance. This hypothesis is confirmed for the model using GVA per worker as dependent variable, while we find no support for this hypothesis when the dependent variable is employment growth.

Table 3. Regression results: Gross value added per worker

	Model 1	Model 2	Model 3
REDI	3.0834*** (0.2113)		
Low REDI		3.8782*** (0.3588)	1.2693 (1.1978)
High REDI		2.3795*** (0.2845)	3.0986*** (0.8427)
Kirznerian entrepreneurship	–0.8177** (0.3165)	–0.7928*** (0.2863)	–0.4939 (0.3831)
Kirznerian entrepreneurship X Low REDI			5.8525* (3.7022)
Kirznerian entrepreneurship X High REDI			1.7146 (2.8886)
Schumpeterian entrepreneurship	–0.0098 (0.0716)	–0.0089 (0.0616)	0.1153* (0.0750)
Schumpeterian entrepreneurship X Low REDI			1.4506* (0.7814)
Schumpeterian entrepreneurship X High REDI			–0.9240** (0.4517)
Capital dummy	–0.2091*** (0.0592)	–0.2004*** (0.0633)	–0.2311*** (0.0637)
Population density	–0.0184 (0.0247)	–0.0103 (0.0245)	–0.0123 (0.0259)
Unemployment rate	2.5888*** (0.3843)	2.7413*** (0.3883)	2.3582*** (0.4278)
Country dummies	Yes	Yes	Yes
Intercept	2.5906*** (0.1642)	4.0001*** (0.1490)	3.8755*** (0.2019)
F-test	40.42***	54.85***	33.93***
Adjusted R2	0.7606	0.7758	0.7856
RMSE	0.2211	0.2139	0.2092
Average VIF	1.44	1.46	7.72
Observations	121	121	121

Robust standard errors are presented in brackets. *, **, *** indicate significance at the 10%, 5% and 1%, respectively.

Table 4. Regression results: Employment growth

	Model 1	Model 2	Model 3
REDI	0.0075 (0.0167)		
Low REDI		–0.0466* (0.0221)	0.0909 (0.0691)
High REDI		0.0554*** (0.0205)	0.0114 (0.0545)
Kirznerian entrepreneurship	–0.0022 (0.0203)	–0.0039 (0.0189)	–0.0201 (0.0273)
Kirznerian entrepreneurship X Low REDI			–0.1531 (0.2490)
Kirznerian entrepreneurship X High REDI			0.1527 (0.1563)
Schumpeterian entrepreneurship	0.0073** (0.0037)	0.0072** (0.0032)	0.0014 (0.0040)
Schumpeterian entrepreneurship X Low REDI			–0.1069** (0.0431)
Schumpeterian entrepreneurship X High REDI			0.0162 (0.0259)
Capital dummy	0.0077* (0.0045)	0.0073* (0.0045)	0.0075* (0.0044)
Population density	–0.0006 (0.0014)	–0.0011 (0.0013)	–0.0014 (0.0014)
Unemployment rate	–0.1283*** (0.0286)	–0.1386*** (0.0295)	–0.1344*** (0.0337)
Country dummies	Yes	Yes	Yes
Intercept	0.0016 (0.0081)	0.0029 (0.0067)	0.0127 (0.0093)
F-test	22.99***	30.83***	22.57***
Adjusted R2	0.4664	0.5037	0.5026
RMSE	0.0144	0.0138	0.0139
Average VIF	1.44	1.46	7.72
Observations	121	121	121

Robust standard errors are presented in brackets. *, **, *** indicate significance at the 10%, 5% and 1%, respectively.

The interaction effect between the REDI and Schumpeterian entrepreneurship is negative and statistically significant, thus pointing to a substitution effect between these variables. Schumpeterian (quality) entrepreneurship is often linked to highly skilled entrepreneurs who create businesses with superior innovative capacities that may potentially redirect consumer preferences by offering high value-added goods or services.

The economic outcome of regions with low-quality innovation systems/ entrepreneurial ecosystems may be restrained by the lack of appropriate mechanisms to allocate entrepreneurial resources to the economy. In this context, innovative entrepreneurs

whose businesses are of high quality constitute a substitute for the shortage of an adequate entrepreneurial ecosystem. Therefore, regions with low REDI scores may rely on Schumpeterian entrepreneurs—who channel new and more innovative resources to the economy—to compensate the absence of entrepreneurship policy-support instruments and increase their economic outcomes, in terms of GVA per worker. This substitution effect may explain the negative result for the interaction term between the REDI score and the Schumpeterian entrepreneurship variable.

The picture is quite different when territorial performance is measured via employment growth. While the results underline the employment enhancing capacity of high quality (Schumpeterian) entrepreneurship often linked to highly skilled entrepreneurs, we find that high quantity-based entrepreneurial rates (Kirznerian entrepreneurship) are not conducive to higher employment levels. Based on these arguments, we therefore cannot support our last hypothesis (**H5**) that proposes that the regional system of entrepreneurship moderates the positive relationship between Schumpeterian entrepreneurship and regional performance.

6.2 Behavioural paths followed by European regions

This section complements the regression assessment by introducing the results of the cluster analysis. Table 5 presents the results for the five different groups of regions that emerge from the cluster analysis. Additionally, Figure 2 graphically presents the distribution of the analysed regions according to the results of the cluster analysis.

The nine regions included in Group 1 are located in developed economies, namely Denmark (Hovedstaden), France (Île-de-France), Finland (Helsinki-Uusimaa), Germany (Hamburg), Ireland (Southern and Eastern), Sweden (Stockholm and South Sweden), and the UK (London and South-East). These high-performing regions show the greatest values in terms of the five analysed variables.

Regions from nine developed countries form Group 2: Austria (Eastern Austria), Belgium (Brussels-Capital Region), Denmark (Midtjylland, Nordjylland, and Southern Denmark), France (Centre-Est), Germany (Baden-Württemberg, Bayern, Berlin, Bremen, Hessen, Nordrhein-Westfalen, and Saarland), Ireland (Border, Midland and Western), Netherlands (Northern Netherlands, Eastern Netherlands, Western Netherlands, Southern Netherlands), Sweden (East Middle Sweden, Upper Norrland, and West Sweden), and UK (Yorkshire and The Humber, East Midlands, West Midlands, East of England, South West, Scotland, and Northern Ireland). These regions report high values for the REDI score (58.78), GVA per worker (73.91) as well as positive employment growth between 2012 and 2014

(0.99%); however, values for the REDI score (*t*-test: 10.66 and *p*-value < 0.001) and the GVA per worker (*t*-test: 4.92 and *p*-value < 0.001) are significantly lower than those reported for regions in Group 1.

We note a drastic performance gap between regions in the first two high-performing groups (Groups 1 and 2) and regions positioned in the rest of groups.

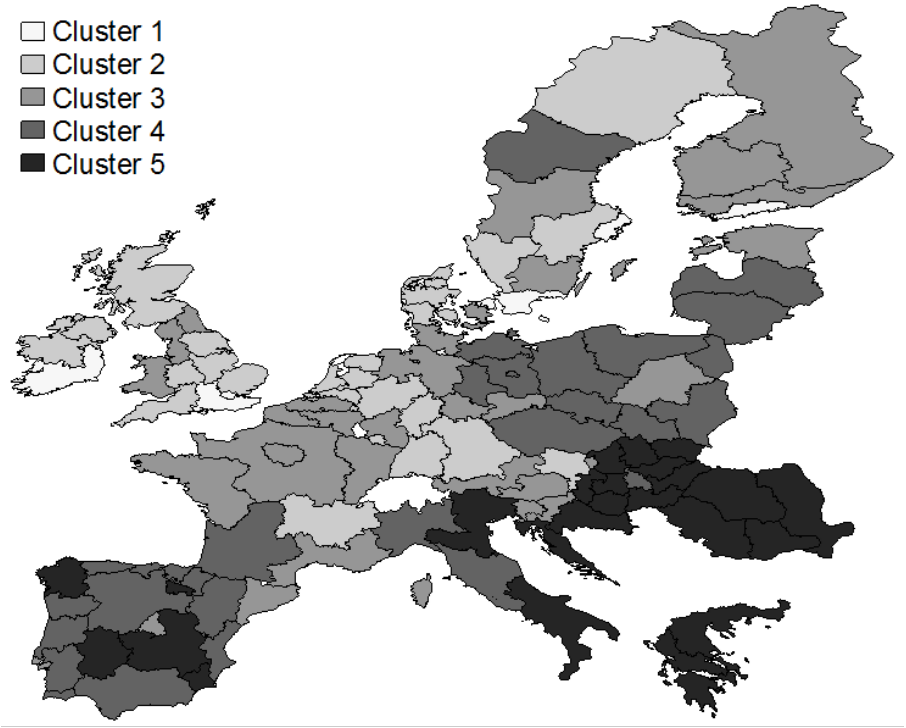
Group 3 includes regions from ten Western European countries and four developing economies mostly located in Central and Eastern Europe: Austria (Southern Austria, and Western Austria), Belgium (Flemish Region, and Walloon Region), Denmark (Sjælland), Estonia, Finland (West Finland, South Finland, North & East Finland), France (Bassin Parisien, Nord, Est, Ouest, Méditerranée), Germany (Niedersachsen, Rheinland-Pfalz, Sachsen, Schleswig-Holstein, Thüringen), Poland (Region Centralny), Portugal (Lisbon), Slovak Republic (Bratislava Region), Slovenia (Eastern Slovenia and Western Slovenia), Spain (Catalonia and Madrid), Sweden (Småland and the Islands and North Middle Sweden), and UK (North East, North West and Wales).

Although these regions show the levels of quantity (Kirznerian) and quality (Schumpeterian) entrepreneurship comparable to those reported by regions in Group 1 and 2, their results for the innovation system/ entrepreneurial ecosystem (REDI: *t*-test: 14.78 and *p*-value < 0.001) and for the performance variables (GVA per worker: *t*-test: 3.14 and *p*-value < 0.01; Employment growth: *t*-test: 2.96 and *p*-value < 0.01) are significantly lower, relative to values observed for regions in high performing groups.

Table 5. Results: Cluster analysis

Variable / Group	1	2	3	4	5	Total
REDI score	73.29	58.88	47.28	35.43	25.10	44.57
GVA / worker	96.47	73.91	63.53	49.36	39.76	60.19
Employment growth	0.0184	0.0099	–0.0021	–0.0095	–0.0094	–0.0010
Quantity churning	0.1950	0.1810	0.1758	0.1483	0.1842	0.1738
Quality churning	2.8882	2.0673	2.0733	1.9837	1.6815	2.0308
Observations	9	28	31	28	25	121

Figure 2. Geographic distribution according to the results of the cluster analysis



Regions in groups 4 and 5 show the poorest results, with the exception of the quantity entrepreneurship variable (Kirznerian entrepreneurship).

Group 4 includes regions from six Western economies and five Central and Eastern European countries: Czech Republic, France (Sud-Ouest), Germany (Brandenburg, Mecklenburg-Vorpommern, Sachsen-Anhalt), Hungary (Central Hungary), Italy (Northwest Italy, Central Italy), Latvia, Lithuania, Poland (Region Południowy, Region Wschodni, Region Północno-Zachodni, Region Południowo-Zachodni, Region Północny), Portugal (Alentejo, Algarve, Centro, Norte), Spain (Andalusia, Aragón, Asturias, Basque Country, Cantabria, Castilla León, Navarra, Valencia), and Sweden (Middle Norrland). Compared to values reported by regions in Group 3, regions in Group 4 show significantly lower levels of the REDI score (*t*-test: 15.13 and *p*-value < 0.001) and performance: GVA per worker (*t*-test: 3.22 and *p*-value < 0.01), Employment growth (*t*-test: 1.69 and *p*-value < 0.10).

Finally, Group 5 comprises poor performing regions from mostly developing countries (four out of the seven countries represented in this group are from Central and Eastern Europe): Croatia (Continental Croatia and Adriatic Croatia), Greece (Voreia Ellada, Kentriki Ellada, Attiki), Hungary (Central Transdanubia, Western Transdanubia, Southern Transdanubia, Northern Hungary, Northern Great Plain, Southern Great Plain), Italy (Northeast Italy, South Italy), Romania (Macroregion one, Macroregion two, Macroregion

three, Macroregion four), Slovak Republic (Western Slovakia, Central Slovakia, Eastern Slovakia), and Spain (Castilla La Mancha, Extremadura, Galicia, La Rioja, Murcia). These regions show the lowest value for the REDI score, the GVA per worker, and the quality (Schumpeterian) entrepreneurship.

7. Concluding remarks

In this study, we proposed that quantity- and quality-based entrepreneurship have a heterogeneous impact on territorial outcomes, measured via GVA per worker and employment growth. Furthermore, we emphasised the relevance of the regional entrepreneurial ecosystem as a key factor moderating the role of different types of entrepreneurship on regional performance. Our approach offers a compelling vision of how to measure quantity and quality entrepreneurship as well as the regional entrepreneurial ecosystem.

The proposed analysis provides further evidence to understand how the entrepreneurial ecosystem contributes to capitalise on regions' entrepreneurial outcomes. Overall, and instead of contemporary quantity-based (Kirznerian) entrepreneurship metrics, our results are consistent with the notion that high quality entrepreneurial activity—which we link to Schumpeterian entrepreneurship—is a relevant outcome conducive to territorial performance across European regions. The results of this study tend to go against policy makers' efforts which have traditionally underlined the use of local resources to encourage entrepreneurial activity, and emphasise the relevance of the quality of the new ventures created in the region and to the characteristics of the regional entrepreneurial ecosystem.

This paper has relevant implications for scholars and policy makers. From an academic perspective, the results of the study help unveil the sometimes unclear relationship between entrepreneurial activity and territorial performance reported in previous studies (see e.g., Acs et al., 2017; Acs & Varga, 2005). We found that quantity entrepreneurship is negatively associated with regional outcomes; however, this type of entrepreneurship may prove itself efficient in territories that benefit from a superior entrepreneurial ecosystem that helps channel entrepreneurial resources to the economy, thus contributing to optimise the impact of new entrepreneurial ventures. We suggest that policy makers need to turn their attention to the characteristics of the entrepreneurial ecosystem when considering the adoption of entrepreneurship support measures. The prioritization of policies oriented to increase quantity entrepreneurship in the short-run may yield sterile outcomes if the region does not enjoy a healthy entrepreneurial ecosystem that contributes to pursue regional goals.

Schumpeterian entrepreneurship—which we link to the creation of high innovative

businesses with disruptive potential—is consistently associated with superior territorial performance. However, the outcomes of this type of entrepreneurship may be restrained by the lack of appropriate mechanisms that allocate entrepreneurial resources to the economy (low-quality entrepreneurial ecosystem). Our results suggest that high quality entrepreneurship may act as a substitute for the shortage of an appropriate entrepreneurial ecosystem. Therefore, regions lacking the appropriate mechanisms to allocate entrepreneurial resources to the economy may rely on Schumpeterian entrepreneurial activity to channel new innovative resources to the economy, thus compensating the absence of entrepreneurship policy-support instruments and, consequently, increase their economic outcome of industries. This aspect is of crucial importance as it suggests that, in regions with a poor entrepreneurial ecosystem, policy makers may foster regional performance by re-directing resources to promote entrepreneurship high in innovativeness.

There are definitely some important limitations of the paper. First, we have examined only two entrepreneurship activity measures; others could also be developed. Second, the output measures—GDP, GVA, employment—all have limitations (e.g. Aghion et al 2017, Audretsch et al 2015). Third, we examine only short run influences and long run effects could also be important (Fritsch 2008, Müller 2016). Fourth, we cannot exclude the possibility that the causality between entrepreneurship and GVA/capita is the opposite and/or the existence of the feedback effects. However, our data does not make possible to investigate such relationships.

References

Acs, Z. J. (2006). How is entrepreneurship good for economic growth? *Innovations, 1,* 97–107. doi: 10.1162/itgg.2006.1.1.97

Acs, Z., & Armington, C. (2004). Employment growth and entrepreneurial activity in cities. *Regional Studies, 38,* 911–927. doi: http://dx.doi.org/10.1080/0034340042000280938

Acs, Z., Åstebro, T., Audretsch, D., & Robinson, D. T. (2016). Public policy to promote entrepreneurship: a call to arms. *Small Business Economics, 47,* 35–51. doi: https://doi.org/10.1007/s11187-016-9712-2

Acs, Z. J., Autio, E., & Szerb, L. (2014) National Systems of Entrepreneurship: Measurement issues and policy implications. *Research Policy, 43,* 476–494. doi: https://doi.org/10.1016/j.respol.2013.08.016

Acs, Z. J., Braunerhjelm, P., Audretsch, D. B., & Carlsson, B. (2009). The knowledge spillover theory of entrepreneurship. *Small Business Economics, 32,* 15–30. doi: https://doi.org/10.1007/s11187-008-9157-3

Acs, Z. J., Estrin, S., Mickiewicz, T., & Szerb, L. (2017). Institutions, Entrepreneurship and Growth: The Role of National Entrepreneurial Ecosystems (February 3, 2017). Retrieved from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2912453

Acs, Z. J., & Szerb, L. (2009). The Global Entrepreneurship Index (GEINDEX). *Foundations and Trends® in Entrepreneurship, 5,* 341–435. doi: http://dx.doi.org/10.1561/0300000027

Acs, Z. J., & Varga, A. (2005). Entrepreneurship, agglomeration and technological change. *Small Business Economics, 24,* 323–334. doi: https://doi.org/10.1007/s11187-005-1998-4

Aghion, P. (2017). Entrepreneurship and growth: lessons from an intellectual journey. *Small Business Economics, 48,* 9–24. doi: https://doi.org/10.1007/s11187-016-9812-z

Aghion, P., Bloom, N., Blundell, R., Griffith, R., & Howitt, P. (2005). Competition and innovation: an inverted-U relationship. *The Quarterly Journal of Economics, 120,* 701–728. doi: https://doi.org/10.1093/qje/120.2.701

Aghion, P., Blundell, R., Griffith, R., Howitt, P., & Prantl, S. (2009). The effects of entry on incumbent innovation and productivity. *The Review of Economics and Statistics, 91,* 20–32. doi: 10.1162/rest.91.1.20

Aghion, P., & Howitt, P. (1992). A model of growth through creative destruction. *Econometrica, 60,* 323–351. doi: 10.3386/w3223

Alvedalen, J., & Boschma, R. (2017). A critical review of entrepreneurial ecosystems research: towards a future research agenda. *European Planning Studies, 25,* 887–903. doi: http://dx.doi.org/10.1080/09654313.2017.1299694

Audretsch, D. B., Belitski, M., & Desai, S. (2015). Entrepreneurship and economic development in cities. *The Annals of Regional Science*, *55*(1), 33-60.

Audretsch, D. B., Falck, O., Feldman, M. P., & Heblich, S. (2012). Local Entrepreneurship in Context. *Regional Studies, 46,* 379–389. doi: http://dx.doi.org/10.1080/00343404.2010.490209

Audretsch, D. B., & Fritsch, M. (2002). Growth regimes over time and space. *Regional Studies, 36,* 113–124. doi: http://dx.doi.org/10.1080/00343400220121909

Baumol, W. J. (1996). Entrepreneurship: Productive, unproductive, and destructive. *Journal of Business Venturing, 11,* 3–22. doi: https://doi.org/10.1016/0883-9026(94)00014-X

Baumol, W. J. (2010). *The Microtheory of Innovative Entrepreneurship*. Princeton, NJ: Princeton University Press.

Baumol, W. J., Litan, R. E., & Shramm, C. J. (2007). *Good capitalism, bad capitalism, and the economics of growth and prosperity*. New Haven, CT: Yale University Press.

Boettke, P. J., & Coyne, C. J. (2009). Context matters: Institutions and entrepreneurship. *Foundations and Trends® in Entrepreneurship, 5,* 135–209. doi: http://dx.doi.org/10.1561/0300000018

Boettke, P. J., & Coyne, C. J. (2003). Entrepreneurship and development: Cause or consequence? In R. Koppl, J. Birner, & P. Kurrild-Klitgaard (Eds.), *Austrian Economics and Entrepreneurial Studies: Advances in Austrian Economics* (pp. 67–87). Bingley: Emerald Group.

Bottazzi, G., & Gragnolati, U. (2015). Cities and clusters: economy-wide and sector-specific effects in corporate location. *Regional Studies, 49,* 113–129. doi: http://dx.doi.org/10.1080/00343404.2012.739281

Braunerhjelm, P., Acs, Z. J., Audretsch, D. B., & Carlsson, B. (2010). The missing link: knowledge diffusion and entrepreneurship in endogenous growth. *Small Business Economics, 34,* 105–125. doi: https://doi.org/10.1007/s11187-009-9235-1

Calinski, R. B., & Harabasz, J. (1974). A dendrite method for cluster analysis. *Communications in Statistics, 3,* 1–27. doi: 10.1080/03610927408827101

Carree, M. A., & Thurik, A. R. (2006). Understanding the role of entrepreneurship for economic growth. In M. A. Carree & R. Thurik (Eds.), *The Handbook of Entrepreneurship and Economic Growth: International Library of Entrepreneurship* (pp. 9–19). Cheltenham: Edward Elgar.

Everitt, B. S. (1980). Cluster analysis (2nd ed.). London: Heinemann Educational Books.

Feld, B. (2012). *Startup Communities: Building an Entrepreneurial Ecosystem in Your City.* Hoboken, NJ: John Wiley & Sons.

Feldman, M. P. (2001). The entrepreneurial event revisited: firm formation in a regional context. *Industrial and Corporate Change, 10,* 861–891. doi: https://doi.org/10.1093/icc/10.4.861

Foster, G., Shimizu, C., Ciesinski, S., Davila, A., Hassan, S. Z., Jia, N., … Morris, R. (2013). *Entrepreneurial ecosystems around the globe and company growth dynamics* (September 2013). Retrieved from World Economic Forum: http://www3.weforum.org/docs/WEF_EntrepreneurialEcosystems_Report_2013.pdf

Fritsch, M., & Changoluisa, J. (2017). New business formation and the productivity of manufacturing incumbents: Effects and mechanisms. *Journal of Business Venturing, 32,* 237–259. doi: https://doi.org/10.1016/j.jbusvent.2017.01.004

Fritsch, M., & Mueller, P. (2004). Effects of new business formation on regional development over time. *Regional Studies, 38,* 961–975. doi: http://dx.doi.org/10.1080/0034340042000280965

Fritsch, M., & Schroeter, A. (2009). *Are More Start-Ups Really Better? Quantity and Quality of New Businesses and Their Effect on Regional Development* (Jena Economic Research Papers 2009 – 070). Retrieved from Econstor: https://www.econstor.eu/handle/10419/32600

Fritsch, M., & Storey, D. J. (2014). Entrepreneurship in a regional context: Historical roots, recent developments and future challenges. *Regional Studies, 48,* 939–954. doi: http://dx.doi.org/10.1080/00343404.2014.892574

Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in Cities. *Journal of Political Economy, 100,* 1126–1152. doi: https://doi.org/10.1086/261856

Greene, W. (2003). *Econometric Analysis (5th ed.)*. Upper Saddle River, NJ: Pearson Education.

Grilo, I., & Thurik, R. (2008). Determinants of entrepreneurial engagement levels in Europe and the US. *Industrial and Corporate Change, 17,* 1113–1145. doi: https://doi.org/10.1093/icc/dtn044

Hessels, J., Van Gelderen, M., & Thurik, R. (2008). Entrepreneurial aspirations, motivations, and their drivers. *Small Business Economics, 31,* 323–339. doi: https://doi.org/10.1007/s11187-008-9134-x

Kirzner, I. M. (1973). *Competition and entrepreneurship*. Chicago: The University of Chicago Press.

Kirzner, I.M. (1997). Entrepreneurial Discovery and the Competitive Market Process: An Austrian Approach. *Journal of Economic Literature*, *35*(1), 60-85. Retrieved from http://www.jstor.org/stable/2729693

Lafuente, E., Szerb, L., & Acs, Z. J. (2016). Country level efficiency and national systems of entrepreneurship: A data envelopment analysis approach. *The Journal of Technology Transfer*, *41,* 1260–1283. doi: https://doi.org/10.1007/s10961-015-9440-9

Lee, S. Y., Florida, R., & Acs, Z. (2004). Creativity and entrepreneurship: a regional analysis of new firm formation. *Regional Studies, 38,* 879–891. doi: http://dx.doi.org/10.1080/0034340042000280910

Levie, J., Autio, E., Acs, Z., & Hart, M. (2014). Global entrepreneurship and institutions: an introduction. *Small Business Economics, 42,* 437–444. doi: https://doi.org/10.1007/s11187-013-9516-6

Marcotte, C. (2013). Measuring entrepreneurship at the country level: A review and research agenda. *Entrepreneurship & Regional Development, 25,* 174–194. doi: http://dx.doi.org/10.1080/08985626.2012.710264

Mason, C., & Brown, R. (2014, January). *Entrepreneurial ecosystems and growth oriented entrepreneurship*. Paper presented at the workshop organised by the OECD LEED Programme and the Dutch Ministry of Economic Affairs, The Hague (Netherlands).

Minniti, M., & Lévesque, M. (2010). Entrepreneurial types and economic growth. *Journal of Business Venturing, 25,* 305–314. doi: https://doi.org/10.1016/j.jbusvent.2008.10.002

Meliciani, V., & Savona, M. (2015). The determinants of regional specialisation in business services: agglomeration economies, vertical linkages and innovation. *Journal of Economic Geography, 15,* 387–416. doi: https://doi.org/10.1093/jeg/lbt038

Mueller, P. (2007). Exploiting entrepreneurial opportunities: The impact of entrepreneurship on growth. *Small Business Economics, 28,* 355–362. doi: https://doi.org/10.1007/s11187-006-9035-9

Müller, S. (2016). A progress review of entrepreneurship and regional development: What are the remaining gaps? *European Planning Studies*, *24*, 1133–1158. doi: http://dx.doi.org/10.1080/09654313.2016.1154506

Nightingale, P., & Coad, A. (2014). Muppets and gazelles: political and methodological biases in entrepreneurship research. *Industrial and Corporate Change, 23,* 113–143. doi: https://doi.org/10.1093/icc/dtt057

Reynolds, P., Bosma, N., Autio, E., Hunt, S., De Bono, N., Servais, I., … Chin, N. (2005). Global entrepreneurship monitor: data collection design and implementation 1998–2003. *Small Business Economics, 24,* 205–231. doi: 10.1007/s11187-005-1980-1

SAB Foundation, Allan Grey Orbis Foundation, The Global Entrepreneurship and Development Institute, The Global Entrepreneurship Network South Africa, & SEA Africa (2017). *The entrepreneurial ecosystem of South Africa: A strategy for global leadership 2017*. Retrieved from South African Breweries: http://www.sab.co.za/wp-content/uploads/2017/03/GEDI-South-Africa-Analysis2.pdf

Schumpeter, J. A. (1934). *The theory of economic development: An inquiry into profits, capital, credit, interest, and the business cycle*. Cambridge, MA: Harvard University Press.

Shane, S. (2009). Why encouraging more people to become entrepreneurs is bad public policy. *Small Business Economics, 33,* 141–149. doi: https://doi.org/10.1007/s11187-009-9215-5

Spigel, B. (2017). The relational organization of entrepreneurial ecosystems. *Entrepreneurship Theory and Practice, 41,* 49–72. doi: 10.1111/etap.12167

Stam, E. (2015). Entrepreneurial ecosystems and regional policy: a sympathetic critique. *European Planning Studies*, *23*, 1759–1769. doi: http://dx.doi.org/10.1080/09654313.2015.1061484

Stam, E., Hartog, C., Van Stel, A., & Thurik, R. (2011). Ambitious entrepreneurship, high-growth firms, and macroeconomic growth. In M. Minniti (Ed.), *The Dynamics of Entrepreneurship: Evidence from Global Entrepreneurship Monitor Data* (pp. 231–249). Oxford: Oxford University Press.

Stam, E., & Spigel, B. (in press). Entrepreneurial Ecosystems. In R. Blackburn, D. De Clercq, J. Heinonen, & Z. Wang (Eds.), *Handbook for Entrepreneurship and Small Business*. London: SAGE.

Stam, E., & Van Stel, A. (2011). Types of entrepreneurship and economic growth. In A. Szirmai, W. Naudé, & M. Goedhuys (Eds.), *Entrepreneurship, innovation, and economic development* (pp. 78–95). Oxford: Oxford University Press.

Szerb, L., Vörös, Zs., Komlósi, É., Acs, Z. J., Páger, B., Ortega-Argilés, R., … Abaligeti, G. (2017). *The New Regional Entrepreneurship and Development Index: Structure, Data and Description of Methodology.* Unpublished manuscript.

Van Stel, A., M. Carree, & Thurik, R. (2005). The Effect of Entrepreneurial Activity on National Economic Growth. *Small Business Economics, 24,* 311–321. doi: https://doi.org/10.1007/s11187-005-1996-6

Vivarelli, M. (2013). Is entrepreneurship necessarily good? Microeconomic evidence from developed and developing countries. *Industrial and Corporate Change, 22,* 1453–1495. doi: https://doi.org/10.1093/icc/dtt005

Welter, F. (2011). Contextualizing entrepreneurship—conceptual challenges and ways forward. *Entrepreneurship Theory and Practice, 35,* 165–184. doi: 10.1111/j.1540-6520.2010.00427.x

Wennekers, S., & Thurik, R. (1999). Linking entrepreneurship and economic growth. *Small Business Economics, 13,* 27–56. doi: https://doi.org/10.1023/A:1008063200484

Wong, P. K., Ho, Y. P., & Autio, E. (2005). Entrepreneurship, innovation and economic growth: Evidence from GEM data. *Small Business Economics, 24,* 335–350. doi: https://doi.org/10.1007/s11187-005-2000-1

Zahra, S. A., Wright, M., & Abdelgawad, S. G. (2014). Contextualization and the advancement of entrepreneurship research. *International Small Business Journal, 32,* 479–500. doi: https://doi.org/10.1177/0266242613519807

Appendices

Appendix1. The Regional Entrepreneurship and Development Index (REDI) calculation methodology

In the constructing the index we followed eight points:

1 ***The selection of variables:*** We start with the variables that come directly from the original sources for each region involved in the analysis. The variables can be at the individual level (personal or business) that are coming from the GEM Adult Population Survey or the institutional/environmental level that are coming from various other sources. Altogether we use 14 individual and 14 institutional variables. Individual data are calculated from the 2007-2011 pooled dataset. In the case of the institutional variables we used the most recent available data on 31. December 2013. Altogether, we have data for a mix of 125 NUTS1 and NUTS2 regions.

2 ***The construction of the pillars:*** We calculate all pillars from the variables using the interaction variable method; that is, by multiplying the individual variable with the proper institutional variable. This results pillar values for all the 125 regions.

$$z_{i,j} = IND_{i,j} * INS_{i,j} \qquad \text{(F1)}$$

for all j= 1 ... k, the number of individual and institutional variables
$IND_{i,j}$ is the original score value for region i and variable j individual variable
$INS_{i,j}$ is the original score value for region i and variable j institutional variable
$z_{i,j}$ is the original pillar value for region i and pillar j

3 ***Normalization:*** pillars values were first normalized to a range from 0 to 1:

$$x_{i,j} = \frac{z_{i,j}}{\max z_{i,j}} \qquad \text{(F2)}$$

for all j= 1 ... k, the number of pillars
where $x_{i,j}$ is the normalized score value for region i and pillar j
$z_{i,j}$ is the pillar value for region i and pillar j
$max\ z_{i,j}$ is the maximum value for pillar j

4 ***Capping:*** 95 All index building is based on a benchmarking principle. In our case we selected the 95 percentile score adjustment meaning that any observed values higher than the 95 percentile is lowered to the 95 percentile.

5 ***Average pillar adjustment:*** The different averages of the normalized values of the pillars imply that reaching the same pillar values require different effort and resources. Since we want to apply REDI for public policy purposes, the additional resources for the marginal improvement of the pillar values should be the same for all pillars. Therefore, we need a transformation to equate the average values of the components. Equation F2 shows the calculation of the average value of pillar j:

$$\overline{x}_j = \frac{\sum_{i=1}^{n} x_{i,j}}{n}. \qquad \text{(F3)}$$

We want to transform the $x_{i,j}$ values such that the potential minimum value is 0 and the maximum value is 1:

$$y_{i,j} = x_{i,j}^k \qquad \text{(F4)}$$

where k is the "strength of adjustment", the k-th moment of X_j is exactly the needed average, $\overline{y}_j$. We have to find the root of the following equation for k

$$\sum_{i=1}^{n} x_{i,j}^k - n\overline{y}_j = 0 \qquad \text{(F5)}$$

It is easy to see based on previous conditions and derivatives that the function is decreasing and convex which means it can be quickly solved using the well-known Newton-Raphson method with an initial guess of 0. After obtaining k, the computations are straightforward. Note that if

$$\overline{x}_j < \overline{y}_j \quad k < 1$$
$$\overline{x}_j = \overline{y}_j \quad k = 1$$
$$\overline{x}_j > \overline{y}_j \quad k > 1$$

that is k be thought of as the strength (and direction) of adjustment.

6 ***Penalizing:*** After these transformations, the PFB methodology was used to create indicator-adjusted PFB values. We define our penalty function following as:

$$h_{(i),j} = min\, y_{(i),j} + (1 - e^{-(y_{(i)j} - min\, y_{(i),j})}) \qquad \text{(F6)}$$

where $h_{i,j}$ is the modified, post-penalty value of pillar j in region i
$y_{i,j}$ is the normalized value of index component j in region i
y_{min} is the lowest value of $y_{i,j}$ for region i.
i = 1, 2,……n = the number of regions
j= 1, 2,…….m= the number of pillars

7. The pillars are the basic building blocks of the sub-index: entrepreneurial attitudes, entrepreneurial abilities, and entrepreneurial aspirations. The value of a sub-index for any region is the weighted average of its average equalized pillars for that sub-index multiplied by a 100. The maximum value of the sub-indices is 100 and the potential minimum is 0, both of which reflect the relative position of a region in a particular sub-index.

$$ATT_i = 100 \sum_{j=1}^{5} h_{i,j} \qquad (F7a)$$

$$ABT_i = 100 \sum_{j=6}^{9} h_{i,j} \qquad (F8b)$$

$$ASP_i = 100 \sum_{j=10}^{14} h_{i,j} \qquad (F8c)$$

where $h_{i,j}$ is the modified, post-penalty value of pillar j in region i
i = 1, 2,……n = the number of regions
j= 1, 2,.……14= the number of pillars

8. The super-index, the Global Entrepreneurship Index, is simply the average of the three sub-indices. Since 100 represents the theoretically available limit the GEDI points can also be interpreted as a measure of efficiency of the entrepreneurship resources

$$REDI_i = \frac{1}{3}(ATT_i + ABT_i + ASP_i) \qquad (F8)$$

where $REDI_i$ is the regional entrepreneurship and development index score of region i.
i = 1, 2,……n = the number of regions

Appendix 2: List of sampled regions

Country	**NUTS level**	**Regions**
Austria	NUTS 1	Eastern Austria, Southern Austria, Western Austria
Belgium	NUTS 1	Brussels-Capital Region, Flemish Region, Walloon Region
Croatia	NUTS 2	Continental Croatia, Adriatic Croatia
Czech Republic	NUTS 1	Czech Republic
Denmark	NUTS 2	Hovedstaden, Sjælland, Southern Denmark, Midtjylland, Nordjylland
Estonia	NUTS 1	Estonia
France	NUTS 1	Île-de-France, Bassin parisien, Nord, Est, Ouest, Sud-Ouest, Centre-Est, Méditerranée
Finland	NUTS 2	West Finland, Helsinki-Uusimaa, South Finland, North & East Finland
Germany	NUTS 1	Baden-Württemberg, Bayern, Berlin, Brandenburg, Bremen, Hamburg, Hessen, Mecklenburg-Vorpommern, Niedersachsen, Nordrhein-Westfalen, Rheinland-Pfalz, Saarland, Sachsen, Sachsen-Anhalt
Greece	NUTS 1	Voreia Ellada, Kentriki Ellada, Attiki
Hungary	NUTS 2	Central Hungary, Central Transdanubia, Western Transdanubia, Southern Transdanubia, Northern Hungary, Northern Great Plain, Southern Great Plain
Ireland	NUTS 2	Border, Midland and Western NUTS-II Region, Southern and Eastern NUTS-II Region
Italy	NUTS 1	Northwest Italy, Northeast Italy, Central Italy, South Italy
Latvia	NUTS 1	Latvia
Lithuania	NUTS 1	Lithuania
Netherlands	NUTS 1	Northern Netherlands, Eastern Netherlands, Western Netherlands, Southern Netherlands
Poland	NUTS 1	Region Centralny, Region Południowy, Region Wschodni, Region Północno-Zachodni, Region Południowo-Zachodni, Region Północny
Portugal	NUTS 2	Norte Region, Algarve, Centro Region, Lisboa Region, Alentejo Region
Romania	NUTS 1	Macroregion one, Macroregion two, Macroregion three, Macroregion four
Slovak Republic	NUTS 2	Bratislava Region, Western Slovakia, Central Slovakia, Eastern Slovakia
Slovenia	NUTS 2	Eastern Slovenia, Western Slovenia
Spain	NUTS 2	Galicia, Asturias, Cantabria, Basque Community, Navarre, La Rioja, Aragon, Madrid, Castile-Leon, Castile-La Mancha, Extremadura, Catalonia, Valencian Community, Andalusia, Region of Murcia
Sweden	NUTS 2	Stockholm, East Middle Sweden, Småland and the islands, South Sweden, West Sweden, North Middle Sweden, Middle Norrland, Upper Norrland
United Kingdom	NUTS 1	North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, East of England, London, South East, South West, Wales, Scotland, Northern Ireland

Appendix 3. Regression results: The relationship between entrepreneurship and GDP growth

	Gross Domestic Product (GDP) growth (2012-2014)	
	Model 1	Model 2
REDI	0.0010** (0.0004)	0.0003 (0.0009)
Kirznerian entrepreneurship	0.0645 (0.0393)	0.0491 (0.1019)
Kirznerian entrepreneurship X REDI		0.0005 (0.0020)
Schumpeterian entrepreneurship	–0.0004 (0.0071)	–0.0287 (0.0305)
Schumpeterian entrepreneurship X REDI		0.0006 (0.0005)
Capital dummy	0.0179** (0.0089)	0.0192** (0.0091)
Population density	–0.0024 (0.0044)	–0.0025 (0.0045)
Unemployment rate	–0.2660*** (0.0898)	–0.2623*** (0.0982)
GDP per head	–0.0486*** (0.0129)	–0.0496*** (0.0148)
Country dummies	Yes	Yes
Intercept	0.1658*** (0.0375)	0.2028*** (0.0691)
F-test	9.71***	9.39***
Adjusted R2	0.5103	0.5075
RMSE	0.2372	0.2378
Average VIF	1.82	6.93
Observations	121	121

Robust standard errors are presented in brackets. The UK is the omitted country dummy variable. *, **, *** indicate significance at the 10%, 5% and 1%, respectively.