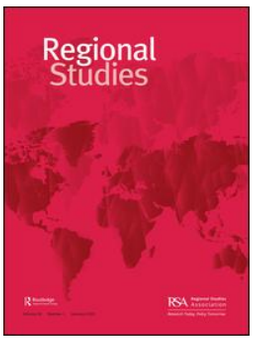

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The relevance of quantity and quality entrepreneurship for regional performance: the moderating role of the entrepreneurial ecosystem

László Szerb[a], Esteban Lafuente[b], Krisztina Horváth[c] and Balázs Páger[d]

ABSTRACT

This study analyzes how the entrepreneurial ecosystem and different types of entrepreneurship impact regional performance. By analyzing 121 European Union regions between 2012 and 2014, it is found that quantity (Kirznerian) entrepreneurship negatively impacts regional performance, while this effect turns positive in the case of quality (Schumpeterian) entrepreneurship. Also, regions with a healthy entrepreneurial ecosystem have a greater capacity to materialize the effects of high business-formation rates, regardless of their quality (Kirznerian entrepreneurship), while regions with weak entrepreneurial ecosystem may rely on innovative (Schumpeterian) entrepreneurs to compensate for the absence of entrepreneurship support policies and increase their economic outcomes.

KEYWORDS

regional entrepreneurship; entrepreneurship ecosystem; Regional Entrepreneurship and Development Index (REDI); Kirznerian entrepreneurship; Schumpeterian entrepreneurship

JEL L26, M13

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INTRODUCTION

While entrepreneurship has long been believed to be a major determinant of economic outcomes, even the latest empirical studies provide mixed and unconvincing evidence about the ultimate relationship between entrepreneurship and various economic performance metrics (Acs, Estrin, Mickiewicz, & Szerb, 2018; Ács & Varga, 2005; Nightingale & Coad, 2014). Moreover, results vary according to the selection of the performance measure chosen (growth, development, prosperity, productivity), the definition and measure of entrepreneurship (single level/multidimensional, quality/quantity), the analyzed geographical 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 at different development levels (Acs, 2006). Entrepreneurship is found to influence territorial performance positively and significantly 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). A wide range of measures such as self-employment rates or the Global Entrepreneurship Monitor (GEM) total early-phased entrepreneurial activity (TEA) are found to influence economic growth moderately, while innovation-related or high-growth start-ups show a much stronger impact on economic growth (Wong, Ho, & Autio, 2005). Scholars propose that national-level research is inappropriate and the spillover effects of entrepreneurship can be more effectively captured

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at subnational levels (Acs & Armington, 2004). Yet, the analysis of the effect of entrepreneurship on economic growth at regional level remains unaddressed.

Many studies claim that intermediate linkages (Wennekers & Thurik, 1999) or contextual factors (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. In this context, the Global Entrepreneurship Index (GEI) has emerged as a relevant EE metric that measures the entrepreneurship system as the complex interactions between entrepreneurial attitudes, abilities and aspirations at country level (Acs et al., 2014). Within the framework of the knowledge spillover theory, Lafuente, Szerb, and Acs (2016) found that GEI explains productivity differences across countries.

Entrepreneurship has been often invoked as a valid mechanism to boost territorial economic performance. Yet, different sources of heterogeneity – which we link to different types of entrepreneurship and to the strength of the EE at the regional level – may condition the relationship between entrepreneurship and territorial outcomes. The present paper sheds a light on the determinants of regional economic growth by connecting the EE and different types of entrepreneurial activity. More concretely, it studies how the entrepreneurship system and different types of entrepreneurship impact employment growth and gross value added (GVA) per worker in 121 European Union (EU) regions.

Instead of connecting canonical entrepreneurship ratios (TEA) to territorial outcomes, we propose two entrepreneurship variables rooted in the Kirznerian and neo-Schumpeterian approaches (Aghion, Blundell, Griffith, Howitt, & Prantl, 2009) which measure different types of entrepreneurship. First, and following Kirzner (1973, p. 74), entrepreneurs contribute to the economy by mobilizing resources and exploiting market opportunities, a process we link to increases in the number of businesses in the economy (Kirznerian entrepreneurship). According to Schumpeter (1934, p. 66), the entrepreneurship function is associated with the introduction of disruptive technologies that create new value-adding input combinations that enhance the territories' productive capacity. In line with this argument, the second variable accounts for qualitative improvements in the regions' stock of firms by comparing the creation of highly innovative firms and the innovation level of incumbent firms.

The analysis of the outcomes that flow from the connection between the EE and different types of entrepreneurship contributes to identify policy actions that can help optimize territories' available resources and, ultimately, lead to a greater territorial economic growth.

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, 2007). In this sense, scholars in the EE field opened a new entrepreneurship research direction focused on the systemic connections that explain the emergence of high-impact ventures. Initially oriented to practitioners, policy-makers and stakeholders (Foster et al., 2013), the need for rigorous research, theory-based concept creation, solid methodology and proper measurement have recently contributed to develop the EE approach (Alvedalen & Boschma, 2017; Brown & Mason, 2017; Spigel, 2017; Stam, 2015).

Building on the regional development and the strategy literature, EE has its roots in other system-type theories of industrial districts, innovation systems and clusters (Acs, Stam, Audretsch, & O'Connor, 2017; Stam & Spigel, 2017). While most conceptual approaches view the entrepreneurial environment as a bundle of different components, EE adopts a multi-context perspective that highlights the *self-reinforcing* forces, interdependencies, supporting effects, and forward and backward linkages among components (Cooke, 2016; Malecki, 2018; Stam, 2015). The evolution of EE components, in particular institutions, takes longer time. This *path-dependent* progress leads to the development of unique EE (Cooke, 2016; Stam & Spigel, 2017). *Spillovers* play an important role in locally embedded knowledge transmission (Qian, 2018).

Four distinctive features characterize EE research. First, EE differentiates the entrepreneurial environment (ecosystem) from entrepreneurial outputs. Of the many types of entrepreneurial outputs, EE focuses on opportunity recognition activities that result in *high-impact*, highly ambitious start-ups[1] and neglects potentially marginal, non-growth, self-employment initiations (Acs et al., 2014; Stam, 2015). Second, the performance of the EE depends on the *interaction* between the entrepreneur, organizations and institutions (Alvedalen & Boschma, 2017). Third, the EE is *geographically bounded, place based* (Audretsch & Belitski, 2017; Qian, Acs, & Stough, 2013). While the EE can be examined and measured at the country level (Acs et al., 2014), agglomeration economies, networking and spillover effects vital for the emergence of high-impact start-ups are effective in smaller geographical units such as cities or agglomeration zones. Finally, because of the uniqueness and the path-dependent nature of EE, its development requires specific, bottom-up, tailor-made as opposed to general universal policies (Acs et al., 2014; Mason & Brown, 2014).

Among the many EE research directions, the GEI is probably the most useful approach as it provides a theoretical base and a novel methodology to measure country-level

entrepreneurship (Acs et al., 2014). According to Acs et al. (2014, p. 119), the system of entrepreneurship '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'. This definition resembles other EE definitions (Audretsch & Belitski, 2017; Qian et al., 2013; Spigel, 2017).[2]

The present study proposed a modified version of the GEI, that is, the REDI, to measure the entrepreneurial performance of 121 EU regions. Following the EE, the adjustment process; i.e., the movement from GEI to REDI, refers to changes in the institutional variables to reflect the regional forces of agglomeration, connectivity and clustering. Thus, REDI is a more appropriate and more precise measure of EE than GEI (Szerb et al., 2017).

The REDI incorporates three sub-indices, 14 different pillars, 28 variables (14 institutional and 14 individual), 44 indicators and 60 sub-indicators. While the individual components of REDI have been adjusted to the smaller territorial units, their content is the same as compared with GEI, the institutional components of REDI are much richer than those of GEI with its 16 institutional variables. A valid criticism of many EE models is that component collection is ad hoc. To create REDI, the sub-indicator selection was based on (1) a thorough review of the scholarly literature to identify 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) data availability over the period 2007–14. A drawback of the REDI sub-indicators is that some important EE attributes are missing. While many dimensions are accurately captured (market, regulation, human capital, culture, networks, knowledge creation and dissemination, infrastructure, and finance), dimensions are mostly captured, there is no indicator on supporting services and mentoring, leadership. The structure of the REDI index and the assigned EE attributes are depicted in Table 1.[3]

While EE scholars have primarily focused on the interrelation between system components, the identification and description of these connections have been largely sidelined. REDI 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. Most indicators are computed as the average of sub-indicators and most variables are calculated as the average of indicators assuming *additive* effects.[4] Notable exceptions include the computation of the Freedom indicator that results from the multiplication of the Business freedom and the Property rights sub-indices. Each pillar is created as the product of individual- and institutional-level variables 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 121 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 with Product innovation. This implies that for the same additional input unit we experience 1.8 times larger improvement in Product innovation than in Finance. The 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.[5]

The core idea of REDI is that regional system performance is 'co-produced' by its constituent elements, meaning that the 14 pillars are interrelated and all support the functioning of the EE. This implies that all pillars should be positively correlated with each other and they should also be positively correlated with the REDI. 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 or not the system of a focal region functions well. For each region, this means 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 a significant increase in the focal sub-index and, ultimately, the overall REDI score. On the 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 using the region's resources.

Some EE scholars argue that each ecosystem is unique in terms of the configuration and 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 the focal region from fully exploiting its

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

Sub-indexes	Pillars	Variables (individual/institutional)	Entrepreneurship attributes
Attitudes Sub-Index	Opportunity Perception	Opportunity Recognition	Market and Regulation
		Market Agglomeration	
	Start-up 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 Start-up	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).

entrepreneurial potential. The REDI complements other case-preferred EE approaches by taking a wider, bird's-eye 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).

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 down to those definitions focused on 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 intra-preneurship or employee-initiated entrepreneurship, the present paper concentrates on autonomous start-ups.

The importance of regional entrepreneurial activity has long been recognized; however, the direction and magnitude of its impact has been debated (Audretsch & Fritsch, 2002; Lee, Florida, & Acs, 2004). Various factors have emerged 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 (Nightingale & Coad, 2014). Contrary to the conventional view that emphasizes the need to increase 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, 2015).

Different types of start-ups coexist in economies, and their overall effect also depends on their composition (Vivarelli, 2013). Moreover, the inverse relationship between the number of businesses and their quality (Fritsch & Schroeter, 2009) 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 leads one to question the validity of combined, one-size-fits-all activity measures (Marcotte, 2013; Vivarelli, 2013). Entrepreneurial activity measures should be concept based; however, most metrics are ad hoc and have strong presumptions (Marcotte, 2013). This is particularly true for one of the most popular activity measures: 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 fewer than 3.5 years (Stam & Van Stel, 2011).[6] 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 of the type of new venture. Thus, the TEA measures the overall magnitude of entrepreneurial activity by standardizing it to the 18–64-year-old population; however, it fails to capture the role of competition on entrepreneurship dynamics that should relate new businesses to existing ones (Boettke & Coyne, 2007; Kirzner, 1973).

Of the many alternative GEM-based entrepreneurship measures (Levie, Autio, Acs, & Hart, 2014), 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 outcomes. 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 likely 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 (Vivarelli, 2013). Innovation has been invoked as a way to enhance the positive effects of competition (Aghion et al., 2009; Aghion & Howitt, 1992). Innovation leads to the creation of 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 therefore propose new quality- and quantity-related measures of entrepreneurial activity that reflect the level of competition and innovation among new and incumbent ventures. The proposed measures use GEM regional data for the period 2012–14. We excluded the 'speculative' nascent businesses and used a different temporal horizon to split the analyzed businesses (new and established ventures).

The first suggested measure reflects exclusively quantity characteristics of businesses and is calculated as the number of start-ups divided by the number of incumbent businesses. We call it 'Kirznerian entrepreneurship':

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

where, for each region ($i = 1, \ldots, m$), the number of new businesses refers to those firms with fewer 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, by comparing start-ups and incumbent firms, this variable 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 indicate that the territory does not offer good business opportunities to entrepreneurs. The main features of this Kirznerian-oriented entrepreneurship variable are opportunity alertness and profit exploitation (Kirzner, 1973). Although this measure includes all types of new businesses, it 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 with 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) the industry sector in which businesses

operate (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:

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

where, for each region ($i = 1, \ldots, m$), the innovativeness of new businesses is the innovation level of firms with fewer 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 with that of incumbent businesses. This variable also captures the competitive pressure of innovative new businesses over existing businesses, that is, it constitutes an accurate measure of what Schumpeter called 'creative destruction' (Schumpeter, 1934). Therefore, we name this indicator 'Schumpeterian entrepreneurship'.

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 the autarchy of uniform 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. As a complex measure, we assume that REDI captures the overall performance of the regional EE by taking into account the subnational diversity (Acs & Armington, 2004). We propose that the EE is conducive to territorial performance and, thus, we hypothesize:

Hypothesis 1: There is a positive relationship between the quality of the entrepreneurial ecosystem and regional performance.

We differentiate 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 to incorporate the effects of market competition on territorial economic performance. For example, Fritsch and Changoluisa (2017) find that new firms, irrespective of 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 the 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 – which is characterized by opportunity alertness and profit exploitation – and Schumpeterian entrepreneurship – that is, creative destruction – on territorial performance must be distinguished. On the one hand, Kirznerian entrepreneurship emphasizes the function of entrepreneurship as a market-discovery process in which entrepreneurs discover and exploit market failures (Kirzner, 1997, p. 71). New business entry intensifies competition by challenging the market position of established firms (Fritsch & Mueller, 2004). The exploitation of business opportunities arguably contributes to an efficient mobilization of resources in the economy (Kirzner, 1973). However, in a context 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 net effect could be negative (Vivarelli, 2013). On the other hand, Schumpeter conceptualizes entrepreneurship as a special economic function in which inventions are transformed into innovations (Kirzner, 1973, p. 81). 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:

Hypothesis 2: Kirznerian entrepreneurship has a negative effect on regional performance.

Hypothesis 3: Schumpeterian entrepreneurship has a positive effect on regional performance.

The scope and quality of entrepreneurial activity are not independent of the environment within which businesses operate. In particular, the 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). At the regional level, the EE constitutes the institutional setting backing entrepreneurial activity. Therefore, it seems plausible to argue that 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 if the focal region enjoys a supportive EE. We argued above that in competitive environments Kirznerian entrepreneurship – which we link to higher rates of new businesses – may produce a negative net effect in the economy via high churning levels that deteriorate resource allocation (Vivarelli, 2013). Yet, a high-quality EE may help alleviate resource allocation problems by promoting the efficient channelling of entrepreneurial outcomes to the

economy (Szerb et al., 2017). Thus, the EE creates the conditions to materialize the effects of high firm formation rates (Kirznerian entrepreneurship).

The proposed effect of Schumpeterian entrepreneurship on regional performance also depends on the innovativeness of existing businesses. Aghion, Bloom, Blundell, Griffith, and Howitt (2005) reveal that innovation can stem from both increased entry rates of innovative (Schumpeterian) firms and the response of incumbent firms to business-formation rates. In the case of the former effect, a healthy EE contributes to channel innovations to the market, which will likely translate into high rates of new innovative firms (Schumpeterian entrepreneurship), in terms of newness of product and technology, as well as industry membership (Szerb et al., 2017). In the case of the latter, the reaction of incumbent firms is conditioned by their distance to the technological frontier: 'frontier firms' will likely make additional efforts to innovate ('escape competition effect'), while 'laggard firms' that are far from the frontier face further difficulties and have no incentives to innovate ('discouragement effect') (Aghion et al., 2005, 2009). These two effects suggest that an increase in the stock of Schumpeterian entrepreneurs (the numerator in equation 2) may contribute to the innovativeness of incumbent firms, thus improving the quality of the regions' business stock – in terms of the newness of new ventures – and, ultimately, regional performance. Thus, we complement the above by formulating the following hypotheses:

Hypothesis 4: The entrepreneurial ecosystem moderates the negative relationship between Kirznerian entrepreneurship and regional performance.

Hypothesis 5: The entrepreneurial ecosystem moderates the positive relationship between Schumpeterian entrepreneurship and regional performance.

DATA, VARIABLE DEFINITION AND METHOD

The data used in this study come from three sources. First, regional figures related to GVA per worker, gross domestic product (GDP) per capita, unemployment and population density were obtained from EUROSTAT. Second, information on business-formation rates was collected from the GEM databases. Third, the variables measuring the quality of the EE across European regions were gathered from the Regional Entrepreneurship and Development Index (REDI) databases. The first version of the REDI based on the 2007–11 GEM Adult Population Survey (APS) data set was created by Szerb, Acs, Autio, Ortega-Argiles, and Komlosi (2013), and with the support of the European Union ('Financial and Institutional Reforms to Build an Entrepreneurial Society' (FIRES), Horizon 2020 project), the latest REDI scores with additional extended-time-period 2012–14 data were created with the objective of scrutinizing and understanding the EE 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, i.e., Nomenclature of Territorial Units for Statistics). 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 (three regions), Belgium (three), Croatia (two), Czech Republic (one), Denmark (five), Estonia (one), Finland (four), France (eight), Germany (16), Greece (three), Hungary (seven), Ireland (two), Italy (four), Latvia (one), Lithuania (one), Netherlands (four), Poland (six), Portugal (five), Romania (four), Slovak Republic (four), Slovenia (two), Spain (15 regions), Sweden (eight), and the UK (12). For a list of the study regions, see Table B1 in Appendix B in the supplemental data online.

This study measures territorial performance via two variables. First, we use a measure of economic production, that is, the average GVA per worker (2012–14), which represents, for each region, the total value of goods and services produced by workers of industry sectors. Second, we employ the employment growth rate between 2012 and 2014.[7]

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

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 fewer than six months of market experience) from firms created in previous periods. In this study, new business refers to those firms with fewer than 18 months of market experience, and equations (1) and (2) are used to compute the quantity- and quality-related entrepreneurship measures respectively.

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 of 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 average unemployment rate (2012–14) and the average GDP per capita (2012–14) as indicators of regional economic

Table 2. Descriptive statistics for the study variables.

	Mean	SD	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
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

Notes: Monetary values – gross value added (GVA) per worker and gross domestic product (GDP) per capita – are expressed in thousands of euros. Number of observations = 121 regions.
REDI, Regional Entrepreneurship and Development Index; SD, standard deviation.

development (Lafuente et al., 2016). Descriptive statistics are presented in Table 2; for the associated correlation matrix, see Table B2 in Appendix B in the supplemental data online.

Given the properties of the dependent variables, we employ ordinary least squares (OLS) regression models to estimate the effect of the EE and the types of entrepreneurship on regional performance. The full model used in this study is as follows:

$$\begin{aligned}\text{Performance}_i = {} & \beta_0 + \beta_1\ \text{REDI}_i \\ & + \beta_2\ \text{Kirznerian entrepreneurship}_i \\ & + \beta_3\ \text{Schumpeterian entrepreneurship}_i \\ & + \beta_{12}\ \text{REDI}_i \times \text{Kirznerian entrepreneurship}_i \\ & + \beta_{13}\ \text{REDI}_i \times \text{Schumpeterian entrepreneurship}_i \\ & + \beta_4\ \text{Control variables}_i + \varepsilon_i \end{aligned} \tag{3}$$

where Performance refers to the GVA per worker and the employment growth rate at the regional level; β_j is the parameter estimates estimated for the independent variables (j); and ε is the normally distributed error term that varies across regions.

RESULTS

The findings for the effect of the EE and different types of entrepreneurship (Kirznerian and Schumpeterian) on regional performance (GVA per worker and employment growth) are now presented. In Table 3, model 1 shows the results for the baseline model estimating regional performance as a linear function of the analyzed types of entrepreneurship (Kirznerian and Schumpeterian). Model 2 reports the results for the full model that includes interaction terms between the quality of the regional EE (REDI) and the analyzed types of entrepreneurship.

To evaluate the threat of collinearity, we computed the average variance inflation factor (VIF) for all variables. The only VIFs 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). The average VIF for model 1 is 1.82 (range = 1.05–4.01). The results for this diagnostic test do not raise collinearity concerns.

From model 1 in Table 3 we observe that the variable linked to the EE (REDI) consistently positively impacts GVA per worker and employment growth. This result is in line with prior studies emphasizing that a healthy EE is conducive to territorial performance (e.g., Acs et al., 2014; Lafuente et al., 2016). Therefore, we support hypothesis 1 that proposes a positive relationship between the quality of the regional EE and territorial performance outcomes.

In the case of Kirznerian entrepreneurship capturing quantity entrepreneurship at a regional level, the results in Table 3 show that this variable has a negative impact on regional performance, excepting the case of the base model when employment growth is the dependent variable (model 1). These results are in line with hypothesis 2 that states that Kirznerian entrepreneurship negatively impacts regional performance. Also, the results show how the effect of the Schumpeterian entrepreneurship variable is positive and significant for the analyzed regional outcomes. The results confirm hypothesis 3 that proposes a positively relationship between Schumpeterian entrepreneurship and regional performance.

The results in model 2 of Table 3 show that the interaction term between the REDI levels and Kirznerian entrepreneurship is positive and significant. That is, creating more businesses is not always enough either to increase the economic output of industrial activities or 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, the results suggest that the regional EE contributes to alleviate this threat. A healthy EE facilitates the efficient allocation of entrepreneurial resources to the economy. This is a necessary condition for effective entrepreneurship, and regions with superior EEs may have a greater capacity to exploit and channel the

Table 3. Regression results.

	Gross value added (GVA) per worker		Employment growth	
	Model 1	**Model 2**	**Model 1**	**Model 2**
REDI	0.0075***	0.0090**	0.0012**	0.0010***
	(0.0023)	(0.0044)	(0.0002)	(0.0003)
Kirznerian entrepreneurship	–0.8959***	–2.5077***	–0.0021	–0.0921**
	(0.2599)	(0.7001)	(0.0171)	(0.0438)
Kirznerian entrepreneurship × REDI		0.0362**		0.0020**
		(0.0142)		(0.0009)
Schumpeterian entrepreneurship	0.0757*	0.3632***	0.0069***	0.0161*
	(0.0443)	(0.1214)	(0.0025)	(0.0096)
Schumpeterian entrepreneurship × REDI		–0.0075***		–0.0002
		(0.0022)		(0.0002)
Capital dummy	–0.3134***	–0.3142***	0.0059*	0.0063**
	(0.0539)	(0.0530)	(0.0031)	(0.0029)
Population density	–0.0134	–0.0097	0.0011	0.0013
	(0.0178)	(0.0185)	(0.0016)	(0.0016)
Unemployment rate	2.5184***	2.0657***	–0.0842**	–0.1056***
	(0.5302)	(0.5432)	(0.0390)	(0.0397)
GDP per head	0.9557***	0.8747***	–0.0367***	–0.0411***
	(0.0913)	(0.0934)	(0.0072)	(0.0074)
Country dummies	Yes	Yes	Yes	Yes
Intercept	0.7696***	0.9671***	0.0645***	0.0874***
	(0.2741)	(0.3571)	(0.0181)	(0.0247)
F-test	110.93***	93.71***	23.56***	18.82***
Adjusted R^2	0.7796	0.8160	0.6464	0.6551
RMSE	0.1431	0.1938	0.0117	0.0156
Average VIF	1.82	6.93	1.82	6.93
Observations	121	121	121	121

Notes: Robust standard errors are shown in parentheses. The UK is the omitted country dummy variable.
GDP, gross domestic product; REDI, Regional Entrepreneurship and Development Index; RMSE, root mean square error; VIF, variance inflation factor.
*, **, ***Significance at 10%, 5% and 1% respectively.

entrepreneurial outcome of individual efforts. Thus, the EE creates the conditions to materialize the effects of high business-formation rates, regardless of their quality level (Kirznerian entrepreneurship). This complementary effect helps to explain the positive finding for the parameter of the interaction term between the REDI score and Kirznerian entrepreneurship. Consequently, we support hypothesis 4 that states that the regional entrepreneurship system moderates the relationship between Kirznerian entrepreneurship and regional performance.

The interaction effect between the REDI and Schumpeterian entrepreneurship is negative and statistically significant when the GVA per worker is the dependent variable, while this variable turns out to be non-significant in the employment growth model. The result for the GVA per worker points 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 EEs 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 EE. Therefore, regions with low REDI scores may rely on Schumpeterian entrepreneurs – who channel new and more innovative resources to the economy – to compensate for the shortage of supportive entrepreneurship policies 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. The results underline the employment-enhancing capacity of high-quality entrepreneurship (model 1 in Table 3). However,

we find that the interaction term between the REDI score and the Schumpeterian entrepreneurship variable is not significant. This implies that the reported positive effect of Schumpeterian entrepreneurship on employment growth is not conditioned by the quality of the EE, that is, Schumpeterian entrepreneurship generates jobs regardless of the strength of the regional EE. Based on these results, we cannot support hypothesis 5 that proposes that the regional system of entrepreneurship moderates the positive relationship between Schumpeterian entrepreneurship and regional performance.

CONCLUSIONS, IMPLICATIONS AND FUTURE RESEARCH LINES

This study proposed that quantity- and quality-based entrepreneurship have a heterogeneous impact on territorial outcomes, measured via GVA per worker and employment growth. Furthermore, it emphasized the relevance of the regional EE as a key factor moderating the role of different types of entrepreneurship on regional performance. The approach offers a compelling vision of how to measure quantity and quality entrepreneurship as well as the regional EE.

The proposed analysis provides further evidence to understand how the EE contributes to capitalize on regions' entrepreneurial outcomes. Overall, and instead of canonical quantity-based (Kirznerian) entrepreneurship metrics, the 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 EU regions. The results of this study tend to go against quantity-based entrepreneurship support policies and emphasize the relevance of the quality of the new ventures created in the region and to the characteristics of the regional EE.

This paper has relevant implications for scholars and policy-makers. From an academic perspective, its results help unveil the sometimes unclear relationship between entrepreneurial activity and territorial performance reported in previous studies (e.g., Acs et al., 2017; Ács & Varga, 2005). Additionally, its results fuel the debate on how to operationalize the EE at the territorial level. We argue that the mismatch between the analyzed concept (EE) and the selected variables used to measure it may explain the unclear relationship between country-level entrepreneurship and territorial outcomes found in previous work (e.g., Bruns, Bosma, Sanders, & Schramm, 2017; Nightingale & Coad, 2014). In this sense, the REDI score – which captures the systemic relationships between entrepreneurs and markets – and the proposed Kirznerian (quantity) and Schumpeterian (quality) entrepreneurship variables represent valid metrics that can contribute both to operationalize territories' EE and different dimensions of entrepreneurship, respectively and to understand better how the EE shape territorial outcomes.

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 EE that helps channel entrepreneurial resources to the economy, thus contributing to optimize the impact of new entrepreneurial ventures. We suggest that policy-makers need to turn their attention to the characteristics of the EE 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 EE that contributes to pursuing regional goals.

Schumpeterian entrepreneurship – which we link to the creation of highly innovative businesses with disruptive potential – is consistently associated with superior territorial performance. Additionally, the results suggest that Schumpeterian entrepreneurship may act as a substitute for the shortage of an appropriate EE. 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. This aspect is of crucial importance as it suggests that, in EU regions with a poor EE, policy-makers may foster regional performance by redirecting resources to innovation-driven entrepreneurship.

However, a series of limitations to the present study must be mentioned, which, in turn, represent avenues for future research. First, the study employs two measures focused on quantity and quality aspects of entrepreneurship. Future studies should evaluate whether other entrepreneurship variables – e.g., linked to the creation of high-growth firms or to the industry configuration of the newly created firms – contribute to explain performance differences across territories. A similar argument holds for the analyzed territorial outputs (e.g., Aghion, Bergeaud, Boppart, Klenow, & Li, 2017; Audretsch, Belitski, & Desai, 2015). Future work should verify the role of the EE and different types of entrepreneurship on other, equally relevant, territorial outcomes. Second, and in a closely related manner, future studies could expand the variables used in the REDI score by including factors related to supporting services, mentoring or leadership in the analysis. Additionally, the computation of the REDI score (or other similar index numbers) in other geographical contexts, e.g., Africa, Asia, and North and Latin America, constitutes a challenge for future research on EEs that can contribute both to expand the geographical scope of the REDI score and to understand better the drivers and economic consequences of territories' EE. Finally, the findings of this study are based on the cross-sectional analysis of 121 EU regions. Obviously, we cannot evaluate the short- and long-run effects of entrepreneurship over regional outcomes, nor do we assess the causality between entrepreneurship and territorial outcomes. Nevertheless, the results presented herein have a strong intuitive and conceptual appeal, and are open to future verification. In this sense, specifically designed future work should

evaluate our arguments on the determinants of regional performance using longitudinal data.

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NOTES

1. Start-ups can be autonomous or employee initiated, intra-preneurial (Stam, 2015).
2. For a more comprehensive summary about EE definitions, see Malecki (2018).
3. For the detailed description of the REDI components and the calculation methodology, see Szerb et al. (2017). See also Appendix A in the supplemental data online.
4. For example, the Quality of education institutional variable has four sub-indicators: three come from the Programme for International Student Assessment (PISA) survey (low achievers in reading, mathematics and science) and the last is the creative class sub-indicator. The PISA indicator is calculated as the average of the three PISA sub-indicators.
5. For more details about the APA methodology, see Acs et al. (2014) and Szerb et al. (2017).
6. The TEA rate is the ratio of the 18–64-year-old adult population who are in an active phase of start-up (nascent) or who own and manage a start-up aged less than 42 months.
7. Regression results using the GDP per capita growth rate as a dependent variable are inconclusive. See Table B3 in Appendix B in the supplemental data online.

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