

**SUSTAINABLE ORIENTATION MANAGEMENT AND INSTITUTIONAL
QUALITY: LOOKING INTO EUROPEAN ENTREPRENEURIAL INNOVATION
ECOSYSTEMS**

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Abstract

While research on entrepreneurship and innovation ecosystems (EIEs) has emerged over the last decade, one question remains unanswered: are entrepreneurs able to efficiently adopt and manage a sustainable orientation to increase the quality and visibility of EIEs? This study argues that institutional quality and the sustainable orientation management of entrepreneurs both shape the productive and growth-oriented entrepreneurial activity necessary to reach the United Nations Sustainable Development Goals (SDGs). Using a primary dataset on 1,676 EIE actors from 16 cities in East and South-East Europe, we theoretically debate and empirically test i) the positive and diminishing marginal returns of sustainable orientation management for EIE quality and ii) the moderation effect of institutional quality in this relationship. Our results provide empirical evidence that the institutional quality and sustainable orientation management of entrepreneurs matter for the quality of EIEs, but not for their visibility. This extends prior research on the high-growth and productive orientation of entrepreneurial ecosystems.

Keywords: Entrepreneurship Innovation Ecosystems; Institutional Quality; Sustainable Orientation Management; Sustainable and Social Entrepreneurship

1. Introduction

In the rush to promote entrepreneurial activity, both policy-makers and researchers have embraced the concept of the entrepreneurial ecosystem (Isenberg, 2010) or its entrepreneurial innovation ecosystem version (Autio et al., 2014). A plethora of systematic empirical evidence combined with detailed studies has confirmed that ecosystems can have a positive impact on entrepreneurial innovations (Garud et al., 2014; Guerrero and Urbano, 2019, 2021), as well as the contribution that entrepreneurial innovations subsequently make to economic (Stam, 2015) and societal (Dutz et al., 2000; Terán-Yépez et al., 2020) development. However, what if the quantity of entrepreneurial activity is not associated with growth orientation and productivity? (Isenberg, 2011; Stam, 2015; Audretsch and Belitski, 2017; Spigel et al., 2020; Guerrero and Urbano, 2017). In introducing the role of institutions for entrepreneurial activity, prior research has demonstrated that not all entrepreneurs have growth aspirations (Estrin et al., 2013a) aim at productive entrepreneurship (Wurth et al., 2021; Audretsch and Belitski, 2020).

The extant literature has fleshed out what constitutes an entrepreneurial innovation ecosystem and its outcomes (Autio et al., 2014; Guerrero and Urbano, 2017, 2019, 2020).

However, few studies have examined sustainable orientation management (Bacq and Janssen, 2011; Dean and McMullen, 2007; Kuckertz and Wagner, 2010) and its role as a conduit of entrepreneurship and innovation ecosystem (EIE) performance. One reason for this omission may be that the EIE literature has generally focused on the context of developed economies (Audretsch and Belitski, 2017, 2020; Stam, 2015; Guerrero et al., 2021; Spigel et al., 2020), where productive entrepreneurship is present and rewarded (Bacq and Janssen, 2011; Bacq and Alt, 2018). Indeed, the desired outcome of EIEs is a productive entrepreneurship, and not increasing the quantity and visibility of entrepreneurial activity, which can be a desired outcomes in other EIEs as the way out of poverty and social inclusion (Belitski et al., 2021).

Prior research on EIEs has overwhelmingly focused on how to help researchers explain the link between a virtuous entrepreneurial ecosystem and the emergence of high-growth firms (Sleuwaegen and Ramboer, 2020) and how to stimulate productive entrepreneurship. Meanwhile, the role that sustainable orientation and institutional quality of a country and region play in EIE performance has been under-researched.

This study's objective is thus to examine how sustainable orientation management by entrepreneurs shapes EIE performance at different levels of institutional quality. In addressing this objective, this study contributes to prior research on the outcomes of EIEs and discusses the mechanisms driving the relationship between the sustainable orientation of entrepreneurs and their performance in the ecosystem. Our research question is: how is the relationship between the sustainable orientation management of entrepreneurs and EIE performance affected by regional institutional quality?

A compelling body of studies on entrepreneurial and innovation ecosystems has discussed the heterogeneous entrepreneurship phenomenon and productive entrepreneurship (Audrestch et al., 2021; Wurth et al., 2021; Estrin et al., 2013a). However, few studies have

investigated how a sustainable orientation could facilitate productive entrepreneurship, or how a country's institutional quality moderates the relationship between sustainable orientation and EIE performance (Sarma and Sunny, 2017).

This study contributes to the technological innovation and ecosystems literature by bringing the sustainable orientation of entrepreneurs to EIE research. This study also contributes by analyzing the effects of sustainable orientation management on the quality and quantity of EIEs in developing European countries addressing the United Nations Sustainable Development Goals (SDGs) (United Nations, 2015).

Based on the previous argument, our main assumption is that entrepreneurial innovation ecosystems outcomes are may be highly heterogeneous. Some EIEs may be more conducive to productive entrepreneurial innovations than others if the ecosystem actors adopt a sustainable orientation and are in an institutional environment conducive to entrepreneurship.

This study understands sustainable orientation management drawing on the theoretical foundations from Bacq and Janssen's (2011, p.388) who defined social entrepreneurship activity "as a source of solutions to certain illnesses of our modern societies", as well as Volkmann's et al. (2019, p.374) definition of sustainable entrepreneurship "as the discovery, creation, and exploitation of opportunities to create future goods and services that sustain the natural or communal environment and provide development gain for others". These study agrees that entrepreneurs pursuing sustainable objectives can find productive and creative solutions to societal challenges and to achieve a "greater good" (Besser et al., 2006). Sustainability-oriented entrepreneurs will be able to explore market opportunities that benefit the public. EIEs aim to support the greater good (Ostrom, 2005) and allow entrepreneurs to provide new solutions to society's problems by sustaining the natural and communal environment (Gregori et al., 2019; Santos, 2012). To shed light on the

relationship between institutional quality, the sustainable orientation management of EIE actors and EIE performance, we use a dataset of 1,676 EIE actors from 16 cities in East and South-East Europe.

The paper contributes to the entrepreneurship, management, and public policy literature in several ways. Firstly, it extends the academic debate that the quality of institutions shapes EIE performance, and that the sustainable orientation management of entrepreneurs is conducive to productive entrepreneurial activity. Secondly, in sharp contrast to the findings of the extant literature on EIEs and social entrepreneurship, we demonstrate that the relationship between the extent of sustainable orientation and productive entrepreneurship has diminishing marginal returns which are not observed for other types of EIE performance outcomes, such as the visibility of entrepreneurs. The diminishing marginal returns to sustainable orientation are more pronounced in countries with a higher quality of institutions for productive entrepreneurship. The effect of sustainable orientation in shaping productive entrepreneurship is conditional on the level of institutional development. A strong sustainable orientation within the EIE cannot fully offset the quality of institutions in a country.

The remainder of this paper is structured as follows. Section 2 outlines the theoretical framework, while Section 3 presents the methodological design. Section 4 presents empirical analysis with robustness checks, then Section 5 discusses our major findings in light of previous studies. Section 6 discusses the conclusions and scholarly implications.

2. Conceptual Framework

2.1 Theoretical foundations of entrepreneurial innovation ecosystems

The theoretical foundations of this study are based on the entrepreneurial innovation ecosystem approach (Autio et al., 2014, Spiegel et al., 2020). Other literature on the sustainable and social entrepreneurship includes (Zahra et al., 2009; Barq and Janssen,

2011; Sarma and Sunny, 2017) and the literature discusses the role of institutional quality and legal reforms to entrepreneurship (Chowdhury et al., 2019; Audretsch et al., 2022a, 2022b, 2022c). The focus on EIEs in productive entrepreneurship has also been supported by Wurth et al. (2021, p.7), who explicitly state that “one of the defining features of entrepreneurial ecosystems research has been a focus on productive entrepreneurship. It is often measured as high-growth entrepreneurship”. Along with productive entrepreneurship outcomes, the objective of the ecosystem in developing economies can be an increase in the visibility of entrepreneurial activity, and the introduction of new-to-market products (Levie and Autio, 2008; Autio et al., 2014; Guerrero et al., 2021).

However, how many entrepreneurs are enough (Isenberg, 2010)? Is the quality of entrepreneurial innovations determined by their quantity (Sobel, 2008; Autio et al., 2014; Chowdhury et al., 2019; Guerrero and Urbano, 2019)? Definitely not. While the quality and quantity of entrepreneurial activity is important, the ‘more the merrier’ principle does not apply to entrepreneurial innovation activity, and an increase in entrepreneurial activity is not always associated with economic growth and wealth creation (Thurik et al., 2008). Indeed, many entrepreneurs have been involved in unproductive activities and socially-irresponsible behavior (Azmat and Samarantunge, 2009). This has the effect of increasing insolvency and the hostility of the business environment, particularly in developing countries. The purpose of the entrepreneurial innovative ecosystem is to promote “the persistence of high-growth entrepreneurship within regions.” (Spigel, 2022, p.49). Spigel and Harrison (2018, p.155) also state that the “Cluster and RIS [Regional Innovation System] concepts provide well-researched frameworks that help us understand why some places enjoy persistently higher rates of high-growth entrepreneurship than others.”

Following on from earlier literature on entrepreneurial ecosystems (Stam, 2015; Audretsch and Belitski, 2017), EIEs have gained momentum (Szerb et al., 2019). EIEs differ from

other concepts in the geography of innovation, such as sectoral innovation systems, regional innovation systems and clusters, as they place emphasis on ecosystem stakeholders and productive high growth entrepreneurs rather than regional policymakers and industries (Wurth et al., 2021; Spigel and Harrison, 2018). Spigel (2022, p.3) in particular argues that "Ecosystems differ from other territorial-based theories of economic development such as clusters and innovation systems due to their focus on the types of regional environment that impact high-growth entrepreneurs" Their main focus is thus on productive entrepreneurship, usually operationalized as the high-growth intentions of entrepreneurs, or the sales and employment growth of entrepreneurs (Audretsch and Belitski, 2020; Stam and Van de Ven, 2021). The desirable outcomes of entrepreneurial innovation ecosystems therefore include productive entrepreneurship and the greater visibility of entrepreneurial innovation (Stam and Van de Ven, 2021; Wurth et al., 2021; Audretsch et al., 2022c). Policy-makers have recognized the threat of unproductive entrepreneurial innovations and have implemented policies correspondingly (Guerrero and Urbano, 2017, 2019).

The main features of the ecosystem approach to keep in mind are that there are many supporting dimensions or contributing factors, that these factors are interconnected and coevolving, and that they are persistent over time. One such factor that allows the creation of productive entrepreneurship is the sustainable orientation of entrepreneurs. This has emerged as an independent stream of literature, and describes an entrepreneur as a 'social value creator' (Bacq and Janssen, 2011; Dean and McMullen, 2007; Kuckertz and Wagner, 2010). Entrepreneurs themselves are seen as contributors to social goals. Sustainable orientation management by entrepreneurs is defined as a socially-oriented entrepreneurship activity (Volkman et al., 2019) which engages with governments, communities, and members of the public to change regulations and societal norms. It also advocates for green agendas and a more careful attitude to environment, and promotes increased environmental

awareness (Schaltegger and Wagner, 2011; Sung and Park, 2018). However, entrepreneurship researchers often overlook the importance of the sustainable orientation of entrepreneurs who aim to create a societal impact through responsible and durable behavior (Miller et al., 2012; Hertel et al., 2019), and the roles that such entrepreneurial activity plays in communities creating a for a greater good. The sustainable orientation of entrepreneurs facilitates ecosystem growth and high-growth firm creation (Meek et al., 2010).

2.2. Institutions and entrepreneurial ecosystems

Understanding the institutional context is key to understanding how EIEs work and evolve (Levie and Autio, 2008; Estrin et al., 2013a; Lefebvre et al. 2015), as formal and informal institutions play an important role in facilitating entrepreneurship activity (Williamson, 2000; Audretsch et al., 2019; 2022a; Guerrero et al., 2021). Institutional theory focuses on the roles of social, political and economic factors in which established and new firms operate and gain legitimacy (North, 1990; Scott, 2014). For a long time, researchers dedicated themselves to first determining what institutions are, and second to analyzing their economic and social effects on entrepreneurship. Both the combination of institutions matters for entrepreneurship (Djankov et al., 2002) along with their quality (Sobel, 2008; Audretsch et al., 2019).

The Global Entrepreneurship Development Index (GEDI) developed by Acs et al. (2017) and Szerb et al. (2013) is often used to measure the quality of institutional environment for entrepreneurs. The GEDI measures the quality of institutions and infrastructure for entrepreneurial innovation and uncovers the systemic relationship between formal and informal institutions, entrepreneurial aspirations, attitudes and framework conditions for entrepreneurial activity (Szerb et al., 2013, 2019; Autio et al., 2014; Acs et al., 2017).

Multiple studies have linked entrepreneurship to the quality of the institutional environment, and demonstrated that various institutions shape both the identification of opportunities by entrepreneurs and how entrepreneurs exploit them (Tolbert et al., 2011; Stenholm et al., 2013; Estrin et al., 2019). El Harbi and Anderson (2010) instead analyzed the effects of several formal institutional elements on the emergence of different types of entrepreneurship, ranging from destructive to productive entrepreneurial activity, and building on prior research of productive and unproductive entrepreneurship (Baumol, 1990). Estrin et al. (2013b) investigated institutions and entrepreneurial aspirations, while Estrin et al. (2019) studied how institutions increase the quality of entrepreneurship. EIE scholars have accepted that EEs consist of a range of diverse and complex components, which are characterized by backward linkages to institutional dimensions, including culture (Fritsch and Wyrwich, 2017).

Further, the three pillars of Scott (2014) are still considered to be a suitable foundation for contemporary studies on institutions and EIEs (Bjørnskov and Foss, 2016; Bosma et al., 2018). All these studies argue that national (Audretsch et al., 2019) and localized institutions (Fritsch and Wyrwich, 2017; Guerrero and Urbano, 2020; Audretsch et al., 2022d) play a significant role in regional entrepreneurship activity, and that ecosystems as institutions affect the willingness and ability of entrepreneurs to enter the market and grow a business. Along with prior research on institutions and entrepreneurship (Stenholm et al., 2013; Estrin et al., 2013a, 2013b), we argue that higher institutional quality facilitates productive entrepreneurship (Stam and van de Ven, 2021). Both developed (Audretsch et al., 2019) and developing countries aim to improve the quality of institutions, including the role of regional governance and law enforcement to stimulate productive entrepreneurial activities (Ben et al., 2018; Guerrero and Urbano, 2019). We therefore hypothesize:

H1: An increase in institutional quality has a positive effect on EIE performance.

2.3. The sustainable orientation of entrepreneurs and entrepreneurial ecosystems

Productive entrepreneurs (Baumol, 1990.; Autio et al., 2014; Spigel et al., 2020) may focus on individual gains as well as the ‘greater good’ of the ecosystem (Ostrom, 2005), society, and/or environment (Shepherd and Patzelt, 2011, 2017). This implies that cultural practices characterized by the sustainable orientation management of entrepreneurs may lead to a wider range of motivations which extend beyond objectives related to individual gains. The range of sustainable orientation activities is therefore conducive to productive entrepreneurship (Audretsch et al., 2022c).

The sustainable orientation of entrepreneurs facilitates growth (Meek et al., 2010) and the creation of high-growth entrepreneurs (Audretsch and Belitski, 2020). It also makes it possible for entrepreneurial activity to generate benefits for society (Szerb et al., 2019; Koe et al., 2014). Furthermore, the sustainable orientation may be enhanced in times of crisis (Spigel and Vinodrai, 2021). Entrepreneurs and society both bear responsibility for their commitment to sustainability (Hervieux and Voltan, 2018; Kostetska and Berezyak, 2014). If the problems are related to our modern lifestyle, entrepreneurs are one of the actors solving or at least mitigating the issues considered to be aspects of the grand societal challenges (Phillips et al., 2015). This change in entrepreneurship did not come out of the blue. As previously mentioned, many entrepreneurs experienced the devastating outcome of irresponsible behavior (Azmat and Samaratunge, 2009), increasing insolvency and the hostility of the business environment, and have turned to societal values and socially-responsible ecosystem structures (Kabbaj et al., 2016; Mair and Schoen, 2007). Indeed, social and environmental issues are worsening and affecting millions – if not billions – of people, who are increasingly asking for more prosocial solutions. Given the growing

visibility of the sustainable orientation of entrepreneurs, the returns from such activity may diminish as a region adopts sustainable orientation. This means that an increase in sustainable behavior at the early stages will give a strong signal to markets and stakeholders, while the effects may diminish once a certain level of sustainable orientation has been achieved.

The role of entrepreneurs at the early stages of sustainable orientation is important to incentivize entrepreneurship activity and reinforce sustainable values. Meanwhile the perseverance of sustainable orientation may add to organizational and transaction costs for entrepreneurs, reducing the size of the effect once a certain threshold of policy has been achieved (Audretsch and Belitski, 2020). As the sustainable orientation of entrepreneurs will target both private and social gains, the conflict between the objectives and the costs associated with further investment in sustainable orientation may overtake the marginal benefits. This will result in a diminishing marginal effect of sustainable orientation behavior for EIE outcomes. It is well established in the literature that the greater the portfolio of sustainable oriented activities, the greater the market end entrepreneurial opportunities (Capaldo, 2007; Volkmann et al., 2019). However, this factor negatively interacts with entrepreneurial learning processes for productive entrepreneurship, as it adds high complexity (e.g., multiple functional partners, multiple locations). These type of EIE actors usually cannot handle this, due to the increased coordination and transaction costs (Wagner and Zidorn, 2017). We hypothesize:

H2: An increase in the sustainable orientation management of entrepreneurs and EIE performance has a diminishing marginal return.

2.4. Institutional quality and sustainable orientation management

There are four reasons why entrepreneurs in regions with a higher level of institutional quality are more likely to benefit from the sustainable orientation of entrepreneurs (Audretsch et al., 2019). Firstly, improving institutional quality enhances productive entrepreneurial activity (Baumol, 1990, 1993; Sobel, 2008; Sanders and Weitzel, 2013). This is because fair authorities which aim to support entrepreneurship increase the payoffs given to productive entrepreneurs, and increase the cost of doing business for unproductive entrepreneurs (Williamson, 2000; Djankov et al., 2002; Sobel, 2008). Secondly, governments in countries with lower-quality business institutions for economic and political reasons will prefer to implement changes with immediate effect for economic, social, and political life. They will focus more on short-term goals rather than long-term orientation, including sustainability and grand societal challenges. This short-sighted governmental behavior creates uncertainty in the market and prevents entrepreneurs from focusing on long-term goals. Meanwhile local and national governments in countries with higher-quality institutions and low uncertainty of doing business will find it easier to develop and introduce long-term sustainable orientation policies and signal to entrepreneurs on the long-term payoffs of a sustainable orientation (Barq and Alt, 2016).

Thirdly, returns from sustainable oriented entrepreneurial behavior are lower in regions and countries with lower-quality institutions, and hence growth-orientation of entrepreneurship is affected first (Almeida et al., 2012; Autio et al., 2014; Kabbaj et al., 2016; Spiegel et al., 2020). The system of incentives and the societal demand for socially responsible behavior of entrepreneurs and sustainable products is why institutional quality is often regarded as a precondition for the sustainable orientation of entrepreneurs (Guerrero and Lira, 2023). Finally, in regions where institutional quality is low, EIE actors may adopt sustainable orientation management for their businesses as a compensation tool. However, the efficiency of sustainable orientation is unlikely on its own to facilitate productive

entrepreneurship and requires high institutional quality (Djankov et al., 2002; Szerb et al., 2013).

We argue that an increase in institutional quality will positively moderate the relationship between the sustainable orientation of entrepreneurs and productive entrepreneurship in the first instance, while the rate of entrepreneurship is unlikely to be affected (Audretsch et al., 2022a). This effect will hold for both the economic and non-economic objectives of entrepreneurs (Bacq and Alt, 2018; Koe and Majid, 2014; Spence et al., 2011). A sustainable orientation culture in a region or country supports the pursuit of prosocial goals and motivates individual behaviors (Shepherd and Patzelt, 2011; Ben et al., 2018). However, an increase in the cost of a sustainable orientation without further restructuring business and introducing new environmental technologies will lead to diminishing returns on sustainable orientation even when institutional quality is growing.

We argue that the effects of diminishing marginal returns will only be observed in countries with higher institutional quality, as entrepreneurs in countries with low institutional quality may not be motivated to commit to a sustainable orientation. We therefore expect to observe the diminishing marginal return curve for countries with high-quality institutions, and only for productive entrepreneurship. Based on these arguments, we hypothesize:

H3: An increase in the sustainable orientation management of entrepreneurs and EIE performance has a diminishing marginal return and institutional quality of a region positively moderates this relationship.

2.5 Proposed conceptual framework

Figure 1 represents the research framework and the research hypotheses we aim to test.

--- Insert Figure 1 here ---

3. Methodology

3.1 Sample

We constructed our sample by collecting primary data via online expert surveys, and by conducting telephone interviews with each respondent in case comments were left or missing values were noticed.

The online survey was conducted across eight types of representative stakeholders within 16 cities in nine Central and Eastern European countries. The cities are characterized by the transition context of institutions. However, during the period analyzed no Soviet-style central planning had any influence on the decision-making of entrepreneurs or create any specific bias which could affect how market economies work. With respect to the context, Croatia, Poland, Romania and Bulgaria are part of the EU Single Market, the world's largest marketplace. The World Bank classifies Croatia and Poland as high-income countries; Romania, Bulgaria and Kazakhstan as upper middle-income countries; and Georgia, Ukraine, Turkey, Bosnia and Herzegovina as middle-income countries. SMEs in these countries in the EU represent between 96-99 percent of all firms, the majority of which are independent and employ about two thirds of the workforce.

In addition to the transitional context, we chose cities and countries with similar societal cultural practices and societal values. In this, we draw on the Globe (2020) report, which clusters countries within the following dimensions: uncertainty avoidance, future orientation, power distance, collectivism, humane orientation, gender egalitarianism, and assertiveness. The Globe (2020) taxonomy enabled us to select a group of similar countries and isolate the national dimension from the meso-level of cities we intend to focus on. This is important for our research question which deals with the sustainable orientation management of entrepreneurs.

The sample of respondents was drawn from different types of EE stakeholders, including university professors across the social sciences, economics and business fields; non-profit organizations; governmental agents; entrepreneurs; technopark or incubator managers; venture investors; representatives of banks or trusts; and multinational company C-level managers. All eight categories were represented in each city. In selecting these categories, we drew on prior research on the role of stakeholders in the entrepreneurial ecosystem (Autio et al., 2014). The respondents were selected from the register compiled by the Chamber of Commerce, as well as the active EE stakeholders in each city that satisfied the requirements of living and working in the city for over 5 years. Almost 85% of EIE actors had a university degree or above. Our four major groups of EIE actors were entrepreneurs (33.0% of the sample), university professors (9.2% of the sample), policy-makers (7.4% of the sample), or possessed multiple affiliations and roles (35.1% of the sample). The sample was drawn from the capitals of each country, and from the largest regional centers of selected countries.

The response rate of the online survey was 73 percent. The EIE actors all received personalized emails or letters asking them to complete the survey due to their expertise in entrepreneurship innovation, or their role in facilitating the development of the EIE.

Our sample provides a comprehensive perceptual set of EIE characteristics (Autio et al., 2014; Garud et al., 2014; Guerrero and Urbano, 2019; Stam, 2015; Guerrero et al., 2021) to answer our research question. Our cross-sectional dataset includes 1,676 observations from the cities of Warsaw (103 obs.) and Wroclaw (102 obs.) in Poland; Lviv (96 obs.) and Kyiv (120 obs.) in Ukraine; Cluj (119 obs.) and Bucharest (120 obs.) in Romania; Plovdiv (100 obs.) and Sofia (101 obs.) in Bulgaria; Astana (104 obs.) and Almaty (106 obs.) in Kazakhstan; Batumi (62 obs.) and Tbilisi (132 obs.) in Georgia; Istanbul (89 obs.) in Turkey; Zagreb (115 obs.) and Osijek (105 obs.) in Croatia; and Sarajevo (103 obs.) in

Bosnia and Herzegovina. The data was collected between December 2018 and February 2020. In this regard, our sample contains 50% of observations from cities that are capitals. The sample includes two cities from each country, except for Turkey (Istanbul is included), Bosnia and Herzegovina (Sarajevo is included)

Our approach suggests that cities are the most appropriate spatial units to fully understand the drivers of the EE, which is spatially bounded (Bosma and Sternberg, 2014). One research strategy is thus to limit a sample within a certain administrative boundary, such as cities (Feldman et al., 2005). Our study follows the Eurostat approach of the core city, also known as the local organizational unit (LAU), corresponding to the administrative boundaries of the city (European Commission, 2010). Core cities provide a more fine-grained analysis than larger regions, where aggregate additional populations and areas skew the values in an unknown direction. It is important to note that the EIE may overpass the core-city boundaries.

To sum up, all variables were collected from 2018 to 2020. Considering the few missing observations, researchers often use averaged indicators to predict the role of institutions in entrepreneurial innovation activity. This is incorrect, as it may produce different results, and causality cannot be claimed. We follow Sobel (2008) estimation approach, who used cross-sectional estimations for entrepreneurship innovation and institutions in US states.

3.2 Variables

Table 1 shows the descriptive statistics and description of variables.

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3.2.1 Dependent variables

We use a novel approach based on three dependent variables to measure EIE quality as a proxy for productive entrepreneurship activity, and EIE visibility as a proxy for the quantity

of entrepreneurial activity. We draw on prior use of these indicators as the outcomes of entrepreneurial ecosystem by Autio et al. (2014), Stam (2015), Audretsch and Belitski (2017) and Guerrero and Urbano (2021).

Our first dependent variable, *EIE quality*, is a proxy for productive entrepreneurship innovation activity. It was used in prior research by Spigel et al. (2020, p.484), who defined ecosystems as: the regional collection of actors (such as entrepreneurs, advisors, workers, mentors, and workers) and factors (cultural outlooks, policies, R&D systems, and networks) that all contribute to the creation and survival of high-growth ventures. The focus on EIE quality as a proxy for productive entrepreneurship is important because it is seen as a major driver of job creation and economic growth in both advanced and emerging economies. Spigel et al. (2020, p.484) further posits that "what entrepreneurial ecosystems are – the types of actors and factors most associated with high-growth entrepreneurship".

The entrepreneurial innovation ecosystem approach has emerged as a suitable - if not the optimal - approach for fostering entrepreneurial initiatives (Audretsch and Belitski, 2017; Isenberg, 2011; Stam, 2015; Autio et al., 2014). It facilitates “‘high-growth’ firms – the firms that ecosystems are, in principle, designed to support” (Spigel et al., 2020, p.485). Stam and Van de Ven (2021, p.817) also used high-growth entrepreneurship that “the envisaged output of the ecosystem: high-growth firms. ... we have proxied productive entrepreneurship with the prevalence of high-growth firms ... the share of high-growth firms of the regional business population”. Audretsch and Belitski (2020) further confirm this thesis for regions in Europe “In measuring productive entrepreneurship (Baumol, 1993), we used the share of high-growth firms in a region (Stam, 2015).”

In our survey, we use the measure “There is a growth-oriented entrepreneurship innovation ecosystem in my region (city) aiming at high-quality entrepreneurship innovation outcomes and growth aspirations” with a Likert scale from 1 – do not agree (destructive

entrepreneurship) to 7 – fully agree (sustainable-productive entrepreneurship). This indicator is compatible with the one described by Spiegel (2017, p.49) argues that high-growth entrepreneurship is a key outcome of EIE, and states that “Entrepreneurial ecosystems have emerged as a popular concept to explain the persistence of high-growth entrepreneurship within regions.” Meanwhile, Spiegel and Harrison (2018, p155) posit that the “Cluster and RIS [Regional Innovation System] concepts provide well-researched frameworks that help us understand why some places enjoy persistently higher rates of high-growth entrepreneurship than others.”

The measure focuses on the extent to which experts believe EIEs exhibit productive and high-growth oriented entrepreneurship behavior (Wurth et al., 2021). This approach was also theorized in the works of Sanders and Weitzel (2013), and Guerrero and Urbano (2021). However, it has not been empirically tested at the level of cities using perception data from experts.

Our second dependent variable, *EIE visibility*, is a proxy of the quantity of entrepreneurs within the EIE as a result of sustainable orientation management (Levie and Autio, 2008; Autio et al., 2014) which increases the presence and visibility of entrepreneurs. EIE visibility draws attention to the number of entrepreneurial entries and the rate of entrepreneurship, and not the growth rate or growth orientation of EIE. It is measured by the question, “There is a high number of new entrepreneurial startups in my region (city) that is both desirable and highly visible (1 – do not agree, 7 – fully agree)”. A similar indicator is used in the Global Entrepreneurship Monitor (GEM) data (Levie and Autio, 2008), which refers to entrepreneurship as a desirable business activity and as a social norm in places where it is seen as a desirable career choice (Zali et al., 2013).

The average value of EIE quality is 4.70 with 1.50 standard deviation, while the average level of EIE visibility is 4.74 with 1.57 standard deviation.

3.2.2 Explanatory variables

We use two explanatory variables and their interactions to understand the effect of sustainable orientation management and institutional quality on EIE performance in a region (Roundy, 2017; Stam and Van de Ven, 2021).

Our first explanatory variable, *sustainable orientation management*, is measured on the Likert scale and the respondents are asked to agree or disagree with the statement: “Entrepreneurs are strongly aware of sustainable orientation in my regions aiming at creating products and services which promote healthy lifestyle, improve energy efficiency, implement corporate social responsibility practices, target climate change, engage in recycling and reducing environmental impact policies (1 – do not agree, 7 – fully agree)”. This indicator was used in previous studies (Hooi et al., 2016; Kuckertz and Wagner, 2010; Roxas et al., 2017; Salonen et al., 2018). The average value of sustainable orientation management is 3.67, with a 1.51 standard deviation.

Our second explanatory variable is *institutional quality*, which is operationalized using the Global Entrepreneurship Development Index rank (GEDI) which we reversed with the highest rank meaning better institutional quality (Acs et al., 2017). The GEDI measures the quality of institutions and infrastructure for entrepreneurial innovation and is used in numerous studies on the relationship between formal and informal institutions and ecosystem quality (Szerb et al., 2013, 2019; Autio et al., 2014). The GEDI² uses the system perspective to reflect entrepreneurship (Acs et al., 2017).

² This index combines three sub-indices: attitudes, abilities and aspiration. Entrepreneurial innovations appear as a response to the dynamic interaction between entrepreneurial abilities, attitudes and aspirations under local institutional frameworks (Acs et al., 2017; Autio et al., 2014).

We created four quartiles of GEDI with the first quartile (0-25 percent) which is associated with the lowest level of institutional quality is used as a reference category. We added three binary variables which represent the continuity of GEDI in the model and uncover the nuances of institutional quality: GEDI rank 2nd quartile, which is a binary variable equal to one if the GEDI (reversed) is in the second quartile (25-50%) (Acs et al., 2017). Accordingly, we added GEDI rank 3rd quartile which is a binary variable equal to one if the GEDI is in the third quartile (51-75%), and GEDI rank 4th quartile, which is a binary variable equal to one if the GEDI is in the fourth quartile (76-100%). We interacted these variables in our model with the ordinal variable of sustainable orientation management to test our research hypothesis.

Finally, we use the interaction between the *sustainable orientation behavior and institutional quality* that reveals the degree of complementarity between a level of institutional quality and sustainable orientation management by entrepreneurs.

3.2.3 Control variables

At the EIE level, we used a set of control variables that measure the effectiveness of the various components within an EIE (Autio et al., 2014). First, we also use control variables for the role that formal and informal networks (Motoyama and Knowlton, 2016) play in entrepreneurial activity. Networks can be described as collaborative relationships that entrepreneurs and firms enter into with their competitors and other stakeholders (Bischoff, 2021). Second, we measure the financial (equity and debt) availability in the region (Brown and Mason, 2017). Third, we measure the efficiency of government programs intended to support entrepreneurship innovation in a region as perceived by respondents (Chowdhury et al., 2019; Guerrero and Urbano, 2021). Fourth, other controls build on prior studies (Ostrom, 2005; Audretsch and Belitski, 2017) and are related to the availability of media

support for entrepreneurship innovation (Stenholm et al., 2013) or entrepreneurial innovation culture in a region (Belitski et al., 2021; Fritsch and Wyrwich, 2017).

At the EIE actors' level, we use the occupations of EIE actors as binary variables, gender, human capital (university degree or above), and age range (Bosma, 2013). In addition, at the EIE city level, we control for city agglomeration effects with control for the capital city and population in logarithm (Audretsch et al., 2017). Capital cities are known to generate more entrepreneurship and agglomeration effects, and are important centers of economic development and growth in the region of study. However, markets in capital and large cities may be more competitive and therefore require more finance to enter. This explains why we interact the institutional quality binary variables and the binary variable capital-city to capture potential regional differences in the capital-periphery nexus. Finally, the 'total population' indicator provides the number of people living within the city, but does not include any surrounding communities outside of the core city. Table 2 illustrates the correlation between the variables used in this study.

--- Insert Table 2 here ---

3.3 Model

Given the nature of our dependent variable, which varies from one to seven on a Likert scale (ordinal variable), we estimate equation (1) using ordered logistic regression. This approach is also applicable if both dependent and independent variables are ordinal. We used the "ologit" command in Stata to estimate an ordered logistic regression model. We use odd ratios when reporting the results of the coefficients, and are thus able to provide an economic meaning of the estimation. The following econometric model was estimated:

$$y_i = f(\beta x_i, \Theta z_i, \mu_i) \quad i=1, \dots, N; \quad (1)$$

where y_i is a vector of dependent variables: EIE quality in the first model, and EIE visibility in the second model, with each variable varying from 1 (low) to 7 (very high). β and Θ are

the parameters to be estimated, x_i is a vector of independent explanatory variables, while z_i is a vector of control variables such as the individual characteristics of respondents; u_{it} is then the error-term. To address concerns of multicollinearity, we verified that the variance inflation factor (VIF) was within conventional accepted range in all models.

4. Results

The analyses are presented in Table 3. Specifications 1-4 illustrate the analysis for productive entrepreneurship as a proxy for EIE quality, while specifications 5-8 illustrate the quantity of entrepreneurship as a proxy for EIE visibility.

--- Insert Table 3 here ---

Regarding the EIE quality, specifications 1 and 5 include selected control variables, and specifications 2 and 6 add our main explanatory variables: sustainable orientation management and institutional quality. Specifications 3 and 7 then add a squared term of sustainable orientation management to test the diminishing marginal return hypothesis. Finally, specifications 4 and 8 demonstrate the interaction between sustainable orientation management and the GEDI quartile index both in levels and a quadratic form. The first quartile of GEDI is a reference category. Our H1, which states that an increase in institutional quality has a positive effect on EIE performance, is supported for EIE quality. For example, EIE actors who are located in a city with a higher level of institutional quality (e.g. in the third GEDI quartile) are 3.54-3.56 times more likely to perceive a higher quality ($\beta=3.54-3.56$, $p<0.001$, specifications 2 and 3, Table 3) of EIE than EIE actors in the first GEDI quartile. Interestingly, EIE actors located in a city in the fourth GEDI quartile are 7.67-7.82 times more likely to perceive a higher quality of EIE ($\beta=7.67-7.82$, $p<0.001$, specification 2 and 3, Table 3) than actors in the first GEDI quartile.

EIE actors located in a city in the fourth GEDI quartile are less likely to perceive a higher visibility of EIE ($\beta=0.48$, $p<0.001$, specification 6 and 7, Table 3) than actors in the first GEDI quartile. We therefore conclude that an increase in institutional quality is positively associated with productive entrepreneurship starting from the second quartile of GEDI, while institutional quality has a reverse effect on the rate of entrepreneurship activity. In economic terms this means that an increase in institutional quality has a reverse effect on the quantity of entrepreneurs used as a proxy for EIE visibility.

Our H2, which states that an increase in sustainable orientation management of entrepreneurs and EIE performance has a diminishing marginal return, is supported for EIE quality ($\beta=1.635$ and $\beta=0.969$, $p<0.001$, specification 3, Table 3) and not supported for EIE visibility ($\beta=1.082$ and $\beta=1.101$, $p>0.10$, specification 7, Table 3). The values of the odd-ratios, which are above one for the level of sustainable orientation management and below one for the quadratic term, demonstrate an inverted U-shaped relationship between the sustainable orientation management and EIE quality. The positive effect of sustainable orientation management for EIE visibility disappears once we control for the level of institutional quality and introduce the interaction terms.

We also found support for H3, which states that an increase in the sustainable orientation management of entrepreneurs and EIE performance has a diminishing marginal return and institutional quality of a region positively moderates this relationship. Our H3 is supported for EIE quality, and again is not supported for EIE visibility. The values of the interaction coefficients for the third quartile of GEDI and sustainable orientation compared to the first quartile of GEDI are positive and significant ($\beta=2.023$ and $\beta=0.911$, $p<0.05$, specification 4, Table 3). We also confirm support for H3 by finding positive and significant interaction coefficients for the fourth quartile of GEDI and sustainable orientation compared to the first quartile of GEDI ($\beta=2.731$ and $\beta=0.890$, $p<0.01$, specification 4, Table 3). The significance

of the different statistical effect increases when moving from the third to the fourth quartile of GEDI associated with a higher level of institutional quality. We therefore argue that an increase in socio-economic orientation management is positively associated with EIE quality, with institutional quality moderating this relationship. The difference between the effects of sustainable orientation management by entrepreneurs on EIE quality is statistically significant, and the gap increases when moving from the second to the third and fourth quartiles of GEDI for EIE quality.

Robustness check

As part of the robustness check, we calculated the predictive margins of a change in sustainable orientation management and its effect on our dependent variables (EIE quality and visibility between regions) conditional on region's institutional quality.

--- Insert Figure 2 here ---

Figure 2a tests H2 and illustrates the diminishing return on sustainable orientation management for EIE quality (left column), while the effect remains linear and positive for EIE visibility (right column). This positive effect further disappears once we control for the institutional quality of a region. Figure 2a (left) demonstrates that productive entrepreneurship activity as perceived by EIE actors greatly benefits from sustainable orientation management by entrepreneurs. However, the effect of sustainable orientation on EIE quality diminishes at the highest levels of sustainable orientation, as returns on this activity are highest at the earlier stages of sustainable orientation (Hervieux and Voltan, 2018; Kostetska and Berezyak, 2014). Figures 2c—2d (left) illustrate an inverted U-shaped relationship between sustainable orientation management and EIE quality, with the relationship becoming more convex for regions with higher levels of institutional quality. Figure 2d (left) clearly demonstrates that at the highest levels of institutional quality (4th quartile of GEDI) there is a clear distinction in the size of the sustainable orientation effect

on EIR quality compared to ecosystems with the lowest level of institutions (1st quartile of GEDI). The effect is not statistically significant for EIE visibility, which does not support our H2 and H3.

Given the diminishing returns to sustainable orientation, for ecosystems a change from 1 to 5 on the sustainable orientation axis in regions with the highest level of institutional quality is associated with an average increase in EIE quality of 4.5 to 6. Moving from 5 to 7 for regions with the highest level of institutional quality does not further add value to EIE quality. An increase in sustainable orientation management from 1 to 7 along with an increase in institutional quality does not add to EIE visibility. Sustainable orientation management by entrepreneurs is important, and it has a stronger effect on the quality of ecosystems in regions with higher-quality institutions (Guerrero and Urbano, 2021).

5. Discussion

5.1 Theoretical implications

In a world continuously challenged by resource scarcity, climate change and other sustainability issues, entrepreneurs are finding new opportunities to foster sustainable orientation behavior as a strategy that leads to productive entrepreneurship activity. As environmental challenges require complex knowledge recombination, entrepreneurs may lead the grand societal challenges through high-growth orientation and productive entrepreneurship.

However, prior research has discussed and demonstrated how entrepreneurship activity exhibits a high degree of heterogeneity (Parker, 2018). Entrepreneurial activity can take many different forms, such as productive, unproductive, and destructive entrepreneurship (Baumol, 1990; Boettke and Piano, 2016), as well as necessity- and opportunity-driven entrepreneurship (Audretsch et al., 2022b). This study provides empirical insights on the

different effects of sustainable orientation management of entrepreneurs on EIE quality, proxied by productive entrepreneurship, and EIE visibility, proxied by the rate of entrepreneurship activity. Our study extends prior research on entrepreneurial innovation ecosystems in demonstrating that EIE quality responds to both sustainable orientation management (Sung and Park, 2018) and institutional quality. This is unlike other ecosystem performance indicators, such as the rate and visibility of entrepreneurial activity (Parker, 2018). In order to promote productive entrepreneurship activity in the ecosystems, policymakers should: i) increase the sustainable orientation of entrepreneurs (Barq and Alt, 2016); ii) enhance the attitudes and aspirations of entrepreneurs towards growth-oriented business (Estrin et al., 2013a); iii) improve the institutional quality of the region and country as a conduit for entrepreneurship quality (Chowdhury et al., 2019).

Our study demonstrates the importance of EIEs and ecosystem actors having a “mandate” to reduce institutional voids, improve institutional quality, and use social mechanisms and sustainable orientation when planning and implementing their high-growth activity (United Nations, 2015; Volkmann et al., 2019; Guerrero and Urbano, 2021; Guerrero and Lira, 2023). Hertel et al. (2019, p.451) explicitly stress the importance of societal “acknowledgment of achievement” for entrepreneurs. In this regard, our study extends the conversation in social entrepreneurship about how entrepreneurs are working for the “greater good” (Besser et al., 2006). It does so by exploring entrepreneurial innovation opportunities that benefit society (Barq and Janssen, 2011), and by identifying the economic outcomes for an ecosystem of entrepreneur’s sustainable orientation (Autio et al., 2014; Stam and Van de Ven, 2021). Likewise, our study also demonstrates how productive entrepreneurship activity of entrepreneurial ecosystems could be achieved: by changing the orientation of entrepreneurs towards sustainability (Volkmann et al., 2019). Our study complements the social entrepreneurship debate (Bacq and Alt, 2018) with the outcomes of

entrepreneurship and innovation ecosystems (Spiegel, 2020, 2022; Sleuwaegen and Ramboer, 2020; Audretsch and Belitski, 2020).

Firstly, improving the quality of formal and informal institutions that constitute the core of the GEDI index we use in this analysis. More specifically, the changes in the formal institutions may include a reduction of time and number of procedures, as well as reduction of cost related to starting and growing business which directly contributes to sustainability. Local and national governments may impose doing Business regulations that delay market entry and do not sufficiently protect property rights and resolving insolvency (Audretsch et al. 2019) which constraints market entry and growth. Improvements in regulation may range from reducing the bureaucratic procedures to tax holidays and concessions for entrepreneurs that seek sustainability of their products and services, comply with high environmental, health and safety standards. These measures will not only increase the entrepreneurial response and growth aspirations (Estrin et al. 2013a), but will serve as a signal to high-growth entrepreneurs (Stam, 2015) on the attractiveness of local (national) markets and regulation.

Secondly, improvement in informal institutions related to nurturing culture of sustainability and entrepreneurship by speaking about the role models, setting up incubator and accelerator programmes which would specifically target creating networks between sustainable-oriented entrepreneurs and venture capital, government agency who can sponsor them. This would not only facilitate the quality of EIE to the extent to which policy-makers foster sustainable orientation management (Autio et al., 2014; Bacq and Alt, 2018; Eichler and Schwarz, 2019), but ensure that sustainable oriented entrepreneurs have access to the localized financial and social resources networks, mentorship and guidance. Despite the fact that reinforcing institutional quality in countries transitioning to stronger market institutions and property rights could take time, as the transformation of culture, values, and

behaviors is slow (Szerb et al., 2013, 2019), this transformation is desirable, viable and feasible in a long-term perspective. The environmental challenges are not fading away, and there is an expectation of the economic agents, including public institutions and customers, that entrepreneurs are one of the key players in sustainable orientation of local economy, they bear equal responsibility with other economic agents to Foster socially responsible and sustainable behavior, raising awareness of sustainable products and services.

Thirdly, more attention should be paid to bolstering EIE performance by increasing the resilience of individual entrepreneurs and EIE in general, which becomes very important during the crises, as we recently evidenced with the COVID-19 pandemic (Khlystova et al. 2022; Siegel and Guerrero, 2021). Drawing on our results, we find that the diminishing marginal returns to sustainable orientation for productive entrepreneurs persist in EIE located in regions with the highest level of institutional quality, while EIE in regions with poor institutions have no diminishing returns effect for quality and visibility of entrepreneurship. This is an important finding as it demonstrates that organizational and transaction costs of pursuing the highest level of sustainable behavior for productive entrepreneurs are high. Public policy tools related to a reduction in such costs, including the improvement of regulation and sharing knowledge, may leverage the cost and lead to more productive entrepreneurs choosing environmental behavior. To overcome these challenges, EIE economic agents need to work collaboratively and competitively to focus in developing supportive environmental policies, investing in digitalization which may speed up the process and time of complying with the regulation and paying taxes.

5.2 Practical implications

Our study has several implications for entrepreneurial innovation ecosystem actors.

First, we confirm that the sustainable orientation management performed by entrepreneurs can efficiently bolster EIE quality (Stam, 2015) but not other quantitative ecosystem outcomes.

Second, our study has demonstrated that entrepreneurship ecosystems are heterogeneous phenomenon, with distinct entrepreneurship behavior and policies, and institutional context shape different outcomes of EIE.

Third, if policy-makers wish to promote productive entrepreneurship activity in their ecosystems, we suggest they develop societal and environmental initiatives which can be equally and positively perceived by all EIE actors. Fourth, learning processes are key for EIE actors who need to gain awareness and knowledge about sustainability orientation (Audretsch et al., 2022d). We assume entrepreneurs could engage in multiple sustainability-orientated behaviors, and they need to choose one at a time or combine several sustainable activities to achieve ecosystem objectives. Although it is well established in the literature that a portfolio of sustainable activities is important for the creation of entrepreneurial opportunities (Volkman et al., 2019), this factor negatively interacts with entrepreneurial learning processes, as it adds high complexity and increased coordination costs which entrepreneurs may find hard to handle (Audretsch and Belitski, 2020). In other words, an increase in the portfolio of sustainable-oriented activities by entrepreneurs may not always result in high growth.

Finally, policy-makers should set up supporting programs that foster sustainable behavior among EIE actors while also increasing corresponding awareness through events, awards, and competitions.

5.3 Limitations and future research

The study has a number of limitations.

First, our methodological design has a static focus. The data collection process (survey responses and interviews) took place from the end of 2018 to the end of 2019. This represents a restriction in implementing a dynamic and evolutive view in terms of regulations and strategic orientation changes oriented towards achieving sustainable development goals over time. Indeed, any strategic implementation requires time and follow-up to understand the positive/negative effects, outcomes, and potential improvements. Future research will be able to use longitudinal data to provide more detail about the variety of EIE agents and their involvement in changing institutions and sustainable orientation over time and across countries.

Second, our operationalization of sustainable orientation management can be improved by considering different types of orientations (e.g., following the sustainable development goals criteria and ecosystem objectives).

Third, while this study answers several important questions on the role of context for sustainable oriented management by entrepreneurs, other theories and perspectives (e.g., resource-based view, knowledge spillover of entrepreneurship, open innovation) could be used to further explain the concavity of the relationship between social orientation management and various EIE performance measures.

5.4 Conclusions

Three main conclusions emerge from this study. First, the institutional quality and sustainable orientation management of entrepreneurs shape the quality of EIEs, but not their quantity or visibility. Second, there are diminishing marginal returns to the sustainable orientation management of entrepreneurs related to resource scarcity. It is, therefore, important to select and choose a combination of sustainable orientation behaviors that will maximize the likelihood of productive entrepreneurship activity. Third, the interplay

between the quality of institutions and sustainable orientation management predicts productive entrepreneurship activity, with the relationship becoming significantly different at the highest level of institutional quality. McMullen and Warnick (2016) posited that every new venture should be required to be a hybrid organization. Our results demonstrate the importance of this statement, specifically for the quality of EIEs.

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Table 1: Descriptive Statistics

	Variables	Description of variables	Mean	S.D.	Min.	Max.
Dependent variable	EIE – entrepreneurship quality	There is a high growth-oriented of entrepreneurship innovation ecosystem in my region (city) aiming at high-growth firms and high quality of entrepreneurship outcomes (1 – do not agree, 7 – fully agree)	4.70	1.50	1.00	7.00
	EIE – entrepreneurship visibility	There is a high number of new entrepreneurial startups in my region (city) that is both desirable and highly visible (1 – do not agree, 7 – fully agree)	4.74	1.57	1.00	7.00
Explanatory variables	Sustainable orientation	Entrepreneurs are strongly aware of sustainable orientation in my regions aiming at creating products and services which promote healthy lifestyle, improve energy efficiency, implement corporate social responsibility practices, target climate change, engage in recycling and reducing environmental impact policies (1 – do not agree, 7 – fully agree)	3.67	1.51	1.00	7.00
	GEDI rank 1 st quartile	Binary variable =1 if Global Entrepreneurship Development Index (reversed) is on the first quartile (0-25%) GEDI data is taken from Acs et al. (2017). An increase in GEDI rank reversed means an increase in the quality of institutions and infrastructure for entrepreneurship and innovation	0.31	0.46	0.00	1.00
	GEDI rank 2 nd quartile	Binary variable =1 if Global Entrepreneurship Development Index (reversed) is in the second quartile (25-50%) (Acs et al. 2017).	0.24	0.43	0.00	1.00
	GEDI rank 3 rd quartile	Binary variable =1 if Global Entrepreneurship Development Index (reversed) is in third quartile (51-75%).	0.27	0.44	0.00	1.00
	GEDI rank 4 th nd quartile	Binary variable =1 if Global Entrepreneurship Development Index (reversed) is in fourth quartile (76-100%)	0.18	0.38	0.00	1.00
Control variables	Government support	Government rules and institutions support entrepreneurship and innovation in my region (city) (e.g., grants, mentoring, etc.) (1 – do not agree, 7 – fully agree)	3.80	1.49	1.00	7.00
	Formal networks	There is a sufficient formal network to support entrepreneurship and innovation in my region (city) (1 – do not agree, 7 – fully agree)	3.83	1.40	1.00	7.00
	Informal networks	There is sufficient support and availability of informal networks to support entrepreneurship and innovation in my region (city) (personal contacts, investors not officially registered, family links) (1 – do not agree, 7 – fully agree)	4.39	1.51	1.00	7.00
	Financial equity resource	There is sufficient support and availability of venture capital/ business angels/crowdfunding in my region (city) (1 – do not agree,7 – fully agree)	3.48	1.55	1.00	7.00
	Financial debt resource	There is sufficient availability of debt capital like banks or other debt credit in my region (city) (1 – do not agree, – fully agree)	4.46	1.68	1.00	7.00
	Entrepreneur	Individual respondent is an entrepreneur = 1, otherwise =0	0.35	0.48	0.00	1.00
	Professor	Individual respondent is a professor = 1, otherwise =0	0.09	0.29	0.00	1.00
	Multiple	individual respondent multiple occupations = 1, otherwise =0. Any any combination of entrepreneur, professor, policy-maker, investor, director/manager in a multinational company, manager of TTO, manager	0.34	0.47	0.00	1.00

	in tech techno park; accelerator); lawyer, other)= 1, zero otherwise				
Gender (male)	Gender (male=1, female=0)	0.56	0.50	0.00	1.00
University degree	Have you got a university degree or higher? (1 - yes; 0 - no)	0.84	0.36	0.00	1.00
Age range	Age group (less than 29 years old = 1; 30-39 = 2; 40-49 = 3; 50-59 = 4; 60-69 = 5; more than 70 = 6)	2.28	1.09	1.00	5.00
Business schools	Number of public and private business schools with specialized business education in a city	10.99	4.55	1.00	17.00
Highways	Number of highways passing through the city	3.73	1.51	1.00	7.00
Airlines	Number of airlines flying in and out of a city	17.99	12.06	3.00	42.00
Business incubators	Number of business incubators	3.18	2.37	0.00	8.00
Capital city	Binary variable=1 if the capital city, zero otherwise	0.54	0.50	0.00	1.00
Population	City population size in logs	13.76	1.10	11.59	16.56

Source: Authors, based on an online survey

Table 2: Correlation Matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. EIE quality	1															
2.EIE visibility	0.66*	1														
3.Sustainable orientation	0.40*	0.33*	1													
4.GEDI rank 2 nd quartile	0.03	0.07*	-0.01	1												
5.GEDI rank 3rd quartile	0.11*	-0.09	0.12*	-0.34*	1											
6.GEDI rank 4th nd quartile	0.03	-0.08	0.01	-0.25*	-0.28*	1										
7.Government support	0.43*	0.42*	0.33*	-0.06*	0.07	0.05	1									
8.Formal networks	0.41*	0.36*	0.43*	-0.08*	0.02	0.11*	0.49*	1								
9.Informal networks	0.37*	0.39*	0.27*	0.15*	-0.11*	-0.08	0.33*	0.49*	1							
10.Financial equity resource	0.42*	0.41*	0.44*	0.05*	-0.02	0.09	0.48*	0.49*	0.36*	1						
11.Financial debt resource	0.41*	0.42*	0.28*	0.15*	-0.06*	-0.108*	0.33*	0.42*	0.46*	0.35*	1					
12.Business schools	0.05*	0.02	0.10*	-0.15*	-0.33*	0.30*	0.10*	0.05*	-0.05*	0.05*	-0.02*	1				
13.Highways	0.21*	0.24*	0.09*	0.29*	-0.05*	-0.22*	0.04*	-0.04	0.07*	0.16*	0.07*	0.07	1			
14.Airlines	-0.16*	-0.12*	-0.10*	-0.12*	-0.05*	-0.04	0.01	-0.07*	-0.05*	-0.08	-0.162*	0.20*	0.35*	1		
15.Business incubators	-0.08*	-0.12*	-0.01	-0.09*	-0.09*	0.47*	0.06*	0.02	-0.06*	0.05	-0.18*	0.42*	0.28*	0.64*	1	
16.Capital city	0.01	0.05*	-0.04	-0.04	-0.03	-0.18*	0.08*	0.02	-0.04*	0.14*	0.01	0.02	0.49*	0.51*	0.32*	1
17.Population	0.01	0.09*	-0.07	0.11*	-0.38*	0.40*	0.04	-0.02	0.08*	0.07*	-0.08*	0.29*	0.53*	0.57*	0.57*	0.13*

Note: *0.001 significance level.

Source: Authors, based on an online survey

Table 3: Ordinary logit model results: Dependent variables: entrepreneurship innovation ecosystem quality and visibility. All coefficients are reported in odd-ratios

Dependent variables Specifications	EIE quality				EIE visibility			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Government support	1.430*** (0.06)	1.397*** (0.05)	1.393*** (0.05)	1.414*** (0.06)	1.486*** (0.06)	1.469*** (0.06)	1.470*** (0.06)	1.486*** (0.06)
Formal networks	1.248*** (0.06)	1.159*** (0.05)	1.159*** (0.05)	1.158*** (0.05)	1.092* (0.05)	1.042 (0.05)	1.042 (0.05)	1.042 (0.05)
Informal networks	1.174*** (0.05)	1.221*** (0.05)	1.218*** (0.05)	1.204*** (0.05)	1.257*** (0.05)	1.257*** (0.05)	1.258*** (0.05)	1.244*** (0.05)
Financial equity resource	1.237*** (0.05)	1.154*** (0.04)	1.157*** (0.04)	1.164*** (0.04)	1.249*** (0.05)	1.198*** (0.05)	1.197*** (0.05)	1.202*** (0.05)
Financial debt resource	1.232*** (0.04)	1.250*** (0.04)	1.254*** (0.04)	1.239*** (0.04)	1.259*** (0.05)	1.276*** (0.04)	1.275*** (0.04)	1.259*** (0.04)
Entrepreneur	1.418*** (0.18)	1.299** (0.17)	1.310** (0.17)	1.277* (0.16)	1.844*** (0.22)	1.919*** (0.24)	1.919*** (0.24)	1.866*** (0.24)
Professor	0.882 (0.16)	0.941 (0.17)	0.938 (0.17)	0.901 (0.16)	0.926 (0.16)	0.920 (0.16)	0.921 (0.16)	0.887 (0.16)
Multiple	0.937 (0.12)	0.963 (0.12)	0.976 (0.13)	0.968 (0.12)	1.174 (0.15)	1.183 (0.15)	1.182 (0.15)	1.162 (0.15)
Gender (male)	1.095 (0.10)	1.111 (0.10)	1.106 (0.10)	1.122 (0.10)	0.951 (0.09)	0.962 (0.09)	0.963 (0.09)	0.969 (0.09)
University degree	2.866*** (0.39)	2.850*** (0.42)	2.800*** (0.41)	2.814*** (0.42)	2.734*** (0.39)	2.867*** (0.42)	2.877*** (0.42)	2.813*** (0.41)
Age range	1.091* (0.05)	0.990 (0.05)	0.989 (0.05)	0.994 (0.05)	1.153*** (0.05)	1.100** (0.05)	1.101** (0.05)	1.100** (0.05)
Business schools	1.032*** (0.01)	1.092*** (0.02)	1.094*** (0.02)	1.089*** (0.02)	1.036*** (0.01)	1.030** (0.01)	1.029** (0.01)	1.027* (0.01)
Highways	1.435*** (0.07)	1.631*** (0.12)	1.635*** (0.12)	1.592*** (0.12)	1.246*** (0.06)	1.064 (0.08)	1.064 (0.08)	1.040 (0.08)
Airlines	0.967*** (0.01)	1.024 (0.01)	1.023 (0.01)	1.022 (0.02)	0.975*** (0.01)	0.948*** (0.01)	0.948*** (0.01)	0.947*** (0.01)
Business incubators	1.045 (0.03)	0.724*** (0.05)	0.724*** (0.05)	0.739*** (0.05)	0.834*** (0.03)	0.918 (0.06)	0.918 (0.06)	0.930 (0.06)
Capital city	0.642*** (0.09)	0.736** (0.11)	0.731** (0.11)	0.705** (0.11)	1.174 (0.16)	1.551*** (0.24)	1.553*** (0.24)	1.515*** (0.24)
Population	1.015 (0.07)	0.822 (0.10)	0.820 (0.10)	0.848 (0.11)	1.635*** (0.11)	2.254*** (0.29)	2.255*** (0.29)	2.337*** (0.31)
GEDI rank 2 nd quartile (H1)		1.989*** (0.36)	1.960*** (0.36)	2.353 (1.56)		0.762 (0.14)	0.764 (0.14)	0.961 (0.65)
GEDI rank 3 rd quartile (H1)		3.540*** (0.57)	3.568*** (0.58)	1.107 (0.75)		1.269 (0.20)	1.268 (0.20)	0.905 (0.62)
GEDI rank 4 th quartile (H1)		7.825*** (3.01)	7.673*** (2.96)	1.030 (0.89)		0.481* (0.19)	0.483* (0.19)	0.105*** (0.09)
Sustainable orientation (H2)		1.225*** (0.04)	1.635*** (0.23)	1.187* (0.26)		1.160*** (0.04)	1.082 (0.16)	0.877 (0.22)
Sustainable orientation squared (H2)			0.969** (0.02)	0.991* (0.02)			1.101 (0.02)	1.042 (0.03)
Sustainable orientation x GEDI rank 2 nd quartile (H3)				1.317 (0.48)				1.147 (0.43)
Sustainable orientation squared x GEDI rank 2 nd quartile (H3)				0.926 (0.04)				0.954 (0.05)
Sustainable orientation x GEDI rank 3 rd quartile (H3)				2.023* (0.76)				1.236 (0.47)

Sustainable orientation squared x GEDI rank 3 rd quartile (H3)				0.911* (0.04)				0.971 (0.05)
Sustainable orientation x GEDI rank 4 th quartile (H3)				2.731** (1.18)				1.866 (0.80)
Sustainable orientation squared x GEDI rank 4 th quartile (H3)				0.890** (0.05)				0.944 (0.05)
Number of observations	1676	1676	1676	1676	1676	1676	1676	1676
chi-square	824.09	1045.54	1049.91	1076.86	734.01	999.49	999.73	1018.37
loglikelihood	-2526.32	-2459.29	-2457.11	-2443.63	-2544.40	-2522.49	-2522.36	-2513.06
pseudo R2	.15	.17	.17	.18	.16	.16	.16	.16

Note: *0.01, **0.05, ***0.001 significance level. Standard errors clustered by city.

Source: Authors, based on an online survey

Figure 1: Proposed conceptual model

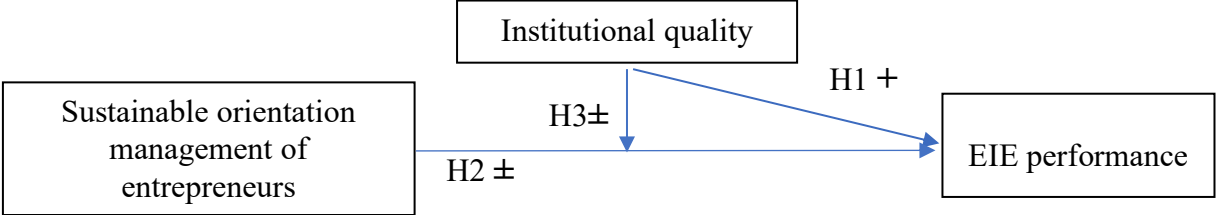
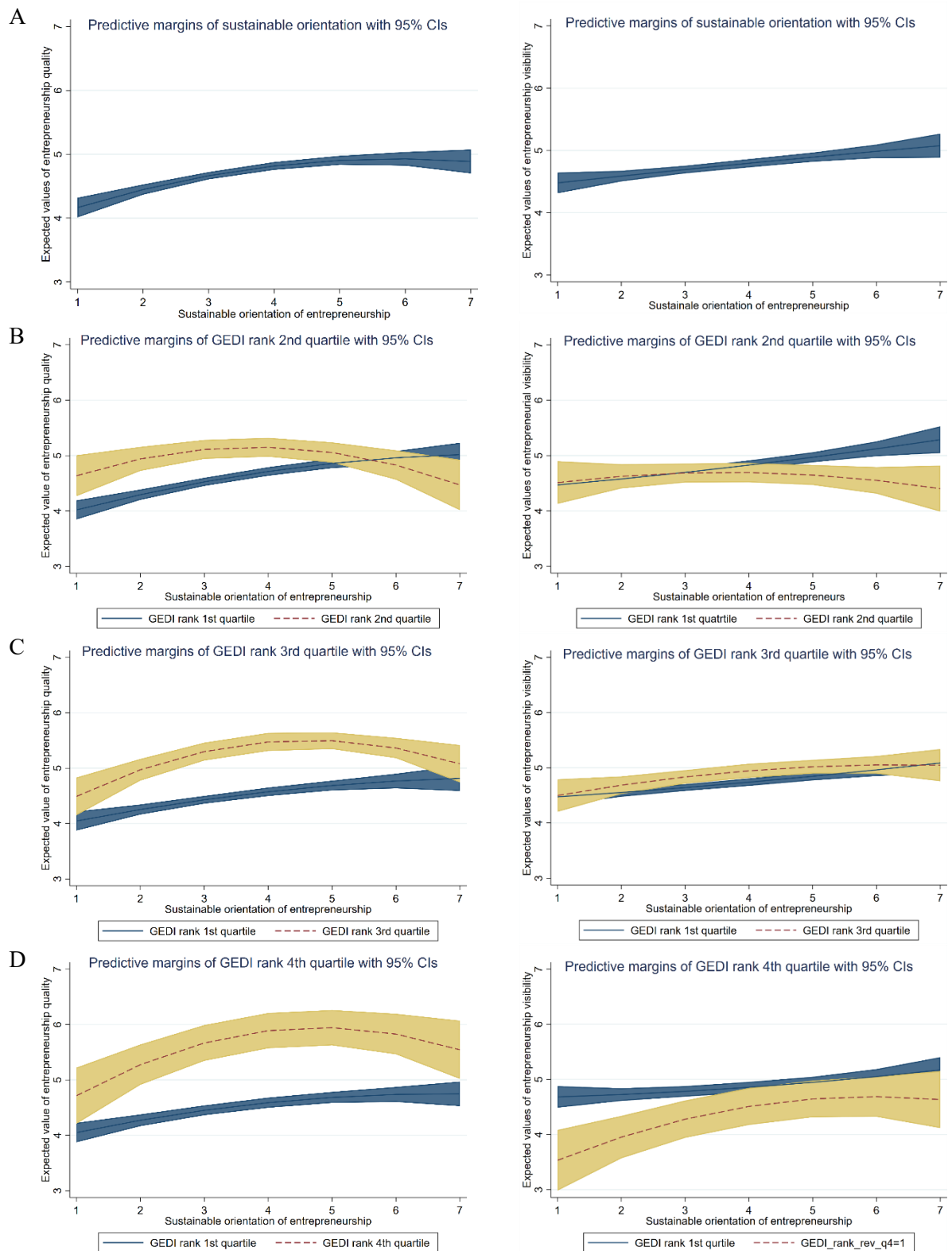


Figure 2: The predictive margins of sustainable orientation for EIE quality (left) and visibility (right) conditional on the country GEDI rank



Source: Authors, based on an online survey