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RESEARCH ARTICLE

Cultural diversity and innovative entrepreneurship

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Abstract A growing empirical literature has established a positive relationship between cultural diversity and entrepreneurship, often attributing this effect to innovation benefits of diversity. However, not all entrepreneurship is inherently innovative, raising the question of whether cultural diversity may increase the likelihood of an entrepreneur pursuing an innovative instead of a more replicative business strategy. This study investigates the relationship between regional cultural diversity and the innovation orientation of early-stage entrepreneurs and considers moderating factors by decomposing shares of foreign-born population by origin (within and outside of the EU) and by education level. Combining survey data from the Global Entrepreneurship Monitor with population-based indicators of cultural diversity, we carry out a multilevel analysis for 140 European regions. The results suggest that entrepreneurs in culturally more diverse regions are significantly more likely to exhibit innovation orientation.

Plain English Summary In regions with a culturally diverse population, entrepreneurs are more likely to pursue innovative rather than replicative business models. According to theory, cultural diversity offers new knowledge, ideas and approaches, which can foster innovative entrepreneurship. In this study, we investigate the role of cultural diversity in explaining regional-level differences in the prevalence of innovation-oriented entrepreneurs in Europe. Using different measures of cultural diversity, we find that more diversity may indeed stimulate innovative entrepreneurship. This provides insights for policy-makers and business practise into the role of cultural diversity in fostering regional innovative potential.

Keywords Cultural diversity · Entrepreneurship · Innovation · European regions · Multilevel analysis

JEL Classification F22 · L26 · O30 · R1

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1 Introduction

Diversity of knowledge and resources is the raw material of Schumpeterian new combinations

(Schumpeter, 1934), as has been established by Jacobs (1961) and the subsequent literature on urban and regional diversity (Florida, 2002; Frenken et al., 2007; Glaeser et al., 1992; Quigley, 1998). This theoretical linkage that we call the Schumpeter-Jacobs theory of innovative entrepreneurship (cf. Baumol, 2010; Stam & Lambooy, 2012; Florida et al., 2017) is also reflected in a growing number of recent empirical studies showing that diversity of the local population is positively related to innovation. While such population diversity may stem from a variety of sources (see, e.g. Karlsson et al., 2021), perhaps the most salient one refers to *cultural diversity* as the composition of regional population by cultural background, proxied in this study by country of birth. Cultural diversity implies local presence of varied experiences, behaviours, markets, knowledge and skills, which can lead to the emergence of new ideas. Theoretically, this may be due to a diverse population facilitating new discovery, evaluating or acting upon opportunities differently (see, e.g. Audretsch et al., 2010) or because diverse regions provide beneficial conditions for innovation, e.g. by offering informal institutions that support experimentation (e.g. Mickiewicz et al., 2019). Indeed, empirical evidence of the potential of cultural diversity has examined effects on measures of innovation such as patents (Nathan, 2015; Niebuhr, 2010; Ozgen et al., 2012) and introduction of innovations within firms (Brixy et al., 2020; Nathan & Lee, 2013), but also on entrepreneurship (e.g. Audretsch et al., 2010, 2021; Rodríguez-Pose & Hardy, 2015).

However, although new firm formation may sometimes be understood as an indicator of innovation itself, not all entrepreneurship is inherently innovative. In this study, we investigate how cultural diversity enables not entrepreneurship in general but specifically entrepreneurship that involves new combinations versus entrepreneurship that replicates existing business models. Innovative entrepreneurship differs substantially in its nature and economic effects from replicative entrepreneurship (Baumol, 2010). *Innovative entrepreneurship* is grounded in the Schumpeterian perspective on entrepreneurs as innovators, commercialising new combinations of production factors (Block et al., 2017; Schumpeter, 1942; Sledzik, 2013). *Replicative entrepreneurship* is instead characterised by adopting existing business ideas, thus serving to establish and diffuse them. If cultural diversity fosters innovation, we would expect cultural diversity to be a more important condition for innovative entrepreneurship than for replicative entrepreneurship. The main objective of this paper is to investigate the relationship between cultural diversity and innovative and replicative entrepreneurship. To achieve this, we proxy cultural diversity through foreign-born population and use a cross-European sample of 140 regions in 24 countries.

The paper's first contribution is conceptually differentiating between innovative and replicative entrepreneurship. We investigate this differentiation in the context of innovation effects of diversity by integrating different theoretical strands of economic geography and entrepreneurship literatures. The existing empirical literature considers the effect of diversity on generic entrepreneurship rates, i.e. without acknowledging that entrepreneurial ventures may differ in their innovative aspirations. While both types of entrepreneurship are relevant for economic development, the theoretical mechanism of diversity spurring knowledge recombination and innovation implies that diverse regions may offer advantageous conditions specifically for innovation-oriented entrepreneurship. Examining the distinctive nature of different types of entrepreneurship thus provides further insight into the relationship between diversity and innovation as well as the role of regional characteristics in fuelling local entrepreneurial activity.

Second, we contribute to the existing empirical literature by investigating diversity and entrepreneurship across regions in 24 European countries but also considering individual-level characteristics. Most previous studies have focused on specific countries (e.g. Audretsch et al., 2010; Rodríguez-Pose & Hardy, 2015; Sobel et al., 2010; Sun et al., 2019) or considered firm formation aggregated at a national, regional or urban scale (Audretsch et al., 2021; Awaworyi Churchill, 2017). These studies show the importance of contextual cultural diversity for regional or national entrepreneurship rates, but by focusing on aggregated trends disregard the specific mechanism of new firm formation, which begins with an individual's propensity to set up shop. A notable exception is the study by Mickiewicz et al. (2019) that includes individual ethnic and immigrant background in addition to regional cultural diversity but still focuses on the UK only. In this study, we also acknowledge the individual level as a decisive level for entrepreneurial actions but implement a multilevel analysis

that simultaneously considers individual, regional and national characteristics. In contrast to the previous literature, we do not focus on a single country but instead exploit the large degree of spatial variation in entrepreneurship and diversity across Europe.

Third, cultural diversity intersects and encompasses different dimensions, making it a theoretically and empirically challenging concept. Considering only a direct effect of diversity by country of birth may not be sufficient, which is why this study additionally investigates non-linear effects and moderating factors. More specifically, we examine whether the effect of diversity on innovative entrepreneurship may depend on its quantitative extent, different diversity indicators, as well as the composition of the foreign-born population in terms of education level and origin (EU vs. non-EU foreign-born population). We thus advance the literature on innovation effects of diversity for entrepreneurship by exploring the role of intervening factors such as human capital availability and cognitive proximity.

This paper proceeds as follows. Section 2 describes the theoretical background of the relationship between diversity and entrepreneurship with respect to the role of innovation. Section 3 discusses the data and methodological approach. Section 4 presents the results before offering a discussion and concluding remarks in Sect. 5.

2 Theoretical background

The emergence of (innovative) entrepreneurship can be explained by a combination of multiple individual and contextual factors (Koellinger, 2008; Stam, 2015). Contributions from the economic geography literature have emphasised the importance of contextual factors characterising the local entrepreneurial ecosystem. These include, for example, the prevalence of networks, intermediate services and an entrepreneurship culture that enable productive entrepreneurship (Stam & Spigel, 2018). Regional economic circumstances (in terms of market demand) and demographic composition (in terms of supply of potential entrepreneurs) influence regional entrepreneurship rates (Bosma & Schutjens, 2009). Specific "opportunity-related" economic circumstances may evoke or limit entrepreneurial activity: such as market concentration, entry- and exit barriers, unemployment levels and urbanisation or localization effects (Wasdani & Mathew, 2014; Stam, 2015; Sternberg, 2009). However, this perspective views the entrepreneur as undergoing these exogenous circumstances rather passively. From the individual perspective and in the Kirznerian tradition (Kirzner, 1979), the individual-opportunity nexus literature additionally emphasises the active and purposeful identification, evaluation and exploitation of opportunities as stages of the entrepreneurial process (Shane, 2003; Shane & Venkataraman, 2000). This literature rejects the idea that entrepreneurship is an individual act only, but also the proposition that merely external factors drive entrepreneurship. Both theoretically and empirically, examining entrepreneurship thus requires integrating both individual and contextual factors.

In the following, we focus on a specific aspect of the regional context and consider why it may be conducive for individuals' discovery or creation of innovative entrepreneurship opportunities: the composition of the local population by country of birth, which we denote as cultural diversity here. It should be noted that the term diversity features in a large variety of literatures and, as such, can refer to many different concepts relating to heterogeneity including, e.g. regional industrial diversification, urban diversity or embeddedness in diverse (international) networks (Karlsson et al., 2021). In contrast to, for instance, sectoral diversity, which refers to industry structure, cultural diversity is usually understood to be a characteristic of the population and implies a focus on its composition by individuals' cultural background (e.g. Niebuhr & Peters, 2020). However, since cultural background is intangible, it is in empirical settings operationalised with more observable characteristics such as country of birth, ethnicity, language or religion. While none of these (or other) individual characteristics embody diversity in cultural background fully, they can proxy the cultural heterogeneity of the population. In this paper, we follow the empirical literature focusing on birthplace diversity (e.g. Alesina et al., 2016), arguing that individuals born outside a specific country will have come into direct contact with more than one culture and can thus potentially introduce new knowledge, approaches, traditions or skills to a region.

Besides literature viewing cultural diversity from a population or migration perspective (with various empirical proxies of the concept) as described,

for instance, by Niebuhr and Peters (2020), cultural diversity also plays a role in the literature on entrepreneurship and creativity in urban environments. Composition of the local population by cultural background is emphasised in this stream of literature but often combined with other indicators, such as the prevalence of creative professions involved in "production" of culture (e.g. Audretsch & Belitski, 2013; Lee et al., 2004) or the presence of cultural amenities (e.g. Audretsch et al., 2021). These approaches implement a broader conceptualisation of culture and cultural diversity as a feature of the urban environment, but they are grounded in a focus on urban agglomerations as location of entrepreneurship. In this paper, we do not restrict our analysis to cities but rather take a regional approach by examining the relationship between entrepreneurship and cultural diversity from a population or labour market perspective (similar to, e.g. Mickiewicz et al., 2019; Rodríguez-Pose & Hardy, 2015). We therefore limit our perspective to cultural diversity as a measure of population heterogeneity by cultural background, focusing specifically on the role of migrant population.

Demographic change and growing international mobility in the last decades have led to internationalisation of the labour force in many industrialised countries, raising questions about the economic impacts of cultural diversity (for a survey of the literature, see Ozgen, 2021). A relevant aspect of these consequences is the effect of immigration and increasing diversity on entrepreneurship, either because of immigrants starting businesses (as described in the literature on migrant entrepreneurship, see, e.g. Sahin et al., 2007) or due to an increase in start-up rates in more diverse regions (e.g. Audretsch et al., 2010; Rodríguez-Pose & Hardy, 2015). Especially the latter stream of literature explains positive correlations between population diversity and entrepreneurship with innovation processes, i.e. suggesting that diversity fosters new business models. However, the existing empirical literature considers diversity effects for entrepreneurship generally and thus does not engage with the nature of entrepreneurial ventures: not all new businesses are (and have to be) innovative. If the effects of cultural diversity on entrepreneurship are, at least partially, due to innovative processes, this would imply not only an increase in the quantity of start-ups but also a qualitative difference with respect to the types of businesses created. Therefore, we argue that cultural diversity may be particularly conducive to entrepreneurial ventures with innovative orientation, i.e. what Baumol (2010, p.18) calls the "Schumpeterian innovator".

In the absence of a single encompassing concept of even innovation, it is difficult to compile a strict definition of innovative entrepreneurship, but Koellinger (2008, p. 22) defines it "as the introduction of new economic activity". As such, the understanding of what is considered innovative is market-based rather than grounded in the process of innovation itself. Focusing on "new economic activity" also encompasses a range of different types of innovation since this could refer, for example, to radical innovation (e.g. an entirely new product), to incremental innovation (e.g. an improved product) but also to other types of innovation, such as marketing-innovation (e.g. a new purpose and hence new customers or demand for an existing product). An advantage of this perspective is, as Koellinger (2008) argues, that businesses do not need to be inherently and globally new to be innovative in a local context. This is particularly relevant when considering the interrelation between diversity and innovation because part of the innovative value could stem from applying knowledge that is common elsewhere to a new context. In this sense, the distinction between innovative and replicative entrepreneurship does not need to be based on radical versus incremental innovation (as described, e.g. by Baumol, 2010) but could rather be rooted in the entrepreneurs' orientation in pursuing "new" (whether radical or incremental) ideas. Entrepreneurship that does not pursue new economic activity instead aims at replicating existing business models. Replicative entrepreneurship also relies on knowledge (i.e. of an existing business model), but rather than creating new ideas, it serves to diffuse them. Replication or imitation does not only increase the spread of new ideas, it can also introduce competitive pressure, reduce innovators' initial market power and thus indirectly stimulate future innovation (Baumol, 2010). Distinguishing between innovative and replicative entrepreneurship is particularly relevant in early business stages when firms face challenges of matching products and markets, as well as liabilities of newness, smallness and opportunity costs.

Although both replicative and innovative entrepreneurship are thus relevant and necessary for processes of discovering and establishing new ideas,

they are not identical. In fact, the notion of Schumpeterian entrepreneurship as a driving force of innovation and, by extension, economic growth (see, e.g. Block et al., 2017) applies especially to innovation-oriented entrepreneurs, i.e. those aiming for the introduction of new ideas rather than the replication of existing ones. At the same time, whether an entrepreneur pursues an innovative or a replicative business model may not only depend on individual factors but also on the regional environment (Koellinger, 2008) suggesting that local context may support or hinder these types of entrepreneurship to differing degrees. Therefore, when considering the relationship between cultural diversity and entrepreneurship, it is essential to consider what kind of entrepreneurial ventures are created: Is cultural diversity associated with more entrepreneurship via replication of existing business models? Or does it support entrepreneurs in pursuing new ideas and thus promote regional innovation? In the following, we explore whether, how and under what conditions a region characterised by cultural diversity may foster innovative entrepreneurial ventures.

2.1 The potential of cultural diversity to drive innovative entrepreneurship

Regional cultural diversity can be linked to entrepreneurship and innovation in different but interrelated ways. At its core, the argument refers to a positive effect of heterogeneity, which may manifest itself in agents, spillovers and opportunities, and the functioning of the regional environment. These manifestations of diversity are discussed here and likely apply (perhaps to varying degrees) simultaneously. However, the aim of this paper is not to disentangle or evaluate these mechanisms. Instead, we highlight different theoretical angles that justify an empirical link between cultural diversity and innovative entrepreneurship and condition our expectation for the nature of this connection. The first key mechanism we want to highlight addresses the promise of cultural diversity for enlarging the pool of talents identifying new business opportunities and emerges from Kirznerian perspectives and the Schumpeterian theory of entrepreneurship. The second key mechanism addresses the attractiveness of culturally diverse regions for innovative entrepreneurs to become active in such a region, as developed in economic geography. This stream of literature emphasises how diversity may shape a regional environment that attracts innovative entrepreneurs and facilitates their activities. We then consider the role of two moderating factors (cognitive proximity and human capital) that may support or hinder innovative entrepreneurship in culturally diverse regions.

2.1.1 *Diversity of agents and perceived business opportunities*

Diversity of agents implies that business opportunities may be evaluated differently by individuals. In culturally diverse populations, i.e. populations characterised by heterogeneous cultural backgrounds, the perceptions, behaviour and expectations related to identifying or creating business opportunities can differ substantially between individuals, as can the implementation of business ideas. Diversity of agents is not limited to migrant or minority entrepreneurs, although they represent a tangible example of the impact of diversity on innovative entrepreneurship (see, e.g. Sahin et al., 2007). Instead of taking such an individual focus, we understand diversity here in terms of actor heterogeneity systematically and across the population. This actor heterogeneity ensures large numbers of differential chances and ways to recognise or create possibilities allowing the "carrying out of new combinations", as Schumpeter (1934, p.66) defined innovation. Thus, diversity of agents does not only imply that more ventures are created, it also holds potential for the innovativeness of ventures.

With diversity of agents also comes *diversity in perceived regional business opportunities*. Central in Kirzner's view is the existence of "objective" opportunities, waiting for individuals to identify and pursue them, as opposed to a more creationist view of people creating opportunities themselves (Alvarez & Barney, 2007; McMullen & Shepherd, 2006; Tang et al., 2012). In this line of thought, in culturally diverse regions, it is relatively easy to recognise opportunities for using or recombining resources, serving varied groups of customers and inventing and producing novel products. Because knowledge changes over time (Arrow, 1974; Knight, 1921) and varies across contexts (places) and people (cf. Akerlof, 1970), there are numerous expectations on and identifications of entrepreneurial opportunities. This heterogeneity in both individuals and external

contexts results in large varieties in entrepreneurial opportunity recognition, creation and exploitation (Dew et al., 2004). Thus, it is at the intersection of individual activity and the existing (variety in) resources in the environment that entrepreneurship is born. Put differently, it requires actors who are able to discover and identify or even create opportunities (Alvarez & Barney, 2007) and an enabling environment (Davidsson et al., 2020) that presents such actors a relevant and promising mix of resources.

Moreover, from a Schumpeterian point of view, investment in research and education can be a pathway to increase business opportunities, entrepreneurship and, ultimately, economic growth through the mechanism of creating, disseminating and recombining new knowledge. Regional cultural diversity not only signals the presence of varied knowledge and ideas but also relates to the value of human capital. As argued above, our understanding of cultural diversity in terms of population heterogeneity is closely related to immigration, which implies a transfer of human capital and knowledge and can fuel the process of knowledge recombination (for a survey of the literature on migration and innovation, see Breschi et al., 2016). Depending on the skill level of migrants, diversity may thus imply access to specific skills and knowledge both at a regional level and in terms of labour pool effects for entrepreneurs. These human capital aspects illustrate that studies on the relationship between diversity and entrepreneurship also need to consider educational factors. This may relate to direct positive effects of diversity on innovation through increasing human capital availability but also to more indirect moderating effects of education, which we discuss further in Sect. 2.1.3. Rodríguez-Pose and Hardy (2015) investigate the interrelation between diversity and human capital by considering diversity in different skill groups finding that diversity among the highly skilled is especially beneficial for regional start-ups. Similarly, Marino et al. (2012) show that both cultural diversity and diversity in educational attainment within firms are positively associated with employees' likelihood to become entrepreneurs. Recently, Mrożewski and Hering (2022) found that a migrant group's education level moderates the effect of difference between host and home country culture on entrepreneurial activity within migrant groups.

While replicative entrepreneurship also relies on some knowledge (i.e. of an existing business model to replicate) and on an opportunity, both the Kirznerian and the Schumpeterian perspectives emphasise the exploitation of "overlooked" opportunities or those created by new ideas, which we would consider innovation-oriented entrepreneurship. In this sense, cultural diversity increases exposure to variety, which could thus trigger potential entrepreneurs and particularly individuals who are oriented at innovation—the ones who are interested in creating "new combinations". Simply put, a large heterogeneity of products, markets and processes offers opportunities for new businesses and, in particular, novel business ideas, a mosaic of customer niches, behaviours, ideas, services and products to recombine and processes to refine and apply.

2.1.2 Attractiveness of culturally diverse regions for innovative entrepreneurs

A second key mechanism connecting cultural diversity to innovative entrepreneurship relates to *the attraction of a regional environment shaped by diversity* potentially enabling new combinations of diverse knowledge. This mechanism links to Florida's (2002) arguments that because highly skilled and creative individuals are attracted by diverse and open-minded places, regions characterised by cultural diversity may signal knowledge spillovers and thus attract potential entrepreneurs. However, there is more to it than only access to knowledge. Culturally diverse regions, and especially intergroup connections, may increase tolerance which also facilitates knowledge exchange among heterogeneous groups. As this could lower barriers to communication, the potential for spillovers increases (Schmutzler & Lorenz, 2018). Empirical studies thus far show different results. Lee et al. (2004) argue that diversity fosters innovation because diverse regions attract individuals with unconventional ideas, although their findings are significant only for the share of same-sex couples and not for cultural diversity in terms of foreign population. Mickiewicz et al. (2019) find that peoples' exposure to diverse groups and communities ("ethnic pluralism") may spur entrepreneurship and innovation and argue that this is due to values of tolerance and experimentation. However, Qian (2013) cautions against equating the concepts of tolerance and diversity: only

a direct positive effect of diversity on entrepreneurship was found, next to positive indirect effects of tolerance on both entrepreneurship and innovation.

The potential role of (national) institutions as moderating factors in the relationship between cultural diversity and entrepreneurship is emphasised by Awaworyi Churchill (2017) who finds a negative effect of ethnic heterogeneity on entrepreneurship in a global cross-country analysis and explains this with high levels of fractionalisation potentially undermining trust and social networks (cf. Putnam, 2007; Olivera, 2015). However, other large-scale studies show that fractionalization in the form of income inequality and political diversity adversely affects social trust while ethnic diversity does not (Bjørnskov, 2008; cf. Uslaner, 2008). It should be noted that the effects described in this stream of literature are difficult to capture empirically and raise issues of endogeneity: it is not clear whether a heterogeneous population is attracted to specific institutional frameworks or whether (informal) institutions evolve in response to changing population compositions. Nevertheless, compared to diversity in agents or in opportunities, this approach draws specific attention to diversity as an influential and multifaceted feature of regional environments, which may affect entrepreneurs in various ways.

2.1.3 Limiting or supporting factors: cognitive distance and human capital

Clearly, the two presented key mechanisms and corresponding theoretical explanations are closely related. Regional diversity of agents and, accordingly, opportunities perceived and identified play out for all residents with entrepreneurial intentions but also may attract innovation and innovators. However, the underlying societal processes of knowledge transfer, innovation, creation, discovery and seizing of opportunities in culturally diverse environments are complex, implicit and may depend on other circumstances and institutions. In particular, the literature on economic impacts of diversity and immigration acknowledges that diversity may also present problems, e.g. due to communication difficulties, intercultural conflict, discrimination or segregation (see, e.g. Ozgen, 2021). These potential costs of diversity may hinder innovation and seem to feature more prominently in literature considering measures of ethnic rather than cultural diversity and especially in global cross-country comparisons (e.g. Alesina & La Ferrara, 2005; Awaworyi Churchill, 2017). When considering the effects of cultural diversity, e.g. on innovative entrepreneurship, the net effect could thus depend on other supporting or limiting factors that influence how diversity interacts with innovation.

More specifically, the utility of cultural diversity for innovative processes and hence innovative entrepreneurship may depend on how "new" the diverse knowledge, skills or ideas are for a given region. This could mean, on the one hand, the pure extent of cultural diversity in a quantitative sense. On the other hand, however, it could also vary with the specific composition of local cultural diversity, where perhaps some cultural backgrounds introduce more easily accessible knowledge than others. Nooteboom (1999, p.140) describes knowledge as being structured by "categories of thought" that people develop within their physical and social environment and infers that cognition can thus be context-dependent. As a result, understanding and learning from each other are facilitated by shared categories or "cognitive proximity" (Nooteboom, 1999). Cognitive proximity or distance (see also, e.g. Boschma, 2005) between cultures may thus be a relevant factor in determining how actors translate cultural diversity into (innovative) entrepreneurial ventures, where, in this paper, we understand cognitive distance as an indicator of (dis)similarity of cultural backgrounds. Applying the notion of cognitive distance to cultural background is related to the concept of cultural distance, which draws on the early work of Hofstede (1980) and is applied, e.g. in the international business literature to describe differences in cultural norms between countries (see Beugelsdijk et al., 2017). However, the literature inspired by international business considers cultural distance quite narrowly in the context of norms and values (Beugelsdijk et al., 2017), which may not be the only relevant aspect of cultural (dis)similarity for innovation: besides norms, there may be other characteristics that are shared among specific cultural backgrounds but not others (e.g. language similarities, cultural traditions, similar institutional frameworks or shared history). These similarities could facilitate communication, exchanging or obtaining information or cooperation, while their absence may increase transaction costs and thus impede the innovative effect of cultural diversity in a region. Thus, investigating the interrelation between cultural diversity and

innovative entrepreneurship may require accounting not only for the amount of overall diversity but also to consider that some cultural backgrounds may be more similar to each other than others.

However, while too much distance can be problematic, too little cognitive distance, i.e. insufficient heterogeneity, means that there is little new informational content or possibilities of recombination arising from diversity, which also limits its innovative impact and can lead to situations of lock-in (Ben Letaifa & Rabeau, 2013; Boschma, 2005; Nooteboom, 1999). If positive economic effects of cultural diversity are due to complementarities (e.g. Docquier et al., 2020; Rodríguez-Pose & Hardy, 2015), there need to be certain differences in the knowledge, skills or approaches between native and migrant populations. In this sense, the effect of diversity could diminish or follow, similar to discussions of optimal cognitive distance generally (Nooteboom, 1999; Nooteboom et al., 2007), an inverted U-shape with some intermediate level of cultural diversity maximising its positive effect. Previous empirical analyses of this have shown mixed results and have mostly focused on the quantitative dimension of diversity by testing for non-linear effects: Sobel et al. (2010) find evidence of diminishing returns on the effect of diversity on entrepreneurship for the USA, while Mickiewicz et al. (2019) find that ethnic pluralism but also ethnic homogeneity are conducive to entrepreneurship in the UK, although ethnic pluralism is found to be more beneficial. Engaging with the more qualitative aspect of cognitive distance in cultural diversity empirically, i.e. accounting for (dis)similarity between migrant groups, is very challenging due to the difficulties of measuring such similarity. A recent example from the migrant entrepreneurship literature is a study by Mrożewski and Hering (2022) who argue that cultural distance, which the authors operationalise as in the international business literature as similarity in cultural values and practises, impedes migrants' capacity to identify and act upon entrepreneurial opportunities. In a study on the impact of diversity on economic growth for the USA, Docquier et al. (2020) proxy cultural distance using language and genetic distance and find the largest positive effects when immigrants are from countries that are either culturally or economically distant but not both, which could be interpreted to indicate that some cognitive distance is economically beneficial but too much may be a hindrance.

Besides differences in how the amount or type of cultural diversity may shape a conducive environment for innovative entrepreneurship, there are also certain individual characteristics that may help potential entrepreneurs take advantage of opportunities in culturally diverse regions. Drawing from the Kirznerian perspective, the human capital dimension acknowledges that an individual's cognitive capacity is a necessary condition for discerning opportunities in the first place; an insight also Kirzner shared in his later work (McMullen & Shepherd, 2006). A similar argument applies when moving away from opportunity-discovery focus and extending to theoretical approaches that centre on a more decisive role of agents, e.g. in terms of creating opportunities (Alvarez & Barney, 2007) or judgement-based approaches to entrepreneurship (Foss & Klein, 2020). This emphasis on purposeful entrepreneurial agency, especially in the face of uncertainty (see, e.g. Audretsch & Belitski, 2021), also suggests that some individuals are better able to identify or create entrepreneurial opportunities, and upon evaluation, to pursue and exploit them. Therefore, there seems to be a relevant role for absorptive capacity (Cohen & Levinthal, 1990) especially with respect to innovative entrepreneurship at an individual or societal level: even in a market shaped by diversity, prospective entrepreneurs require specific capabilities to make sense of the stimuli. Diversity of agents implies that not everyone may be similarly equipped to exploit diverse knowledge successfully, but there may also be a role for human capital (experience, knowledge, skills) in supporting the creation, identification and eventual pursuit of innovative business ideas. The results of the recent study by Mrożewski and Hering (2022) are in line with this argument: while cultural distance limits entrepreneurial activity in various migrant groups, they find that this effect is moderated by human capital—highly educated migrants may be able to cope with bridging large cultural differences more easily.

2.1.4 Hypotheses

We now turn to formulating our hypotheses based on the two mechanisms described above (cultural diversity widening the pool of talent and the attractiveness of culturally diverse regions for innovative entrepreneurs) and potential moderating factors. Overall, the theoretical and empirical literature discussed above suggests that diversity has the potential to increase

not only rates of new firm formation generally (as documented in previous literature, e.g. Audretsch et al., 2010; Mickiewicz et al., 2019; Rodríguez-Pose & Hardy, 2015; Sobel et al., 2010; Sun et al., 2019) but that it could also enable innovative entrepreneurship specifically. Taking together the insights on the innovative effect of heterogeneity via agents, opportunities and regional frameworks, we expect regions with more cultural diversity to exhibit a higher prevalence of innovation-oriented rather than replication-oriented entrepreneurship.

At the same time, the discussion in Sect. 2.1.3 acknowledges that there may also be limiting factors to the innovative use of diversity, implying that beyond a certain level, too much diversity may be a hindrance. Applying the notion of an optimal cognitive distance (Nooteboom et al., 2007) to the case of cultural diversity suggests a non-linear relationship: innovation is thought to increase with diversity up to an (optimal) point when further increases in diversity start reducing the innovative effect (i.e. an inverse U). Since theory and previous results are ambiguous on the shape of the relationship, we formulate two alternative hypotheses H1a and H1b:

H1a: Regional cultural diversity is positively associated with the likelihood of innovation orientation among entrepreneurs.
H1b: The relationship between cultural diversity and innovation orientation among entrepreneurs is non-linear with increasing diversity and follows an inverse U-shape.

However, while H1a and H1b refer to the quantitative extent of cultural diversity, our discussion in Sect. 2.1.3 also emphasised that there may be differences with respect to the (dis)similarity of cultural backgrounds. Innovation derived from cultural diversity implies that business opportunities need to be recognised or created and acted upon, and diverse knowledge needs to be accessed and applied. In terms of the described two mechanisms, the diversity of some agents or some opportunities may be more complementary and accessible, or some diversity may integrate more easily into the regional environment. The extent to which migrants are born and raised, and therefore immersed in a society with different formal and informal institutions, social norms and economic opportunities, influences both the newness of opportunities created and the capacity of agents to exploit them (see, e.g. Kemeny, 2017). At the same time, while new information and learning requires novelty and therefore heterogeneity, some level of cognitive proximity may be required in order to translate diversity into innovation (Boschma, 2005; Nooteboom et al., 2007). Thus, diversity from relatively more "distant" cultural backgrounds could hold more potential for new combinations but may also be more challenging to convert to, or could even hamper, innovation. Empirically, only the net effect of cognitive distance can be investigated here; however, we still formulate two hypotheses that illustrate the extreme cases of the theoretical trade-off between novelty and ease of communication:

H2a: Regional cultural diversity has a stronger effect on the likelihood of innovation orientation when the foreign-born population is from more distant cultural backgrounds.
H2b: Regional cultural diversity has a weaker effect on the likelihood of innovation orientation when the foreign-born population is from more distant cultural backgrounds.

Besides the origin of and implicit cognitive distance in a region's foreign-born population, a further relevant dimension may be its human capital endowment (Rodríguez-Pose & Hardy, 2015). On the one hand, related to the knowledge spillover theory of entrepreneurship, if the foreign-born population is relatively more highly educated, their human capital itself may stimulate innovative action. On the other hand, a more highly educated foreign-born population may be able to bridge cultural differences more easily and thus facilitate the transfer and uptake of innovative entrepreneurial ventures also by others, for instance in their role as business partner or employee. This leads us to hypothesise:

H3a: The effect of cultural diversity on the likelihood of innovation orientation is positively moderated by the educational attainment of the foreign-born population.

The discussion above also emphasises the relevance of certain competences of entrepreneurial agents themselves, whether migrant or native, required to make use of new information. In this sense, human capital, i.e. experience or education

level, may enable entrepreneurs to recognise, act upon or create business opportunities from innovative stimuli of cultural diversity. Comprehending and applying the novel content of diversity may thus require a certain level of absorptive capacity on an individual level, i.e. competences to identify, create and pursue business opportunities initiated by diversity. It is possible that the innovative effect of diversity is unequally distributed across individual entrepreneurs, where those who have the necessary absorptive capacity are inspired towards innovative business models more than those who lack certain skills. We proxy absorptive capacity with educational attainment and hypothesise:

> H3b: The effect of cultural diversity on the likelihood of innovation orientation is positively moderated by the educational attainment of the entrepreneur.

3 Data and methods

3.1 Data

Entrepreneurship data are taken from the Global Entrepreneurship Monitor (GEM), a representative annual survey of adult population on entrepreneurial activity and perceptions of entrepreneurship (Reynolds et al., 2005). The GEM data allow identifying individuals involved in Total early-stage Entrepreneurial Activity (TEA), including nascent entrepreneurs and owners of businesses younger than 3.5 years. To distinguish innovation-oriented from replication-oriented early-stage entrepreneurs, we use two questions from the GEM dataset[1]: we categorise early-stage entrepreneurs who consider their goods or services unfamiliar to at least some customers and expect few or no competitors (as opposed to many competitors) as innovation-oriented. Otherwise, the respondents are categorised as replication-oriented entrepreneurs. It should be emphasised here that we measure self-reported innovation orientation and therefore cannot distinguish whether individuals are truly more innovation-oriented or whether they may differ in their self-perception of being innovative, as expressed in the survey. Besides entrepreneurial activity and business orientation, the GEM dataset also covers general individual characteristics such as gender, age, educational attainment, occupational status and household income and indicators describing attitudes towards entrepreneurship more generally.

3.1.1 Dependent variable

For our analysis, we are interested in the role of regional characteristics on individual respondents' business orientation, which is why we consider their geographical location in terms of sub-national regions within Europe. Since we rely on statistics reported by Eurostat, the regions correspond to the standardised administrative boundaries of the European NUTS (*Nomenclature des unités territoriales statistiques*) regions. Given data constraints and limited regional sample sizes in the GEM, we use the smallest geographical units possible: NUTS 2 regions in some countries and NUTS 1 regions in others (see Appendix for a list of included regions). Pooling the GEM surveys from 2002 to 2014 and excluding observations with missing values,[2] we have information on 24,085 individuals across 140 regions and 24 European countries. Of these, we identify 6842 (28.41%) as innovation-oriented early-stage entrepreneurs, whereas the remaining 17,243 (71.59%) are categorised as replication-oriented.

3.1.2 Independent variables

Although the broad geographic coverage of the GEM data is an advantage, it also causes challenges

[1] The two items refer to "How many (potential) customers consider the product new/unfamiliar? (all/some/none)" (TEACUST) and "How many businesses offer the same products? (many/few/none)" (TEACOMP). Entrepreneurs are classified as innovation-oriented if at least "some" customers consider the product new and at most "few" other businesses offer the same product.

[2] As we are controlling for a large number of factors and can only consider individuals in the regressions where all covariates (individual, regional and national) are available, we had to limit our dataset to a smaller but complete subset of the GEM and to exclude the year 2003 from analysis (due to missing individual level information). The basic aggregated GEM file (i.e. prior to matching with regional data and excluding any observation) included information on 53,048 early-stage entrepreneurs. However, the prevalence of innovative entrepreneurship does not change substantially when restricting the dataset to complete observations (27.5% vs. 28.4%).

in operationalising cultural background. While cultural diversity data, e.g. in terms of ethnic composition or detailed country-of-birth statistics, is available for some countries, regional availability of these variables is very limited and comparability across countries even more so. The most widely available unified indicator is the share of foreign-born population per region, which was captured in the European Population and Housing Census in 2011.[3] The share of foreign-born population is a simple measure of birthplace diversity but allows proxying the relative prevalence of individuals having directly experienced at least one other (national) cultural setting. Clearly, this measure cannot embody the full depth of cultural diversity, but it does allow distinguishing regions shaped by a culturally heterogenous population from more homogeneous ones, which is how we use it here.

The European census data also records foreign-born population by education level as well as whether migrants were born in another country within or outside the European Union. We use the former distinction to test our hypotheses on human capital and the latter as a rough proxy of cognitive distance. Of course, assessing similarity in cultural backgrounds has more dimensions than the differentiation between EU and non-EU can possibly capture, but more detailed indicators (such as measures of cultural norms in the literature on international business (Beugelsdijk et al., 2017; Mrożewski and Hering (2022)) require information on migrants' origin countries, which is not available for this regional sample. While it is a rough proxy, we thus argue that individuals born in the EU originate from cultural, linguistic and institutional settings that are, on average, more similar to other EU countries than to non-EU countries. At the same time, there is clearly substantial heterogeneity within and across these two groups, which is why we suggest interpreting this measure cautiously.

Overall, the operationalisation of cultural diversity in this paper is strongly affected by the limited availability of data on birthplaces for multiple countries and at a regional level and thus implies clear limitations. Country of birth is not the only determinant of cultural background, and the share of foreign-born population hides a large amount of heterogeneity, which may be instrumental to capturing the true degree of diversity. Birthplace diversity also does not consider cultural differences on a regional (rather than national) level, which could be substantial. In order to broaden our analysis and test the robustness of our results using the share of foreign-born population, we consider a few alternative specifications of diversity that rely on operationalising differences among population groups, keeping in mind the substantial data limitations that we face.

A fractionalisation index captures the probability that two randomly selected individuals differ in their cultural backgrounds and is usually calculated based on a full range of country of birth or ethnicity variables.

$$F_{\mathrm{i}} = 1 - \sum_{k=1}^{k} s_{\mathrm{ik}}^2$$

Here, we implement a simplified version that considers only the shares (s_{i}) per region across the three groups of "native population", "born in another EU country" and "born in a non-EU country". Generally, F increases with the number of distinct population groups as well as their size. However, since the number of groups is fixed at three here for all regions, the only variation in F is due to different relative sizes of the shares of native, foreign-EU and foreign-non-EU population.

Since the fractionalisation index tends to overweigh large groups (Niebuhr & Peters, 2020), we also calculate a Theil entropy index:

$$T_{\mathrm{i}} = -\sum_{k=1}^{K} s_{\mathrm{ik}} \ln(s_{\mathrm{ik}})$$

To obtain an index between 0 and 1, we normalise T_{i} by dividing by $\ln(K=3)$. The Theil index is maximised when all three shares are equal, i.e. 1/3

[3] Besides foreign-born population, foreign population by citizenship is available. While both conceptualisations have drawbacks, citizenship raises issues of second-generation immigrants potentially being counted as "foreign" due to some countries assigning parental citizenship. Since we conceptualise cultural diversity for the purpose of capturing diverse knowledge and experiences, we expect that country of birth is a slightly more reliable indicator. However, being born in another country of course does not guarantee a cultural background different to country of residence just as cultural background is not guaranteed to be homogenous among individuals with the same citizenship.

of the population is native-born, 1/3 is from another EU country and the last 1/3 was born in a non-EU country.

To further broaden our measure of diversity and conduct robustness checks of our results using more encompassing data, we also obtained alternative diversity measures from other empirical applications. While these alternative measures allow perhaps more nuanced proxies of diversity, they are only available at the national level, which means that we lose geographic variation in our regional-level sample. We consider the birthplace diversity index by Alesina et al. (2016), which is a fractionalisation index for the year 2000 based on migration stock data originally used by Artuc et al. (2015). To implement a different notion of diversity entirely, we also consider the Historical Index of Ethnic Fractionalisation (Drazanova, 2020) and the Index of Ethnic Linguistic Fractionalisation (ELF) (Desmet et al., 2012).[4]

3.2 Methods

Since we are interested in the relative prevalence of innovation- versus replication-oriented early-stage entrepreneurship, our dependent variable is binary: 1 if the respondent is an innovation-oriented early-stage entrepreneur and 0 otherwise. We thus specify a logistic regression that models the likelihood of innovation- rather than replication orientation based on different characteristics of the entrepreneur and their environment. Individual characteristics are crucial in determining entrepreneurs' business orientation, but the regional context may also play an important role. Indeed, cultural diversity, and thus the main variable of interest of this analysis, refers to the composition of the local population and is, therefore, a regional rather than an individual factor. Moreover, there may be relevant institutional framework conditions that differ by country (i.e. on a national rather than sub-national level). Modelling individual alongside regional and national characteristics requires taking into account that there is a hierarchical structure in the data where individuals are clustered into regions, and regions, in turn, are clustered into countries. To address this unobserved heterogeneity, we implement a multilevel analysis with random intercepts at the region and country level. The analysis thus comprises three levels: individuals (level 1), sub-national regions (level 2) and countries (level 3).

$$\text{Level 1: } ln\left(\frac{\pi_{ijk}}{1-\pi_{ijk}}\right) = \beta_{jk} + \beta_1\{\text{individual factors}\}_{ijk} + \eta_t + e_{ijk}$$
$$\text{Level 2: } \beta_{jk} = \gamma_k + \gamma_1\{\text{regional factors}\}_{jk} + u_{jk}$$
$$\text{Level 3: } \gamma_k = \delta_0 + \delta_1\{\text{national factors}\}_k + v_k$$

In the logistic regression, we use the log-odds defined through the probability (π_{ijk}) that a given entrepreneur i in region j and country k exhibits innovation- rather than replication orientation. The explanatory factors of this probability refer to a vector of characteristics of the entrepreneur (level 1) denoted by the regression coefficient β_1, regional characteristics (at level 2) captured by the coefficient γ_1 and national characteristics (δ_1 at level 3). By including random intercepts at the region and country level, the model includes residuals at the individual level (e_{ijk}) but also at the regional (u_{jk}) and the country level (v_k). Besides acknowledging the hierarchical structure of the data, multilevel models also allow estimating the amount of variation in the dependent variable that is explained by the respective levels. For these reasons, multilevel estimation is a widely implemented approach to simultaneously modelling the individual and contextual factors of entrepreneurship (e.g. Stuetzer et al., 2014; Estrin et al., 2022). We pool the GEM data across the years to ensure adequate sample size and maximum geographic coverage but also include fixed effects (η_t) based on the year of the survey to account for differences in the GEM data over time.

Besides our main variable of interest, the different operationalisations of cultural diversity, we include control variables for a range of other aspects that may affect innovative entrepreneurship at the individual, the regional and the national level. At the individual level, we use the GEM data to control for demographics (gender, age, education level) but also household income and work status. It should be noted that "working" (full-time or part-time) is not mutually exclusive to being an early-stage entrepreneur (and is, in fact, quite common in the data). The GEM denotes self-employed individuals as working, but this may also refer to individuals who are still in the planning or

[4] The ELF can be calculated at various levels of aggregation depending on the detail of language classification (from 1 to 15). Following Desmet et al. (2020), we use the intermediate level ELF-5 for our robustness check here but find equivalent results when using other levels of aggregation.

very first phases of starting their business, which could occur while in other employment. However, early-stage entrepreneurs who are not working or are students or retirees may not face the same time constraints as individuals in employment, which could represent a hurdle to engaging especially in innovative business ideas, which is why we control for work status in our analysis. To account for sector differences in innovation orientation, we also add a control for the entrepreneurs' industry along four categories defined in the GEM survey (extractive sectors, transforming sectors, business services sectors and consumer-oriented sectors).

At the regional level, we consider characteristics capturing regional economic (GDP per capita, unemployment, share of manufacturing employment) and innovative conditions (share of population with tertiary education, R&D spending, patents) as well as demographic circumstances (population density, share of population aged 18–34) for the year 2010 all obtained from the Quality of Governance EU Regional Dataset (Charron et al., 2016) and Eurostat. Moreover, we use the GEM survey to calculate population-weighted indicators for regional entrepreneurial attitude (or entrepreneurial culture) referring to the share of all respondents who know an entrepreneur, think of themselves as having the skills to be an entrepreneur, see good opportunities for entrepreneurship in the area or consider fear of failure a deterrent from entrepreneurship. These indicators are proxies of regional institutional framework conditions, but we also include individuals' responses to these questions as a control variable. To further capture differences in institutional framework conditions, we also control for the share of GEM respondents who consider entrepreneurship a desirable career choice[5] and for total venture capital as share of GDP at the national level. Both these variables are not available at the regional level but capture two additional dimensions of entrepreneurial conditions, i.e. the ease of accessing finance and societal desirability of entrepreneurship. Variable descriptions and summary statistics are presented in the Appendix.

After testing our baseline hypothesis H1a, we test for a potential non-linear effect of diversity by including a squared term. To address the potentially varying effects of diversity for specific sub-groups that were defined in the hypotheses, we implement different approaches. On the one hand, we decompose the broad diversity indicator of foreign-born population into groups by EU/non-EU country of birth and by education level. On the other hand, we include interaction terms between the share of foreign-born population and the respective educational attainment among these groups. To investigate H3b, we introduce a cross-level interaction between diversity and high individual educational attainment (post-secondary or above) to test whether more highly educated early-stage entrepreneurs have an advantage in identifying new opportunities arising from culturally diverse regions, resulting in innovation-oriented new businesses. As a further extension and robustness checks, we experiment with different alternative indicators for cultural diversity and implement a multinomial multilevel regression (Sect. 4.4).

4 Results

4.1 Descriptive analysis

Figure 1 illustrates the geographic distribution of early-stage entrepreneurship generally alongside the share of innovation orientation across European regions. As expected, there are clear geographic differences in the prevalence of early-stage entrepreneurship between but also within countries, with higher TEA rates occurring especially in Eastern Europe. While innovation orientation also differs geographically, the pattern is distinct from the overall prevalence of entrepreneurship: regions with relatively high shares of early-stage entrepreneurs do not necessarily have more innovative entrepreneurship. Indeed, there is no significant correlation among these two shares (Pearson correlation $r = 0.0022$) indicating that innovation orientation represents a qualitatively different dimension of entrepreneurship rather than simply reflecting its quantitative extent (Fig. 2).

Cultural diversity also shows distinct geographic patterns (Fig. 3). Overall, it is clear that capital and

[5] The relevant GEM variables are the following binary response items: KNOWENT (personally knows someone who started a firm in the past two years), SUSKIL (perceives to have the required knowledge and skills to start a business), OPPORT (perceives good opportunities to start a business in the area where you live) and FEARFAIL (fear of failure would prevent you from starting a business). Aggregated only to the national level (due to many missing values), we also use NBGOODC (considers entrepreneurship a desirable career choice). All shares were calculated using the respective population weights.

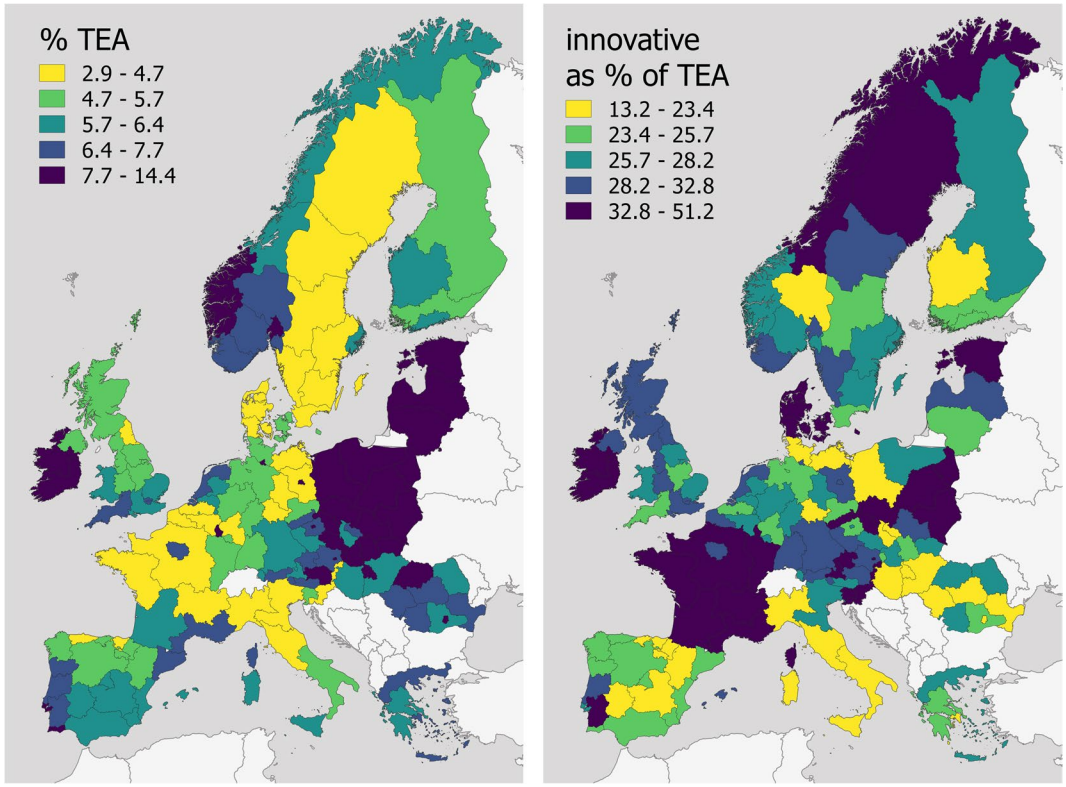

Fig. 1 Rate of early-stage entrepreneurship (left) and share of innovation orientation among TEA (right) by quantile. Data source: GEM surveys 2002–2014, aggregated including regional population weights

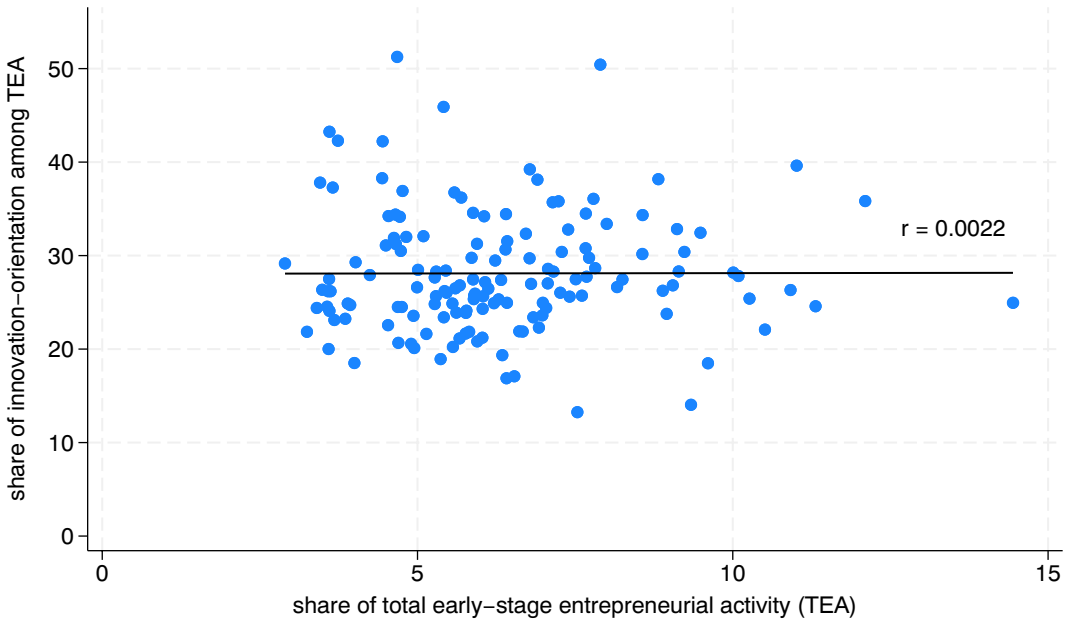

Fig. 2 Correlation between total early-stage entrepreneurship rate and share of innovation orientation among TEA. Data source: GEM surveys 2002–2014, aggregated including regional population weights

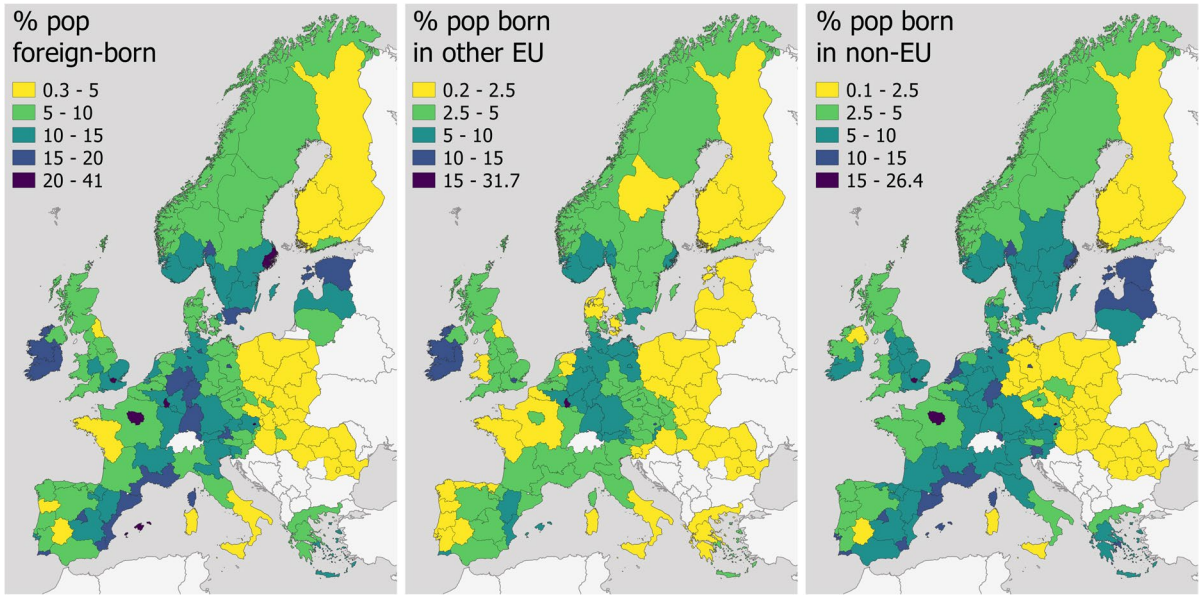

Fig. 3 Share of foreign-born population overall (left), share of population born in another EU country (middle) and share of population born in a non-EU country (right)

economic core regions have higher shares of foreign-born population. Disaggregating this indicator further by EU and non-EU native country shows that the share of non-EU foreign-born population is concentrated especially in capital regions (e.g. London, Brussels, Vienna, Paris) but also in peripheral and border regions (e.g. Southern France, Estonia and Latvia). This finding illustrates the large heterogeneity within the category of non-EU-born population and is likely evidence of further sorting mechanisms by origin and skill level. In contrast, a high share of foreign population born in other EU countries but not non-EU countries is evident, for instance, in Ireland, Luxembourg and, on a relative scale, also in East Germany.

4.2 Baseline results

The results for the baseline regression are presented in Table 1. The null model (column 1) as well as all other models demonstrates the relevance of variation at the country level, which exceeds the remaining variation at the regional level. The intraclass correlation calculation reveals that the country level alone explains 2.31% of the total variation, whereas considering regions clustered in countries explains 2.44%. While these are comparatively small values, they are in line with (and indeed slightly larger than) the result of similar studies for TEA (e.g. Stuetzer et al. (2014) at the regional level and Bosma and Sternberg (2014) at the urban area level, who both report an ICC of 1.9%). Considering the nature of innovative entrepreneurship, it should not be surprising that the variation between individuals within regions strongly outweighs the variation across regions. Nevertheless, the regional and country-level variation is statistically significant, which confirms our decision to consider a three-level multilevel specification in addition to controlling for local regional characteristics.

The share of foreign-born population (model 2) is significantly positive, indicating that early-stage entrepreneurs in regions with a higher share of foreign population are more likely to report innovation orientation. The average marginal effect (AME) of this estimate is 0.31: an increase in the share of foreign-born population by 10 percentage points is, on average, associated with an increase in the probability of innovation orientation among early-stage entrepreneurs by 3.1 percentage points. Although this is a small effect size, it is not negligible—especially considering the substantial differences in the spatial distribution of foreign-born population within Europe and the increasing scale of migration in recent years. Hence, our results align with the theoretical value of

Table 1 Multilevel logistic regression of innovative vs. replicative entrepreneurship

Dep. var	Innovative vs. replicative	(1)	(2)	(3)
Cultural diversity	Share foreign-born		1.585***	0.248
			(0.4511)	(1.0209)
	Share foreign-born squared			3.799
				(2.8518)
Individual factors	Female		0.044	0.043
			(0.0310)	(0.0310)
	Age		-0.000	-0.000
			(0.0013)	(0.0013)
Education (base: no degree)	Some secondary		0.353**	0.378**
			(0.1553)	(0.1558)
	Secondary degree		0.460***	0.485***
			(0.1525)	(0.1530)
	Post-secondary		0.606***	0.635***
			(0.1525)	(0.1530)
	Graduate experience		0.837***	0.856***
			(0.1552)	(0.1556)
Work status (base: full/part-time)	Not working		0.261***	0.259***
			(0.0551)	(0.0552)
	Retired/student		0.295***	0.298***
			(0.0858)	(0.0859)
Income group (base: lowest tertile)	Middle tertile		0.004	0.004
			(0.0413)	(0.0413)
	Highest tertile		-0.049	-0.045
			(0.0404)	(0.0404)
Industry (base: extractive sector)	Transforming		0.321***	0.309***
			(0.0782)	(0.0784)
	Business services		0.481***	0.471***
			(0.0779)	(0.0780)
	Consumer oriented		0.556***	0.546***
			(0.0760)	(0.0761)
Self-perceptions entrepreneurial attitudes	“Fear of failure”		-0.195***	-0.194***
			(0.0345)	(0.0345)
	“Know entrepreneur”		0.138***	0.137***
			(0.0321)	(0.0322)
	“Opportunities”		0.289***	0.288***
			(0.0310)	(0.0310)
	“Skills”		0.097**	0.093**
			(0.0463)	(0.0463)

Table 1 (continued)

Dep. var	Innovative vs. replicative	(1)	(2)	(3)
Regional factors	Ln GDP p.c		-0.074	-0.019
			(0.1079)	(0.1192)
	Unemployment		-0.786	-0.512
			(0.5285)	(0.6686)
	Manuf. employment		-0.716*	-0.483
			(0.4129)	(0.3932)
	Pop density		-0.000***	-0.000***
			(0.0000)	(0.0000)
	Share pop aged 18–34		0.073	0.641
			(1.0469)	(1.1805)
	Share pop with tertiary educ		-0.059	-0.477
			(0.3688)	(0.4182)
	R&D spending % of GDP		-1.246	1.544
			(3.5119)	(3.3222)
	Patents per capita		-0.000	-0.000
			(0.0003)	(0.0003)
Regional entrepreneurial attitudes	Share "fear of failure"		1.284***	1.356***
			(0.3913)	(0.5074)
	Share "know entrepreneur"		-0.171	0.038
			(0.5417)	(0.7881)
	Share "opportunities"		1.121***	1.047**
			(0.3784)	(0.4927)
	Share "skills"		-1.565***	-2.224***
			(0.4448)	(0.6279)
National factors	Venture capital as % of GDP		-2.346	-2.092
			(1.7381)	(2.4255)
	Share "good career choice"		-0.463**	-0.355
			(0.2167)	(0.3419)
	Constant	-0.838***	-1.247	-2.759***
		(0.0608)	(1.1042)	(0.9366)
	var(_cons[country])	0.078***	0.000	0.021**
		(0.0274)	(0.0000)	(0.0094)
	var(_cons[country > NUTSID])	0.004	0.009**	0.000
		(0.0038)	(0.0045)	(0.0000)
	LR test vs. logistic	178.2	7.622	28.07

Observations: 24,085. Random intercepts for NUTS regions and countries, survey-year fixed effects and standard errors in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

cultural diversity for innovative entrepreneurship discussed in Sect. 2 and support H1a.

From a theoretical perspective, there are reasons to believe that the effect of cultural diversity may be non-linear. More specifically, if diversity is initially positive but becomes more difficult to manage, understand or use in very heterogenous environments, we would expect the effect of cultural diversity on innovative entrepreneurship to follow an inverse U-shape. We test this by including an additional square term of the share of foreign-born population (column 3). In this specification, both the simple and the squared terms are insignificant although the squared term (p-value 0.18) emerges as very large relative to the main term. Thus, and in contrast to Sobel et al. (2010), who analysed the effect of cultural diversity on entrepreneurship rates for US states, we do not find evidence for a diminishing effect of diversity at higher levels. Instead, our model suggests a stable positive relationship between population heterogeneity and entrepreneurs' propensity to pursue innovative business models.[6]

Besides our variable of interest, cultural diversity, the control variables also hold some interesting conclusions for the relative prevalence of innovative entrepreneurial ventures. The individual-level variables largely confirm expectations derived from the literature. The probability that an early-stage entrepreneur engages in innovative rather than replicative behaviour increases with educational attainment. Moreover, entrepreneurs who are students, retirees or generally not working are also significantly more likely to exhibit innovation orientation. Thus, while education may yield innovative business ideas, work status could indicate the effect of opportunity costs or willingness and ability to take on risks. We also find significant differences by entrepreneurs' broad sector category, with entrepreneurs in all industries, and especially consumer-oriented industries, significantly more likely to engage in innovation-oriented business models than in extractive sectors (base category). In contrast, we do not find differences in the type of entrepreneurship by gender, age and household income.

For the regional characteristics, economic conditions do not explain differences in the likelihood of innovation- and replication-oriented entrepreneurship and most of the demographic indicators in Table 1 are also insignificant. We do find a statistically significant but very small negative effect for population density. This would imply that all else equal, entrepreneurs in dense (urban, agglomerated) areas are more likely to exhibit replication rather than innovation orientation and seems to contradict the image of dense, urban areas as innovation hubs. However, it should be noted that the analysis here is at the level of NUTS 1 and NUTS 2 regions, which are too big to accurately reflect urban and rural characteristics, and more detailed data would be required to test these effects adequately. Neither regional education level nor the indicators for regional innovative performance (R&D spending, patents per capita) emerge as significant, which suggests that classical regional knowledge spillovers may not be the driving forces of innovation-oriented early-stage entrepreneurship in our model.

In terms of attitudes towards entrepreneurship, individuals who express a fear of failure are more likely to engage in replicative entrepreneurship, whereas knowing an entrepreneur, seeing opportunities for entrepreneurship or believing to have the required skills are all associated with an increased likelihood of innovation orientation among entrepreneurs. On a regional level, the share of population who sees opportunities for entrepreneurship is positively associated with individuals' innovation orientation. However, individuals in regions where more people consider fear of failure to be an obstacle are also more likely to express innovation orientation. Although this effect seems counterintuitive at first glance (especially compared to the equivalent variable measured at the individual level), it may indicate an underlying selection mechanism among entrepreneurs in risk-averse regions. Individuals who choose to become entrepreneurs despite a regional-level cultural attitude of risk-avoidance may have identified a particularly valuable, and likely innovative, opportunity. In more cautious environments, it may therefore only be the particularly innovative individuals who decide to engage in early-stage entrepreneurial activity altogether. In contrast, the regional share of people who consider themselves to have the

[6] In the robustness checks using fractionalisation and the Theil index (Table 3), the squared term actually emerges as significantly positive at confidence levels of 10% further contradicting a diminishing effect and perhaps even indicating potentially increasing effects of diversity.

necessary skills and the national share of people who consider entrepreneurship a desirable career choice are both associated with a decreased likelihood of innovation orientation. One may speculate that in regions with great faith in possessing entrepreneurial skills or where entrepreneurship is viewed as a viable career choice, individuals aspiring entrepreneurship more often compare themselves to incumbent entrepreneurs and existing business ideas, thus judging their entrepreneurial venture to be more replicative. Especially considering that we rely on entrepreneurs' self-assessment of innovation here, these results hint at complex interactions between individuals' true and perceived innovativeness and the broader societal attitudes towards entrepreneurship.

4.3 Considering cultural diversity by origin and education

The share of foreign-born population is a broad category, which hides a lot of heterogeneity itself. To investigate hypotheses 2 and 3, Table 2 shows decompositions and interaction models by country group of origin (EU vs. non-EU foreign-born population) as well as the skill level of the foreign population (high vs. low educational attainment). Since the estimated coefficients on the individual and regional control variables are almost identical to those in the baseline estimation (repeated in column 1), we do not report these coefficients in the following tables.

When decomposing the overall share of foreign-born population into population born in other EU countries and in non-EU countries (column 2), both indicators emerge as significantly positive, although the effect size is slightly larger and more significant for the share of EU-foreign-born population (p-value 0.004 versus p-value 0.045). Thus, even when controlling for the share of EU-born foreign population, a larger share of non-EU-born population is still associated with higher innovation propensity for entrepreneurs in a given region (and the other way around). This result shows that foreign-born population is generally associated with a greater propensity for innovative rather than replicative entrepreneurship, and this applies regardless of the origin of the foreign-born population, at least when considering only the broad distinction of EU and non-EU countries. Similar to our result contradicting an inverse U-shaped quantitative effect for H1b, we do not find evidence for the effect significantly differing with cultural distance (i.e. for neither H2a nor H2b), although the effect size is marginally larger for the share of foreign-born population from within the EU.

It could be argued that the apparent beneficial effect of cultural diversity on the likelihood of innovative entrepreneurship is simply due to the level of human capital (i.e. education, skills or expertise) in diverse populations rather than its inherent variety. To investigate this hypothesis, we consider only differences in educational attainment and disregard the difference between EU and non-EU country of birth in column 3. Note that this is not an interaction but a simple decomposition: analogous to different origins, we now consider if a larger share of high (or low) educated foreign-born population may have differential effects. We find a significantly positive coefficient for the share of total population that is both foreign-born and highly educated. Thus, in regions with a higher share of population that was born abroad and has completed tertiary education, entrepreneurs seem particularly likely to engage in innovation-oriented ventures. In contrast, the effect of low educational attainment among the foreign-born population is insignificant but not negative.

Potentially, the effect captured in column 3 could be related to column 2, i.e. affected by differences in educational attainment between the EU-foreign-born and non-EU population. For this reason, we need to investigate skill level and origin of diversity jointly to analyse whether there are differential effects by skill level and origin, e.g. because education may be able to help bridge cognitive distance more effectively. Columns 4–9 thus present results for different interaction models that test the moderating roles of education. However, none of the interaction models yield significant results. While our baseline results show a strong positive effect for the share of foreign-born population, this effect does not seem to depend on the education level, neither in terms of most highly (tertiary education) or lower (at most lower secondary degree) educated groups. Jointly, the results show a robust significant effect for the share of foreign-born population, emphasising particularly the role of migrants born in other EU-countries, in potentially supporting innovation among entrepreneurs. Simultaneously, while we do find that the positive effect of the share of foreign-born population seems to

Table 2 Decomposition and interaction models by origin of foreign-born population and educational attainment, i.e. low educational attainment (at most lower secondary education (ISCED 0–2)) and high educational attainment (tertiary education (ISCED 5 and 6))

Innovative vs. replicative	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Share foreign-born	1.585***			0.959	3.459**					1.781***
	(0.4511)			(0.9134)	(1.4277)					(0.4604)
Sh. foreign: EU-born		1.951***				0.218		1.883		
		(0.6755)				(2.6928)		(2.8594)		
Sh. foreign: non-EU-born		1.265**					0.420		3.143**	
		(0.6311)					(1.2325)		(1.4701)	
Sh. foreign and high educ			3.049**							
			(1.2738)							
Sh. foreign and low educ			1.176							
			(1.2258)							
Sh. high education among foreign pop				0.253						
				(0.4257)						
Sh. foreign * sh. high educ among foreign				1.938						
				(2.6658)						
Sh. low education among foreign pop					0.548					
					(0.4354)					
Sh. foreign * sh. low educ among foreign					-5.528					
					(3.7522)					
Sh. high education among EU foreign						0.215				
						(0.4452)				
Sh. foreign: EU * sh. high educ among EU foreign						6.597				
						(8.7133)				
Sh. high education among non-EU foreign						0.215	0.311			
							(0.3267)			
Sh. foreign: non-EU * sh. high educ among non-EU							3.968			
							(3.5386)			
Sh. low education among EU foreign-born								0.068		
								(0.3880)		
Sh. foreign: EU * sh. low educ among EU foreign								0.355		
								(7.3523)		
Sh. low education among non-EU foreign-born									0.204	
									(0.3090)	

Table 2 (continued)

Innovative vs. replicative	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Sh. foreign: non-EU * sh. low educ among non-EU									-6.061	
									(4.3809)	
Dummy: entrepreneur with tertiary education										0.396***
										(0.0701)
Sh. foreign-born * entrepreneur with tertiary educ										-0.496
										(0.5375)
var(_cons[country])	0.000	0.000	0.016*	0.018**	0.016*	0.021**	0.000	0.020*	0.000	0.000
	(0.0000)	(0.0000)	(0.0084)	(0.0090)	(0.0087)	(0.0095)	(0.0000)	(0.0107)	(0.0000)	(0.0000)
var(_cons[country > NUTSID])	0.009**	0.009**	0.000	0.000	0.000	0.000	0.010**	0.001	0.010**	0.008*
	(0.0045)	(0.0044)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0047)	(0.0035)	(0.0049)	(0.0043)
LR test vs. logistic	7.622	7.622	13.40	16.42	10.49	23.03	8.037	21.23	8.583	6.013

Observations: 24,085. Full set of individual and regional control variables, random intercepts for NUTS regions and countries, survey-year fixed effects and standard errors in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

refer especially to those with high educational attainment, we find no evidence of a moderating role for migrants' education as stated in hypothesis 3a.

Additionally, column 10 in Table 2 tests whether the effect of cultural diversity depends instead on entrepreneurs' education level. We introduce a cross-level interaction between a dummy variable identifying individuals with at least post-secondary education and the regional share of foreign-born population. While the probability of being an innovation-oriented entrepreneur increases with the share of foreign-born population (as in our baseline estimates) and is significantly higher for entrepreneurs with high educational attainment, the interaction effect among these two variables is insignificant: more highly educated individuals do not seem to have an advantage in translating cultural diversity into innovative business ideas. Thus, cultural diversity seems to inspire entrepreneurs towards innovative ventures regardless of their educational attainment. This result, surprisingly, contradicts hypothesis 3b, stating that a certain skill or education level is required to be able to translate regional cultural diversity into innovative ideas as would be expected from perspectives of absorptive capacity. Instead, we find no differential impact of the role of regional cultural diversity by individual educational attainment (conditional on all other individual and regional control variables).

4.4 Alternative diversity measures and robustness checks

While the population shares used to capture cultural diversity in the baseline analysis indicate its relevance for innovation orientation of early-stage entrepreneurs, these measures constitute only rough proxies of cultural diversity. Table 3 presents the estimation results for alternative operationalisations of cultural diversity and shows that alternative indicators of diversity yield comparable results. Both the fractionalisation and Theil index (columns 1 and 3) show that in regions with a more diverse overall population (i.e. where the three groups (native, EU-born, non-EU-born) are relatively more equal in size), entrepreneurs are more likely to be innovation-oriented. Moreover, for both these measures of cultural diversity, introducing a squared term (columns 2 and 4) yields a significant result at confidence levels of 10% (p-value for squared fractionalisation = 0.058, for squared

Table 3 Results for alternative diversity measures and non-linear effects

Innovative vs. replicative TEA	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Fractionalisation	0.863***	-0.351					
	(0.3140)	(0.7421)					
Squared fractionalisation		2.925*					
		(1.5359)					
Theil index (normalised)			0.528**	-0.574			
			(0.2209)	(0.6582)			
Squared Theil index				1.452*			
				(0.8143)			
National-level birthplace diversity (AHR)					1.010***		
					(0.2958)		
HIEF (Drazanova)						-0.002	
						(0.1831)	
ELF-5 (Desmet et al.)							0.334
							(0.2793)
var(_cons[country])	0.022**	0.000	0.023**	0.022**	0.015**	0.000	0.027**
	(0.0101)	(0.0000)	(0.0112)	(0.0102)	(0.0078)	(0.0000)	(0.0122)
var(_cons[country > NUTSID])	0.000	0.009**	0.000	0.000	0.000	0.011**	0.000
	(0.0000)	(0.0044)	(0.0031)	(0.0000)	(0.0000)	(0.0047)	(0.0000)
LR test vs. logistic	20.84	7.956	22.05	22.04	13.49	10.83	26.91
Observations	24085	24085	24085	24085	23455	23434	24085

Random intercepts for NUTS regions and countries, survey-year fixed effects and standard errors in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

Theil index = 0.075). These results lend further evidence against the idea that innovation effects could be diminishing for very heterogeneous populations (hypothesis H1b). Instead of a hypothesised negative squared term, these models suggest that the innovative effects of cultural diversity may even increase as regions become more diverse. This would be in line with the suggestion by Mickiewicz et al. (2019) that cultural diversity may not have a U-shaped but rather a J-shaped relationship with start-up activity.

Columns 5 to 7 present estimations using three different national-level diversity measures adopted in other studies. These indicators present richer operationalisations of cultural diversity but are not available or have insufficient sample sizes at sub-national levels. In column 5, we include the national-level fractionalisation index of birthplace diversity presented by Alesina et al. (2016). As in our baseline results, we again find a strongly significant effect of diversity on the likelihood of being innovation- rather than replication-oriented. Especially considering that the national level seems to explain a larger share of the individual variation than the regional level, the confirmation of our regional-level diversity effects with a more detailed national-level diversity indicator further supports our results.

In contrast, both the HIEF measure of ethnic fractionalisation (Drazanova, 2020) (column 6) and the measure of linguistic fractionalisation presented by Desmet et al. (2012) (column 7) are insignificant and thus do not seem to explain differences in individual entrepreneurs' likelihood to report innovation orientation. However, these measures are again defined at the national rather than the regional level, and it is not clear whether ethnic and linguistic differences offer sufficient variation to exploit for a cross-European analysis as for comparable global studies.

Although the research question of this paper focuses fundamentally on the distinction between innovation- and replication-oriented entrepreneurship and the role of cultural diversity therein, there is an important limitation in this approach. Defining the model as a logistic regression assumes sequential decision-making where individuals first decide to

become entrepreneurs and then decide what type of entrepreneur they would like to be. While computationally advantageous, this method raises questions of whether we neglect relevant information on the effect of diversity by excluding all individuals who are not involved in TEA. To engage with this concern, we implemented a multilevel multinomial logistic regression, which allows modelling a choice between the three possible outcomes (non-TEA, replication-oriented TEA and innovation-oriented TEA) simultaneously. We thus defined a categorical variable capturing these three outcomes and estimated a multinomial logistic regression again adding random intercepts at the country and region level.[7]

The results of the multinomial multilevel model are presented alongside our baseline results in columns 2 and 3 of Table 4.[8] Both columns represent the results relative to the base category (non-TEA, i.e. individuals who are not engaged in early-stage entrepreneurship). Note that we had to exclude the control variable for industry of the entrepreneur since this variable does not exist for non-entrepreneurs. For our variable of interest, share of foreign-born population, we find an insignificant coefficient for replication-oriented early-stage entrepreneurship but a highly significant positive coefficient for innovation-oriented entrepreneurship. Thus, the share of foreign-born population is not associated with a higher or lower probability of replicative entrepreneurship relative to non-entrepreneurs. However, the probability that an individual becomes an innovation-oriented entrepreneur rather than not becoming an entrepreneur at all increases significantly with the share of foreign-born population in the region. The fact that this variable emerges as significant only for innovation-oriented but not for replication-oriented entrepreneurship supports our conclusion and provides further evidence in favour of a robust positive relationship between regional cultural diversity and innovative entrepreneurship.

[7] The model was estimated using the mblogit command from the R package mclogit (Elff, 2022).

[8] While we present these results here together to show common patterns in significances, it should be emphasised that our baseline model and the multinomial model refer to fundamentally different specifications, which means that the coefficient sizes are not directly comparable.

5 Discussion and conclusion

This paper investigated how the likelihood that individuals engage in innovative entrepreneurship varies with cultural diversity across European regions. We argued and identified evidence that innovative entrepreneurship is not just a corollary of early-stage entrepreneurship in general, but, in line with Baumol (2010), represents a distinct type of entrepreneurship. Indeed, we find spatial heterogeneity in innovative entrepreneurship specifically, suggesting that different contexts, drivers and mechanisms are at play. In general, and throughout all our results, regional cultural diversity, whether measured simply as share of foreign-born population or using different diversity indices and for both EU and non-EU foreign-born population, emerges as a statistically significant positive factor in the probability of an entrepreneur exhibiting innovation orientation. In contrast to theoretical suggestions and results for the USA (Sobel et al., 2010), we do not find evidence of this effect diminishing with increasing shares of foreign-born population. These robust positive empirical results thus support the theoretical expectations developed from the Schumpeter-Jacobs theory of entrepreneurship that regional diversity stimulates innovation.

We also considered how this effect of cultural diversity may differ across different groups, investigating population born in other EU countries and non-EU countries from a theoretical perspective of cognitive distance and proximity. In contrast to our hypotheses, the results do not indicate a clear difference in innovative entrepreneurship effects of foreign population from more (or less) distant cultural backgrounds. Instead, we find that even when controlling for the regional share of foreign-born population from within the EU, an increase in non-EU-born population is still associated with a higher likelihood of entrepreneurs pursuing innovative business models (and vice versa). Thus, diversity overall seems to be conducive for innovative entrepreneurship, whether from culturally similar or different backgrounds. Two aspects stand out in interpreting this result. First, the theoretical frameworks on the innovative effect of cognitive distance are centred on a conceptual trade-off between novelty (i.e. potential for learning and hence new combinations) and ease of accessing new knowledge. Our empirical application here can only identify a net positive effect for foreign-born

Table 4 Multilevel multinomial logistic regression for three outcomes: not involved in TEA (base category), replication-oriented TEA, innovation-oriented TEA

		Baseline logistic	Multinomial: replication-oriented vs. non-TEA	Multinomial: innovation-oriented vs. non-TEA
Cultural diversity	Share foreign-born	1.585***	-0.248	1.657***
		(0.4511)	(0.419)	(0.498)
Individual factors	Female	0.044	-0.230***	-0.190***
		(0.0310)	(0.015)	(0.024)
	Age	-0.000	-0.019***	-0.021***
		(0.0013)	(0.001)	(0.001)
Education (base: no degree)	Some secondary	0.353**	0.058	0.434**
		(0.1553)	(0.065)	(0.135)
	Secondary degree	0.460***	0.061	0.559***
		(0.1525)	(0.064)	(0.133)
	Post-secondary	0.606***	0.051	0.724***
		(0.1525)	(0.064)	(0.133)
	Graduate experience	0.837***	0.073	0.980***
		(0.1552)	(0.066)	(0.135)
Work status (base: full/part-time)	Not working	0.261***	-0.769***	-0.409***
		(0.0551)	(0.028)	(0.041)
	Retired/student	0.295***	-1.730***	-1.303***
		(0.0858)	(0.044)	(0.061)
Income group (base: lowest tertile)	Middle tertile	0.004	-0.074***	-0.080*
		(0.0413)	(0.020)	(0.032)
	Highest tertile	-0.049	-0.061**	-0.114***
		(0.0404)	(0.020)	(0.032)
Industry (base: extractive sector)	Transforming	0.321***		
		(0.0782)		
	Business services	0.481***		
		(0.0779)		
	Consumer oriented	0.556***		
		(0.0760)		
Self-perceptions entrepreneurial attitudes	"Fear of failure"	-0.195***	-0.480***	-0.685***
		(0.0345)	(0.016)	(0.027)
	"Know entrepreneur"	0.138***	0.726***	0.902***
		(0.0321)	(0.015)	(0.025)
	"Opportunities"	0.289***	0.465***	0.757***
		(0.0310)	(0.015)	(0.024)
	"Skills"	0.097**	1.726***	1.845***
		(0.0463)	(0.021)	(0.036)

Table 4 (continued)

		Baseline logistic	Multinomial: replication-oriented vs. non-TEA	Multinomial: innovation-oriented vs. non-TEA
Regional factors	Ln GDP p.c	-0.074	-0.038	-0.143
		(0.1079)	(0.102)	(0.125)
	Unemployment	-0.786	1.005	0.096
		(0.5285)	(0.633)	(0.730)
	Manuf. employment	-0.716*	0.394	-0.195
		(0.4129)	(0.322)	(0.402)
	Pop density	-0.000***	0.000	-0.000*
		(0.0000)	(0.000)	(0.000)
	Share pop aged 18–34	0.073	1.181	1.225
		(1.0469)	(1.089)	(1.260)
	Share pop with tertiary educ	-0.059	0.523	0.186
		(0.3688)	(0.399)	(0.459)
	R&D spending % of GDP	-1.246	2.028	1.752
		(3.5119)	(2.297)	(2.884)
	Patents per capita	-0.000	-0.000	-0.000
		(0.0003)	(0.000)	(0.000)
Regional entrepreneurial attitudes	Share “fear of failure”	1.284***	-0.893	0.716
		(0.3913)	(0.540)	(0.590)
	Share „know entrepreneur”	-0.171	-0.051	0.273
		(0.5417)	(0.803)	(0.890)
	Share “opportunities”	1.121***	-0.336	0.535
		(0.3784)	(0.468)	(0.544)
	Share “skills”	-1.565***	2.015***	-0.288
		(0.4448)	(0.571)	(0.638)
National factors	Venture capital as % of GDP	-2.346	-5.483	-5.830
		(1.7381)	(3.486)	(3.383)
	Share “good career choice”	-0.463**	-0.011	-0.525
		(0.2167)	(0.517)	(0.492)
	Constant	-1.247	-4.048***	-4.446***
		(1.1042)	(1.052)	(1.285)
	var(_cons[country])	0.000	0.0716***	0.058***
		(0.0000)	(0.0000)	(0.0000)
	var(_cons[country > NUTSID])	0.009**	0.007***	0.007***
		(0.0045)	(0.000)	(0.000)
	Observations	24085	398024	398024

Random intercepts for NUTS-regions and countries, survey-year fixed effects and standard errors in parentheses

***$p < 0.01$; **$p < 0.05$; *$p < 0.1$

population from within and outside the EU but it does not allow insights on the relative composition of this effect with respect to the benefits and costs of cognitive distance. While the estimated effect size of the share of foreign-born population from non-EU countries is slightly smaller than for EU countries, the significant positive effect overall could indicate that any potential hurdles of cognitive distance are in our sample compensated by the innovation stimulus of diversity. Second, it should be noted that the implemented grouping into EU-and non-EU population is very broad and hides extensive heterogeneity. This applies to intra-EU and sub-national differences but especially to the very heterogeneous category of non-EU countries. Moreover, depending on local contexts, history and institutions, the cognitive distance between local and foreign-born population may vary immensely across our sample. Thus, the results presented here for 140 European regions could contain geographically differentiated positive and negative trends. Additionally, there may also be different dimensions to cognitive proximity, as suggested for instance by Docquier et al. (2020) who find that the positive effect of diversity is most pronounced for immigration from countries that are either culturally or economically distant. However, such geographically differentiated positive and negative trends as well as different dimensions of proximity could only be disentangled with more detailed information on the origin countries of foreign-born population.

In contrast to the strong and robust effects for cultural diversity overall, education aspects generally seem less relevant in explaining innovation orientation among early-stage entrepreneurs. Although we find that especially the group of highly educated foreign-born population is associated with an increased probability of innovative entrepreneurship, the results do not identify significant moderating effects. Thus, the positive effect of cultural diversity on innovative entrepreneurship does not seem strictly education-related but rather seems to stem from heterogeneity in cultural background itself. In this sense, knowledge spillovers or innovative opportunities may refer to tacit knowledge, ideas and approaches of culturally diverse populations, rather than their human capital investment as captured by educational attainment. Also, on an individual level, we do not find evidence for education moderating the effect of cultural diversity on innovation orientation. The results contradict the notion that entrepreneurs need a certain level of education ("absorptive capacity") to make sense of the ideas and opportunities of cultural diversity. These findings are surprising when considering previous empirical results, such as those presented by Rodríguez-Pose and Hardy (2015), who emphasise that diversity among the high skilled seems to exert the strongest effect on start-up rates in the UK. However, the analysis presented here considers a cross-European dataset and innovation orientation rather than the prevalence of new firms in general, which may explain the difference in results. Moreover, education is an imperfect proxy of the competencies required for intercultural communication, so more nuanced indicators would be desirable when considering the role of absorptive capacity in future research especially before offering firm policy implications based on our results.

Some further methodological caveats to the analysis should be considered. First, our analysis relies on self-reported innovation orientation among early-stage entrepreneurs, which is a subjective measure of innovation. In interpreting the results, it needs to be kept in mind that entrepreneurs may not be impartial judges of their own innovativeness, and the venture may also be too young to already achieve measurable innovation success. Identifying innovative entrepreneurs is difficult due to data availability as well as general problems of comparability of objective innovation indicators across sectors and types of businesses. Thus, self-reported innovation orientation as implemented here, i.e. along two items from the GEM-survey, yields a rare and valuable opportunity to investigate questions of innovation among entrepreneurs in general and especially in a sub-national European setting. Further research may also attempt to measure the success of these innovations (for example with sales growth and market leadership) and thus examine the prevalence of successful innovative ventures. Second, data limitations also apply to measures of cultural diversity on a regional and cross-European scale. We addressed this issue by exploring different indicators of diversity, both on the regional and national level. However, more detailed information on the composition of regional population is needed to disentangle the role of diversity more effectively. This applies especially to the notion of cognitive proximity, which we

only measure roughly and indirectly. In contrast to single-country studies (e.g. Docquier et al., 2020), obtaining such measures on the regional level and for all European countries is a data challenge but could yield valuable insights in future research. Third, our analysis, while accounting for unobserved heterogeneity through a multilevel approach, does not establish a causal relationship between diversity and innovative entrepreneurship. Thus, while our results provide relevant descriptive insights for European regions on average, the causal channels underlying these patterns remain unclear and would require future research to engage more directly with micro-level perspectives on how and why innovative entrepreneurship emerges and thrives in diverse regional contexts. This is particularly salient when considering the close interrelations between cultural diversity and broader institutional factors as empirical results indicate lasting economic impacts of diversity e.g. through immigration shaping the institutions and characteristics of places (Rodríguez-Pose & von Berlepsch, 2019). For instance, benefitting from the innovative potential of cultural diversity requires participation of culturally diverse groups in the entrepreneurial ecosystem. We only consider the presence of cultural diversity in regions and countries, not the degree to which regional and national entrepreneurial ecosystems are inclusive (cf. Bakker & McMullen, 2023). For a better understanding of the mechanisms through which cultural (and other types of) diversity lead to innovative entrepreneurship, we should take into account the mediating effect of inclusion as well. Data limitations prevent us from engaging with such institutional and historical aspects of diversity, but future research may provide new insights.

Despite these issues, our results provide strong indications of the innovative value of cultural diversity for entrepreneurship and thus contribute to documenting the economic potential of migration. In this sense, we provide new evidence of the Schumpeter-Jacobs theory of innovative entrepreneurship, building on the previous literature on the role of diversity in fostering entrepreneurship (e.g. Audretsch et al., 2010, 2021; Mickiewicz et al., 2019) and on innovation more generally (e.g. Brixy et al., 2020; Lee, 2015; Niebuhr, 2010). At the same time, our findings provide novel tests and insights due to our empirical approach linking regional and individual characteristics to innovative versus replicative entrepreneurial behaviour across 140 regions in 24 European countries. The analysis shows that across European regions, cultural diversity is positively associated with innovation orientation among early-stage entrepreneurs. These innovative entrepreneurial ventures imply economic opportunities both from a regional and business standpoint. Promoting cultural diversity in regions can be an effective investment for stimulating innovative entrepreneurship. More generally, the positive effect of diversity for innovative entrepreneurship may support processes of discovery and experimentation, which can improve future productivity and quality of life on a societal level. This could present a strong argument for policy to embrace cultural diversity and immigration to benefit from the innovation enhancing effects of diverse regional populations.

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Declarations

Competing interests The authors declare no competing

Table 5 List of variables

Diversity measures		
Share foreign-born	Share of foreign-born population	Eurostat
Sh. foreign: EU-born	Share of population born in another EU country	Eurostat
Sh. foreign: non-EU-born	Share of population born in a non-EU country	Eurostat
Sh. foreign: high educ	Share of foreign-born population with high education (ISCED 5,6)	Eurostat
Sh. foreign: low educ	Share of foreign-born population with low education (ISCED1, 2)	Eurostat
Sh. EU-born, high educ	Share of EU-born foreign population with high education (ISCED 5,6)	Eurostat
Sh. EU-born, low educ	Share of EU-born foreign population with low education (ISCED1, 2)	Eurostat
Sh. non-EU-born, high educ	Share of non-EU-born foreign population with high education (ISCED 5,6)	Eurostat
Sh. non-EU-born, low educ	Share of non-EU-born foreign population with low education (ISCED1, 2)	Eurostat
Fractionalisation	Fractionalisation index (own calculation based on Eurostat data)	
Theil index	Theil index of diversity (own calculation based on Eurostat data)	
Birthplace diversity (AHR)	Alesina et al. (2016)	
HIEF	Ethnic fractionalisation index (Drazanova, 2020)	
ELF-5	Ethno-linguistic fractionalisation at aggregation level 5 (Desmet et al., 2012)	
Individual characteristics		
Innovative entrepreneur	Dummy variable for innovative vs. replicative early-stage entrepreneurship (own definition based on GEM: TEACUST and TEACOMP)	
Female	Dummy variable for gender of individual	GEM
Age	Individual age in years	GEM
Education	Educational attainments in 5 categories	GEM
Work status	Employment status in three categories (employed, not working, retired/student)	GEM
Income group	Income category by tertile	GEM
Industry	Industry category (extractive sector, transforming sector, business services sector, consumer-oriented sector)	GEM
Fear of failure	Respondent says that fear of failure would prevent them from starting a firm (FEARFAIL)	GEM
Know entrepreneur	Respondent says that they know an entrepreneur (KNOWENT)	GEM
Opportunities	Respondent thinks there will be good opportunities to start a business (OPPORT)	GEM
Skills	Respondent thinks that they have the required skills to start a business (SUSKIL)	GEM
Regional characteristics		
ln GDP p.c	Log of GDP per capita (in PPS)	Charron et al. (2016), Eurostat
Unemployment	Unemployment rate (among population 20-64 years old)	Charron et al. (2016), Eurostat
Manuf. employment	Share of employment in manufacturing	Charron et al. (2016), Eurostat
Pop density	Population density	Charron et al. (2016), Eurostat
Share pop aged 18–34	Share of population aged 18–34	Eurostat
Share pop with tertiary educ	Share of population with tertiary education	Charron et al. (2016), Eurostat
R&D spending	R&D spending (total) as % of GDP. Imputed as average of 2009 and 2011 for AT, DE, NL, SE. 2011 for EL, NO.	Charron et al. (2016), Eurostat

Table 5 (Continued)

Patents per capita	Patent applications to the EPO per million inhabitants	Charron et al. (2016), Eurostat
Sh. fear of failure	Share of respondents who say fear of failure would prevent them from starting a firm (FEARFAIL)	GEM
Sh. know entrepreneur	Share of respondents who say that they know an entrepreneur (KNOWENT)	GEM
Sh. opportunities	Share of respondents who think there will be good opportunities to start a business (OPPORT)	GEM
Sh. skills	Share of respondents who think they have the required skills to start a business (SUSKIL)	GEM
National characteristics		
Venture capital	Venture capital as % of GDP	OECD
Sh. good career	Share of respondents who say that entrepreneurship is a desirable career choice (NBGOODC)	GEM

Table 6 NUTS regions included in regression analysis

Country	Level	Regions
Austria	2	AT11, AT12, AT13, AT21, AT22, AT31, AT32, AT33, AT34
Belgium	1	BE1, BE2, BE3
Czech Republic	2	CZ01, CZ02, CZ03, CZ04, CZ05, CZ06, CZ07, CZ08
Germany	1	DE1, DE2, DE3, DE4, DE5, DE6, DE7, DE8, DE9, DEA, DEB, DEC, DED, DEE, DEF, DEG
Denmark	2	DK01, DK02, DK03, DK04, DK05
Estonia	1	EE00
Greece	1	EL3, EL4
Spain	2	ES11, ES12, ES13, ES21, ES22, ES23, ES24, ES30, ES41, ES42, ES43, ES51, ES52, ES53, ES61, ES62, ES70
Finland	2	FI19, FI1B, FI1C, FI1D
France	1	FR1, FR2, FR3, FR4, FR5, FR6, FR7, FR8
Hungary	1	HU1, HU2, HU3
Ireland	2	IE01, IE02
Italy	1	ITC, ITF, ITG, ITH, ITI
Latvia	1	LV00
Luxembourg	1	LU00
Lithuania	1	LT00
Netherlands	1	NL1, NL2, NL3, NL4
Norway	2	NO01, NO02, NO03, NO04, NO05, NO06, NO07
Poland	1	PL1, PL2, PL3, PL4, PL5, PL6
Portugal	2	PT11, PT15, PT16, PT17, PT18
Romania	2	RO11, RO12, RO21, RO22, RO31, RO32, RO41, RO42
Sweden	2	SE11, SE12, SE21, SE22, SE23, SE31, SE32, SE33
Slovakia	2	SK01, SK02, SK03, SK04
UK	1	UKC, UKD, UKE, UKF, UKG, UKH, UKI, UKJ, UKK, UKL, UKM, UKN

Table 7 Summary statistics

	N	Mean	SD	Min	Max
Share foreign-born	24085	0.107	0.064	0.003	0.410
Sh. pop foreign and EU-born	24085	0.040	0.034	0.002	0.317
Sh. pop foreign and non-EU-born	24085	0.067	0.045	0.001	0.264
Sh. pop foreign and high educ	24085	0.032	0.028	0.001	0.216
Sh. pop foreign and low educ	24085	0.040	0.026	0.000	0.166
Sh. high educ among foreign	24085	0.267	0.096	0.094	0.586
Sh. low educ among foreign	24085	0.347	0.098	0.131	0.586
Sh. high educ among EU-foreign born	24085	0.278	0.099	0.059	0.558
Sh. low educ among EU-foreign born	24085	0.272	0.110	0.054	0.607
Sh. high educ among non-EU born	24085	0.331	0.101	0.105	0.694
Sh. low educ among non-EU born	24085	0.350	0.114	0.114	0.665
Fractionalisation	24085	0.189	0.098	0.007	0.566
Theil index	24085	0.349	0.149	0.023	0.870
Birthplace diversity (AHR)	23455	0.148	0.095	0.010	0.531
HIEF	23434	0.394	0.213	0.058	0.661
ELF-5	24085	0.158	0.151	0.011	0.598
Female	24085	0.362	0.481	0	1
Age	24085	39.357	11.308	18	84
Education	24085	2.489	1.008	0	4
Work status	24085	1.128	0.408	1	3
Income group	24085	2.241	0.785	1	3
Industry	24085	3.051	0.934	1	4
Fear of failure (ind)	24085	0.273	0.445	0	1
Know entrep. (ind)	24085	0.651	0.477	0	1
Opportunities (ind)	24085	0.508	0.500	0	1
Skills (ind)	24085	0.872	0.334	0	1
GDP p.c	24085	25501.378	8908.346	7700	64400
Unemployment	24085	0.119	0.064	0.026	0.282
Manuf. employment	24085	0.144	0.059	0.037	0.319
Pop density	24085	336.697	727.846	3.300	6902
Share pop aged 18–34	24085	0.230	0.024	0.162	0.297
Share pop with tertiary educ	24085	0.294	0.081	0.090	0.479
R&D spending	24085	0.016	0.010	0.002	0.049
Patents per capita	24085	88.460	114.922	0.178	710.788
Sh. fear of failure	24085	0.376	0.094	0.213	0.590
Sh. know entrepreneur	24085	0.299	0.061	0.159	0.438
Sh. opportunities	24085	0.216	0.073	0.094	0.501
Sh. skills	24085	0.384	0.070	0.239	0.567
Venture capital	24085	0.023	0.015	0.000	0.077
Sh. good career	24085	0.417	0.128	0.118	0.639

Table 8 Correlation matrix

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29
1	for_birth	1.00																												
2	for_EU	0.71	1.00																											
3	for_NEU	0.91	0.34	1.00																										
4	for & high	0.81	0.61	0.71	1.00																									
5	for & low	0.88	0.66	0.78	0.55	1.00																								
6	high in for	0.14	0.13	0.11	0.56	-0.15	1.00																							
7	low in for	-0.14	-0.06	-0.15	-0.42	0.26	-0.66	1.00																						
8	high_EU	0.30	0.14	0.32	0.59	0.06	0.89	-0.52	1.00																					
9	high_NEU	0.03	0.18	-0.07	0.49	-0.26	0.94	-0.65	0.73	1.00																				
10	low_EU	-0.29	-0.18	-0.29	-0.45	0.03	-0.57	0.82	-0.65	-0.45	1.00																			
11	low_NEU	0.00	0.00	0.00	-0.33	0.37	-0.60	0.89	-0.38	-0.72	0.54	1.00																		
12	lngdppc	0.46	0.50	0.31	0.38	0.48	0.21	0.17	0.43	0.05	-0.24	0.39	1.00																	
13	unem	0.09	-0.05	0.15	-0.03	0.13	-0.26	0.11	-0.30	-0.22	0.39	-0.04	-0.47	1.00																
14	manu	-0.32	-0.15	-0.33	-0.41	-0.19	-0.44	0.22	-0.49	-0.32	0.23	0.13	-0.32	-0.19	1.00															
15	density	0.61	0.39	0.58	0.61	0.52	0.19	-0.06	0.30	0.10	-0.23	0.02	0.33	-0.13	-0.30	1.00														
16	sh_1834	0.22	0.17	0.20	0.33	0.11	0.05	-0.17	-0.02	0.18	0.06	-0.38	-0.35	0.49	-0.13	0.25	1.00													
17	edu_high	0.33	0.19	0.33	0.46	0.17	0.50	-0.19	0.57	0.38	-0.29	-0.06	0.58	-0.18	-0.38	0.26	-0.03	1.00												
18	tot_rd	0.19	0.25	0.10	0.13	0.18	0.13	0.05	0.25	0.01	-0.27	0.28	0.62	-0.51	0.03	0.12	-0.37	0.43	1.00											
19	pat_pc	0.22	0.30	0.12	0.10	0.26	-0.03	0.12	0.08	-0.13	-0.19	0.32	0.58	-0.55	0.16	0.08	-0.44	0.22	0.80	1.00										
20	fearfail	-0.12	-0.21	-0.04	-0.32	0.01	-0.53	0.24	-0.52	-0.47	0.38	0.11	-0.44	0.64	0.24	-0.19	0.36	-0.28	-0.37	-0.37	1.00									
21	knowent	-0.07	-0.15	-0.01	-0.20	-0.07	-0.44	0.17	-0.35	-0.42	0.15	0.14	-0.13	0.34	0.08	-0.16	0.29	-0.08	0.02	0.02	0.56	1.00								
22	opport	0.18	0.05	0.21	0.19	0.02	0.20	-0.20	0.36	0.06	-0.45	-0.01	0.44	-0.30	-0.21	0.04	-0.13	0.32	0.46	0.43	-0.21	0.43	1.00							
23	skill	-0.01	-0.12	0.06	-0.13	0.08	-0.34	0.21	-0.33	-0.27	0.37	0.02	-0.34	0.61	0.04	-0.11	0.56	-0.19	-0.43	-0.47	0.78	0.53	-0.17	1.00						
24	VC_GDP	0.10	0.19	0.02	0.27	0.02	0.47	-0.06	0.50	0.36	-0.26	0.11	0.52	-0.44	-0.19	0.03	-0.35	0.37	0.55	0.43	-0.60	-0.16	0.45	-0.51	1.00					
25	goodc	-0.02	-0.23	0.12	-0.15	0.08	-0.30	0.23	-0.24	-0.31	0.36	0.11	-0.15	0.59	-0.16	-0.19	0.27	0.12	-0.39	-0.37	0.59	0.42	-0.13	0.63	-0.40	1.00				
26	fract_3	0.99	0.71	0.90	0.77	0.89	0.13	-0.14	0.29	0.01	-0.30	0.01	0.48	0.10	-0.31	0.54	0.18	0.33	0.21	0.24	-0.12	-0.08	0.19	-0.01	0.10	0.00	1.00			
27	Theil	0.98	0.72	0.87	0.74	0.89	0.12	-0.11	0.29	0.00	-0.28	0.05	0.52	0.08	-0.32	0.51	0.13	0.34	0.23	0.27	-0.13	-0.11	0.19	-0.03	0.12	-0.01	1.00	1.00		
28	elf5	0.07	-0.07	0.14	0.13	-0.16	0.11	-0.34	0.03	0.15	-0.23	-0.36	-0.17	-0.18	-0.03	0.04	-0.02	0.03	-0.05	0.05	-0.41	-0.08	0.10	-0.45	-0.06	-0.15	0.06	0.03	1.00	
29	bpdiv (AHR)	0.38	0.07	0.45	0.37	0.13	0.25	-0.46	0.25	0.18	-0.40	-0.33	0.08	-0.12	-0.24	0.08	-0.15	0.23	0.07	0.14	-0.36	-0.13	0.31	-0.35	0.12	-0.09	0.39	0.37	0.66	1.00
30	hief	0.17	-0.07	0.27	0.01	0.26	-0.11	0.25	-0.11	-0.15	0.47	0.13	-0.10	0.65	-0.19	-0.06	0.15	0.21	-0.34	-0.41	0.37	-0.03	-0.34	0.47	-0.29	0.60	0.19	0.21	-0.21	0.06

Appendix

Tables 5, 6, 7, 8

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