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Abstract

The advent of digital economy has brought about major changes, and understanding their impacts on entrepreneurial dynamics is a challenge for managers and policymakers. We adopt Richard Florida's three Ts (talent- tolerance- technology) framework for a region and evaluate how the interplay between technology and digital affordances shape regional entrepreneurial dynamics. Using data on 112 European regions in 21 countries (2008-2015) we distinguish between the role that technology and digital affordances play on new business formation, survival and high-growth employment. We find that complementarities between digital, culture and human capital affordances within the 3T framework serve as a conduit for a net entrepreneurial entry, while the complementarities between technology and human capital affordances reduce high-growth employment. Joint negative effect of a technology and human capital affordances on high-growth employment and business survival is seen as lack of required skills in high-tech industries to facilitate technology diffusion. Our findings offer policy and managerial implications.

Keywords: digital affordances, technology, complementarities, entrepreneurial dynamics, European regions

1. Introduction

The rise of digital technology (e.g. the Internet-of-Things, artificial intelligence, blockchains, digital markets and platforms) over the past few decades has led to the modernization of organizational structures and processes. This has helped business activities become less spatially bound and predefined, and has contributed to substantial social change around the world (Verhoef et al., 2021).

From the early 1990s, a growing body of academic literature has highlighted the important role Information and Communication Technologies (ICT) has played in enhancing firm performance and productivity (Oliner & Sichel, 2000; Spiezia, 2013; Adarov & Streher, 2020). A number of scholars have also examined how digital transformation has benefited historically disadvantaged groups of people and businesses by causing society to become more financially inclusive (DeYoung et al., 2011; Jagtiani & Lemieux 2018; Fuster et al., 2019). At the same time, research has also highlighted negative externalities from digital technologies, including the way they have fundamentally altered a number of industries, often leading to large-scale bankruptcies and job losses and increasing the psychological pressure on many employees to adapt to digital technologies (Westerman, 2016; Ciarli et al., 2021; Verhoef et al., 2021). Digital infrastructure and networks have also increasingly shaped entrepreneurial dynamics, helping to transform economies and deliver societal change (Alcácer et al., 2016; Nambisan et al., 2017).

The recent global pandemic has strained economies worldwide, testing their resilience to curtailed production, and a reduction in cross-border trade and labour mobility. Resource-constrained startups and small and medium-sized businesses, which comprise the majority of enterprises globally and play a significant role in economic development, have been under particular pressure (Gourinchas et al. 2020; OECD, 2020). At the same time, the pandemic has provided new opportunities. Combined with the digitalisation processes, we therefore anticipate significant post-pandemic changes in their business operations. A survey of over 5,000 SME leaders during Nov-Dec 2020 commissioned by Google found that while 90% of SMEs reported that they had been negatively impacted by the pandemic, those that used digital tools as an integral part of their operations (42%) were able to minimize the pandemic's negative economic effects on their businesses (Digitally Driven, 2021). This clearly illustrates how instrumental digital economics have become in shaping entrepreneurial trends, offering new solutions to societal challenges and promoting economic growth both globally and regionally (Audretsch et al., 2015; Digitally Driven, 2021).

While some regions have become relying on digital technologies to a greater extent, offering further opportunities and challenges for entrepreneurs wishing to organize their businesses (Li et al., 2016; Castellacci et al., 2020; Digitally Driven, 2020, 2021), there remains substantial dispersion in regional digitalisation even within advanced economies (Digitally Driven, 2021). There remain many obstacles to the broad adoption of digital affordances by entrepreneurs, particularly due to a lack of skills and uncertainty regarding how to use digital tools and understand the value of digital technology (Berlingieri, 2020).

Digitalisation on its own may not be enough to generate a significant economic and social impact. For example, Bruno et al. (2021) show that the direct effect of sectoral digital capabilities on firm performance is marginal, and that it primarily manifests via various complementarities, including tangible and human capital. Prior research on the complementarities between technology, talent and culture emphasized that it was the combination of the three components (3Ts) that drives regional economic development and innovation (Florida, 2002). Other studies suggest that organizations would not fully reap the benefits of digitalisation if they fail to equip their workforce with digital skills (Li et al., 2016; Kane et al., 2019). Enhancing ICT skills and core digital competences is at the core of a sustainable EU strategy (EC, 2019). Understanding the complementary effects of digitalisation is therefore crucial if we are to increase the performance of entrepreneurial firms and inform policymakers and managers about the important pre-conditions needed to maximise the benefits of investment in digital technologies.

Unlike industry-embedded technologies which are more specific, new digital technologies, defined here as digital affordances (Nambisan et al., 2017), offer extensive digital mechanisms for connecting entrepreneurs, customers and suppliers. Differentiating between traditional and digital technologies is important for enriching our knowledge of the role technology intensity and digitalisation play in shaping entrepreneurial dynamics. So far, this has been mainly investigated using data on traditional (non-digital) technologies.

Consequently, this study's core research question is how digital and industry-specific technology affordances affect various entrepreneurial outcomes in European regions. We specifically focus on the context of various complementarities between key regional factors which are viewed in the literature as also playing important roles in shaping regional development. We draw here on Florida's (2002; 2003) 3T framework (Technology, Talent, Tolerance) and more recent literature on the societal effect of technology (Yu & Si, 2012; Si et al., 2015, 2020) to demonstrate that regional talent (defined as human capital affordances), a regional culture of tolerance (cultural affordances), and the technological or digital affordances (Dosi, 1983; Wang & Chien, 2007) embedded in a region constitute a tripod fostering regional economic development (Acemoglu & Restrepo, 2018).

We test our conceptual model by merging Eurostat business structure data with European Social Survey (EES) data to obtain a sample of 112 NUTS2 (Nomenclature of territorial regions for statistics[1]) regions in 21 European countries during the period 2008-2015. We offer new evidence of the importance of complementarities between technology (digital), human capital and cultural affordances in shaping regional entrepreneurship dynamics. More importantly, we find that digital affordances facilitate entrepreneurial activity to a greater extent than industry-embedded technology affordances (Kenney and Zysman, 2016).

[1] For definition of NUT2s regions see https://ec.europa.eu/eurostat/web/nuts/background

This study makes two important contributions to the technology, innovation and entrepreneurship literature. Firstly, it develops a theoretical framework rooted in Florida's 3T theory to highlight that unlike industry-embedded technology affordances (Gibson, 1977), digital affordances (Nambsian, 2013, 2017; Nambsian et al., 2017; Autio et al., 2018) can be applied ubiquitously across sectors with different employment levels, and that the tripod of affordances contributes to a region's entrepreneurial activity.

Second, this study differentiates between industry-specific technology affordances (Gibson, 1977) and digital affordances (Nambisian, 2017) under different contingencies. It also underlines the importance of various complementarities between different types of (spatial) proximity-related affordances within the 3T framework. The latter is used here as an umbrella term for human capital as well as both cultural and digital affordances. Spatial affordances create and transfer region-specific architectural knowledge (Tallman et al., 2004), allowing for effective business development, innovation and entrepreneurship (Nambsian, 2013, Nambsian et al., 2019). Overall, our findings inform policymakers regarding how complementarities between digital affordances (or traditional technology) together with other regional complementarities shape entrepreneurial activity. We also suggest a number of specific innovation and digital strategies intended to bolster the regional development of European regions.

This paper is structured as follows. The next section discusses the complementarity framework of affordances and formulates the research hypotheses. Section 3 describes the data, variables and methodology, while Section 4 presents our results. Section 5 discusses the findings, further contextualising them in the literature and drawing policy implications. Section 6 concludes.

2. Conceptual framework

2.1. The role of affordances within the three Ts of entrepreneurial dynamics

A compelling body of past and recent research has shown that digitalisation substantially affects the nature and type of entrepreneurial activity, making businesses more resilient and enhancing regional economic development (Wang & Chien, 2007; Autio et al., 2018). Digitalisation facilitates the formation of new product ideas and business models, and allows for a dynamic enactment of new opportunities via improvisation and repeated cycles of experimentation (Nambisan et al., 2019). Digital tools have proven particularly useful in helping firms mitigate the negative impact of COVID-19. Nicolas Génot, owner of the iconic Soeurs Macarons shop *La Maison des Soeurs Macarons* in Nancy, France, says that *"The Nancy Macaroon has been part of the gastronomic heritage of the people of our region for centuries. During the pandemic we turned to modern digital tools to save his centuries-old business"* (Digitally Driven, 2021: 66).

While the economic importance of digitalisation has grown over the past few decades, the mechanism by which digital technologies can help entrepreneurs to develop digital capabilities (Guerrero et al., 2021; Rosin et al., 2020; Zhang, Gerlowski, & Acs, 2021) and generate substantial social impacts (Kwon et al., 2017) remains understudied. Similarly, it is unclear whether digitalisation affects entrepreneurial trends in the same way as traditional industry-embedded technologies. Some recent evidence on firm performance suggests that the effect of digitalisation manifests not so much directly as in combination with other firm, industry or regional capabilities (see, for example, Bruno et al., 2021).

To embrace the complex process of digitalisation and the transformation of firms which adopt digital tools, this study uses the concept of digital affordances, comprised of digital artifacts embedded in a new product or service; digital platforms; and digital infrastructure (Nambisan et al., 2017; Autio et al., 2018). We argue that at a regional level the impact of technology in general, and digital technology specifically, should be viewed in the context of other regional affordances including cultural and human capital. We define cultural affordances as a ‘tolerance’ of other people: the willingness of people located in a region to welcome European immigrants to come and settle in the region (Qian, 2013). We regard human capital affordances as the regional talent pool, measured via the share of residents with a tertiary education who live and work in a region (Glaeser, 2005).

All three collectively - technology, talent and tolerance - are rooted in Florida’s (2002) Three Ts framework, positing that regions open to the creative class attract and create talent associated with a flow of new technology-based opportunities. According to Florida (2003), it is not sufficient for a region to be endowed in only one type of affordance but not the others. This is why Baltimore, St Louis and Pittsburgh failed to grow despite the high concentration of advanced technology and world-class universities in (ibid). These cities invested substantially in developing high-tech industries, university-industry partnerships, entrepreneurial incubators and venture capital funds, but these efforts appeared to have little effect. Highly educated technical talent leaked away to other regions which were more attractive in terms of creative economy amenities and more tolerant of different cultures and ideas. It is argued that the combination of all three, technology, talent and tolerance, are needed to facilitate regional entrepreneurial activity and enable regional success (Florida2002; 2003). For cities and regions to grow on the basis of innovation and entrepreneurship, residents and firm managers must have both a formal college education as well as creativity, diversity and tolerance of other ideas and cultures (Audretsch et al., 2010, 2021). Florida (2003) cites the San Francisco Bay Area, Boston, Austin and Seattle as examples of truly creative places where the 3Ts interact well together and enable these places to grow.

We will now discuss the impact of high-tech industry-specific technologies and digital affordances in the context of other regional affordances. Technological affordances derive from the technical architecture and a combination of intensive high-technology industries, and support the economy-wide creation of value, delivery, and capture processes. Technological affordances disrupt the way new ideas and products are developed and organized. This is particularly the case when a new technology allows for more efficient economic interactions and higher economic outputs, such as faster transportation, greater production per unit of time, wider distribution, and better management and coordination (Autio et al., 2018).

The complementarities within the 3Ts create a cyclical pattern from the interplay between technological development, spatial characteristics, and economic organization in society. Freeman and Perez (1988) describe it as "techno-economic paradigms" which bring new ideas, products and industries, and transform the way existing industries work (see also Dosi, 1983). While the entry of new firms based on new technologies is likely to imply greater uncertainty because a business model is not yet established, a growing body of empirical evidence suggests that entrepreneurs who adopt a strategy of innovation have above-average survival (Colombelli et al, 2016) and growth (Love and Roper, 2015) rates, and a superior post-entry performance in general (Arrighetti and Vivarelli, 1999).

Along with R&D-intensive technology, entrepreneurial dynamics are shaped by the affordances embedded into institutional and spatial contexts (Foss and Klein, 2017). These affordances influence entrepreneurial judgment regarding the commercialization of ideas, along with other growth strategies (when to grow and how much; whether to exit the market, merge or acquire other startups; and so on). While entrepreneurial engagement in process innovation using new technologies facilitates startup growth ambitions directly, the effect is further reinforced via knowledge-intensive and creative industrial environments. Entrepreneurs operate within these in close proximity, learning from each other reciprocally as they interact (Estrin at al., 2020). Such interactions lead to new entrepreneurial opportunities through knowledge spillovers (Audretsch and Keilbach, 2007), with alternative formulations of new ideas or processes being recombined in the search for sustainable competitive advantages, further shaping the performance of new ventures (Agarwal et al., 2007; Estrin et al., 2020).

Cultural diversity further works as a key conduit of the knowledge spillovers that underlie new venture formation, survival and growth (Audretsch et al., 2021).

The 3T perspective enriches the beliefs of entrepreneurs by demonstrating that entrepreneurial actions are based on the entrepreneur's subjective perceptions of affordances, in particular their tolerance of new ideas and culture; the availability of skills and human capital; and the use of technology to create new products and commercialize them in the market. Entrepreneurs are good at combining and reconfiguring affordances to start new firms which survive and grow. Our first hypothesis is formulated as follows:

H1: Technology affordances act as complementarities to cultural and human capital affordances within the 3T framework and facilitate regional entrepreneurial dynamics (net entry, survival and high-employment growth).

While cultural diversity and knowledge are positively associated with new business entry and high growth (Audretsch et al., 2021), recent studies emphasise the role of digital affordances in the identification of entrepreneurial opportunities (Autio et al., 2018; Nambisan, 2013, 2017; Digitally Driven, 2020, 2021). Autio et al. (2018) highlight that the digitalisation process directly supports cultural and human capital affordances that shape the locus of entrepreneurial opportunities as well as entrepreneurial cognition. The emergence of digital affordances, also known as the Digital Safety Net, is positively associated with the financial and operational performance of the SMEs using these new digital tools to survive, adapt, and recover from economic or societal shocks (Digitally Driven, 2021).

Let us first discuss the mechanisms by which digital affordances enhance regional entrepreneurial dynamics. Firstly, digital affordances reduce asset specificity and increase the effectiveness of operation of manufacturing value chains (Yoo et al., 2010). In doing so, they thereby increase firm survival and facilitate startup growth. Secondly, digitalisation promotes direct contact between customers and entrepreneurs, reducing the number of stakeholders and mediators within the value chain, leading to disintermediation and reduction of transaction costs. Thirdly, adoption of digital technologies enables greater collaboration and retention of customers (Digitally Driven, 2020, 2021). This allows more freedom for new product development, facilitates the entry of new firms (Gellman, 1996), and increases survival rates by improving business operating efficiency. Finally, using digital affordances (accessing Internet, business and social digital networks, sharing data and e-commerce) enables quicker opportunity recognition by entrepreneurs and new entry. This is also enabled by speeding up the process data collection (e.g. Google Forms, Surveys, Google Analytics, etc.) as well as the commercialization, testing, prototyping and adoption of new products (Nambisan et al., 2017, 2019). We therefore expect firms will use digital and other affordances to experiment with new business models by starting new ventures.

However, the link between digital affordances and business performance outcomes *per se* is weak (Bruno et al., 2021). It is unclear whether digital technology adoption on its own enables entrepreneurs to survive and grow (Blichfeldt and Faullant, 2021). There are several mechanisms by which digital affordances may indirectly enhance entrepreneurial outcomes at the regional level.

The adoption of digital tools and the identification of entrepreneurial opportunities for market entry and growth require different organizational and digital skills (Li et al., 2016; Schleimer et al., 2020). Digital affordances need to be complemented by human capital affordances that include skills and competences in the application of digital technologies, enabling entrepreneurial judgement on market opportunities and market growth (Li et al., 2016). Human capital affordances are also mechanisms of knowledge transfer, with digital affordances enabling entrepreneurs to quickly solve problems and identify opportunities via open innovation. For example, digital affordances enable cost and risk sharing, as well as collaborative R&D. This creates new solutions to market needs, improving the post-entry performance of startups (Delmar and Wiklund, 2008).

Cultural affordances related to tolerance and diversity create a conducive environment for the introduction of new products and services. This is because the variety of people and cultures is intrinsically linked with the variety of market needs and ideas (Audretsch et al., 2021). Cultural affordances will complement digital affordances in increasing the demand for products and services as well as their diversity. This will also enable instant feedback via digital platforms, which can be further improved and modified to better address the diverse market needs.

In addition to a combination of digital and human capital affordances, cultural affordances embodied in people in a region create social value and capital, bonding economic agents together (Korosteleva et al., 2020). In doing so, they are enabled to access and transfer tacit knowledge and generate localized knowledge spillovers (Audretsch et al., 2006).

Cultural and digital affordances together enable entrepreneurs to introduce new-to-market products through direct interactions with diverse end-users, therefore optimising value creation and accelerating the startup scaling-up process (Prahalad & Ramaswamy, 2003; Nambisan et al., 2017). An alignment between cultural and digital affordances is related to the stronger competitive advantage of entrepreneurs who target multi-cultural and multi-segmental markets offering more sizable returns. This is partly due to platform economies of scale, which allow such startups to survive and grow faster. Based on this, we hypothesize:

H2: Digital affordances act as complementarities to cultural and human capital affordances within the 3T framework and facilitate regional entrepreneurial dynamics (net entry, survival and high-employment growth).

Next, we turn to discussing why the complementarity effect of digital affordances on entrepreneurial outcomes at the regional level is likely to be greater than the complementarity effect of technology affordances (i.e. high-tech intensive technology). Demand and supply side mechanisms can help explain these differences.

Firstly, on the supply side, we argue that entrepreneurs who develop digital affordances and master digital skills (Blichfeldt and Faullant, 2021) are more likely to cope better with current and future market challenges (e.g. financial crises, demand shocks, the COVID-19 pandemic, etc.) than entrepreneurs who adopt other technologies. Digital technologies require skills which often involve tacit knowledge unlike industry-specific technologies, which need more codified knowledge. This means that more firms and individuals can adopt digital tools for their businesses, with innovation in digital affordances becoming commonplace (Digitally Driven, 2021). Digital tools and industry-specific technologies require different sets of skills, the latter being highly specialized, niche, and requiring more time to learn and introduce (Teece, 1986).

Digital affordances enable stronger complementarities with human capital and culture, as they allow the in-sourcing of skills and knowledge across different geographical regions and cultures as long as employees can work from home anywhere (Zhang et al., 2021). Access to markets beyond local reach and the ability to source labour from outside the local region are less feasible options for businesses with non-digital technology.

On the demand side, entrepreneurs are especially exposed and vulnerable to uncertainties, and any external shocks could result in the immediate suspension or disruption of innovation activity (Parker, 2018). However, this does not hold for digitally-enabled ventures that rely on the digital readiness of individuals who use the internet for business, leisure and e-commerce (Eurostat, 2021). To deal with market uncertainties and risks, entrepreneurs adopt digital technologies to develop resilience and tap into numerous new markets as a key feature of successful startups and scale ups in digital economies (Nambisian, 2017). In addition, cultural and human capital affordances further reinforce the effect of digital affordances on firm survival and growth via access to a more diversified pool of customers, who connect with them through digital platforms and e-commerce (Digitally Driven, 2020, 2021).

Overall, the effect of complementarities between digital, human and cultural affordances would be greater than the effect of complementarities with industry-specific technology (i.e. technology affordances) because more customers and suppliers will use digital platforms to connect with each other. This will lead to cost reductions as well as greater collaboration and engagement, while also increasing the speed of interactions and making it easier to maintain relationships with customers. Our third hypothesis is thus formulated as follows:

H3: The effect of complementarities with digital affordances on regional entrepreneurial dynamics is greater than the effect of complementarities with technology affordances.

Overall, our hypotheses are reported in Figure 1, illustrating Florida's 3T framework augmented with digital affordances.

{INSERT FIGURE 1 ABOUT HERE}

3. Research Design

3.1 Data sample

Our main source of data for our dependent variables is Eurostat's (2018) regional statistics for 2008-2015, merged with the European Social Survey (ESS) (2016) data for the years 2008, 2010, 2012, 2014 and 2016. The bi-annual European Social Survey is a good source of data on the attitudes, beliefs and behavioural patterns of the populations in Europe at the level of household respondents. It was used to construct a measure of cultural affordances proxied by the regional tolerance to other nations, and was obtained by aggregating the ESS individual-level data by NUTS2 regions (please see sub-section 3.3 for a detailed explanation of the construction of this measure). The cultural affordances indicators were merged with Eurostat regional statistics at the NUTS2 level, with the values for the reference and a follow-up year being regarded as the same given its bi-annual availability. This approach is acceptable given that cultural values and beliefs are time-persistent and change slowly over time (Williamson, 2000). In turn, three dependent variables underlying entrepreneurial outcomes (net entry, survival and employment growth) are constructed. Within business structure data, Eurostat's (2018) regional statistics offer business demography statistics for all EU member states at industry NACE2 Rev and regional levels. The final dataset covers 112 NUTS2 regions across 21 European countries[2] during 2008-2015 (see Appendix A3). Accounting for some missing observations, the merged dataset overall yields 547 region-year observations. Table 1 reports descriptive statistics for all variables in the sample, while Appendix A3 provides information on the mean values of new entry rate, survival rate and high growth rate across the NUTS2 regions, which this study uses as a geographical unit of analysis. We observe some significant regional variations across our core dependent variables.

{INSERT TABLE 1 ABOUT HERE}

3.2 Defining entrepreneurial outcome variables

We draw on prior research on innovation and entrepreneurship (Zahra and Wright, 2011; Coad et al., 2013) to operationalise our three dependent variables. Respectively, we focus on three entrepreneurial outcomes. Our first dependent variable, a net entry rate, is measured as the number of new firm births minus firm deaths divided by all active firms (Audretsch et al.,

[2] The final dataset after cleaning and merging include the following countries: Austria, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Spain, Finland, France, Hungary, Italy, Lithuania, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Sweden, Switzerland.

2006). Our second dependent variable, known as the survival rate, is the number of enterprises born in t-3 which survived to t divided by all active firms (Stearns et al., 1995; Coad et al., 2013). Our third dependent variable is the number of firms which demonstrated at least 10% employment growth over the last 3 years divided by all active firms (Zahra and Wright, 2011; Pereira et al., 2020).

3.3 Explanatory variables

In order to test complementarities of affordances within the 3Ts framework, we distinguish the following explanatory variables. First, technology affordances are measured by the level of employment in high-tech sectors (%) to total employment at a NUTS2-level (Eurostat, 2018). Second, digital affordances are measured drawing on some studies (e.g. Nambisian, 2017; Autio et al., 2018; Ciarli et al., 2018; Digitally Driven, 2021), and include the following variables which were combined in the digital affordances index: households (HHs) with access to internet at home, %; HHs with broadband access, %; Frequency of residents with internet access - daily, % total population; Internet use participating in social networks, %; Internet use - Internet banking, %; Internet use - selling goods or services, %; Internet use - online ordering of goods or services, % (e-commerce).

The Cronbach alpha reliability test statistic is equal to 0.91, which validates the construction of a scale variable underlying the measure of the digitalisation. As part of the robustness check of the Cronbach alpha creation, we performed a principal-component factor analysis and validated the digital affordances construction by all variables loading to a single factor only. We used a varimax rotation option and retained factors with eigenvalue indicates > 1. As mentioned earlier, all our variables load into a single factor. This confirms the importance of considering all these elements of digital affordances as a single construct using a Cronbach alpha.

Our third explanatory variable is cultural affordances, and is constructed using the European Value Survey (2016) data described in section 3.1. The question that we use in a survey to obtain an indicator of cultural affordances is formulated as follows: “Should we allow fewer migrants to come and live here?”. The variable has a scale of 4, and is reversed in order to capture progressively increasing tolerance of ethnic minorities and migrants: 1 denotes the response ‘Allow none’, while 4 denotes the response ‘Allow many to come and live here’. As discussed in section 3.1, we further aggregate individual responses by merging NUTs2-survey wave reference year (2008, 2010, 2012, 2014, 2016) with the Eurostat (2018) regional statistics on business demographics.

Our fourth explanatory variable is human capital affordances measured as the share of population with tertiary educational attainment (age 25-64 years) in total population, obtained from Eurostat (2018) regional statistics.

Building on the combination of four affordances (Technology, Digital Technology, Tolerance and Talent), we create five additional scale constructs. In doing so we use the Cronbach Alpha approach discussed earlier: “Technology affordances-Tolerance”; “Technology affordances-Talent”, “Tolerance-Talent”, “Digital affordances-Tolerance”, and “Digital affordances-Talent”. In addition to these pairwise affordances constructs, we also create two more complementary measures of affordances as a tripod of affordances embedded in the spatial context of NUTS2 regions. These are illustrated in Figure 1 (‘Technology-Tolerance-Talent’ and Digital Affordances-Tolerance-Talent) using the same Cronbach alpha variable scale construction approach. The summary statistics of all scale variables are reported in Table 1.

3.4 Control variables

We use the NUTS2 population in a logarithm form, controlling for the market size of each region (Audretsch et al., 2015). A higher population size signifies a potential customer base, and therefore captures an agglomeration economies effect (Fritsch and Mieller, 2008). To control for a region's level of economic development (Carree et al., 2007), we use GDP per capita in constant 2010 prices by NUTS2 region. To control for the structural changes in the labour market, as well as the deprivation level of the regions, we add an unemployment rate to labour force (Thurik et al., 2008). Region fixed effects were used to control for unobserved heterogeneity at a regional level (e.g. culture, geography, organizational networks) and year-specific fixed effects were introduced to control for the various shocks that may have affected the regions (e.g. financial crises; technological advancements etc.). Table 2 contains the correlation matrix for our key variables of interest.

[INSERT TABLE 2 ABOUT HERE]

3.5 Methodology

We expect interdependences between the three entrepreneurial outcomes, and therefore simultaneously model our three entrepreneurial outcome variables, including net entry, survival, and high growth rates. For example, factors which affect survival rate may also facilitate high employment growth (Coad et al., 2013; Audrestch et al., 2019). A standard way of modelling jointly determined indicators is using a system of seemingly unrelated regression equations (SURE), where all three equations are linked only by their errors (Zellner, 1962). We apply a mixed process estimator using the "cmp" option in Stata, based on the Geweke, Hajivassiliou, and Keane (GHK) algorithm (Roodman, 2009).

The model represents a system of equations:

$$\begin{cases} E_{(j,c,t)} = \beta_0 + \sum_{j=1}^{n} \beta_{11} x_{j,c,t} + \sum_{j=1}^{n} \beta_{12} z_{j,c,t} + \rho_{1j} + \lambda_{1t} + u_{1(j,c,t)} \\ S_{(j,c,t)} = \beta_0 + \sum_{j=1}^{n} \beta_{21} x_{j,c,t} + \sum_{j=1}^{n} \beta_{22} z_{j,c,t} + \rho_{2j} + \lambda_{2t} + u_{2(j,c,t)} \\ Y_{(j,c,t)} = \beta_0 + \sum_{j=1}^{n} \beta_{31} x_{j,c,t} + \sum_{j=1}^{n} \beta_{32} z_{j,c,t} + \rho_{3j} + \lambda_{3t} + u_{3(j,c,t)} \end{cases} \quad (1)$$

where $E_{j,c,t}$ is net entry (firm birth-firm death) in region j, country c in time t to all active firms in the region (new firm rate). $S_{j,c,t}$ is the number of enterprises in region j, country c, born in t-3 and which survived to t, to all active firms in the region (survival rate). Finally, $Y_{j,c,t}$ is the number of firms in region j, country c and time t who achieved at least 10% employment growth as a percentage of all active firms in a region. $x_{j,c,t}$ is a vector of our variables of interest: 3Ts with technology affordances proxied by the level of employment in high-tech sectors and the 3Ts with digital affordances proxied by the level of digital index, and also their five pairwise constructs. $z_{j,t,c}$ is a vector of control variables for a region i, country c and time t. We include ρ_j that denotes regional fixed effects and λ_t - time-fixed effects. The error term is denoted by $u_{j,c,t}$ for region j, country c, at time t. $u_{j,c,t)}$ is assumed to be identically and independently distributed with mean zero and constant variance σ2. The equations are related to each other, having errors that are jointly normally distributed and therefore inter-dependent.

4. Results

Appendix A1 (model 1) illustrates the effect of each interplay between three types of affordances with technology within the 3Ts framework on entrepreneurial dynamics. Appendix A2 (model 2) illustrates the same set of results for digital affordances and entrepreneurial dynamics. Both models also include pairwise constructs of a tripod of affordances, namely Technology-Talent, Technology–Tolerance and Tolerance–Talent, in addition to the core 3Ts results reported in each model. Each pairwise construct is entered into models 1 and 2 respectively one at a time along with a 3T construct in order to avoid multicollinearity problems arising as a result of the way they are constructed. Table 3 reports the average marginal effects of the 3T combinations with respect to three dependent variables (net entry, survival, and high-employment growth) based on the results of SURE estimations (Appendices A1 and A2).

[INSERT TABLE 3 ABOUT HERE]

The differences between models 1 and 2 in their effects on entrepreneurial outcomes should be explained as the differences between 3T complementarities with technology affordances vs digital affordances. Disentangling the effect of digital affordances within the 3Ts framework from the effect of technology affordances is possible by analysing the differences in the marginal effects across two models (see Table 3).

Our hypothesis H1, which states that technology affordances act as complementarities to cultural and human capital affordances within the 3T framework and facilitate regional entrepreneurial dynamics, is not supported. We find a negative and significant effect of the 3Ts driven by technology affordances on firm's survival rate. This effect specifically manifests via the negative effect of the Technology-Talent construct (see Appendix A1, column 8), which we discuss further below. The relationship between 3T and net firm entry (Appendix A1, column 10) and high-employment growth (Appendix A1, Column 12) is not statistically significant. However, we observe some pairwise significant effects of the affordances.

Our hypothesis H2, which states that digital affordances act as complementarities to cultural and human capital affordances within the 3T framework and facilitate regional entrepreneurial dynamics, is partly supported. There is a positive effect of complementarities driven by digital affordances in the 3T on net firm entry ($\beta=0.208$, $p<0.05$) (Model 2, Table 3). However, we find that complementarities within 3Ts with digital affordances do not have a statistically significant effect on firm survival and growth.

The complementary effect of digital affordances on net entry is positive and greater than the complementarities driven by technology affordances, supporting hypothesis H3 (see Table 3, models 1 and 2 within the column reporting net entry results). However, the effect of 3Ts in models 1 and 2 is not statistically different for survival and high-employment growth outcomes.

This suggests there are no differences between the two in their complementary effects to cultural and human capital affordances. Our hypothesis H3 is thus only partly supported.

Having discussed the results related to our main hypotheses, we turn to the discussion of pairwise complementarities within spatially embedded affordances with technology and digital affordances. We found a combination of technology and talent had a negative effect on survival rates (β=-0.001, p<0.05) (Table 3, model 1). This seems to be the channel by which technology affordances may exert a negative effect within the 3T construct on startup survival rates. This result may reflect a mismatch between digital skills and technology, which has been recently advocated as a problem across the EU regions (Li et al., 2016; Berlingieri et al., 2020). We also find the 'Technology-Talent' had a negative effect on high-growth firms (β=-0.040, p<0.05) (Model 1, Table 3). When considering this jointly with the negative effect on survival rates, we argue that a possible mismatch between workforce skills and technology can impede scaling up and survival.

We find a negative effect of 'Digital-Talent' in model 2 (Table 3) on high growth firms. The effect is weaker in magnitude (β=-0.029, p<0.05) than the coefficient of 'Technology-Talent' for high-growth firms. However, we should note one peculiarity when interpreting these results. We do not observe a negative effect of 'Digital-Talent' on survival rates, as in the case of 'Technology-Talent' complementarities. This means that the reduction in the rate of high-employment growth businesses may not necessarily be a negative phenomenon. The negative coefficient may reflect a job displacement effect caused by a decrease in demand for labour and a potential increase in structural unemployment, resulting in employees being retrained for new types of work. Our findings expand on Castellacci's et al. (2020) results, as this phenomenon applies to all industries that adopt digital technologies and across all skills that need to be upgraded due to efficiency gains arising from the digitalisation of value-chain activities (Guerrero et al., 2021).

While digital affordances indeed displace human labour, we see this as part of a natural trend of digitalisation reducing demand for labour due to increased operating efficiency and outsourcing tasks via digital platforms, facilitating an overall market dynamism. However, we interpret the negative effect of technology and human capital affordances on high growth and survival rates as a lack of required skills in high-tech industries to facilitate technology diffusion.

We also find that the direct effect of the 3Ts, using digital affordances, on firm net entry (Table 3, model 2) primarily manifests via the complementarity between "Digital–Tolerance" (β=0.138, $p<0.05$) and "Talent-Tolerance" (β=0.109, $p<0.05$).

Regions with a higher concentration of Tolerance and Talent have a higher effect on new entrants who are more likely to disrupt markets by merging different ideas (Florida, 2002) and challenging incumbent firms.

Our results for control variables are as follows. European regions with higher population growth facilitate firm survival due to their larger markets and higher employment growth and consumption rates. Population growth negatively affects firm entry, as it is more likely to benefit incumbent firms, creating barriers for new startups. Economic development, proxied by regional GDP per capita in constant prices, has a negative effect on a net firm entry and a positive effect on survival. Thich means that firms in most economically-developed European regions experience lower new firm entry rates. However, they are more likely to survive (Fritsch and Mueller, 2008). The higher survival rate seen in regions with higher levels of economic development is driven by market size, customer capacity and availability of public finance support of business, in particular at the early growth stages and when scaling up. In regions with higher economic development, entrepreneurial entry is lower as the opportunity costs of starting business are higher and labour markets are more developed (Carree et al., 2007; Wennekers et al., 2010). The differences are found between firms with high-employment growth (more than 10% a year) across regions with different levels of economic development. Interestingly, in wealthier regions firms do not grow quickly via employment. While the direct effect of regional unemployment rate on new firm entry is neutral, this can be caused by an inverted U-shaped relationship between unemployment and firm entry (Thurik et al., 2008). The effect of unemployment on firm survival and high employment growth is negative.

5. Discussion and Policy Implications

The economic impacts of digital affordances embedded in European regions have entered the entrepreneurship and public policy agenda in Europe. European policymakers desire a European society powered by digital affordances that are strongly rooted in culture and common values, and which enrich the lives of people more broadly (European Commission, 2020). Entrepreneurs require digital affordances, including skills, tools, platforms and infrastructure. Together, these enable the commercialization of innovation by allowing entrepreneurs to start new businesses which can be quickly scaled up and expanded. While Europe has a big picture overview of digital transformation, the spatial affordances embedded in the culture and history of European regions are the backbone of the 3T framework.

This study examines how technology and digital affordances may complement other affordances (particularly, human capital and culture) in supporting regional entrepreneurial outcomes – starting a business, high-employment growth and survival.

Our results suggest that digital affordances have a stronger effect on net entry than technology affordances. This effect manifests primarily through attracting more creative and diverse-skilled workers and entrepreneurs-to-be.

We also find that technology affordances within the 3T framework are negatively associated with firm survival in Europe. We interpret this as a possible indication that technology-intensive industries lack the required skills, slowing down the process of technology diffusion (Berlingieri et al., 2020). Unlike digital affordances, we do not find technology affordances have any significant effect on new firm entry, which further raises the issue of the effectiveness of technology diffusion across European regions. Finally, we also find digital affordances and talent have a negative effect on high-growth firms when exploring pairwise complementarities of the 3Ts. This can be interpreted as a natural trend of the 'job displacement' and structural unemployment caused by digitalisation (Murawski & Bick, 2017). This effect is smaller in magnitude than the positive net entry effect of the 3Ts framework with digital affordances.

Reflecting on differences in the effect of complementarities with digital affordances on regional entrepreneurial dynamics vs. the effect of complementarities with technology affordances, we suggest that Florida's 3T framework requires revision in light of the enhancement of digital technologies (Pick et al., 2015) and their complementarities with regional culture and human capital.

Following this finding, one interesting conclusion we may draw is that the effect of digital affordances is greater in complementarity with other regional affordances. Technology affordances remain confined within high-tech sectors, while the effect of digital affordances may spillover to other sectors (e.g. mid-tech and low-tech services), thus facilitating new entry.

Policymakers aiming to develop entrepreneurship activity in their regions may consider digital affordances as a more powerful mechanism for creating startups than traditional technologies. Local institutional context, which is discussed here as spatial affordances, plays an important role in explaining entrepreneurial outcomes across European regions.

Finally, our main messages to firm managers and entrepreneurs are as follows. Firstly, managers and entrepreneurs who decide on market entry in European regions may wish to consider the potential knowledge spillover effects emanating from digital capabilities infrastructure. Secondly, managers and entrepreneurs should also be aware that some of the negative effects of different dimensions of the 3Ts, in particular those related to a combination of technology and human capital (Talent), suggest a potential mismatch between highly-specific technologies and skills required to adopt them. Thirdly, market entry in regions tolerant to migrants and ethnic minorities cannot directly foster survival and high growth. Rather, all three elements (Technology, Talent and Tolerance) need to be present together as a tripod to leverage the contingencies and strengthen entrepreneurial dynamics.

6. Conclusions

This study contributes to the extant literature in technology, digitization and regional entrepreneurship (Yu & Si, 2012; Dougherty & Dunne, 2012; Pick et al., 2015; Matos and Hall, 2020) in two ways: (1) it employs the 3T framework (Florida, 2002) and demonstrates that technology and digital affordances have idiosyncratic effects across different entrepreneurial outcomes; and (2) it develops a model to measure and compare the effects of technology and digital affordances embedded in a region complementary to human capital and cultural affordances on regional entrepreneurial dynamics.

Overall, this study addresses a call in the technology and innovation literature (Yu & Si, 2012; Si et al., 2015, 2020) regarding the role of digitalisation for entrepreneurship and economic development. We theoretically debate and empirically evaluate the differences in the effect of complementarities with digital affordances on regional entrepreneurial dynamics vs. the effect of complementarities with technology affordances.

Our findings have interesting and unexpected implications for public entrepreneurship policy and managerial decision-making. We argue that cultural affordances, such as the tolerance for migrants and ethnic minorities in a region and talent, affect entrepreneurial dynamics to a greater extent when combined with digital affordances. Digital affordances here play a particularly important role in facilitating new ideas and firm entry in regions which are both culturally diverse and rich in human capital.

Secondly, we show that entrepreneurs-to-be would rather make entry easier by investing in the adoption of digital tools and technology. This is because traditional advanced technology requires more specific skills for operation and capital endowment that may be a luxury for early-stage startups.

This study is not exempt from limitations. While this is a cross-regional and cross-country study, more regions need to be analysed to cover all European countries. To capture various dimensions of digital affordances, it would also be beneficial to increase the focus on startups. A firm-level analysis would offer access to richer data on startups' use of digital tools, enabling researchers to explore the extent to which different digital technologies are embedded in the products and services entrepreneurs offer, and how these technologies affect their post-entry performance. Future research could also potentially explore the effects of digital affordances on different types of entrepreneurs (e.g. Schumpeterian entrepreneurs driving creative destruction versus Kirznerian entrepreneurs who are seen as a driving force behind market efficiency) who differ in their potential to contribute to economic growth (Estrin et al., 2020). Finally, research should continue identifying other regional affordances as possible channels via which the effects of digitalisation on different entrepreneurial outcomes can manifest to maximise the economic benefits of investment into digital technology.

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Table 1: Variables description and summary statistics

Variable	Description	Mean	St.dev	Min	Max
1.Net entry	Number of births minus death of firms in time t (net entry) to total active firms, %	0.57	3.10	-9.66	14.53
2.Survival	Number enterprises born in t-3 survived to time t to total active firms, %	5.46	1.36	2.91	11.73
3.High-growth	Number high-growth firms (with growth driven by 10% plus employment annually) in time t to total active firms, %	0.47	0.26	0.08	1.79
4. Technology	Technology affordances: Employment in high-tech sectors % of total employment by NUTS2 (Eurostat 2018)	3.32	1.94	0.60	10.00
5. Talent	Human capital affordances: Tertiary educational attainment age 25-64 % total population by NUTS2 (Eurostat 2018)	23.01	9.34	8.60	51.30
6. Tolerance	Cultural affordances: Allow few migrants vs. ethnic majority: 1 - Allow none; 2 - Allow a few 3- Allow some; 4 - Allow many to come and live here averaged by NUTS2 using individual data from ESS EES (waves 4-7 corresponding to the years of 2008, 2010, 2012 and 2014)	2.75	0.27	1.78	3.36
7.Digital	Digital affordances: Cronbach alpha of the following variables at NUTS2 level (Eurostat 2018): households (HHs) with access to internet at home, %; HHs with broadband access , %; Frequency of residents with internet access - daily, % total population; Internet use participating in social networks, %; Internet use - Internet banking, %; Internet use - selling goods or services, %; Online ordering goods or services, %	-0.55	0.85	-3.50	1.42
8. Tolerance-Technology	Cronbach alpha of two variables Tolerance and Technology	-0.14	0.83	-3.80	3.31
9. Tolerance-Talent	Cronbach alpha of two variables Tolerance and Talent	-0.33	0.76	-2.48	2.45
10.Technology-Talent	Cronbach alpha of two variables: Technology and Talent	-0.17	0.84	-1.47	2.88
11.Technology - Talent-Tolerance (3T)	Cronbach alpha of three variables: Technology, Talent, Tolerance	-0.21	0.74	-2.48	2.88
12. Digital –Tolerance	Cronbach alpha of two variables Digital technology and Tolerance	-0.45	0.81	-3.15	1.74
13. Digital-Talent	Cronbach alpha of two variables Digital technology and Talent	-0.39	0.86	-2.61	2.24
14. Digital-Talent-Tolerance (3T Digital)	Cronbach alpha of three variables: Digital technology, Talent, Tolerance	-0.38	0.74	-2.21	2.24
15. GDP per capita	GDP per capita in constant 2010 prices NUTS2, in logs	0.02	0.01	0.00	0.06
16. Population	NUTS2 population, in logs	14.18	0.91	10.21	16.31
17. Unemployment	Unemployment rate (% of labour force)	0.12	0.09	0.02	0.57

Note: Number of observations=547. Source: Eurostat (2018) and ESS (waves 4-7 corresponding to the years of 2008, 2010, 2012 and 2014)

Table 2: Correlation matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1.Net entry	1															
2.Survival	0.10*	1														
3.High-growth	0.47*	0.36*	1													
4. Technology	0.15*	0.08	0.22*	1												
5. Talent	0.10*	0.00	0.25*	0.59*	1											
6. Tolerance	0.21*	0.13*	0.33*	0.17*	0.11*	1										
7. Digital Affordances	0.11*	-0.27*	0.12*	0.47*	0.58*	0.07	1									
8. Tolerance-Technology	0.18*	0.11*	0.31*	0.83*	0.48*	0.78*	0.37*	1								
9. Tolerance-Talent	0.17*	0.08	0.37*	0.54*	0.80*	0.77*	0.47*	0.75*	1							
10. Technology-Talent	0.14*	0.04	0.26*	0.89*	0.88*	0.17*	0.59*	0.73*	0.75*	1						
11.**Technology-Talent- Tolerance (3T)**	0.18*	0.08*	0.35*	0.84*	0.79*	0.62*	0.53*	0.91*	0.91*	0.91*	1					
12. Digital –Tolerance	0.21*	-0.13*	0.27*	0.45*	0.50*	0.75*	0.81*	0.66*	0.74*	0.54*	0.71*	1				
13. Digital-Talent	0.14*	-0.13*	0.22*	0.61*	0.89*	0.11*	0.90*	0.50*	0.73*	0.83*	0.75*	0.73*	1			
14. Digital-Talent-Tolerance (3T Digital)	0.19*	-0.06	0.32*	0.60*	0.81*	0.58*	0.81*	0.70*	0.90*	0.79*	0.87*	0.91*	0.91*	1		
15. GDP per capita	0.18*	-0.27*	0.13*	0.46*	0.49*	0.24*	0.58*	0.45*	0.45*	0.53*	0.52*	0.54*	0.61*	0.59*	1	
16. Population	-0.09*	0.01	-0.14*	0.14*	-0.03	0.02	-0.20*	0.11*	-0.03	0.05	0.05	-0.14*	-0.12*	-0.10*	-0.13*	1
17. Unemployment	-0.33*	-0.21*	-0.38*	-0.25*	0.09*	-0.17*	-0.05	-0.24*	0.01	-0.09*	-0.12*	-0.09*	0.01	-0.03	-0.31*	0.22*

Note: * significant at 5% significance level. Number of observations=547
Source: Eurostat (2018) and ESS (2016)

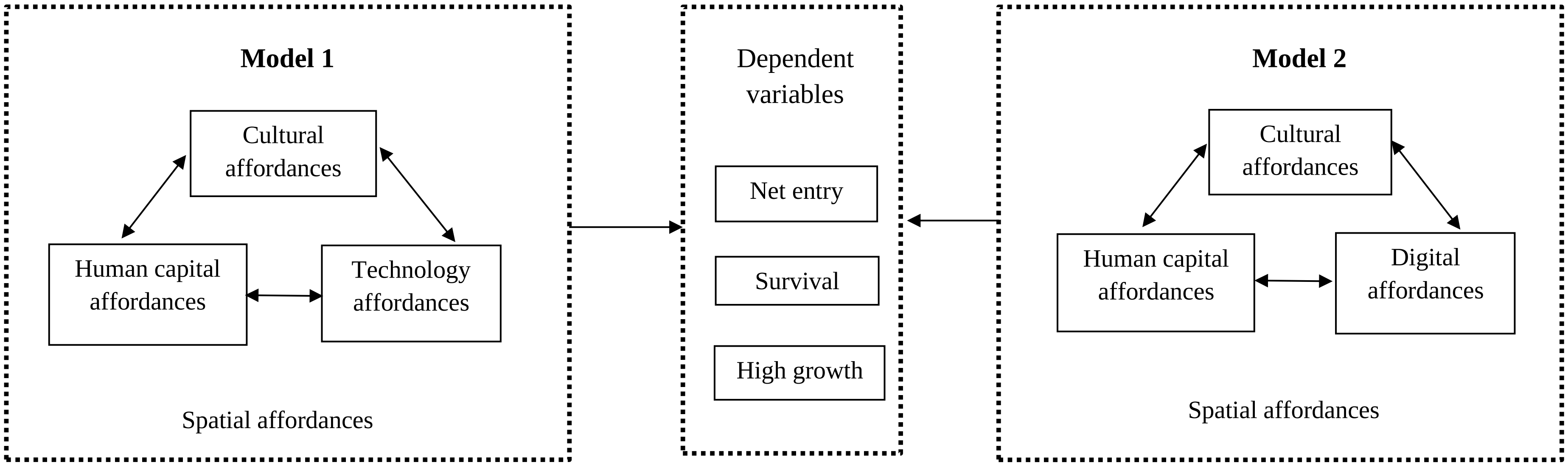
Table 3: Average marginal effects (dy/dx) of the 3T combinations with respect to three entrepreneurial outcomes: Model 1 with high-tech employment (M1); Model 2 with digital technology (M2).

DV	**Net entry**		**Survival**		**High-growth**	
Specification	1	2	3	4	5	6
Variables	**Model 1**	**Model 2**	**Model 1**	**Model 2**	**Model 1**	**Model 2**
Tolerance-technology	0.044 (0.049)		-0.001 (0.00)		-0.003 (0.003)	
Tolerance-Talent[3]	0.109** (0.047)	0.109** (0.047)	-0.001 (0.001)	-0.001 (0.001)	0.001 (0.004)	0.001 (0.004)
Technology-Talent	0.099 (0.129)		-0.001*** (0.00)		-0.040** (0.012)	
3T	**0.113 (0.072)**		**-0.001* (0.00)**		**-0.006 (0.006)**	
Digital-Tolerance		0.138** (0.161)		-0.001 (0.00)		-0.001 (0.004)
Digital-Talent		0.182 (0.192)		-0.001 (0.00)		-0.029** (0.012)
3T Digital		**0.208** (0.082)**		**-0.001 (0.00)**		**-0.003 (0.006)**

Note: * 0.1 ** 0.05 *** 0.01 significance level. Marginal effects are calculated using command "margins" in Stata based on the SURE estimation reported in Appendix A1 (Model 1) and Appendix A2 (Model 2). Standard errors are robust for heteroskedasticity. Delta-method standard error calculation is used.

[3] The indicator has similar values for model 1 and 2, because it was used in both models as part of the 3T index and on the same sample.

Figure 1: Conceptual model representing affordances and entrepreneurial dynamism



Appendix A1: Mixed process SURE estimation of Model 1: DV – net entry rate, survival rate, high growth employment rate

Dependent variable	Net entry	Survival	High-growth	Net entry	Survival	High-growth	Net entry	Survival	High-growth	Net entry	Survival	High-growth
Specification	1	2	3	4	5	6	7	8	9	10	11	12
Tolerance-technology	0.25 (0.28)	-0.15* (0.09)	-0.01 (0.01)									
Tolerance-Talent				0.62** (0.27)	-0.08 (0.09)	0.01 (0.01)						
Technology-Talent							0.57 (0.75)	-0.87*** (0.28)	-0.11*** (0.04)			
3T (H1)										0.64 (0.41)	-0.26* (0.13)	-0.02 (0.02)
GDP per capita	-323.0*** (124.84)	127.61*** (41.48)	-12.15* (6.98)	-341.3*** (125.02)	125.4*** (41.50)	-12.60* (7.06)	-330.91*** (120.05)	148.31*** (42.35)	-9.05 (7.06)	-337.91*** (125.49)	131.61*** (42.17)	-11.83* (7.09)
Population	-42.06*** (9.21)	12.31*** (2.03)	1.86*** (0.30)	-43.21*** (9.18)	12.33*** (2.03)	1.85*** (0.30)	-42.62*** (9.30)	13.43*** (2.06)	2.02*** (0.31)	-42.83*** (9.22)	12.57*** (2.04)	1.88*** (0.30)
Unemployment	-3.52 (3.43)	-2.09** (1.07)	-0.84*** (0.18)	-4.40 (3.41)	-2.24** (1.08)	-0.86*** (0.18)	-3.19 (3.30)	-2.10** (1.02)	-0.82*** (0.17)	-4.01 (3.44)	-2.01* (1.09)	-0.83*** (0.18)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	607.01** (132.19)	-170.18** (29.07)	-26.21** (4.31)	624.01** (131.91)	-170.91** (29.14)	-25.99** (4.27)	615.31** (133.52)	-187.31** (29.58)	-28.56** (4.49)	618.51** (132.51)	-174.51** (29.30)	-26.50** (4.31)
Atanhrho12		-0.186*** (0.07)			-0.186*** (0.07)			-0.185*** (0.06)			-0.183*** (0.07)	
Atanhrho13		0.194*** (0.04)			0.192*** (0.04)			0.199*** (0.04)			0.196*** (0.04)	
Atanhrho_23		0.090 (0.06)			0.092 (0.06)			0.071 (0.06)			0.089 (0.06)	
Number of obs.		547			547			547			547	
Wald chi2		2,212,923			2,354,711			3,578,330			4,734,932	
Log MLE		-1096.949			-1096.903			-1087.099			-1095.747	

Note: * 0.01 ** 0.05 *** 0.01 significance level. Region and year fixed effects are included to control for unobserved heterogeneity, suppressed to safe space. Standard errors are robust for heteroskedasticity. Reference region = Aalto-Helsinki (Finland); Reference year=2008 Source: Eurostat (2018) and ESS, (waves 4-7 corresponding to the years of 2008, 2010, 2012 and 2014), aggregated to NUTS2 level.

Appendix A2: Mixed process SURE estimations of Model 2: DV – net entry rate, survival rate, high growth employment rate

Dependent variable	Net entry	Survival	High-growth	Net entry	Survival	High-growth	Net entry	Survival	High-growth	Net entry	Survival	High-growth
Specification	1	2	3	4	5	6	7	8	9	10	11	12
Digital –Tolerance	0.79** (0.35)	-0.08 (0.09)	-0.03 (0.01)									
Tolerance -Talent				0.62** (0.27)	-0.08 (0.09)	0.01 (0.01)						
Digital-Talent							1.04 (1.09)	-0.46 (0.31)	-0.08** (0.04)			
3T Digital (H2)										1.19** (0.47)	-0.13 (0.13)	-0.01 (0.02)
GDP per capita	-331.70*** (114.83)	127.30*** (39.95)	-12.33* (7.01)	-341.3*** (125.02)	125.4*** (41.50)	-12.60* (7.06)	-335.50*** (107.85)	131.70*** (39.99)	-10.79 (7.07)	-345.96*** (114.36)	125.51*** (40.49)	-12.26* (7.09)
Population	-41.02*** (8.98)	12.78*** (1.97)	1.89*** (0.31)	-43.21*** (9.18)	12.33*** (2.03)	1.85*** (0.30)	-40.16*** (9.57)	11.42*** (1.97)	1.72*** (0.29)	-41.33*** (8.97)	12.09*** (2.00)	1.85*** (0.30)
Unemployment	-3.85 (3.21)	-2.41** (1.01)	-0.85*** (0.18)	-4.40 (3.41)	-2.24** (1.08)	-0.86*** (0.18)	-2.72 (3.32)	-2.54*** (0.99)	-0.88*** (0.18)	-4.24 (3.24)	-2.2** (1.04)	-0.852*** (0.18)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Region fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	592.31*** (128.90)	-177.21*** (28.20)	-26.50*** (4.44)	624.01*** (131.91)	-170.91*** (29.14)	-25.99*** (4.27)	580.22*** (137.19)	-158.12*** (28.21)	-24.23*** (4.18)	597.42*** (128.79)	-167.61*** (28.71)	-25.98*** (4.33)
Atanhrho12	-0.18*** (0.07)			-0.18*** (0.07)			-0.18*** (0.06)			-0.18*** (0.07)		
Atanhrho13	0.20*** (0.04)			0.19*** (0.04)			0.20*** (0.04)			0.19*** (0.04)		
Atanhrho_23	0.08 (0.06)			0.09 (0.06)			0.08 (0.05)			0.09 (0.06)		
Number of obs.	547			547			547			547		
Wald chi2	3,321,121			2,351,221			6,541,221			5,920,001		
Log MLE	-1081.842			-1096.903			-1092.928			-1094.077		

Note: * 0.01 ** 0.05 *** 0.01 significance level. Region and year fixed effects are included to control for unobserved heterogeneity, suppressed to safe space. Standard errors are robust for heteroskedasticity. Reference region = Aalto-Helsinki (Finland); Reference year=2008 . Source: Eurostat (2018) and ESS (2016)

Appendix A3: Average value of DVs (2008-2015) by region NUTS2 included in this study

NUTS2 region	Net entry	Surviv al rate	High-growth	NUTS2 region	Net entry	Surviv al rate	High-growth	NUTS2 region	Net entry	Survival rate	High-growth
Abruzzo	-0.65	0.30	0.05	Jadranska Hrvatska	-1.27	0.63	0.05	Salzburg	2.00	0.57	0.05
Alentejo	-2.73	0.23	0.05	Jihovýchod	-0.02	0.38	0.06	Sardegna	-1.09	0.26	0.04
Algarve	-2.65	0.22	0.06	Jihozápad	-0.65	0.29	0.06	Severen tsentralen	1.46	1.01	0.07
Andalucía	-1.55	0.26	0.05	Kontinentalna Hrvatska	-0.25	0.89	0.05	Severoiztochen	2.46	0.94	0.08
Aragón	-1.15	0.28	0.05	Kärnten	2.11	0.46	0.05	Severovýchod	-0.43	0.30	0.06
Basilicata	-0.43	0.30	0.04	Közép-Dunántúl	-1.22	0.49	0.05	Severozapaden	0.65	0.89	0.07
Bratislavský kraj	3.73	0.69	0.07	Közép-Magyarország	-1.28	0.57	0.05	Severozápad	-1.45	0.30	0.06
Bucuresti - Ilfov	2.03	0.33	0.08	La Rioja	-1.02	0.27	0.05	Sicilia	-0.64	0.25	0.05
Burgenland (AT)	4.11	0.49	0.06	Lazio	-0.03	0.31	0.05	Sjælland	-1.36	0.47	0.06
Calabria	-0.93	0.23	0.05	Lietuva capital	8.59	0.89	0.05	Steiermark	2.78	0.54	0.06
Campania	-0.45	0.32	0.05	Liguria	-0.73	0.23	0.04	Stredné Slovensko	1.85	0.37	0.07
Canarias (ES)	-1.26	0.30	0.05	Limburg (NL)	5.78	0.92	0.04	Strední Cechy	-0.15	0.26	0.06
Cantabria	-1.48	0.25	0.05	Lombardia	-0.15	0.37	0.04	Strední Morava	-0.71	0.33	0.06
Castilla y León	-1.37	0.21	0.04	Länsi-Suomi	0.77	0.55	0.05	Sud - Muntenia	1.62	0.30	0.07
Castilla-la Mancha	-1.98	0.23	0.05	Marche	-0.55	0.29	0.04	Sud-Est	-0.49	0.32	0.08
Cataluña	-1.18	0.33	0.05	Midtjylland	-0.18	0.69	0.06	Sud-Vest Oltenia	0.36	0.25	0.07
Centro (PT)	-2.17	0.30	0.05	Molise	-0.81	0.26	0.05	Syddanmark	-0.58	0.67	0.06
Centru	-0.25	0.32	0.07	Moravskoslezsko	-0.78	0.34	0.06	Tirol	1.62	0.49	0.05
Ciudad Autónoma de Ceuta	-1.34	0.16	0.04	Niederösterreich	3.04	0.44	0.06	Toscana	-0.61	0.27	0.04
Com. Foral de Navarra	-1.02	0.38	0.05	Noord-Brabant	6.91	0.94	0.05	Umbria	-0.64	0.29	0.04
Com. Valenciana	-1.94	0.30	0.05	Noord-Holland	7.55	0.85	0.04	Utrecht	7.98	1.00	0.05
Com de Madrid	-0.74	0.44	0.05	Nord-Est	0.81	0.25	0.07	Veneto	-0.34	0.36	0.04
Drenthe	6.78	0.73	0.05	Nord-Vest	1.22	0.29	0.07	Vest	1.13	0.29	0.07
Dél-Alföld	-0.91	0.53	0.05	Nordjylland	-0.75	0.71	0.06	Vorarlberg	2.46	0.60	0.05
Dél-Dunántúl	-1.36	0.40	0.05	Norte	-1.27	0.39	0.06	Východné Slovensko	2.10	0.39	0.07
Eesti	1.57	1.03	0.07	Nyugat-Dunántúl	-0.90	0.52	0.05	Wien	1.97	0.58	0.06
Emilia-Romagna	-0.56	0.34	0.04	Oberösterreich	2.46	0.63	0.06	Yugoiztochen	2.64	0.85	0.07
Etelä-Suomi	0.58	0.52	0.06	Overijssel	6.91	1.14	0.05	Yugozapaden	5.52	1.08	0.08
Extremadura	-1.35	0.23	0.05	País Vasco	-2.53	0.34	0.05	Yuzhen tsentralen	2.14	1.01	0.08
Flevoland	7.62	0.99	0.05	Piemonte	-0.62	0.28	0.04	Zeeland	5.91	0.89	0.04
Friesland (NL)	6.74	0.79	0.05	Pohjois- ja Itä-Suomi	0.62	0.65	0.05	Zuid-Holland	7.53	0.95	0.04
Friuli-Venezia Giulia	-0.71	0.36	0.04	Praha	0.97	0.51	0.07	Západné Slovensko	1.95	0.43	0.07
Galicia	-0.76	0.28	0.05	Principado de Asturias	-1.37	0.25	0.05	Área Metropolitana de Lisboa	-2.01	0.31	0.05
Gelderland	6.81	0.96	0.05	Provincia Autonoma di Bolzano/Bozen	0.41	0.44	0.03	Åland	1.33	0.39	0.05
Groningen	7.52	0.79	0.04	Provincia Autonoma di Trento	0.15	0.36	0.04	Észak-Alföld	-0.96	0.50	0.05
Helsinki-Uusimaa	1.11	0.78	0.06	Puglia	-0.19	0.28	0.05	Észak-Magyarország	-1.55	0.40	0.05
Hovedstaden	0.44	0.70	0.07	Región de Murcia	-2.13	0.27	0.05	Île de France	5.88	0.57	0.06
Illes Balears	-1.33	0.22	0.05								

Source: Eurostat (2018) and ESS (2016)