RIERC Regional Innovation and Entrepeneurship Research Center

WORKING PAPER SERIES

2021-005

Report on Extension of the REDI-indicator

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Pécs, 2016 február

List of Abbreviations

REDI: Regional Entrepreneurship and Development Index

NSI: National System of Innovation

NSE: National Systems of Entrepreneurship

RSE: Regional Systems of Entrepreneurship

KSTE: Knowledge Spillover Theory of Entrepreneurship

GEM: Global Entrepreneurship Monitor

1. Executive Summary

Entrepreneurial dynamics in regions are complex and refer to a multidimensional process. An understanding of them requires a holistic approach. Achieving this requires a deep understanding of how the Regional System of Entrepreneurship (RSE) works, what the most important regional drivers are, and identifying which of them are bottlenecks and how these could be alleviated. The Regional Entrepreneurship and Development Index (REDI) can provide important guidance for creating conditions in which the region's entrepreneurial dynamics operates efficiently. The REDI index can be used as a platform that facilitates the design of effective tailor-made development policies in EU regions. However, any regional System of Entrepreneurship will be infinitely more complex than what an index like the REDI index can capture.

With the creation of the REDI index our main objective was (1) to identify the crucial regional drivers of the entrepreneurial „discovery" process, (2) to emphasize the system-characteristics of these identified drivers, and (3) finding adequate regional (or country-level) variables and proxies. This is why the REDI index was designed to incorporate 14 different pillars, each created as a product of individual- and institutional-level data. A careful scrutiny of the relative differences between individual pillars, both within a given region and across benchmark regions, should provide good initial guidance for the search of prospective strengths and weaknesses within regions.

The first chapter synthesizes results of the literatures which serve with clear evidence that entrepreneurship is influenced by numerous regional processes (drivers), therefore the regional level is a sufficient scale to capture the socioeconomic and institutional context of the systems of entrepreneurship.

The structure of the REDI index, the conceptual model behind it, the description of individual- and institutional-level variables, and the coherency between the variables and regional drivers of entrepreneurship are all presented in the second chapter.

In the third chapter, we conducted a detailed literature review of each identified regional drivers of entrepreneurship in order to verify their contribution to entrepreneurship. In addition, we show which variables, proxies were used to measure the effect of these regional drivers.

Also those regional drivers were determined which requires the finding and testing of new variables, proxies, because

- some used institutional variables were available only at country-level, therefore using regional-level variables instead of them would be advantageous, e.g. Opportunity Perception (Urbanization), Risk Acceptance (Business Risk), Networking (Social Capital);
- in the case of Networking pillar the employed institutional proxy (Technological Readiness) was not the most feasible one;
- in the case of some institutional variables now new proxies are available, which would be more feasible regarding their statistical characteristics, e.g. Opportunity Perception, High Growth.

In the case of the other REDI index pillars, such as Startup Skills, Cultural Support, Opportunity Startup, Technology Adaptation, Human Capital, Competition, Product and Process Innovation and Financing finding and testing new variables, proxies is not necessary, because the earlier identified variables, proxies are adequate regarding their interpretation in the Regional System of Entrepreneurship, and statistically are useful choices as well.

Fourth chapter shows those new drivers which were not considered and involved in the earlier version of the REDI index. However the literature refers to them as important aspects of regional entrepreneurship as well. Here the literature review main aim is to reveal whether the given driver plays a positive or negative effect on regional entrepreneurship. If the direction cannot be clearly decided, the driver should be decline, because the logic of the index-building requires clear opinion about the effect of each driver. As new drivers mentioned by the literatures should be examined: Labour Market, Taxation, Knowledge Institutions, Digital Skills and Industrial Specialization.

2. Regional System of Entrepreneurship

Framing entrepreneurship as a system that includes mutually dependent elements of individual agency and structural institutional characteristics has important implications for the level of analysis. Our emphasis on the regulating influence of the institutional context implies that entrepreneurship is best studied at levels that transcend the individual decision to engage in entrepreneurial activity, for example, the decision to set up a new firm. At the same time, the distinct functional ranges of the institutional framework conditions that are part of the entrepreneurship system defy a precise aggregate and spatial delineation of the issue. Many rules and regulations concerning business operations may be set at the national level, for example, whereas the availability of social capital and the other contexts of entrepreneurship are likely most relevant at the local level. We argue here that, ***given the conceptualization of entrepreneurship as a system, the regional level – that is the sub-national level – is an appropriate aggregate level in many situations***. It provides a ***sufficient scale to capture the socioeconomic and institutional context of systems of entrepreneurship***. At the same time, it acknowledges existing literature that has argued that many of the characteristics of the entrepreneurial process are inherently local (Feldman, 2001; Sternberg, 2012).

The regional nature of the outcomes of entrepreneurship is probably best evidenced by the stylized fact that most firms are started in or very near to the place of residence or work (Stam, 2007). In addition, setting up firm in a familiar environment is a pertinent determinant of success (Dahl – Sorenson, 2009; 2012). Figueiredo et al (2002) show that the perceived home-region advantage is large enough to the extent that investors are willing to accept higher labour costs if that allows them to keep the firm in the area of residence. The rootedness of entrepreneurs can be partially attributed to spatial inertia per se or a strong preference for a

certain residential environment. Baltzopolous – Broström (2011) suggest that if residential preferences are leading and if people fail to find a suitable job in the preferred region, they are likely to be pushed into self-employment. In addition, business owners are generally well-embedded in local networks which they can use to the benefit of their firm. Several studies have underscored the importance of embeddedness in different networks for starting up successful firms. Shane (2000) argues that business networks and industry experience determine the recognition of entrepreneurial opportunities. Dahl and Sorenson (2009; 2012), Westlund and Bolton (2003) and Westlund (2006), among others, stress the support that comes from social networks made up by friends and family. Also, access to finance has a regional component. Again, social networks may be important in providing financial support, but also banks are more likely to invest in a firm if it is located nearby (Kerr – Nanda, 2009). In short, ***entrepreneurship is a regional process because the effect of determinants of entrepreneurship including access to resources for production, access to finance, and embeddedness in regional networks attenuate quickly with distance***. In addition to elements in the entrepreneurship decision itself, also the broader institutional context in which the decision takes place has important regional dimensions. Henrekson and Johansson (2011) stress the importance of the institutional framework and argue that regional differences in firms' entry rates likely reflect the role of regulatory and institutional frameworks, all of which affect reallocation dynamics in various ways. For example, high barriers to entry, subsidies to incumbents, or policy measures that delay the exit of failing firms, may stifle competition and slow the reallocation process relative to an economy without barriers. Regional regulations, agreements between incumbent market players (suppliers or distributors), limited access to regional input resources, bankruptcy laws and labor market regulations also contribute to reducing the rate of entry of new firms. These barriers affect entry opportunities and hence

have a strong influence on industrial renewal and entrepreneurship (Aghion et al., 2005; Audretsch – Keilbach, 2007, 2008). Henrekson and Johansson (2011) also stress that the regulatory framework alone is strongly differentiated with a number of actors involved at different judicial levels. Thus, both national and regional regulatory frameworks matter for entrepreneurship. National regulatory frameworks are a clear element in the system of entrepreneurship through, for example, general taxes, the level of corruption, labor laws and regulations, bankruptcy legislation, and the openness of the economy (Acs et al, 2013b). However, national regulations are complemented by the subnational regulatory framework (see also Sternberg, 2012). In addition to the regulatory framework, the less tangible part of the institutional framework has important regional elements. Through self-reinforcing demonstration and learning effects, ***regions may create an informal institutional framework that is conducive to entrepreneurship, an "entrepreneurial climate"*** (Andersson – Koster, 2011; Andersson et al, 2011). This does not only explain regional differences in entrepreneurship, but it also partially explains why regional patterns in entrepreneurship are persistent over time (Andersson – Koster, 2011; Fritsch – Mueller, 2007; Fritsch – Wyrwich, 2012). The literature has shown that regional specificities, related to firms' accessibility to financing and innovation needs, together with the quality and quantity of human capital, or the proximity to scientific and technological infrastructures, are all among the most important characteristics that shape regional entrepreneurial and innovative climates (Audretsch – Feldman, 1996; Boschma – Lambooy 1999; Andersson et al, 2005; Okamuro – Kobayashi, 2006). Although the studies reviewed adopt different conceptualizations of entrepreneurship than the systems approach advocated above, the results clearly point towards a research strategy adopting the regional level. Both elements of the system of entrepreneurship, the

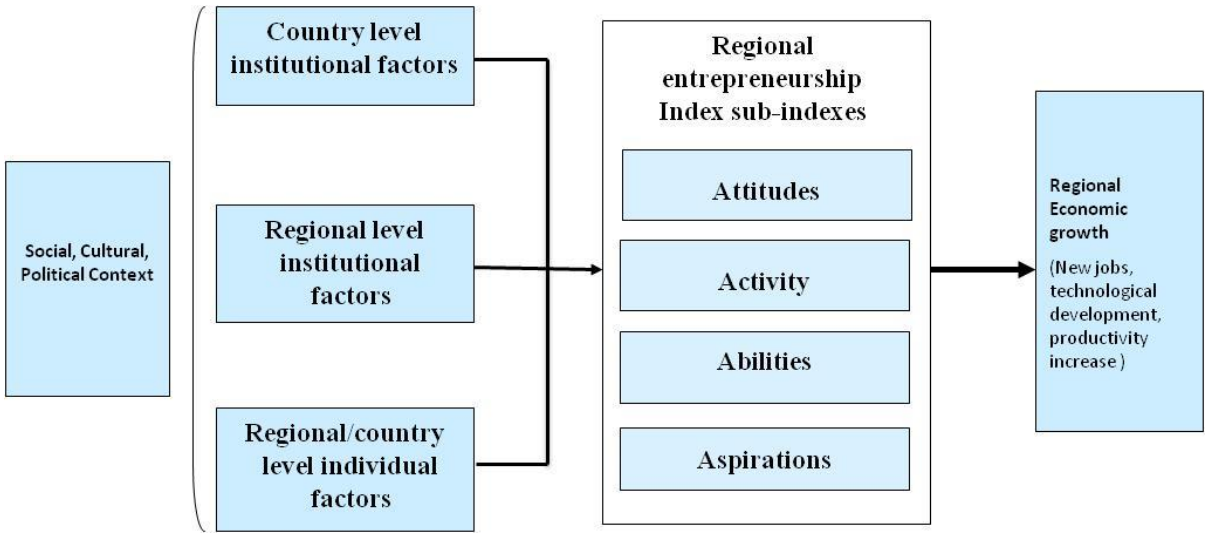
individual decision making process and the relevant institutional context framework; carry information that is pertinent to the subnational level.

3. Present Structure of the REDI Index

3.1 Contextual model and the structure of the REDI index

The Regional Entrepreneurship and Development Index (REDI) captures the contextual dimensions of regional entrepreneurship. In fact, REDI combines together institutional and individual factors of entrepreneurship. The indicators of the Global Entrepreneurial Development Index (GEDI) employing country-level institutional and individual (survey) data must be adapted to reflect regional conditions. Therefore, besides the county-level institutional data the indicators are amended with regional institutional and individual variables as well. Regional level institutional variables serve to capture the local spillover effects of agglomeration (size of the region, market potential), connectivity, networking/clustering, social capital, education system, human capital, effects of knowledge spillover and innovation, role of regulation, the quality of governance, as well as financing.

Figure 1 The Regional Entrepreneurship and Development Index (REDI) conceptual model



The increasing data collection activity at the regional level of the European Union provides a unique opportunity to construct a regional entrepreneurship index. Nevertheless, the adaption of country-level institutional variables for regional analyses is complicated, because the same country-level variable used in the GEDI index is maybe not available for regional level. Several solutions exist to overcome this limitation. One possible solution is to use closely correlated regional proxies to substitute for a missing variable. When possible, we avoid using complex indexes representing country- or regional level in order to eliminate the accumulation of similar variables in the database. The selection criteria for a particular institutional variable were:

1. The potential to link logically to the particular entrepreneurship variable.
2. The clear interpretation and explanatory power of the selected variable.
3. Avoiding the appearance of the same factor more than once in the different institutional variables.
4. The pillar created with the particular variable should positively correlate to the REDI.

We proposed a six level index-building: (1) sub-indicator, (2) indicator, (3) variables, (4) pillars, (5) sub-indices, and, finally, (6) the super-index. As a consequence of the above-mentioned reasons, the REDI Index incorporates 14 pillars which contain simultaneously regional individual, regional and country-level institutional variables, respectively. These pillars compose three sub-indexes: Entrepreneurial Attitudes (5 pillars), Abilities (4 pillars), and Aspirations (5 pillars). Regional and country-level institutional variables derived from different databases. The 40 indicators are the building blocks of the variables. Some institutional indicators are complex creatures by themselves adding up to 76 sub-indicators altogether (for more details see Appendix A, B).

We used to calculate the REDI scores for the mix of 125 NUTS regions of 24 European Union countries.

Figure 2 The structure of the Regional Entrepreneurship and Development Index

Structure of the GEDI 3 Sub-indexes 14 Pillars		National and regional institution variables	Regional level individual variables
Entrepreneurial *Aspiration* Sub-index	**Financing**	FINANCIAL INSTITUTIONS	INFORMAL INVESTMENT
	Globalization	CONNECTIVITY	EXPORT
	High growth	CLUSTERING	GAZELLE
	Process innovation	TECHNOLOGY DEVELOPMENT	NEW TECHNOLOGY
	Product innovation	TECHNOLOGY TRANSFER	NEW PRODUCT
Entrepreneurial *Ability* Sub-index	**Competition**	BUSINESS STRATEGY	COMPETITORS
	Human capital	EDUCATION & TRAINING	EDUCATION LEVEL
	Technology sector	ABSORPTIVE CAPACITY	TECHNOLOGY LEVEL
	Opportunity start-up	BUSINESS ENVIRONMENT	OPPORTUNITY MOTIVATION
Entrepreneurial *Attitudes* Sub-index	**Cultural support**	OPEN SOCIETY	CARRIER STATUS
	Networking	SOCIAL CAPITAL	KN OW ENTREPRENEURS
	Risk acceptance	BUSINESS RISK	BUSINESS ACCEPTANCE
	Startup skills	QUALITY OF EDUCATION	SKILL PERCEPTION
	Opportunity perception	MARKET AGGLOMERATION	OPPORTUNITY RECOGNITION

Source: own editing.

A potential criticism of our method – as with any other index – might be the apparently arbitrary selection of individual and institutional variables and the neglect of other important factors. In all cases, we aimed to collect and test alternative institutional factors before making our selection. Our choice was constrained by the limited availability of data in many regions. To eliminate potential duplication, instead of using existing complex institutional variables offered by different research agendas, we created our own complex indexes using relevant simple indicators or sub-indicators. In the calculation of the REDI index we apply the most recent institutional variable indicators available on June 30. 2013.

3.2 Explanation about the coherency between REDI pillars/variables and the main drivers of regional institutional context

While the Entrepreneurial Abilities and Aspiration sub-indices capture actual entrepreneurship abilities and aspiration as they relate to nascent and start-up business activities, the Entrepreneurial Attitude sub-index aims to identify the attitudes of a region's population as they relate to entrepreneurship. It consists of five pillars.

1. ***Opportunity Perception*** pillar – as part of the Entrepreneurial Attitudes sub-index – combines the individual-level variable of GEM *Opportunity Recognition* with the *Market Agglomeration* institutional-level variable. Market Agglomeration reflects to the size of the market in a particular region including the growth of the population, the level of urbanization and the accessibility of the region. Market Agglomeration institutional variable exemplifies spatial agglomeration effects as one of the important institutional drivers influencing entrepreneurship. Spatial agglomeration effects refer to considerable cost savings generated through the locating together of people, firms and organizations across different industries. These effects promote the accumulation of regional entrepreneurial supply (number of firms, suppliers) and demand (available human capital as potential workforce and customers) in urban areas. According to the literature, we presume that *setting up a business in high densely urban areas offers considerable cost savings via spatial agglomeration effects (urbanization and localization economies), and thereby enhance the propensity of business opportunity recognition and exploitation.*
2. *It is also critical to have proper start-up skills to be able to exploit opportunities.* ***Start-up Skills*** depend on the populations' self-esteem about its ability to start successfully a business (individual variable) and on the *Quality of Education* institutional variable. Quality of Education institutional variable encompasses several proxies which reflect the quality of

the education system combined with variables reflecting to the presence of the creative class in a region. *Different skills, talent and creativity are inevitably essential factors both of business opportunity recognition and entrepreneurial success. Skills and creativity are unambiguously influenced by the quality of the education system.*

3. The premise behind the consideration of ***Risk Acceptance*** as REDI pillar *is the recognition that fear of failure can discourage and hold back new business creation*. The magnitude of risk acceptance of the population is the individual variable part of *GEM Risk Perception*. On the institutional side the *Business Disclosure* rate of the country is used as a proxy of general business risk. Business Disclosure index incorporates also evaluation of a country's property right system, which is among the important drivers of entrepreneurship as well. *Strong property right system can foster productive form of entrepreneurship, while weak property right system promote destructive form of entrepreneurship, or even deter potential entrepreneurs from risk taking.*
4. ***Networking*** pillar is a part of Entrepreneurial Attitude sub-index. The individual variable, knowing an entrepreneur personally (*GEM Knowing Entrepreneur*) is mixed together with the country level *Social Capital* and a regional level *Technological Readiness* variable. *Social connections and personal networks, role models are important for potential entrepreneurs because help them to collect necessary resources to start a business e.g. financial resources, knowledge or information.*
5. ***Cultural Support*** pillar belongs to Entrepreneurial Attitude sub-index. The individual variable *GEM Carrier Status* contains the view of the population about the carrier possibilities and the social status and respect of entrepreneurs. *Open society* is the institutional variable containing a country level (*Personal freedom*) and a regional level indicator (*Corruption*). Personal freedom measures countries' performance in individual

freedom and social tolerance. *When civil liberties, rights are protected, a country benefits from higher levels of national income. However, the presence of corruption could destroy trust that clear rules and individual capabilities determine the reward structure of a region. When the level of corruption is low (strong control of citizens) and the quality of governance is high, the satisfaction of the citizens is higher. Therefore, we assume that regional corruption and quality of governance data can be used as good proxies of open society.*

The Entrepreneurial Abilities sub-index is principally concerned with measuring some important characteristics of the entrepreneur and the start-up with high growth potential.

6. As important aspect of high growth potential is the drive for start-ups. ***Opportunity Start-up*** pillar – as part of the Entrepreneurial Abilities sub-index – mixes together the *GEM Opportunity Motivation* of the population (individual variable) with the favourability of the *Business Environment* (institutional variable). Country wide aspect as the freedom to start and operate business (*Business Freedom*), and a regional aspect, the quality of local government (EU QoG Index). *Good business environment promote the creation of new ventures and the survival of competitive firms too. Therefore, we used as a proxy Business Freedom developed by Heritage Foundation which is a quantitative measure of the ability to start, operate, and close a business that represents the overall burden of regulation as well as the efficiency of government in the regulatory process.*
7. The sectorial composition of start-ups could also be a sign of potential high growth. ***Technology Adoption*** pillar – belong to the Entrepreneurial Abilities sub-index – highlights the role of technology and creative sectors. We use the percentage of the young and nascent businesses that belong to a technology-intensive or creativity sectors (*GEM Technology level*) as individual variable. The institutional variable (*Absorption capacity*) measures the technological readiness of the firms in a country and the regional level of employment in knowledge intensive and high technology

firms. *The notion behind that although we know that new knowledge via spillover effects creates entrepreneurial opportunities, but the absorptive capacity of potential entrepreneurs plays also an important role as referring the skill needed for recognizing, combining and exploiting new knowledge.*

8. Most owners/managers of high growth potential businesses are educated persons. Moreover, it is also important to find such employees who have received some training to have an updated knowledge. ***Human Capital*** pillar – as part of the Entrepreneurial Abilities sub-index – has two ingredients: the share of early phase entrepreneurs who have over secondary level of education (*GEM Educational Level*) is merged together with the involvement of the region's population in training and life-long learning (*Education and Training*). *The available quantity and quality of human capital in a region – as the available workforce for entrepreneurs – has a direct effect on regional firm rates.*

9. ***Competition pillar*** is part of the Entrepreneurial Abilities sub-index. Those businesses that face a low level of competition could grow faster than businesses with many competitors. The individual variable of *GEM Competitors* is the number of competitors, benchmarking those ventures that have not too many competitors. The institutional variable is *Business Strategy* measuring the country's nature of competitive advantage and the regional level sophistication of the businesses. Unique products, processes and the number of employees working in sophisticated sectors serve as benchmarks. *These indicators can catch different sides of country and regional competitiveness. Since competitiveness is a complex, multidimensional phenomenon, therefore it seems to be attached to almost all fields of regional institutional context.*

The entrepreneurial aspiration (ASP) sub-index refers to the distinctive, qualitative, strategy-related nature of entrepreneurial activity. Entrepreneurial businesses are different from regularly managed businesses, thus it is particularly important to be able to identify the most relevant institutional and other quality-related interaction variables.

10-11. ***Product*** and ***Process Innovation*** pillars – belong to the Entrepreneurial Aspiration sub-index. Product Innovation reflects not only to the newness of the product (individual component), but also on the ability of the businesses in the region to create such products. Ultimately, the regional level institutional variable (*Technology transfer*) reflects to the regions' potential to patent and to create scientific publications. Technology Innovation has also two components. The individual variable (*GEM New Technology*) measures the technology innovation potential of the businesses. The institutional variable (*Technology Development*) measures the financial aspect of innovation as the percentage of Research and Development in the regional gross domestic product (GERD). *Entrepreneurs task to bring innovation into the market through the commercialization of ideas and new knowledge. Innovation is very important for early stage entrepreneurs helping them entry into the market, on the other hand, important for incumbent firms as well for their survival among sharp competition.*

12. ***High Growth*** pillar – belong to Entrepreneurial Aspiration sub-index. It includes the percentage of gazelles as businesses with high growth ambitions (*GEM Gazelle*) and a *Clustering* institutional variable. Clustering takes into account that businesses are supported by other cluster members contributing to counterbalance missing individual resources and to get further support for high growth. *According to the evidence of the literature, we assume that clustering of firms refers to considerable cost saving for those firms participating in a cluster, and promote their growth both inland and abroad.*

13. ***Globalization*** pillar also belong to Entrepreneurial Aspiration sub-index. A frequently noticed characteristic of high growth potential businesses is their capability to internationalize. The Globalization pillar combines together the *export potential* (*GEM Export*) as measured by the percentage of the businesses that have foreign customers, and

the *Connectivity* of the region. *It does not need particular explanation that physical connectivity play a basic role for supporting new firm formation. Regions without an adequate physical infrastructure cannot promote the internationalization of their firms, and therefore hinder the growth orientation of them.*

14. ***Financing pillar*** – as a part of to Entrepreneurial Aspiration sub-index. The financing possibilities of the businesses are frequently viewed as the most important aspect of exploiting high growth potential. The individual variable of the Financing pillar is a measure of informal financing possibilities provided by friends, relatives or business angels. The country level institutional variable the Depth of Capital Market is a complex variable by itself measuring the access to different capital and depth markets. Here we have a regional institutional variable about the concentration of financial services. *The availability of formal and informal financing promotes new firm formation and growth aspiration of firms.*

4. Drivers of Regional System of Entrepreneurship

We reviewed existing literature on the determinants of entrepreneurship in regions. These determinants feed into the different aspects of the Regional Entrepreneurship Development Index. In contrast to existing studies, the index explicitly tries to incorporate the recursive relationships between the different elements contributing to entrepreneurship.

Existing studies, such as these, help to inform the construction of the index as they pinpoint different relevant elements that explain regional entrepreneurial activity, as well as its outcomes. Given the goal of the index to also address the ***quality aspect of entrepreneurship***, and with it development issues, we specifically include determinants of high-quality entrepreneurship.

We reviewed the existing literature in five broad interrelated categories that describe pertinent elements in the entrepreneurship process: 1) Spatial externalities, 2) Clustering, networking, social capital, 3) Education, human capital and creativity, 4) Knowledge spillovers and innovation, and 5) The state.

4.1 Spatial externalities

A. Agglomeration economies, size of the region, market potential

The regional demand for entrepreneurship is often linked to population growth and population density (Bartik 1989; Audretsch – Fritsch, 1994; Keeble – Walker, 1994; Reynolds 1994; Reynolds et al, 1994, 1999; Delmar – Davidsson, 2000). As Keeble and Walker (1994) and Reynolds (1994) point out, ***population growth and high population density undoubtedly affect the number of entrepreneurs***. The literature has also shown that SMEs favor countries

within a ***low geographical distance with a large market potential*** (Ojala – Tyrväinen, 2007). Large markets allow firms to develop and benefit from economies of scale and could give incentives to entrepreneurship and innovation (Yasuhiro et al, 2012; European Commission, 2010). The literature on economic growth and regional development has also shown that both entrepreneurial activity and agglomeration have a positive and statistically significant effect on technological change, having indirectly an effect on regional development. In addition, the spillover impact in knowledge production is positively related to the size and density of the region due to the richer network linkages and the wider selection of producer services in larger areas (Varga, 2000; Acs – Varga, 2005). All this results in ***more entrepreneurship activities (also in relative terms), the larger is the population of the urban area.***

Several pieces of work have found that ***urban areas host more entrepreneurship activities than non-urban regions in the same country*** (see Sternberg, 2004; Rotefoss – Kolvereid, 2005; Acs et al, 2008). Two important aspects of urban areas relate to this category of environmental resource; the demand for and supply of entrepreneurship (Keeble – Walker, 1994, Reynolds 1994, Verheul et al, 2002). The literature on economic development suggests that a ***dense, urbanized context reflects the advantages of agglomeration, presumably including the benefits of access to customers and resources*** (Delmar – Davidsson, 2000). Wagner and Sternberg (2004) found that ***the propensity to become self-employed is higher for persons who live in more densely populated and faster growing regions with higher rates of new firm formation***. The authors also found that in densely populated regions higher prices of land and risk aversion can have a negative effect on new firm formation. Using Dutch regional data for the period 1988–2002 van Stel and Suddle (2008) found that ***the employment influence of new firms is stronger in areas with a higher degree of urbanization***. Spatial proximity of knowledge owners and potential users appears to be critical for the transmission of tacit

knowledge (Polanyi, 1966). Urban areas attract younger, better educated adults, thereby increasing the pool of potential entrepreneurs. People living in urban areas are more likely to be aspiring entrepreneurs, nascent entrepreneurs and business founders compared to individuals living in rural areas (Rotefoss – Kolvereid, 2005; Bosma et al, 2008). In the case of Finnish regions, Kangasharju (2000) found that the presence of small firms and economic specialization, as well as urbanization and agglomeration have a consistent positive effect on firm formation. Most of the theoretical arguments in favor of agglomeration (in an economic sense) also hold true for economic growth in many regional types (see McCann – van Oort, 2009; or argument in favour of connectivity see McCann – Acs, 2011; Rodríguez-Pose, 2012). By investigating a sample of 60 firms in the high-tech industry located in the metropolitan area of Milan, Capello (2002) find that ***large firms seem to appreciate urbanisation economies regarding their TFP.*** Likewise Konishi and Saito (2012) investigate the effect of agglomeration on the productivity of Japanese manufacturing firms. Their results show that ***TFP values are positively correlated with their calculated urbanization index***. In several studies urban population (density and/or growth) has been used as a proxy for exemplify the effect of urbanization economies (Audretsch – Fritsch, 1993; Acs – Armington, 2002; Miyase – Köksal, 2003; Babtista et al, 2008; Uchida – Nelson, 2009). On the other hand, in other studies special urbanization indexes has been calculated (see as an example Mukkala, 2004; Braunerhjelm and Borgman, 2004).

In the REDI index ***Opportunity Perception*** pillar – as a part of the Entrepreneurial Attitude sub-index – was measured by *Market Agglomeration* institutional and G*EM Opportunity Perception* individual-level variables. *Market Agglomeration* as institutional variables combined the effects of (1) population growth, (2) urbanization (percentage of urban population) and (3) accessibility (see more detail in Appendix B). As individual level variable

GEM Opportunity Perception shows the percentage of the 18-64 aged population recognizing good conditions to start business next 6 months in area he/she lives.

Potential variables which can be tested as new REDI institutional variables:

- ***Percentage of urban population***: in the calculation of the REDI index country level data were used (World Urbanization Prospects 2011) to express urbanization. Therefore instead of country level data using regional level data are more favourable, e.g. available data of OECD Regional Typology 2010 or EU new Urban Rural Typology.
- ***Calculating indexes measuring urbanization/diversity***: see for example paper of Mukkala, 2004 or Uchida – Nelson, 2009; or testing Cluster Observatory „Sector" dataset by calculating regional diversity index (http://www.clusterobservatory.eu/index.html).
- ***Calculating regional ROXY index for measuring urbanization economies***: ROXY* Index as an indicative instrument can be used to quantitatively identify the major stages of the spatial cycle. *ROXY means "Ratio of Weighted Average Growth Ratio (abbreviated as X) to Simple Average Growth Ratio (abbreviated as Y)" (Kawashima 1985)
- ***Measuring market potential***: testing „Domestic Market Size Index" (WEF, country level) and foreign immigration data as potential proxies (Eurostat, regional level, description: Population aged 15-64 born in another country, 2007. Measures the number of people aged 15-64 residing in a country which is different from the country of birth divided by the total population aged 15-64.)

4.2 Clustering, networking, social capital

A. Clustering

The literature has also explored the positive impact of other types of industrial concentration, for example, the effect of clusters, defined as geographically proximate groups of interconnected firms and associated institutions in related industries, on new firm formation (for the case of German regions see Rocha – Sternberg, 2005). ***Industrial clusters can enhance new firm births as well as the productivity of existing firms.*** Linkages among firms and related institutions, which are the key characteristics of the cluster phenomenon, can serve as an important determinant of new firm formation. The network aspect of clusters helps nascent entrepreneurs to find resources and information easier and faster than in an isolated environment (Koo – Cho, 2011). For the US, Koo and Cho (2011) found that clusters based on knowledge sharing (i.e., knowledge-labour cluster) significantly affect new firm formation, whereas clusters based on market transactions (i.e., value-chain cluster) do not seem to play a role. Sternberg and Litzenberger (2004) also found that ***cluster characteristics may reduce the barriers of firm entry***. Their results confirmed the lower entry barriers make risk taking easier for potential entrepreneurs. Delgado et al (2010), also for the US, found that after controlling for convergence in start-up activity at the region-industry level, ***industries located in regions with strong clusters*** (i.e. a large presence of other related industries) ***experience higher growth in new business formation and start-up employment***. Strong clusters are associated with the formation of new establishments of existing firms, thus influencing the location decision of multi-establishment firms and contributed greatly to start-up firm survival. By investigating the effects of clusters on the survival and performance of new entrepreneurial firms Wennberg and Lindqvist (2010) noted that ***firms located in strong clusters create more jobs, higher tax revenues, and higher wages.***

In the REDI index ***High Growth*** pillar – as part of the Entrepreneurial Aspiration sub-index – was measured by *Clustering* institutional variable and *GEM Gazelle* individual variable.

In order to measure the Clustering institutional variable the so called „Cluster Mix" index (DG Region Individual Dataset, regional level, see more detail in the REDI Report, 2014, 140. p.) was used as a proxy.

Potential variables which can be tested as new REDI institutional variables:

- „Size" and „Focus" variables developed by Cluster Observatory for EU regional level: Size variable shows the cluster's size, while Focus variable express extent to which the locality (the region) is geared towards and focused upon production in the relevant industries comprising the cluster.

B. Networking, role models

Entrepreneurs may become role models and encourage other individuals to consider business ownership. Evidence suggests that ***areas with a high proportion of small firms may provide role models for potential entrepreneurs*** (Fritsch, 1992; Reynold, 1994, Garofoli, 1994; Hart – Gudgin, 1994; Love, 1995; Malecki, 1997; Spilling, 1996). Davidsson et al (1994) claim that ***the availability of role models and people with relevant work experience is the single most important determinant of regional variation in new formation rates.*** Their study, conducted in Sweden, reveals that regions with a high proportion of small firms have significantly higher new firm formation rates. Apart from SME presence, networks in general influence the decision to become an entrepreneur as networks and peer groups may provide role models. Therefore, a region with high levels of entrepreneurship may further encourage new entrepreneurial initiatives because it is easier to access information or resources from other entrepreneurs (Bosma et al, 2012). The ***self-reinforcing effect of role models may also go some way in explaining the persistence in the regional distribution of start-up rates***

(Andersson – Koster, 2011; Fritsch – Mueller, 2007; Fritsch –Wyrwich, 2012). Garo et al (2015) according to the answers of Albanian business school students find that students who have been exposed to entrepreneurial role of families show high intention to become entrepreneurs compared with those who lack this role model. By investigating German regions Wyrwich et al (2015) find that ***knowing an entrepreneur reduces the fear to fail***.

In the REDI index ***Networking*** pillar – as a part of Entrepreneurial Attitudes sub-index – was measured by country level *Social Capital* and regional level *Technological Readiness* institutional, and *GEM Knowing Entrepreneur* individual variables. Knowing Entrepreneur calculated by GEM shows the percentage of the 18-64 aged population knowing someone who started a business in the past 2 years. Technological Readiness includes variables which measures the accessibility of the population to digital networks.

Potential variables which can be tested as new REDI institutional variables:

- Technological Readiness proxies are poorly reflect the different aspects of social networking. Therefore, finding and testing further potential proxies is necessary.

C. Social capital

There are different conceptions of social capital, which each relate to entrepreneurship (Westlund – Bolton, 2003). First, social capital can be seen as the network through which valuable resources for the start-up of a new firm can be attained. This view is in line with Bordieu's conception of social capital (Bourdieu – Waquant, 1992). Secondly, value can be derived from the social network itself through the shared values, information in the social group. This mimics a conception of social capital that puts more emphasis on the social network itself – rather than the resources for production derived from it - as the defining

element (see, for example, Coleman 1990). Without going into a detailed discussion on definitions and conceptions of social capital, this simple dichotomy helps structure the empirical examples that allude to social capital. We have already mentioned a number of studies that stress how important resources for firm formation are derived from the social network. This includes access to finance (Kerr – Nanda, 2009), access to ideas and the recognition of opportunities (Shane – Venkataraman, 2000) and access to labor in the form of friends and family helping out in the business (Dahl and Sorenson, 2009). In this view, the benefits from social capital may in principle be available to all members of the social network, but once allocated they are rival goods and only accrue to the entrepreneur (or firm) accessing them. This is in contrast with the other type of social capital in which values, ideas and acceptance vis-a-vis entrepreneurship are shared in the social group. The effects are embedded in the group and become a public good for the members of the group. Schutjens – Völker (2010) stress this type of social capital as they see it as a culture of interaction among people. Social capital promotes regional learning both within a region and beyond, as it reinforces the openness to the ideas of others. The literature on role models can also be reframed in this conception of social capital. The role models, if relevant in a social group, can have an effect on the whole social network. Likewise, the occupational structure of regions may indicate the human capital endowments of the people and as a result their propensity of starting a firm. It can also be seen as a crude measure of the existence of shared values and beliefs that may or may not stimulate entrepreneurship (see, for example, Hart – Gudgin, 1994). From the results reviewed here, it is apparent that social capital is seen as an important part of the entrepreneurial decision that also explains an important part of the idea why entrepreneurship is an inherent local phenomenon (Fornahl, 2003). Still, it is seems difficult to empirically pinpoint the effect of social capital. If it seen as a means of accessing resources,

the availability of the resources can just as well be seen as the explanatory factor; if it seen as a value-laden network affecting entrepreneurship, it is difficult to measure directly. Gedajlovic et al (2013) suggest that ***social capital theory should be part of the theory of entrepreneurship***. Likewise Percoco (2012) findings also support that social capital is important for entrepreneurship. de Dominicis et al (2013) conclude that both ***social capital and spatial proximity are crucial factors in explaining the observed differences in the production of innovative output across European regions***. According to Malecki (2012) innovation and entrepreneurship take place among people, therefore ***social capital matters regarding regional development***.

On the other hand, Mallon et al (2015) found only small support for the hypothesis that social capital is the most important driver of firm success. Rather, specific ***human capital appears to be most important, conjointly with either social capital or financial capital***. Also there is a growing evidence of the possible negative effects of social capital. As Payne (2015) pointed out as network complexity increases, the likelihood of costly, unproductive or destructive social capital is much greater.

In the REDI index ***Networking*** pillar – as a part of Entrepreneurial Attitudes sub-index – was measured by *Social Capital* institutional and *GEM Knowing Entrepreneur* individual variables. The Social Capital institutional variable was exemplified by „Social Capital" sub-index developed by Legatum (country level, see more detail in the REDI Report, 2014, 137. p.)

<u>Potential variables which can be tested as new REDI institutional variables:</u>

- ***Social Capital variable/proxy***: in present calculation only country level data are used, therefore finding and using regional level data is favourable.

4.3 Education, human capital and creativity

A. Education and vocations

Education has been related in the literature to knowledge, skills, problem-solving ability, discipline, motivation and self-confidence (Cooper et al, 1994). There seems to be agreement that ***attaining a high level of education positively influences the probability of becoming involved in business start-up processes*** (Cooper et al, 1994; Bates, 1995; Delmar and Davidsson, 2000). In addition, schooling has an important impact on successful entrepreneurship. Van der Sluis et al (2008) review over 100 studies on the issue and they find a marginal return of 6.1% to an additional year of schooling. For wage income, they find an even larger marginal effect, suggesting that other factors are relatively important in explaining income from self-employment. Iversen et al (2010) reinforce this observation in their study of returns to self-employment in the Danish labour market. They find a similar overall marginal effect of 6.5%, but also show that the effect is highly influenced by those that have enjoyed very long episodes of schooling. The marginal effect only increases significantly for those with at least 17 years of schooling. The level of education, however, is not the only determinant of self-employment (success). Also the type of study influences the incidence of self-employment (see, for example, Falk – Leoni, 2009). This may have to do with the content of the study and to what extent the content prepares the graduate for self-employment, but it is also importantly influenced by the labour market arrangements that are common in the industries the graduates are likely to be active in. In the Netherlands, for example, General Practitioners are generally organized in a specific legal arrangement that involves self-employment. Similarly, Glaeser and Kerr (2009) find that ***abundant workers in relevant occupations strongly predict regional entry***. For the case of Greek regions, ***the supply of skilled***

manufacturing labour was found to attract moving firms and stimulate new firm formation (Fotopoulos – Spence, 1999). Human resources in science and technology have a strong impact on the number of new start-ups and new jobs. They are typically the workers who come up with new ideas and put them into practice, which leads to more new and more innovative and productive firms and higher creation of jobs (Kern – Runge, 2009). ***Entrepreneurs with high level of education are more likely to have a role model, and the likelihood that these entrepreneurs view their role models as crucially important is significantly higher*** (Bosma et al, 2012). Universities can be an important anchor tenants for regional clusters (Hausman, 2012; Chatterji et al, 2013). Certain studies have shown that long-run employment and wages increased quickly in industries more closely related to local universities' pre-existing strengths in innovation. This effect was realized through the entrance of new firms and, especially, the expansion of multi-unit firms into the area. The power of local universities to engender economic growth is also studied by Moretti (2004) and Glaeser and Saiz (2003). By identifying the determinants of regional variation of new firm formation Acs and Armington (2002) pointed out that people in regions that have a high percentage of college graduates are much more likely to start businesses than those in regions with high concentrations of less skilled workers.

In the REDI index ***Human Capital*** pillar – as a part of Entrepreneurial Abilities sub-index – was measured by the *Education&Training* institutional variable and by the *GEM Educational Level* individual variable. The *Education&Training* institutional variable was exemplified by variables related to high education, training and lifelong learning: (1) Share of population aged 25-64 years with higher educational attainment, (2) Share of population aged 25-64 years participating in education and training (Eurostat Regional Database, for regional level). The

Educational Level individual-level variable developed by GEM shows the percentage of the TEA businesses owner/managers having participated over secondary education.

B. Creative class, talent

Talent and creativity have become the key factors in economic growth and development. Talent refers not simply education attainment, but it also comprises occupation and different skills (Florida – Mellander, 2015). According to the ***"economic geography of talent" hypothesis*** put forward by Florida (2002a, b) ***highly qualified people tend to live in close spatial concentration***. Such regions are characterized by low barriers to entry for well-educated, young workers who are attracted in particular by cultural diversity and openness toward the new and the "different". Up until then a small number of empirical studies on the spatial mobility and entrepreneurial activities of the member of Florida's "creative class" (Florida 2002b, Boschma – Fritsch, 2009) show that they are highly mobile in a spatial sense, very discriminating when choosing locations and that they represent a high level of entrepreneurial potential. Given the fact that creative people are more inclined to economic independence, it seems plausible that they have a higher propensity to start a business comparing to non-creative people. Consequently, regions with a higher proportion of creative people (that is, mainly, urban areas) should also be characterized by higher start-up rates than rural areas (Sternberg, 2012). For the case of Italian regions, Piergiovanni et al (2009) observed that the regional employment growth is influenced by the prevailing patterns of sectoral specialization and by the rate of growth of the share of firms in creative industries (artists' and writers' creation, fashion design, advertising, architectural and engineering activities and industrial design, software, etc.). Given the preference for attractive urban regions, the positive effect of agglomeration may therefore partially be a sorting effect of entrepreneurial

talent congregating in certain areas. Utilizing European Urban Audit Surveys and creating a cross-sectional dataset included 187 cities in 15 European countries during 1999-2002, Audretsch and Belitski (2015) concluded that new business start-ups with a relatively high proportion of creative class in finance, artistic, culture and IT moderate the relationship between the proportion of people employed in those sectors and regional development.

In the REDI index ***Startup Skills*** pillar – belongs to REDI Entrepreneurship Attitudes sub-index – was measured by *Quality of Education* institutional variable and by *GEM Skill Perception* individual-level variable. On the one hand, the *Quality of Education* institutional variable was denoted by PISA (low achievers in reading, math and science). PISA results are available only for country level. On the other hand, the Creative Class variables derived from ESPON database were used to demonstrate the quality of education system: (1) Annual employment in creative class / economically active population, (2) Number of jobs in the creative workforce per active population (regional level).

As individual level variable *GEM Skill Perception* was employed which shows the percentage of the 18-64 aged population claiming to possess the required knowledge/skills to start business.

4.4 Knowledge Spillovers and Innovation

A. Knowledge Spillovers

As long as the knowledge necessary for technological change is codified (i.e., it can be studied in written forms either in professional journals and books or in patent documentations),

access to it is not essentially constrained by spatial distance; among other means, libraries or the Internet can facilitate the flow of that knowledge to the interested user, no matter where the user is located. However, where knowledge is not codified, because it is private, or not yet completely developed, or is so practical that it can only be transmitted while being applied, the flow of it can only be facilitated by personal interactions. Thus, ***for the transmission of such tacit knowledge spatial proximity of knowledge owners and entrepreneurs appears to be critical*** (Polanyi, 1967). Adam Jaffe (1989) was the first to identify the extent to which university research spills over into the generation of commercial activity. His statistical results provided evidence that corporate patent activity responds positively to commercial spillovers firm university research. Building on Jaffe's work, Feldman (1994) expanded the knowledge production function to innovative activity and incorporated aspects of the regional knowledge infrastructure. She found that innovative activity is conditioned by the knowledge infrastructure and responds favourably to spillovers from university research at the state level, strengthening Jaffe's findings. Varga (1998) built further on this solid foundation. His main concern was whether university-generated economic growth observed in certain regions and from selected industries can be achieved by other regions. He extends the Jaffe-Feldman approach by focusing on a more precise measure of local geographic spillovers. Varga approaches the issue of knowledge spillovers from an explicit spatial econometric perspective and for the first time implements the classic knowledge production function for 125 Metropolitan Statistical Areas, yielding more precise insights into the range of spatial externalities between innovation and research and development. The Jaffe – Feldman – Varga research into R&D spillovers takes us a long way towards understanding the role of R&D spillovers in knowledge-based economic development. ***A host of recent empirical studies***

have confirmed that knowledge spillovers are geographically bounded (Acs et al., 1992, 1994; Jaffe et al., 1993; Audretsch – Feldman, 1996; Anselin et al, 1997; Keller 2002).

In their study Ghio et al (2015) conducted a review of literatures which have been built linking between endogenous growth theory, knowledge spillovers and entrepreneurship. According to their summary, the main questions of these studies are: (1) the creation of knowledge-based entrepreneurial ventures, (2) the sources and nature of knowledge spillovers, as well as (3) the impact of entrepreneurship generated by knowledge spillovers on growth. New knowledge is non-excludable and not rival in consumption, and thus not fully appropriable, therefore it plays as source of entrepreneurial opportunities. New venture as „vehicle and channel" helps commercialize knowledge and appropriate the returns of it (Audretsch and Keilbach 2007; O'Gorman et al 2008; Braunerhjelm et al 2010; Acosta et al 2011; De Silva and McComb 2012; Plummer and Acs 2014; Stam 2013 among others). Qian et al (2013) and Qian and Acs (2013) confirm also that new knowledge creates entrepreneurial opportunities, but also recognize the role of entrepreneurial absorptive capacity. It refers to the combination of scientific and business skills needed by perspective entrepreneur to effectively pursuit the knowledge exploitation (Audretsch and Belitski 2013).

In the REDI index ***Technology Adoption*** pillar – as a part of Entrepreneurial Abilities sub-index – was measured by institutional-level *Absorptive Capacity* variable and individual-level *GEM Technology Level* variable. To express the level of absorptive capacity of human capital Firm-level Technology Absorption institutional variable (WEF, available only at country level) and variables related to employment in high-tech sectors (regional level) were used: (1) employment in high-technology adoptions (high-tech manufacturing and knowledge-intensive services), (2) employment in technology and knowledge-intensive sectors, (2) researchers as % of total employment, (4) annual data on human resources in science and

technology (HRST) (Eurostat Regional Database, regional level). Expressing the individual-level we used *GEM Technology level* variable, which shows the percentage of the TEA businesses that are active in technology sectors (high or medium) and belong to the creative sector.

B. Innovation

The literature of innovation systems, even if highly influenced by the work by Schumpeter seems not to have a clearly defined role for entrepreneurship. Radosevic (2007) ascribed this absence to the predominantly institutional emphasis of the innovation system literature, which has made it difficult to accommodate the individual-centric perspective of the entrepreneurship literature (Shane, 2003). For instance, in the institutional tradition of the National Systems of Innovation literature, institutions engender, homogenize, and reinforce individual action: it is a country's institutions that create and disseminate new knowledge and channel it to efficient uses. In this perspective, individual action is either not considered or is supposed to happen automatically, subject to the homogenizing influences of the institutions. This routine-reinforcing perspective of the systems of innovation literature has proven difficult to reconcile with the individual-centric, routines-breaking emphasis of the entrepreneurship literature (Radosevic, 2007; Schmid, 2004). The literature highlights three main problems typical of regional innovations systems that need to be addressed: (1) fragmentation, (2) absence of key resources, and (3) negative lock-in (Tödtling –Trippl, 2005). Fragmentation can be a problem in regions where all the necessary components of a successful innovation system already exist. This means that strong actors are present in all three subsystems and that there is an institutional framework well suited to these actors. The problem of fragmentation occurs when the authors are not aware of each other and/or when they do not act in harmony with each other. One reason may be that there is an institutional and/or functional mismatch. An

example of institutional mismatch can be the absence of an overall collective action. Functional mismatch, where the functions that the innovation system supports do not result in mutually reinforcing synergies, is experienced in the case of a lack of coordination. The absence of key resources that are necessary for a proper functioning of an innovation system, such as the regional presence of human capital, represents a grand challenge in many regions. In this situation the region faces the challenge of attracting key resources either by influencing the regional 26 supply or by stimulating the regional actors to meet the resource needs through contracts with actors outside the region. This may also be the case for entrepreneurship. Finally, negative lock-in represents the most difficult problem for regions today. Negative lock-in may occur when regional specialization has emerged in a sector that in the medium or long term does not have good growth potential, but which may still be an important part of the region's industrial identity. In this context, it is not necessarily just lock-in in obsolete technology that is in question, but also lock-in in skills and market terms. The main challenges for the development initiative in such a situation is to influence those actors who represent or support the specialization that is risky or problematic in the long term to be open to new inspiration or to change direction. The prerequisites for avoiding this kind of negative lock-in are probably better in regions with a diversified economy within related industries, as this provides opportunities for new combinations of existing knowledge and thus renewal in terms both of technology and of market orientation. Additionally, Henning et al (2010) describe a final issue that is complementary to all the previous ones (4) inconsistencies between the regional economic structure and the priorities of the regional policy. A lack of correspondence between the policy measures implemented by the actors in the innovation system's support structure and, on the other hand, the regional economic structure, can result in an inefficient support structure and an unexploited regional innovation capacity.

Innovation and entrepreneurship are closely related. Innovative entrepreneurs are often among the most important drivers of economic growth (Cornett – Sorensen 2015). In the case of Europe the innovative orientation is relative high among early stage entrepreneurs (Bosma et al 2012).

Innovation is the process transformation of creative ideas, knowledge into practical applications. Entrepreneurs' task to bring innovation into the market place through the commercialization of ideas and new knowledge. For Baumol (1993) ***the entrepreneur's productive contribution is innovation and also the dissemination of the innovations in the market.*** The set-up of the regional and national system of innovation becomes crucial factors for the effectively functioning business environment (Cornett – Sorensen, 2015).

In the REDI ***Product*** and ***Process Innovation*** pillars – as part of Entrepreneurial Aspiration sub-index – were measured by *Technology Transfer* and *Technology Development* institutional variables, respectively. *Technology Transfer* as institutional-level variable was exemplified by some variables of the „Innovation sub-index" created by Annoni and Dijkstra (European Regional Competitiveness Report, regional level) using variables as (1) total patent application, (2) scientific publications, (3) high-tech inventors, high-tech patent applications, (4) ICT inventors, PCT patent applications. While *Technology Development* institutional-level variable was exemplified by regional GERD data. As individual-level variables *New Technology* and *New Product* calculated by GEM was employed. Individual-level variables were combined with *Product Innovation* and *Process Innovation* variables developed by Capello et al (2013) (see detailed descriptions of the variables in the Appendix A and B).

C. Protection of property rights

Based on broad historical studies such as North (1981) and Rosenberg and Birdzell (1986) or Rodrik et al. (2004) and Acemoglu and Johnson (2005), it is now widely recognized that protection of property rights is of fundamental importance for economic growth. Aidis et al. (2010) find the property right system to play a pivotal role in determining entrepreneurial entry, in particular in low and middle income countries while Johnson et al. (2002) also provide evidence that weak property rights discourage entrepreneurs from reinvesting profits. Depending on the level of protection of property rights different types of entrepreneurship will be favoured. For example, strong private property rights will help productive entrepreneurship to thrive as the entrepreneurial rents are expected to be retained. In contrast weaker property rights will favour the establishment of unproductive entrepreneurial activities or other productive activities such as private security services, created to solve the lack of security in the environment. Henrekson (2007) also points that in recent years the excessive protection of property rights is likely to impede productive entrepreneurship.

Using the Global Entrepreneurship Monitor (GEM) surveys for 42 countries over the period 1998-2005 Estrin et al (2009) find that a strong property rights system is important for high-growth aspiration entrepreneurship, but has less pronounced effects for entrepreneurial entry.

In the REDI index ***Risk Acceptance*** pillar – as part of Entrepreneurial Attitude sub-index – was measured by *Business Risk* institutional variable and by *GEM Risk Acceptance* individual-level variable. As institutional variable *Business Risk* was measured by „Business Extent of Disclosure index" (World Bank, World Development Indicators, available only country level, see more detail in the REDI Report, 2014, 137. p.). While *GEM Risk Acceptance* variable shows the percentage of the 18-64 aged population stating that the fear of failure would not prevent them starting a business.

Potential variables which can be tested as new REDI institutional variables:

- ***Property right***: rather using country level data, regional level data are more favourable.

D. Finance

Small and newly established firms are more dependent on equity financing than large, well-established firms. Individual wealth positions have been considered as an important determinant in explaining the propensity of individuals to become entrepreneurs and to innovate in the case of SMEs (Parker, 2004). However, in the case of pure traditional measures of entrepreneurship, the literature seems not to be conclusive in determining the effect of saving rates on entrepreneurship. Young (1992) compares the cases of Singapore and Hong Kong and concludes that having GDP rates very similar but double the saving rates in Singapore, the Hong Kong economy appears to be more entrepreneurial. In the case of the mature welfare states in Northern Europe the entrepreneurial activity as conventionally measured seems to be low. Welfare state provisions such as unemployment or sick-leave benefits, income-dependent pensions and subsidizing health and care services remove a number of savings motives for 27 the individual and this could be the reason why entrepreneurs do not have at their disposal the required savings to start a business. Henrekson (2007) also points that the composition, and not just the volume, of saving is of importance for entrepreneurship. For this reason, any social arrangement that channels savings and asset control to large institutional investors is likely to limit the supply of financial capital to potential entrepreneurs. While it is hard to deny the importance of banks in the provision of traditional type of debt especially in the European Union, over the last two decades some alternative forms of mainly equity financing has been emerging.

Entrepreneurial finance refers to the alternative sources of capital (Denis, 2004; Winton – Yerramilli, 2008). For startups and entrepreneurial firms venture capital is particularly important (Berger – Udell, 1998; Gompers et al, 2005; Kanniainen – Keuschnigg, 2004). Beside money, venture capitalist and business angels provide various assistance and help to the generally inexperienced young business owners (Gompers, 1995, Helman – Puri, 2002). Most start-ups have no other choice but to approach their relatives, friends or other acquaintances if the founders own savings are not enough for launching the business (Mason, 2007). GEM data based analyses highlight that the amount of informal investment exceeds that of the formal venture capital by 8-20 times. At the same time the average amount invested in one business by venture capitalists can be hundreds times higher than that of the informal venture source of family members, friends and alike (Bygrave – Hunt, 2004; Bygrave – Quill, 2007). Overall, the adequate supply of both formal and informal venture capital is vital for providing the necessary fuel for high growth potential businesses in their critical phases of the life cycle. ***Both formal and informal investment, in particular angel finance, tends to concentrate to more prosperous agglomerated areas*** (Florida – Smith, 1993; Jones-Evans – Thompson, 2009; Martin et al 2002, Mason – Harrison, 2003). ***Spatial proximity regarding financing is particularly important in certain high tech, biotechnology or internet based sectors and clusters*** (Powell et al, 2002; Zook, 2008).

Venture capital is not just money. Venture capitalists provide their networks, contacts, linkages, and resources necessary to launch new enterprises as well. Venture capital help attract entrepreneurs and skilled workforce to regions where it is abundant, creating a self-reinforcing cycle of firm formation, innovation, and economic development (Forida – Kenney, 1988).

In their study, Baron and Markman (2000) point out that entrepreneur's social skills also play a role in their success. A high level of these social skills, built on reputation and experience facilitate entrepreneurs reaching access to venture capitalists. On the other hand, using unique data set for the United States, Kim et al (2006) examined the relative importance of three forms of resources in pursuing start-up ventures: financial, human, and cultural capital. Their results show that neither financial nor cultural capital resources are necessary conditions for entrepreneurial entry. Davila et al (2003) examines the relationship between venture capital (VC) and the growth of start-ups. According to their findings venture-backed start-ups grow faster. Samila and Sorenson (2011) using a panel of U.S. metropolitan areas, find that increases in the supply of venture capital positively affects firm formation, employment, and regional income. Sternberg (2009) also identified financing as one of those regional factors which affect an individual's entrepreneurial propensity and activity.

Mason and Harrison (2003) analysed the regional distribution of venture capital investments in the UK in the 1990s. They conclude that the regional concentration of venture capital as investments in nascent firms with high growth potential remained highly concentrated in densely urbanized areas. In their study Martin – Berndt – Sunley (2005) analysing UK and German data they find clear evidence that the venture industries in both countries are spatially embedded. Venture capital firms inclined to concentrate and their regional location shows clear evidence of spatial proximity effects. On the other hand, Fritsch and Schilder (2008) examine the role of spatial proximity for venture capital (VC) investments in Germany. However, their analysis confirms that regional proximity is less dominant factor in VC partnership.

In the REDI index ***Financing*** pillar – as part of Entrepreneurial Aspiration sub-index – was measured by *Financial Institutions* as institutional-level variable and ***Informal Investment*** as

individual-level variable. *Financial Institutions* variable was denoted by (1) the Depth of Capital Market (country level) and by (2) variable measures the concentration of financial services (regional employment in financial services sector as percentage of total regional employment, regional level). *Informal Investment* variable was created by using GEM Business Angel and Informal Investment individual-level variables (see detailed description of the variables in the REDI Report, 128. p., 141. p.)

4.5 The Role of the State

A. Regulations

The regulative institutions are those controlling systems that are legally sanctioned, such as laws and regulations. Normative institutions, however, are not necessarily linked to any direct sanction system, but are maintained by (often unconscious) moral considerations and are thus indirect sanction systems (anyone who does not adhere to normative institutions loses his legitimacy and is marginalized in the long run). Examples of normative institutions are perceptions of what is accepted as good business practice in different contexts. Views on this may differ between industries, nations or regions. The cognitive institutions are shaped by culture and daily routines/practices and are thus more or less taken for granted by individuals. They are adhered to, therefore, without further reflection (Moodysson, 2007). One example of this is the way in which problem-solving is conducted. In somewhat simplified terms, one can say that regulative institutions are largely but not entirely formal (particularly with regard to laws and regulations), while normative and cognitive institutions are to a significantly greater extent informal (norms and values). The above classifications do, however, overlap to

a certain extent. As such, the three institutional types should not be regarded as distinctly separate categories, but rather as interdependent, inseparable dimensions that together form the institutional framework that affects the harmony of the innovation system by governing actors' behaviour towards each other and the outside world. (Henning et al, 2010) The literature has shown that ***the effect on entrepreneurship activity on regional development is driven by the institutional context in which entrepreneurial activity takes place***. Since Baumol (1990, 1993), a literature has emerged suggesting that ***disparities in entrepreneurial activity between countries (or regions) can be explained by the quality of their supporting institutions***. Institutional theory has argued that ***company behaviour, including entrepreneurial choices, will be context specific*** (Meyer – Peng, 2005), and a literature has emerged to show that e***ntrepreneurial activity is sensitive to the quality of institutions*** (Batjargal, 2003; Henrekson, 2007; Sobel, 2008) as well as to the level of economic and social development. The institutional context can be either conducive or detrimental to the entrepreneurship. It is reasonable to think that higher levels of corruption or weaker intellectual property rights will have a negative impact on entrepreneurship. A favorable business environment, where entrepreneurial activities are supported by institutions and a trustable governance system, will infer a positive effect in the creation and impact of entrepreneurship (North, 1990, 1994; Baumol, 1993; Davidsson – Henrekson, 2002). The degree of regulation of labour markets and wage-setting can be expected to influence incentives for entrepreneurship, since it restricts the freedom of contracting and therefore curtails the possible combinations of factors of production. The literature has found important differences between countries in terms of labour market regulation. 3 Although the impact of institutions on entrepreneurship can vary depending on the stage of entrepreneurship and aspects such as the stage of economic development of the country or region, in this section

these two aspects will be omitted. We then are going to consider as a whole the institutions that have an influence in entrepreneurship creation and their impact non-discriminating the stages of entrepreneurship. Henrekson (2007) states that there are reasons to believe that strict employment security provisions, and other regulations that restrict contracting flexibility, are more harmful for smaller and more entrepreneurial employers. Another labour market arrangement that may impact on the incentives for entrepreneurship is wage-setting institutions. Institutional pressures for wage compression are likely to disadvantage smaller and more entrepreneurial businesses. The cross-country comparative studies on the effect of labor market regulations on job counts can help to understand some entrepreneurship and firm evolutionary patterns. Birch and Medoff (1994) hypothesize that in the US the really good entrepreneurial firms become fast-growing gazelles and the self-employment is fairly low in US. Oppositely, in Italy, the high regulatory environment with high labor taxes make difficult and risky to grow businesses, such that they prefer to remain smaller (Lazerson – Lorenzoni, 1999). In empirical studies it found that strict regulatory environment on product markets have a negative effect on productivity and new firm formation (Scarpetta et al 2002).

In the REDI index ***Opportunity Startup*** pillar – as a part of Entrepreneurial Abilites sub-index – was measured by institutional-level Business Environment and GEM individual-level Opportunity Motivation variable. *Business Environment* institutional-level variable was exemplified by Business Freedom developed by Heritage Foundation (only available for country level) and QoG Index (for regional level). *GEM Opportunity Motivation* variable shows percentage of the TEA businesses initiated because of opportunity start-up motive (rather than necessity).

B. Corruption, quality of governance

Corruption has been seen as being negative for firm entry by raising the costs and therefore reducing the returns to entrepreneurial activity (Anokhin – Schulze, 2009). Desai and Acs (2007) argue that a corrupt environment may have negative supply side effects on entrepreneurs, and especially on those with higher aspirations, leading them to satisfy their ambitions through rent seeking rather than the formation of new firms. The effects of a corrupt institutional environment seem to have higher negative effect on higher growth aspiration entrepreneurship. Its negative effect impact more highly on potential new firms than incumbents, because incumbents have developed a higher resilience in operating longer in corrupt environment which is highly uncertain (Aidis et al, 2008, 2010). Estrin et al (2012) find that the coefficient on freedom from corruption appears to be highly significant in explaining employment aspirations by entrepreneurs.

In their study Djankov et al (2002) analysed how much time and money that a firm requires to spend on starting a new venture in 85 countries. They find important coherency between higher entry costs and high level of corruption and the size of ineffective unofficial sectors. Strict entry regulations help utilization of the private and public goods in a more effective manner. Rule of law, adequate regulations, and control of corruption can reduce income inequality and poverty, foster education, enhance the subjective happiness of citizens, a lower the chance of civil war and, in general, consolidate democratic institutions (see literature review of Djankov et al 2002).

In their paper Chowdhury – Audretsch – Belitski (2015) consider a possible moderating effect of corruption on nascent international entrepreneurship. Their findings indicate that the effect of regulations in the case of this type of firms depends on the types of regulation. According to their results corruption serves as both *grease* and *sand* for international new ventures. They highlighted the fact as well that corporate tax is not a significant deterrent factor for firms when corruption is low.

In the REDI index ***Cultural Support*** pillar – as a part of Entrepreneurial Attitudes sub-index – was measured by institutional-level *Open Society* and *GEM individual-level Carrier Status* variable. Open Society institutional-level variable was exemplified by Personal Freedom developed by Legatum (only available for country level) and regional Corruption index. *GEM* Carrier Status variable shows (1) the percentage of the population age 18-64 thinking that people attach high status to successful entrepreneurs (Status), and (2) the percentage of the population age 18-64 saying that people consider starting a business a good carrier choice.

5. The Re-composition of the REDI by Introducing Additional Institutional Variables

5.1 Industrial Specialization

One aspect of industry specialization that is important for regional economic growth is the type of entrepreneurial activity. While there are many different type of start-up firm one type of specialization is especially important. That is while many firms are similar a subset of these is about scale and wealth creation. This subset of high impact firms is responsible for most of the job creation, innovation and growth. Other types of agglomeration patterns are also associated with entrepreneurship. In the case of Finnish regions, economic specialization was shown to have a positive effect on regional firm formation (Kangasharju – Pekkala, 2004). The degree of industrial specialization provides the opportunity for industries to explore localization economies also in the case of Greek regions (Fotopoulos – Spence, 1999). In the case of Italian regions, the production structure and mainly local productive specialization appear to be one of the most important determinants for explaining firm formation and regional differentiation. The high specialization of the industrial environment, associated with an overrepresentation of small businesses, is positively associated with high new firm formation rates (Garofoli, 1994). Likewise Delgado et al (2010) pointed out that ***the presence of industrial specialization accelerates the growth of newly established firms and their performances***. Qian et al (2012) confirm that ***specialization presents a positive and significant relationship with human capital, and exhibits a positive direct effect on entrepreneurship***. Although specialization in specific industries may positively impact on firm formation, the findings contrast with the more general ideas from agglomeration theory as discussed in the

above, and the spill-over theory of entrepreneurship. Both advocate that a diverse set of actors will stimulate the discovery and development of new entrepreneurial opportunities. Audretsch and Keilbach (2008) confirm this empirically for Germany.

On the contrary, there are also some evidence that specialization can contribute to firm exit. For instance, Staber (2001) and Antonietti et al (2013) concluded that belonging to a specialized industrial district can seriously reduce firm survival. Also the empirical findings derived by Glaeser et al (1992) suggest that industries grow slower in regions where they are overrepresented.

Potential variables which can be tested as new REDI institutional variables:

- „Specialization" variable calculated by Cluster Observatory for regional level, also well-known in the literature as the Location Quotient (see also O'Donoghue – Gleave, 2004).
- Reviewing literature for indexes which measure specialization: see as an example Fotopoulos – Spence (1999) and their „Specialization Coefficient" index.

5.2 Labour Markets

The labour market and entrepreneurship has a complex relationship. Several studies investigated the question whether the processes of labour market do have an impact on the new firms' creation. One of the main fields among the different labour market issues is the effect of unemployment on the new entrepreneurships. The results of studies showed that the relationship of unemployment rate and entrepreneurial performance is ambivalent. Basically, there are two main effects among unemployment and new venture creation: the push effects and pull effects. The "push motivation" of new firm's foundation seems to be

stronger as the unemployment rate is relatively high in a region, because unemployed persons starts to self-employ themselves instead of being unemployed. Among others Storey (1991), Marlow and Storey (1992), Tervo and Niittykangas (1994), Ritsilä and Tervo (2002) found that these push forces dominate at the personal level. The "pull motivation" seems to be stronger as the region's economic performance relatively strong and unemployment rate is relatively low, the higher level of demand creates opportunities for new start-ups (see for e.g. Delmar–Davidsson 2000, Fölster 2000, Ritsilä and Tervo 2002). Some studies analysed the changes of unemployment rate. Garofoli (1994) claimed that increasing unemployment rate reduces the number of firm births. Similar results were provided by Davidsson et al. (1994) and Reynolds et al. (1994). Some recent studies have investigated the unemployed people as a heterogeneous mass and assumed. Audretsch, Dohse and Niebuhr (2015) assumed that unemployed people differ from each other in their qualification or duration of their unemployment status They proved for German regions that there is a positive connection between high-qualified unemployed and knowledge-intensive start-ups. The analysis found that for knowledge-intensive new firms the skills (for example university degree) may be more important than the duration of unemployment. However they also emphasized that long-term unemployment discourages people for starting new ventures in low- and medium-tech sectors and the effect of long-term unemployment is ambiguous in the case of new firms in high-tech sectors.

Unemployment is not the only factor that may impact entrepreneurial activity and new firms' creation. According to Masuda (2006), the unemployment rate and total cash earnings have positive impacts on latent entrepreneurship. Klapper et al. (2006) investigated the effects of different entry regulations (among them labour regulations) on entrepreneurship. They found that labour regulations have a dampening effect on entry in labour-intensive industries. It is

more or less similar as Scarpetta et al. (2002) found. They proved by using a firm-level survey that firm entries are lower in those countries where labour regulations are stricter. The mobility of labour, especially the high-qualified labour may play also an important role in founding new firms. Audretsch and Lehmann (2005) built a link between agglomeration economies, knowledge creation and entrepreneurship in the Knowledge Spillover Theory of Entrepreneurship. According to this concept concentration of human capital facilitates the creation of new knowledge, physical proximity helps the easy flow among local agents, and finally knowledge spillovers generate entrepreneurial opportunities. Frederiksen, Wennberg and Balachandran (2016) studied the effect of labour mobility for the entrepreneurial entry rate. They found that there is a positive link among the mobility and founding new entrepreneurships, but it does not affect the entrepreneurial performance. These processes are driven not only by the accumulation of knowledge from mobility, but alternative mechanisms also, such as an individual's "taste for variety" or individuals being ill matched to the labor market.

As the first version of REDI Index was composed, there were several attempts to put a measure for labour market issues. We focused on regional unemployment rate primarily. However the draft results and tests strengthened what the literature emphasizes, that its relationship to new firms' creation is ambivalent. Because of these ambiguous results, the regional unemployment rate could not be built in REDI Index. Although the unemployment measure was omitted, other employment measures were involved in Pillar "Technology Adoption", "Competition" and "Financing". In the first case the regional concentration of high-technology sectors' employment (high-tech manufacturing and knowledge-intensive services) and human resources in science and technology were included. To measure the business sophistication within "Competition" pillar, we applied the employment share of sophisticated sectors (J and

K sectors) compared to the total employment. In the third case, the regional employment share of financial service sector was one of the indicators which composed the “Financial Institutions” pillar.

Potential variables which can be tested as new REDI institutional variables:

- Share of self-employed persons within all employed persons (by Eurostat),
- Change in share of employed persons who do not work in that region where officially lives (commuting employment) (by Eurostat)
- Change in share of part-time and full-time employed persons (by Eurostat)
- Change in share of short- and long-term unemployed persons (by Eurostat)

5.3 Taxation

It is a widely accepted opinion that taxation can influence the decision to become self-employed. Nevertheless, it is also a common view reflected in the literature that tax system can generate complex, often equivocal and even paradoxical effect on the level of entrepreneurship. Due to the increased availability of datasets research being concerned with the effects of taxation on entrepreneurial activity has multiplied. However, despite the ardent interest testified by the rapidly growing literature, thus far little consensus has been achieved with regard to the effects of taxes on entrepreneurship. As a consequence of the theoretical ambiguity it remains unanswered whether taxation has an incentive or deterrent consequence on entrepreneurship.

It seems to be a reasonable arguing that taxation curtails entrepreneurial payoff, therefore in this manner, high taxes deter the founding of new firms and the growth of incumbent firms as well. On the contrary, in regions where expected reward earned by entrepreneurs is high, perhaps because of favourable taxation, higher rates of self-employment can be observed (OECD 1998). However, to prove this relationship is virtually impossible. Many articles also highlighted the fact that high taxes could promote and induce self-employment, because it offers better opportunities to avoid reporting and hide some of their income and evade or avoid tax liabilities (Murphy et al 1991; Parker, 1996; Hamilton, 2000; Hall and Sobel 2006).

Nevertheless, other recent time-series analyses have not found a significant effect of taxes on firm rates (Briscoe, Dainty, and Millett 2000, and Bruce and Mohsin 2003). Moore (2003) using cross section US tax data even found a negative relationship between tax rates and self-employment. Henrekson et al (2010) further moderate this view by arguing that high taxation on income may encourage people to start a business, but it could also weaken their incentives

to develop high growth firms. HGFs do not start their ventures simply to avoid paying higher taxes, therefore authors argue that high taxes reduce opportunities for productive entrepreneurs with opportunity and growth motivation. They admit that their conclusion is still too simplistic, and emphasize that the different effects of different tax forms (corporate taxes, taxes on capital, VAT etc.) should be carefully considered as well. Also criticizing the results of earlier studies using the level of self-employment, which is a rather "crude proxy" for entrepreneurship.

In their study Bruce and Moshin (2006) made efforts to overcome some of the abovementioned critiques. They considered the effect of different tax policies (including income, payroll, capital gains, corporate income, and estate taxes) and use more advanced time-series econometric tools to test their hypothesis. Regression results show that most of the taxes have significant but small effects on entrepreneurship. They also confirmed that taxation is likely to be an ineffective tool for provoking changes in entrepreneurial activity.

There are countries where low tax rates do not enhance the level of entrepreneurship, while other countries with rather high tax rates are highly entrepreneurial. The effect of taxation is also determined by the nature of entrepreneurial motivation, whether we talk about an opportunity seeking or a necessity driven firm. Besides the extent of the tax rate, the predictability as an overall attribute of the tax system is important as well. If tax system can be characterized by high uncertainty, it can lower the propensity of entrepreneurial risk taking.

<u>Potential variables which can be tested as new REDI institutional variables</u>:

- World Bank, World Development Indicators offers indicators related to taxation, e.g. Tax revenue (% of GDP), Tax payment, Tax on goods and services, Taxes on income profits and capital gain (% of revenue), Labour tax and contributions (% of commercial

profit), Total tax rate, or Profit tax (% of commercial profit). We intend to multiply one or more of these tax related indicators with the Quality of Good Governance (regional) institutional variables.

5.4 Knowledge Institutions

As we have already summarized the main issues of knowledge spillovers and innovation, we will focus on the role of knowledge institutions in this section. Labour market issues, especially the skills and knowledge of employees are in close relationship with the knowledge institutions. New products and innovations may stimulate the foundation of entrepreneurships and generate new firms (Feldman 2001, Audretsch–Keilbach 2004, Stam 2010). The knowledge that induces the decision to start new firms is generated by investments. Therefore, the start-up serves as the mechanism through which knowledge spills over from sources that produced it (such as a university or research laboratory in an incumbent firm) to a new organizational form where it is actually commercialized (Acs et al. 2009).

According to the general concept of National Innovation System (for e.g. Lundvall 1992, Nelson 1993), firms are the appliers of knowledge that sources from knowledge institutions like universities and research centres. The regional innovation system has more or less the same structure as the national level. Furthermore there are some special processes like knowledge spillovers, agglomeration effects and clustering (Tödtling and Trippl 2005). Universities and research centres are the main source of knowledge and it has crucial role for entrepreneurships (Agrawal et al. 2004, Fritsch–Müller 2007 among others). The higher rate

of graduated people in given fields of study influence positively the regional entrepreneurial activity (Fritsch–Müller 2007).

The REDI Index applies different knowledge related measurements in different pillars. The indicators for high-tech and knowledge-intensive sector workers were mentioned at the labour markets. Beside them “Education and training” pillar contains measures for the share of tertiary educated people within the 25-64 years old population, and also the share of those who participate in education and training. The “Technology Transfer” pillar summarizes the innovation related indicators. It includes patent applications, scientific publications as well as high-tech-, ICT- and biotech-inventors. Since these measures have already been applied, it is relatively difficult to use more or less similar variables (like R&D expenditure for higher education sector, or number of researchers in higher education sector). However we could recommend the share of higher education sector in these measures (i.e. the R&D expenditure and researchers within higher education sector). The other way to measure effect of knowledge institutions on entrepreneurial performance would be the effect of spin-offs, but it is quite difficult to measure them.

<u>Potential variables which can be tested as new REDI institutional variables</u>:

- R&D expenditure of higher education sector
- Number of researchers and/or R&D employees in higher education sector

5.5 Digital Skills

As a brand new part of the REDI Index, digital skills measuring variables will be also included. It could be asked, why digital skills does play a crucial role in regional entrepreneurship. The info communication technologies (ICT) are having an emerging impact on economy. And it creates new dimension of location factors, regional differences and economic environment through this increasing effect. As Graham (2000) provided some examples, the development of information and communication technology (ICT) extends the digital divide among different regions or cities within a country. He claims that a close connection can be observed between ICTs, global urban polarization, and the extending power of transnational corporations. Similar observations have been made by van der Meer and his colleagues (2003) about the territorial differences in the ICT sector.

Most explorations of the effect digitization has on economic growth show that causality runs from investment in digital infrastructure to desired economic outcomes: in other words, the digital infrastructure drives economic development, not the other way around. Roller and Waverman (2001) demonstrate that investment in digital infrastructure drove subsequent economic performance in 21 OECD countries from 1970 to 1990. Similar effects have been reported for EU countries (Timmer, Ypma, & Ark, 2003), Central and Eastern Europe (Madden & Savage, 1998) and in global sampling that covers all continents (Hardy, 1980; Jorgenson & Vu, 2005).

There is strong evidence that investing in the digital infrastructure is beneficial for the economy. The implication for policy, then, is that to make an economy stronger and more dynamic a country should invest in digital infrastructure. However, while this advice rests on convincing evidence, it is not very nuanced. Should digital infrastructure always boost

economic growth? There is little evidence that ICT has a positive influence on SME performance (Jordan & Galperin, 2011). This suggests that the link among entrepreneurship and economic development, while resting on powerful overall evidence, is not very useful in guiding policy. To understand the relationship more fully and support more effective policy, we need to take a closer look at the mechanics of the relationship. In other words, why should investment in digital infrastructure drive economic growth?

The link between digital infrastructure, entrepreneurship and innovation as well as economic development is consistent with the European Commission's strategic policy on digital entrepreneurship (European Commission, 2015). However, this relationship is not detailed enough to support smarter policymaking for the Digital Economy. To understand the relationship more fully, we need to understand how the digital infrastructure promotes entrepreneurship and innovation, and thus drives the Digital Economy. Digital infrastructure combined with entrepreneur¬ship and innovation gives us digital entrepre¬neur¬ship; the entrepreneurship leverages the infrastructure to drive economic development.

We have already applied some measures of information society in the REDI Index. These indicators were used in "Social capital" variable and they focused on the technological readiness of households. They measured the access of households to Internet and use of e-buying opportunities. As digital skills will be included in the structure of REDI Index, we will deepen the circle of indicators, and the new measures will focus on the use of Internet for different activities on the one hand and the use of "wireless" Internet (i.e. access the Internet not at home or work) on the other hand.

<u>Potential variables which can be tested as new REDI institutional variables</u>:

- Share of individuals who used the internet, frequency of use and activities,
- Share of individuals who used the internet for interaction with public authorities,

- Share of individuals who accessed the internet away from home or work