



**CRIANDO CAPACIDADE DE RESILIÊNCIA ATRAVÉS DA  
INOVAÇÃO: DESTAQUES DE RELATÓRIOS EUROPEUS**

**BUILDING RESILIENCE CAPACITY THROUGH INNOVATION:  
HIGHLIGHTS FROM EUROPEAN REPORTS**

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# **BUILDING RESILIENCE CAPACITY THROUGH INNOVATION**

## **RESUMO**

Mais do que nunca as empresas deverão desenvolver estratégias para lidar com crises e choques na economia e sociedade. Elas necessitarão da chamada capacidade de resiliência, a qual é um termo agregador de estratégias e modelos de planeamento que podem ajudar as empresas a desenvolver a capacidade de lidar com desafios. O presente artigo é baseado num conjunto de trabalhos que exploram relatórios Europeus recentes sobre performance de inovação. A discussão constata que as empresas terão de encontrar novos modos de reduzir a sua resistência ao risco e tornar-se mais flexíveis. Para serem mais resilientes, deverão adotar estratégias que lhes permitam desenvolver capacidades que melhor respondam e se adaptem aos choques socio-económicos. Tais capacidades devem ser planeadas no sentido de tornar os nossos atuais sistemas económicos mais flexíveis e dinâmicos. As pequenas e médias empresas estão mais expostas às pressões competitivas. Assim, a escolha de setores e de parcerias são oportunidades fundamentais. Com a polarização da criação do conhecimento na Europa, poucos são os países responsáveis pela maior parte da inovação e produção de conhecimento. Por isso, deve ser dada atenção ao investimento em difusão e captação de conhecimento dependendo do contexto nacional. O facto de algumas características do sistema nacional de inovação explicarem a persistência em inovar face a choques económicos traz esclarecimento sobre a resiliência de certas empresas.

***Palavras-chave:** crises económicas, performance de inovação, resiliência, sistemas de inovação, startups.*

## **ABSTRACT**

More than ever firms will be required to develop strategies for coping with shocks and stresses to our economic and social infrastructures. They will need to build the so called resilience capacity, which is an umbrella term for the planning and design strategies that can help firms develop the capacity to cope with challenges. The present work is based on an assessment of works that explored recent European reports on innovation performance. The discussion acknowledges that firms will have to find new ways to reduce their risk-aversion and become more flexible. To become more resilient, firms will need to adopt strategies that

allow them to develop capacities that better respond and adapt to the economic and social stresses. These capacities must be planned to transform our current economic systems into much more flexible and dynamic ones. Small and medium enterprises are more exposed to competitive pressures. Thus, the choice of sectors and the design of public procurement policies are fundamental opportunities. With the polarization of knowledge creation across Europe, a few countries are responsible for the bulk of innovation and knowledge production. Therefore, attention should also be given to investment in knowledge diffusion and absorption depending on the specific national context. The fact of some characteristics of the national innovation system explain persistency on innovating in response to major external shocks sheds light on the resilient behavior of firms.

**Keywords:** *economic shocks, innovation performance, innovation systems, resilience, startups.*

## 1. INTRODUCTION

Most managers agree that innovation enhances business performance. But how can companies manage innovation in order to become more resilient? Resilience is an important concept for companies in turbulent times. Researchers refer it as the capacity to endure stress and bounce back. It is an umbrella term for the planning and design strategies needed to help firms develop the necessary capacity to meet challenges. The need to build capacity for resilience will require firms to develop strategies for coping with continuous shocks and stresses to our economic and social infrastructure systems. This work compares the results from recent European reports on the impact of economic crisis on innovative performance. These reports have captured differentiating impacts of the world crisis on innovation behavior. Some of the impacts acknowledge that firms will have to find new ways to reduce their risk-aversion and become more flexible. For example, through dynamic design strategies which are based on clear guidelines for information systems design fitted to a flexible organizational design. The main objective is to cope with infrastructural shocks, in order to facilitate the development of a greater capacity for future resilience.

In social systems, resilience is the added capacity of humans being able to anticipate and plan for the future. In both human and ecological systems, resilience is conferred by their capacity for adaptation to the exogenous stresses. Thus, to become more resilient, firms will need to adopt strategies that better respond and adapt to future economic and social crisis. Those strategies will involve firms in a complex web of planning decisions that must be designed to transform our current economic systems into much more flexible and dynamic ones. Planning and design competences will be more challenged to find new paradigms, new tools and new business models in order to implement future resilient organizational structures.

Besides the correlation between insufficient financial resources and stagnation, at an increasing number of firms, the problem is also connected with technology solutions and lack of related skills and knowledge (Antlová, 2010). Therefore the companies try to develop their applications in-house, sometimes not in a sophisticated mode. In companies where the potential of new technologies is incorporated in the long term business strategy, and where the relationship with costumers is developed, there is more sustainable growth (Fernandes, 2010). Then it is important to improve the technology competencies of management and employees.

The development of knowledge networks in organizations is one concrete solution. A knowledge network involves a set of people, resources and relations assembled in order to capture, transfer and create knowledge. For example, there are some firms with their own wiki-type knowledge database of practices shared by employees whose contributions are then monitored using balanced scorecard (Kaplan and Norton, 2004). This tool provides managers with comprehensive frameworks that translate a company's strategy into a set of performance measures. These measures can be used to help align individual, organizational and cross-departmental initiatives. This tool is then used as a communication, informing and learning system. Previously, it was used the enterprise architecture approach for integrating and crossing initiatives for aligning proposes. However, this approach has lost flexibility and real-time dynamism due to the standardization of its application. More dynamic approaches or models are required using wikis, balanced scorecard, action matrixes, etc.

The above-mentioned cases have included in their corporate strategy's requirements the consistent use of their costumers and employees' knowledge/experience. On the basis of this attitude to management, corporate knowledge management strategies are significant factors of organization's growth to be incentivized. In today business environment, not only organizational but also individual knowledge can make difference in gaining competitive advantages. It is crucial to align business strategy with knowledge management, especially through knowledge sharing and creation. Also, most effective technology tools should be integrated to support business and knowledge processes and help create a sharing environment. Small and medium enterprises are more exposed to high competitive pressures. Thus, they have to search for new business opportunities and this effort has to be significantly supported by information system tools' sharing.

This paper is organized as follows. The next section puts forward the theoretical background of the subject. Section 3 presents some sources for comparison and discussion on innovation and crisis resilience across Europe. Section 4 explores aspects and challenges of resilient systems of innovation. And section 5 concludes this work with some final considerations.

## **2. RESILIENCE: THE BALANCE BETWEEN EFFICIENCY AND RENEWAL**

In the 1980s companies were primarily interested in furthering innovation through specializing in fields of expertise. In the 1990s the emphasis shifted toward sharing knowledge across these fields of expertise and facilitating internal knowledge transfer

(through company intranets and best-practice teams). Today, companies go beyond conventional knowledge, searching for new knowledge and new insights. The important thing is the company's ability to recover fast and quickly get back in the game with new strategies and business models. These are resilient companies, seeking new knowledge both within and outside them and working hard to sustain their entrepreneurial behaviors. Lengnick-Hall and Beck (2005) differentiate three types of resilience:

- 'cognitive resilience', when the company has a deep understanding of what is happening around it, not only noticing how things change but making sense of those changes;
- 'behavioral resilience', when the company reacts to the opening communication channels creating interpersonal ties and seeking multiple sources of information when uncertainty increases;
- 'contextual resilience', when the company depends on internal social connections, interpersonal networks which rapidly help it cope with and respond to changes.

However, companies are failing more frequently and innovating less quickly because the world is becoming turbulent faster than organizations are becoming resilient (Kanerva and Hollanders, 2009). Even successful companies are finding more difficult to deliver consistently superior returns. Most companies have been working in retrenchment mode, resizing their cost bases to accommodate this unprecedented competitive pressure. Focus is reinforced every day through many ways: training programs, benchmarking and measurement systems. But are these ways reinforcing strategic variety and wide-scale experimentation? And how have these been reflected in employee training, management processes and performance measuring? Resilience will only become a process when companies dedicate as much energy and work for continuous renewal as they have done for operational efficiency (Hamel and Valikangas, 2003).

Some strategies have focused on corporate attributes, while others have focused on issues such as risk awareness and reduction of vulnerabilities. And strategic resilience has been defined as a capability companies need to reinvent themselves in order to overcome barriers and develop multiple sources of advantage (Reinmoeller and Baardwijk, 2005). According to these authors, most resilient companies are those that continually integrate a dynamic balance of four main strategies: 1) knowledge management, 2) exploration, 3) cooperation, and 4) entrepreneurship.

Thus variety matters for resilience; if the range of strategic alternatives a company explores is narrower than the breadth of change in the environment, its business will be more vulnerable to turbulence. Also, if a company systematically favors existing programs over new initiatives and experimentation, it will find itself investing in declining strategies and outdated programs. Open innovation is bridging internal and external resources and executing on the opportunities that arise from this combination. Beyond the benefit of ensuring that companies remain focused on the marketplace, working with external partners means that executives become familiar with other ways of doing things. Open innovation also allows corporate leaders to evaluate their practices in light of other real-world examples. As open innovation becomes more prevalent the functional, divisional or matrix organizational structures we know today will change. New structures will be a clear side effect of these types of initiatives.

### **3. WHICH FACTORS WEIGHT MOST?**

Comparing the results from the Innobarometer 2009 survey (European Commission, 2009b) and the European Innovation Scoreboard 2008 (European Commission, 2009a), a question arises: which are the most resilient companies? These surveys acknowledge that more resilient firms (facing the crisis) are:

- the more innovative, where products and services account for a larger share of sales, and where R&D (Research and Development) is part of their innovation activities;
- with broader innovation strategies, such as open innovation and user innovation;
- operating more in local markets than in international markets;
- that have public support;
- that have been experiencing effective rates of improvement in their innovation performance.

This could indicate a redirection of firms' activities to their home markets, and a need to reopen export markets for economic recovery. Surprisingly, most new firms in EU (European Union) are micro firms employing less than four people. It is the individual entrepreneur who starts his own business, alone or with a few employees. Thus, SMEs (small and medium enterprises) play an important role in the net growth of enterprise population. They are often established by young people with new ideas and keen on introducing innovations.

The continuous renewal of the enterprise population will stimulate the competitive position of the EU economy. According to the 2008 EU Survey on R&D Investment Business Trends

(European Commission, 2009c), the most successful business starters are in the service sector: research and development; computer and related activities; and real estate activities. And the subsectors that have the highest contribution to employment growth are also in the service sector: real estate activities; financial mediation; construction; hotels and restaurants. Adversity can turn into advantage: high unemployment can lead to more start-ups as people discover opportunities to start a business, either as employee or as young starter. Also enterprise death creates opportunities to latent entrepreneurs for start-up. Fast growing enterprises, besides creating more employment, they create additional growth of production in other enterprises through outsourcing relations.

Back to the comparison grounded on European reports, Filippetti and Archibugi (2011) crossed two indicators: *InnoStruct* (composite indicator addressing structure of country's system of innovation) and *InnoInv* (indicator addressing country's innovation performance) for the 2006-2008 period and then for the year 2009 (because this transition is specially related with the crisis impact). The crossing of these two indicators resulted in the following integrative map:

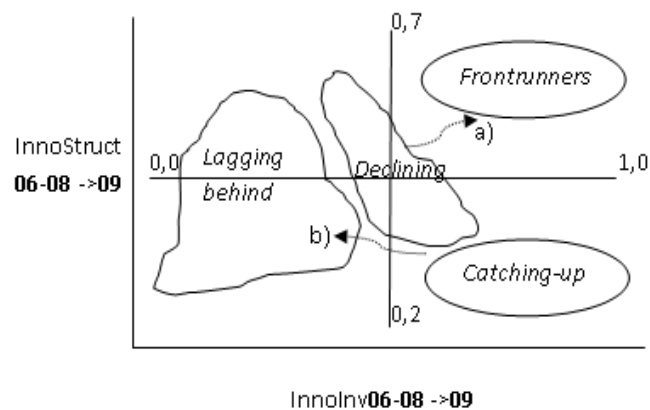


Figure 1. Innovation performance (*InnoInv*) and national innovation system strength (*InnoStruct*)  
Source: Filippetti and Archibugi (2011)

Legend:

- Frontrunners: this group consists of countries that show both a consolidated leadership of their innovation performance and an increase of their investments in innovation. Countries: Sweden, Switzerland, Finland, Germany, Austria;

- Catching-up: these countries do not have a high strength of their national innovation system, but they have been increasing their investments. This group includes the five new Member States. Countries: Romania, Lithuania, Bulgaria, Slovakia, Poland;
- Declining: despite having a strong national innovation system, these countries have been relatively less increasing their innovation expenditures. Countries: Denmark, UK, Luxemburg, Belgium, France, Netherlands, Slovenia, Czech Rep., Norway, Greece;
- Lagging-behind: these countries are characterized by a low innovation performance at national level and a low performance in innovation spending. Interestingly, this group includes some new Member States (such as Hungary and Latvia) as well as larger countries (like Italy and Spain). Countries: Ireland, Estonia, Portugal, Spain, Italy, Hungary, Latvia.

#### **4. HOW RELEVANT IS THE NIS (NATIONAL INNOVATION SYSTEM) STRUCTURE?**

According to innovation system theory, innovation and technology development are results of a complex set of relationships among actors in the system which includes enterprises, universities, research institutes and other actively related institutions. The concept of a national system of innovation was developed by Lundvall (1988), and was later applied to regions and sectors.

As a consequence of the crisis (from 2006-08 to 2009), the distance between the Frontrunners and the other countries has increased. This result is related with three major factors, among which the national innovation system has an important role (Filippetti and Archibugi, 2011):

- the impact of the global economic downturn on firms' investment in innovation had different magnitudes across European countries (such as the new Member States which initially were catching up and now are lagging behind -> b );
- structure of the national innovation system matters: countries endowed with stronger innovation systems are those less affected by the recession (such as the countries which initially were declining and now are tending to behave as frontrunners -> a );
- National innovation system's pattern: the historical processes behind the development and interaction of organizations and industries with national policies and institutions over time also contribute to the strength of the NIS (Fagerberg et al., 2009). This factor is called 'path dependency'.

For example, the case of Netherlands (a) has “strong local agents and a good coordination of them to explore their synergies, and this creates national research”, said Peter Nijkamp at an international meeting (Nijkamp, 2011). If these principles of connectivity are accomplished, in order to reinforce research initiatives for national and international projects, national research will function more effectively.

The next figures show several comparisons among those countries. For example, figure 2 illustrates venture capital investment (as a percentage of GDP) by country, depending on funding seed/start-up initiatives or early development expansions. Indeed some gaps on these results are related with the factors above mentioned.

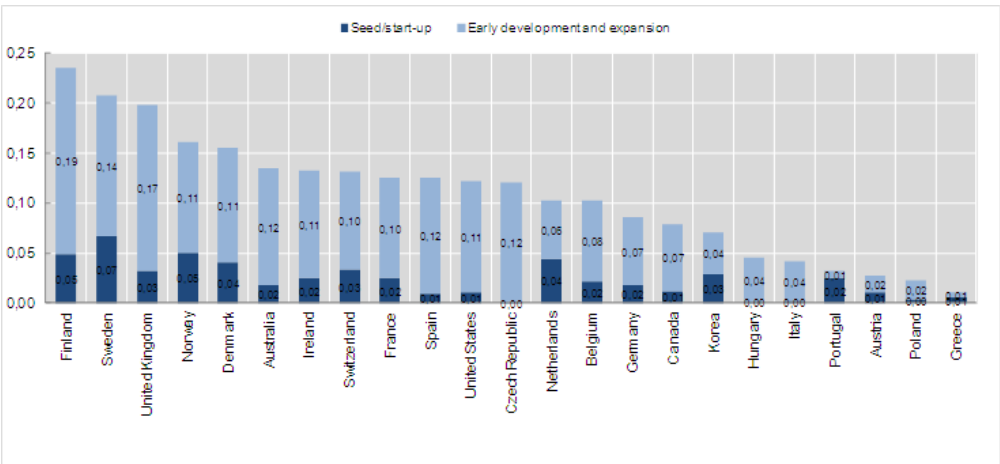


Figure 2. Venture capital investment as a percentage of GDP  
Source: OECD (2009a)

Frontrunners present the highest levels of venture capital investment, especially on early development expansion. These countries also experiment more direct government funding for business R&D (figure 3).

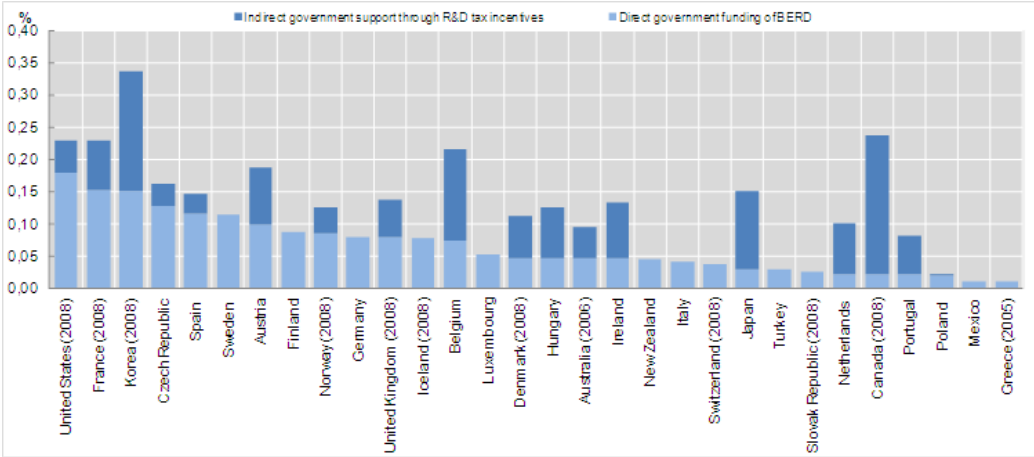


Figure 3. Direct and indirect government funding of business R&D and tax incentives for R&D as a percentage of GDP  
Source: OECD (2010a)

And this historical path justifies the strength of their innovation systems and performance, such as for instance the level of broadband support extension (figure 4).

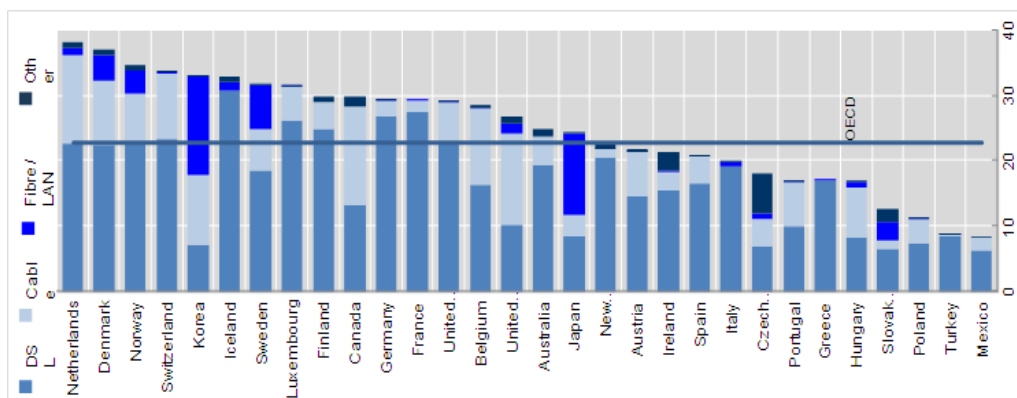


Figure 4. OECD broadband subscribers per 100 inhabitants, by technology  
Source: OECD (2009c)

Another interesting aspect is that innovations in frontrunner countries reveal more cooperation (partnerships) among inventors from the same region, or other domestic regions, than among inventors from foreign countries (figure 5).

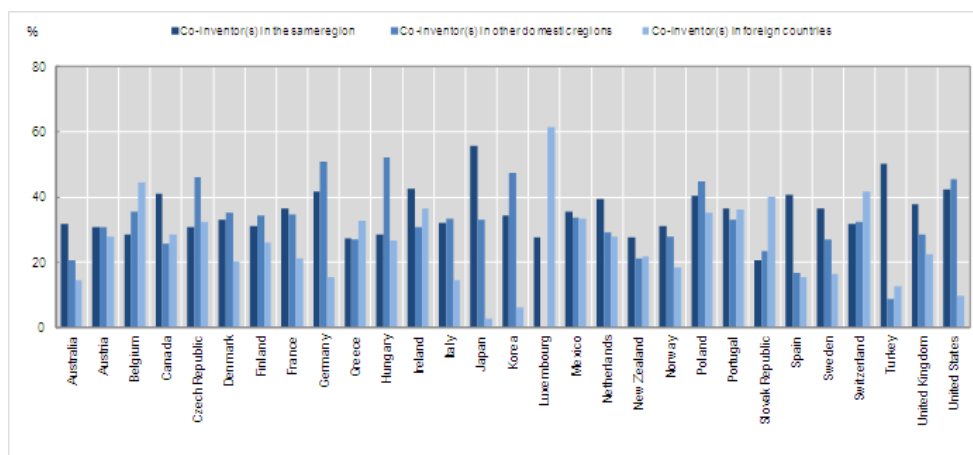


Figure 5. Regional average of PCT patents with co-inventor(s) by location as a percentage of all patents  
Source: OECD (2010b)

Thus, these countries have been strengthening or empowering themselves (in resources, linkages, skills, etc.). According to population evolution (based on data from the United Nations), cities will increase being based in both virtual and physical proximities. European

countries have to balance and plan this very well taking into account their resources and sustainability.

Even those frontrunners are the most attentive countries to current social and environmental stresses, as figure 6 shows for their higher levels of innovations on energy-efficient buildings/ lighting and renewable energy.

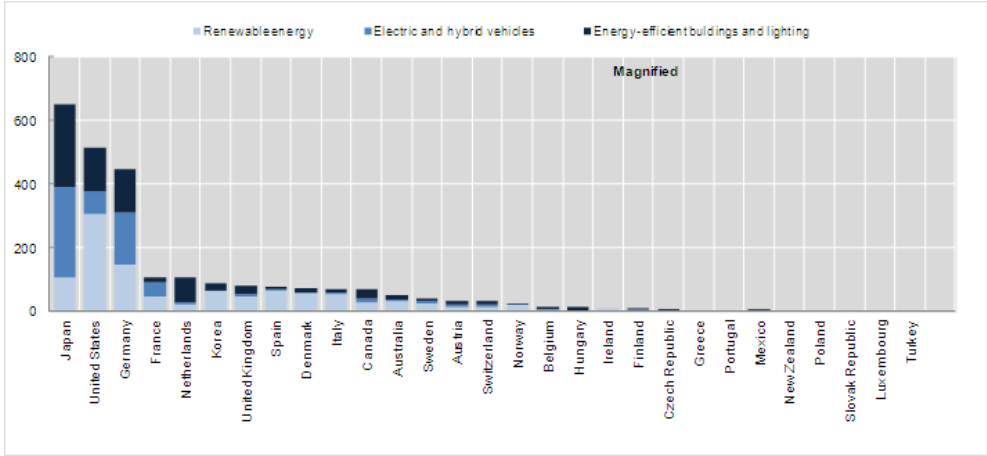


Figure 6. Patents for climate change mitigation technologies  
PCT patent applications  
Source: OECD (2010c)

According to Kitching et al. (2009), policies can have important roles in countering the negative effects of crisis and contribute to resilient enterprises and economies:

- policies and strategies should aim at furthering new business models and new networks of firms with public research organizations;
- help firms' creation by facilitating local networks in which new firms have better access to investors, technology and information;
- redefine cross-sector initiatives, through cross-specialist linkages and partnerships, as policies are still rooted in traditionally defined sectors;
- governments could promote firms that have grown fast in previous economic downturns and build case studies of their successful strategies and ways of resisting;
- foster creative talent and areas of technological strength. Policies focusing on current social stresses – climate change, transformation of regions<sup>1</sup>, and population ageing – could encourage new business opportunities.

<sup>1</sup> According to the *Regional Innovation Scoreboard 2009* (European Commission, 2010).

## 5. CONCLUSION

From the results discussed, clearly the negative effects of the world economic crisis are remarkable. And they are not likely to diminish in the immediate future. As the catching up countries are the worst hit by the recession, this also affects the EU convergence process in innovation performance. This can seriously hinder the reduction of regional disparities which is today a key factor for the EU to compete with US and Asian economies (such as China and India). Another important issue to address is the impact of the global crisis at country's regional level. Is the crisis exacerbating regional disparities inside countries? This analysis could shed some light on the presence of a double-level divergence in innovation performance across countries. The availability of more data at the regional level describing the impact of current crisis would be useful (European Commission, 2010).

Therefore, discussions of regional development are shifting from a focus on growth and development to a focus on the resilience of regional economies in response to rapid transitions in technologies, markets, and external economic shocks (Kanerva and Hollanders, 2009). This emphasis on sustainable regions rather than economic competitiveness will extend the research on learning regions to a broader conceptualization of embedded institutional adaptive capacities. Empirical evidence increasingly shows that institutional capacities and firm networks are more critical to the ability of regions to manage transitions (Treado and Giarratani, 2008). Agglomeration economies alone are not sufficient to guarantee the kind of ongoing innovation essential to firms' success facing shorter product cycles. Innovation increasingly requires a skilled creative regional labor market operating under entrepreneurial conditions (Gertler and Wolfe, 2002). Thus, resilience discussion emerges into the debate about the role of small firm innovation and entrepreneurship in developing long-run adaptive capacities in regions.

It remains to be seen how regions will be able to react since competencies, skills and knowledge are highly embedded in organizations, routines, workers' skills, capital goods. Another aspect to consider is: how will the economic environment be transformed by the crisis? New sectors can emerge as a result of new opportunities as well as of substantial public policies. An example is the "green industry" which is believed to be a fundamental source of innovation and development for the coming future (OECD, 2009b). The winners are more likely to be those which are equipped with both strong innovative infrastructures and

domestic knowledge base. If these factors are not properly accounted by country's public and business policies, there is the risk of its national innovation system being substantially weakened undermining resilience and growth.

The fact that some structural characteristics of the NIS explain persistency of innovation, in response to major economic shocks, sheds some light on the behavior of firms during crisis and represents a step forward in terms of understanding the aspects underlying the relationship between macro and micro-determinants of innovation.

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