Entrepreneurial Regions
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Chapter 6

6. Summary and Conclusions

6.1 Introduction

The endogenous growth revolution (Romer, 1986; Lucas, 1987) has established human capital and innovation as powerful sources of sustained economic growth. New growth theories have brought back Schumpeter’s (1934; 1942) insights on the role of the entrepreneur as a key driver of knowledge spillovers, technological change and innovation (Aghion and Howitt, 1992; Acs et al., 2013). Such approaches have returned entrepreneurship as a central issue in modern economic research (Parker, 2009) and policy agendas (Gilbert et al., 2004).

Following these new intellectual trends, regional science has shifted attention towards entrepreneurship and innovation-led dynamics of regional growth (Audretsch and Keilbach, 2004; Acs and Plummer, 2005). At the same time, the development of new theories of location, such as urban economics (Abdel-Rahman, 1988; Ciccone and Hall, 1996) or the New Economic Geography (NEG) (Krugman, 1991; Fujita et al., 1999), has reinvigorated interest in the regional determinants of the spatial variation of entrepreneurial activity (Audretsch and Fritsch, 1994, Glaeser et al., 2010, Sato et al., 2013). Thus latter question has drawn the attention of regional scientist since at least the decade of the 1960s (Chinitz, 1960; Jacobs, 1969).

This dissertation builds upon elements from spatial economics, the economics of entrepreneurship and endogenous growth theory to advance our understanding of the relationships between location, entrepreneurship, and regional innovation. The research addresses some existing knowledge gaps regarding the mechanisms governing these relationships. This final chapter summarizes the main results in the dissertation, both in terms of theoretical contributions and in terms of new empirical evidence.

The overarching conclusion is that location in relation to markets matters for regional entrepreneurship and that entrepreneurship matters for regional innovation. Although not tested here, there is a wealth of evidence in the literature of the positive effects of innovation for long-term regional growth (e.g. Beugelsdijk, 2007, Rodríguez-Pose and Crescenzi, 2008), which render the location-based drivers of entrepreneurship a key aspect of regional development. The research findings in this thesis first show that interregional demand linkages create profit opportunities that stimulate both business entry and regional business activity (Chapter 3). But at the same time, other findings show that a greater market potential also leads to increased regional wages, which in turn increase the incentives to choose salaried work over self-employment (Chapter 4). Combined, the findings indicate that while a positive partial correlation between
market potential and entrepreneurship is consistent, the functional relationship between market proximity and the regional supply of entrepreneurs is not unambiguously positively correlated. The other important finding of this dissertation is that a broader regional entrepreneurship base favors local innovative performance, because a larger stock of entrepreneurs facilitates localized knowledge spillovers by easing the conversion of local knowledge into economic innovation (Chapter 5).

Section 6.2 summarizes the results from the descriptive analysis of Chile’s framework conditions (at the national and local levels) for innovation and entrepreneurship (in Chapter 2). The section briefly reviews the general research setting of this dissertation and motivates the subsequent economic geography approach to the spatial variation of entrepreneurship and innovation in the country. Section 6.3 addresses the relationship between interregional demand linkages and the number and size of firms from a New Economic Geography perspective and summarizes some empirical results at the level of Chilean municipalities (in Chapter 3). Section 6.4 reviews the theoretical results of a spatially-explicit occupational choice model explaining the countervailing effects of location on the regional supply of entrepreneurs, and summarizes the empirical evidence obtained for the case of Chilean municipalities (in Chapter 4). Section 6.5 outlines the results of a knowledge-matching framework aimed at establishing a relationship between regional entrepreneurship and innovation, a framework which is applied to data, again, at the level of municipalities (in Chapter 5). Section 6.6 draws some conclusions regarding remaining questions and emerging research issues. Finally, section 6.7 reviews some policy implications of the research work taken as a whole for Chilean business support and regional development policies.

6.2 National and local framework conditions for entrepreneurship and innovation in Chile

Innovative and entrepreneurial activity are to a large extent the result of an enabling environment shaped by the social, economic and institutional conditions influencing individual agents’ decisions (Boettke and Coyne, 2003; Levie and Autio, 2008; Nelson, 1993; Lundvall, 1992). Some of these circumstances are common to all regions within a country, such as the macroeconomic policy framework (e.g. Parker, 2005), whereas others are highly variable across space, such as the industrial structure, the stock of knowledge inputs or the quality of local governance (Rodríguez-Pose and Di Cataldo, 2014; Rodríguez-Pose and Crescenzi, 2008; Amorós et al., 2013; Reynolds et al., 1995). Moreover, even cross-cutting institutions, policies and trends may have very different impacts according to the specific local conditions (Cooke, 1992; Barca, 2009; Barca et al., 2012). Therefore, analyzing both national and local framework conditions is of crucial importance for understanding observed sharp and persistent differences in regional entrepreneurial activity and innovative performance (Parker, 2005; Fritsch and Mueller, 2007; Fritsch and Slavtchev, 2007; Fledman and Florida, 2002).

Chapter 2 describes the national and local framework conditions for innovation and entrepreneurship in Chile, based on a review of the literature and the analysis of data
from several statistical sources. The chapter discusses the reasons for the remarkable
growth performance of the Chilean economy since mid-1980s, as a combination of
market-based policies (initiated in the decade of the 1970s) with institutional
development and social investments (undertaken since the 1990s). In terms of
entrepreneurship and innovation support policy, the chapter discusses the evolving
rationale from the support of small and medium-size firms toward a strategic focus on
innovative entrepreneurship by the mid-2000s.

The argument that national framework conditions for entrepreneurship are, in general,
favorable in Chile is based on the sound economic and institutional environment and
committed support from the central government. Despite such favorable conditions, the
observed evolution of entrepreneurship and entrepreneurial activity rates casts doubts
(as noted in Atienza et al., 2015) on the thesis of a supposed “entrepreneurial revolution”
as suggested by flagship reports in the country (Amorós and Poblete, 2013). With respect
to innovation, despite becoming a strategic focus of recent national economic policy, the
chapter shows how pre-conditions for knowledge creation and innovation are still very
weak in the country; in particular, there is a lack of advanced human capital, a weak
scientific base and a still limited use of technological infrastructure.

Using data from secondary sources, Chapter 2 then analyzes sub-national disparities in
local framework conditions for innovation and entrepreneurship, focusing on core-
periphery gaps reported in previous studies (Amorós et al., 2013; Conicyt, 2010).
Conditions for general entrepreneurship are not concentrated in the core areas, as
evidenced by the spatial distribution of access to credit and business activity rates.
Moreover, lower wages (and higher unemployment rates) appear to be, as established in
the literature (Lucas, 1978; Parker, 2005), contributing to pushing people to start their
own businesses in remote areas. By contrast, framework conditions enabling innovation
and more productive entrepreneurship are extremely concentrated in core areas,
particularly the stock of advanced human capital, technological infrastructure and
agglomeration externalities. These results are verified both in terms of regional gaps
with respect to the Santiago Metropolitan region, but also within each region with
respect to the regional capital cities.

Chapter 2 demonstrates for the Chilean case the uneven spatial distributions of human
capital, of agglomeration externalities and of technological infrastructure. The literature
more generally shows that the uneven distributions of knowledge inputs, of knowledge-
 intensive firms and even of specialized knowledge and business support services are
largely the result of agglomeration dynamics (Carlino and Kerr, 2014). Taken together,
the particular facts of Chile and previous research both invite the economic-geography
approach to the study of local entrepreneurship and innovation in Chile pursued in the
following chapters.
6.3 Regional market potential and the number and size of firms

Although several authors have emphasized the importance of market size (Carree & Thurik, 1996), agglomeration economies (Naudé et al., 2008), and the distance to markets (Harris, 1954) for the spatial distribution of economic activity and business start-up rates, to date there have been no microeconomic foundations developed specifically addressing the role of interregional demand linkages in determining the local number and size of firms. The relationship between the region’s number of firms per capita and the region’s market potential is an important but largely missing element in current discussions on regional entrepreneurship. Business density has been regarded as a necessary condition for entrepreneurship, innovation and job creation, all leading together to regional competitiveness and growth (Huggins, 2003).

In chapter 3 a model of the relationship between market potential and the number of local firms and the average size of these firms is developed. The model borrows its basic structure from the Krugman-Helpman-Hanson (KHH) NEG multi-region, core-periphery model (Krugman, 1991; Helpman, 1998; Hanson, 2005). In this framework, the spatial distribution of economic activity arises endogenously from the interactions between centripetal forces that lead to agglomeration of firms and workers, and centrifugal forces that disperse them. The model’s centripetal force is the increasing returns in production and transport costs, and the centrifugal forces are related to competition effects in congested markets, and – in the KHH version – a non-tradable industry, such as housing.

The proposed model in chapter 3 introduces regional heterogeneity on the supply-side of the differentiated-good sector, through a labour-unrelated, place-specific fixed cost of production. This regionally-variable fixed cost is the source of increasing returns, and is consistent with hypotheses of regional differences in the cost of doing-business as a major factor conditioning business entry (Glaeser et al., 2010; Glaeser and Kerr, 2009). The implication is that the free-entry (zero-profit in equilibrium) labour input and the firm output in the tradable sector are not constant across regions (as they are in the standard KHH framework), but positively related to the regional fixed costs and negatively related to the regional wage. Higher fixed costs imply larger economies of scale, which stimulates the up-scaling of regional firms; higher wages (marginal costs), by contrast, stimulate downsizing of regional firms.

Equilibrium wages, in turn, are positively influenced by regional market potential, which is the standard NEG mechanism reflecting a higher compensation to workers in regions facing a higher inter-regional demand (Hanson, 2005). This mechanism along with the clearing of the labour market (full employment) allows establishing an equilibrium relationship where the number of firms per capita (a constant parameter in the KHH model) is positively related to the regional market potential and negatively related to the region-specific fixed cost. In addition, labour market clearing determines that in the short run – before wage differentials trigger interregional mobility – the average firm size is negatively related to market potential and positively related to the fixed costs.88

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88 In the longer run, higher wages will stimulate in-migration of workers, pushing wages down and increasing average firm size.
The intuition behind the two main relationships in this model is that surpluses generated by a positive shock in market potential are initially only partially captured by workers' wages; there is room for short-term profits for incoming entrepreneurs before business entry and competition for labour eventually drive profits to zero via increased wages. By contrast, an increase in the fixed costs to participating firms in the home region erodes profits, forcing firms to exit.

The model is tested with data on the number of firms per adult in Chilean municipalities (called comunas) for the period 2005-2010. The availability of panel data allows for testing not only the equilibrium relationships, but also whether or not there are dynamic adjustments (convergence and cyclical reversion) towards equilibrium. This permits a distinction between the long and short run unavailable in the standard empirical NEG model. Following Hanson (2005), the model is structurally estimated by means of non-linear GMM methods, which yield estimates of the implicit NEG parameters in the theoretical model. This allows for a stricter validation of the NEG core-periphery model and the underlying agglomeration mechanisms in regard to their explanatory power over the spatial distribution of the number of firms per capita in Chile. This approach provides a novel way, alternative to the wage equation (ubiquitous in the applied NEG literature), for testing the effects of agglomeration over the spatial distribution of economic activity.

The main result is the verification of the theoretical predictions of the model. First, the elasticity of the number of firms per capita with respect to the regional market potential is positive and statistically significant. The elasticity with respect to the local fixed-costs (here proxied by means of a municipal index of accessibility to notarial services, a significant cost of doing business in Chile) was negative. These estimates of the two core relationships are robust in the presence of other regional controls of business density. Furthermore, the estimated values of the implicit NEG parameters were in accord with the theoretical framework and highly statistically significant in all cases. In addition, convergence and partial adjustment were verified, which indicates that the proposed dynamic empirical specification fits the Chilean data better than a static equilibrium relationship.

Other notable results relevant to the NEG approach (and consistent with what one would expect in a country like Chile) are worth noting:

1. A low elasticity of substitution, lower than previous estimates for Italy (Mion, 2004) and the USA (Hanson, 2005).
2. Consequently, a more imperfectly-competitive market structure (higher monopolistic power).
3. Accordingly, an industrial structure with larger returns to scale compared to these other countries.
4. Higher interregional transaction costs compared with these other countries.
5. Verification of the agglomerating effects of interregional demand linkages (estimates consistent with the “no black-hole” or “stability condition”).

Finally, with the estimated parameters, a simulation experiment was carried out of a transitory shock in the main local market (the national capital city of Santiago). This
exercise revealed that, while important, the spatial reach of demand linkages are limited (around 250-300 Km), and also that the effects fade rapidly over time (effectively nonexistent by the third year).

6.4 Location and entrepreneurship: a spatially-explicit occupational choice model

The model in the third chapter sheds lights on the role of market potential in the spatial distribution of firms. It cannot, however, be considered a complete model of regional entrepreneurship, because it does not address the location-driven mechanisms behind the individual’s decision to set up a business. The economic incentives behind such decision are at the core of economic theories of entrepreneurship (e.g. Parker, 2009). More specifically, as correctly claimed by Glaeser et al. (2010b), the zero-profit equilibrium condition (in which the model in chapter 3 rests) implicitly assumes that the “supply schedule of entrepreneurs is everywhere the same, and indeed everywhere horizontal. This assumption essentially takes entrepreneurship out of the model” (pag. 4).

Chapter 4 presents a model that goes a step forward in accounting for the full-effects of location in the regional supply of entrepreneurs. In particular, it introduces occupational choice and heterogeneous managerial ability (Lucas, 1978; Parker, 2005) into the spatial Dixit-Stiglitz setting (Fujita et al., 1999) to improve our understanding of the relationships between market potential (derived from the NEG model), regional wages and entrepreneurship rates.

In this model, the distribution of managerial ability in a region introduces firm-level heterogeneity in the production technology, which implies that more able entrepreneurs achieve costs efficiencies with a lower use of labor. This way of introducing managerial ability is consistent with existing views of the entrepreneur as an agent capable of recombining resources in more efficient ways to innovate and create value (see Carree and Thurik, 2003). The distributions of managerial ability are assumed to be the same across regions, but business profits are positively dependent on the regional market potential, due to higher incomes in external markets and lower transport costs of imported goods (Hanson, 2005). Workers can choose between entrepreneurship and salaried work based on the expected returns to alternative occupations, dependent on location (market potential) and individual managerial ability.

The free-entry occupational choice equilibrium is where the business net income of the marginal entrepreneur equates to the regional salaried wage (the opportunity cost facing all entrepreneurs). More managerially talented entrepreneurs earn an economic rent. The occupational choice equilibrium defines a regional marginal ability function, which is, ceteris paribus, decreasing in the market potential and increasing in domestic wages. This means that when market potential is larger, less able entrepreneurs can succeed in business. In contrast, higher wages induce less able entrepreneurs to leave management and to pursue salaried work. This relationship is consistent with the tradeoff between push (given by opportunity costs) and pull (given by spatial demand linkages) factors stimulating entrepreneurship (e.g. Schjoedt and Shaver, 2007). An implication is that, ceteris paribus, regions with a greater market potential will have more firms, of larger
average size and lower average labor productivity. Regions with higher wages will have, *everything else constant*, fewer firms, of smaller average size and greater labor productivity. From this regional marginal ability function an entrepreneurship supply equation, which is positively dependent of the market potential and negatively dependent on domestic wages, is derived.

The model goes further in developing the regional labor market equilibrium to account for the dependence of regional wages on the market potential (Fujita et al., 1999; Hanson, 2005). The full-equilibrium result is that the pro-entrepreneurship profit effect is exactly offset by the anti-entrepreneurship opportunity-cost effect. This result is a consequence of the constant mark-up pricing rule in the monopolistic, competition-based market structure of the spatial Dixit-Stiglitz model, along with the occupational choice condition of equalization of business profit and wages.\(^{89}\)

The theoretical model is tested through the estimation of the model’s entrepreneurship supply function. The theory predicts a negative elasticity of the entrepreneurship rates with respect to wages and a positive elasticity with respect to market potential. Also it predicts that the ratio of these two elasticities should be the constant-elasticity-of-substitution parameter from the NEG consumer utility function. The model is applied to the Chile, a country that exhibits a weak spatial association between self-employment rates and local market potential. In particular, areas of high self-employment rates can be found in both agglomerated areas and in poor, remote regions. On the other hand, low entrepreneurship rates can be found in areas of medium-to-high market potential but with a high labor demand and wages.

A dynamic specification is fitted with a panel of non-farm self-employment rates in Chilean municipalities. The results confirm both the positive partial correlation between municipal entrepreneurship rates and the market potential function, and the positive correlation between entrepreneurship rates and domestic wages. The estimated elasticity of substitution is consistent with the monopolist’s maximizing behavior on which the spatial Dixit-Stiglitz setting rests; i.e., statistically significant and greater than one. Moreover, the point estimates are not merely statistically indistinguishable but differ only in decimals from those obtained from chapter 3’s equation for the number of firms per capita. The closeness of the estimates is notable, given the different dependent variables used in the two equations, the difference in time spans, the distinct estimation strategies and market potential variables. The main results are robust to various specifications of the estimated model and included variables. The results hold for different sub-periods and changes to the *a priori* value of the elasticity of substitution in the market potential function. They also are robust to the inclusion of potential shifters of the regional supply of entrepreneurs, and to alternative measure of entrepreneurship.

\(^{89}\) Again, this is a comparative statics exercise that leaves unaddressed the potential interregional mobility of person and the possible effects on the regional distribution of managerial ability.
6.5 Regional entrepreneurship and innovation: a knowledge matching approach

In chapter 5 the focus is shifted towards the implications for regional innovation of the spatial variation of entrepreneurship. Despite the wealth of theoretical and empirical results pointing at the importance of entrepreneurship for regional growth (Acs and Armington, 2004; Bosma et al., 2011), the development of the “knowledge filter” (KF) hypothesis (Acs et al., 2004; Acs and Plummer, 2005) and the “knowledge spillover theory of entrepreneurship” (KSTE) (Braunerhjelm et al. 2010; Acs et al., 2013) has brought a renewed interest in the role of entrepreneurship in regional innovation processes. Notwithstanding, as noted by Carree and Thurik (2003), entrepreneurs have multiple roles in the process of economic development, and there remains a gap in our understanding of exactly how regional entrepreneurship and innovation are linked.

Chapter 5 presents a model to explore the role of the entrepreneur as a liaison between pure knowledge and economic innovation. It adapts Michelacci’s (2003) model of matching research and entrepreneurial skills to the regional case. The model provides a complementary microeconomic foundation to Romerian endogenous growth frameworks on which the KF and KSTE approaches rely. In addition, from an empirical point of view, the model provides an attractive alternative to the knowledge production function (KPF) approach commonly used in the regional innovation literature. The model posits a micro foundation for the emergence of innovations as a result of interplay between incentive-driven entrepreneurs and random knowledge production, in contrast to innovation as the certain output of the application of R&D inputs in regional economies.

The Michelacci (2003) model advances innovation as the result of a random match between the stock of knowledge in the economy and the number of free entrepreneurs willing to incur the cost of searching and implementing potentially useful inventions. It builds on the idea of the need for pure knowledge to be transmitted from knowledge sources to productive agents and converted into economic knowledge through purposeful entrepreneurial action (Acs et al., 2004; Audretsch and Keilbach, 2004). The probability of this match is dependent on the knowledge intensity in the regional economy, i.e. the stock of inventions available per entrepreneur. This knowledge intensity, in turn, is a function of the research effort in the region, which is the proportion of R&D workers in the labor force. By combining the matching probability with a stochastic law of motion for the net rates of knowledge generation, one arrives at a steady state relationship. The solution casts the functional specification of the number of innovations in terms of the number of entrepreneurs and R&D workers in the regional economy. This knowledge matching function reflects the need of both research and entrepreneurial skills for innovation to take place, and that the knowledge matching process is costly and subject to search frictions (Michelacci, 2003).

The model is extended by conditioning knowledge generation dynamics to a set of contextual factors related to other complementary mechanisms behind regional knowledge spillovers. These other factors are: i) the knowledge production function (KPF) (Griliches, 1979); ii) creative destruction (CD) (Schumpeter, 1942) and iii) agglomeration externalities (AE) (Glaeser et al., 1992). This gave rise to an extended knowledge matching function. A linear feed-back specification is proposed in order to
capture dynamic effects related to path dependencies and knowledge capital depreciation (Blundell et al., 2002). The proposed model is tested with a panel dataset of patent applications, new firms and R&D workers in Chilean municipalities.

The estimation results confirm the proposed knowledge matching mechanism as a contributing factor to the spatial variation of innovative activity in Chile. More directly, in terms of the importance of entrepreneurship in innovation, the results support an underlying role of entrepreneurs in linking knowledge with to market needs in Chilean local economies. The tested entrepreneurship-led knowledge matching process proves to be robust with respect to the inclusion of other regional factors conditioning knowledge spillovers.

In terms of other hypotheses of regional innovation, of secondary importance to this study, the results indicate that:

1. Local R&D inputs in terms of public and private research investment are positively and significantly related to local innovation levels.\(^\text{90}\)
2. There is some evidence of inter-municipal knowledge spillovers of scientific research, which are of a non-negligible spatial reach (tested at 200 and 300 kms).
3. There is no evidence of creative destruction effects on local innovation.
4. There is some weak evidence of agglomeration externalities in innovation, in particular in the form of diversification externalities (Jacobs) but not in terms of specialization externalities (Marshall) or innovation-enhancing competition effects (Porter).
5. Depreciation of the knowledge capital is very rapid, which suggest little technological lock-in effects in local economies.

6.6 Implications for a research agenda on location, entrepreneurship and regional development

This research has established, both theoretically and empirically, the importance of agglomeration forces in shaping the spatial distribution of business and entrepreneurial activity. Recalling the theoretical framework presented in chapter 1 (Figure 1.1, reproduced here as Figure 6.1), the pro-entrepreneurship role of interregional demand linkages has been verified (relationship C in the Figure). These demand linkages create profit opportunities that entrepreneurs capitalize by establishing firms in areas of higher market potential. The anti-entrepreneurship effect of local costs of doing business (relationship D in the Figure) has also been confirmed.

The model of regional business density in chapter 3 advances a complementary approach to economic agglomeration from the perspective of firm’s location, in contrast to standard NEG models built to analyze the problem by focusing on the spatial distribution of the labor force (e.g. Fujita et al., 1999). The literature to date has assumed that both spatial processes take place simultaneously, the mechanics of firm’s

\(^{90}\) It is worth noticing that private R&D inputs were proxied by an admittedly very crude proxy (the number of large and medium-sized firms in the comuna).
agglomeration having not been made explicit. In this thesis, however, the firms’ location problem is formalized in an NEG-based framework. The model in chapter 3 also provides an alternative way for the empirical validation of the NEG approach in contrast to the usual reliance on the NEG wage equation (Hanson, 2005; Brakman et al., 2004; Fingleton, 2006; Hering and Poncet, 2010). In short, this thesis makes a novel contribution towards a broader empirical validation of the New Economic Geography.

This dissertation has also contributed to the spatial theory of entrepreneurship by explicitly addressing, for the first time, the countervailing effects of location on the individual’s occupational choice. In particular, it has been shown that a NEG framework is suited to account for the effects of regional market potential on both push and pull forces (Choi and Pan, 2006) conditioning the regional supply of entrepreneurs. Along with the pro-entrepreneurship profit effect of market proximity, there is simultaneously an anti-entrepreneurship effect produced by the higher opportunity costs of being an entrepreneur, i.e. higher wages. Recalling the conceptual framework in Figure 6.1, the relationship C has been again supported, and relationship E empirically verified.

Nevertheless, the algebraic model yields an exact offsetting effect between the two opposing forces, given largely by the internal structure of monopolistic competition in the spatial Dixit-Stiglitz setting (i.e., the constant mark-up pricing) along with the occupational choice equilibrium based only on the equalization of economic returns. One can modify the model to shift the net effect from an exactly-offsetting result, but as it stands the model well accounts for the lack in the case of Chile of spatial correlation between changes in market potential and changes in self-employment rates. This result, of course, may not be the case in other countries, and chapter 4 discusses some ways in which this spatial occupational choice framework could be extended to account for alternative spatial patterns.

At first reading, there might appear a tension between the results in chapter 3, regarding the impact of spatial demand linkages on firm density, and the results in chapter 4, regarding the impact of those same linkages on self-employment rates. Both results relate to the effects of spatial demand linkages on measures of regional entrepreneurship. In interpreting the overall results, the apparent tension disappears if one bears in mind that the regional firm density and self-employment rates are related but different aspects of regional entrepreneurship, likely responding to associated but different processes. The number of formal businesses and the demand-led mechanism of firm’s location in chapter 3 seem broadly consistent with the case of mobile entrepreneurs choosing location based on profit opportunities, much in the spirit of footloose entrepreneurship models of agglomeration (Forslid and Ottaviano, 2003). On the other hand, the self-employment rates and the spatial occupational choice model in chapter 4 seems particularly well suited to case of local (mainly immobile) entrepreneurs (Michelacci and Silva, 2007) who choose entrepreneurship either as a response to perceived business opportunities (Kangasharju, 2000), or as a response to the lack of labor opportunities (Choi and Pan, 2006) in their own local contexts.
Both forms of entrepreneurship seem to fit well in the conceptual distinction between “opportunity” versus “necessity” entrepreneurship, which research projects, such as the Global Entrepreneurship Monitor (Reynolds 2000), have tried to disentangle. Based on the results of this present thesis, combined with the evidence from cross-country analyses (e.g. Wennekers et al., 2005), there are good reasons to investigate the possibility of a spatial segmentation of both kinds of entrepreneurship. “Opportunity” entrepreneurship could be of more importance in richer, agglomerated areas and necessity entrepreneurship in poorer, remote places. Conducting descriptive analyses identifying the spatial distributions of both kinds of entrepreneurship and their evolution in time is logical first step towards a better understanding of the drivers of the
geography of entrepreneurship in Chile and elsewhere. A more ambitious attack on this new question would be to craft a spatial entrepreneurship model that could account for such a dual geographic nature, while being empirically testable with the type of data usually available. Elements of such models would include entrepreneurs’ heterogeneity (in the form of ability, asset endowment and mobility), differentiated incentives (push and pull factors), and the tensions between agglomeration and dispersion forces.

The reader will note that the models developed in this thesis have largely yielded static equilibrium theoretical results, although the basic models were modified to admit a more-realistic dynamic analysis in the empirical specifications. While the static approach is useful for obtaining multi-region equilibrium equations, suitable for estimation via standard econometric techniques, it is at the same time an important limitation to understanding the role of interregional mobility in local entrepreneurship and business creation. As mentioned in both chapter 3 and 4, the introduction of an explicit mechanism for labor mobility would allow dynamic sensitivity analysis under alternative assumptions about workers/entrepreneurs mobility (Forslid and Ottaviano, 2003). From such an analysis using numerical simulations, one could build additional predictions about local entrepreneurship dynamics, testable against observed changes in spatial patterns of entrepreneurial activity.

In regard to their role in regional growth, currently it is widely accepted that entrepreneurs perform a wide range of functions in the process of economic development (Carree and Thurik, 2003). This dissertation has established, and verified for the Chilean case, one specific mechanism through which entrepreneurs can affect regional economic performance: their bridging role between pure knowledge and innovation (relationship F in Figure 6.1). At the same time, chapter 5 has verified the importance of regional conditions (or “social filter” variables in the nomenclature by Rodríguez-Pose and Crescenzi, 2008), particularly of regional knowledge inputs, for knowledge creation and diffusion (linkage G in the Figure).

The knowledge matching mechanism is particularly interesting in the regional context, given the well-establish importance of entreprenurial action for knowledge spillovers and technical change (Aghion and Howitt, 1992; Braunerhjelm et al, 2010, Acs et al., 2013), and given the spatially-bounded nature of knowledge spillovers (Döring and Schnellenbach, 2006). However, as stressed above, entrepreneurs are heterogeneous economic agents, as is the nature of entrepreneurship. This returns the discussion to the distinction – now in the context of regional knowledge matching models – between entrepreneurship by necessity and entrepreneurship by opportunity. Such a distinction has already been made in other kinds of regional models of entrepreneurship, innovation and growth (Stephens et al., 2013). Moreover, as highlighted in chapter 5, the role of spatial structures and interactions (e.g., distance decay, labor sorting, economic density) should also be taken into account in the knowledge matching process, as stressed in the literature on matching in labor markets (Coles and Smith, 1996; Combes et al., 2008).

This dissertation has addressed the links between location, entrepreneurship and regional innovation. The ultimate objective of any regional entrepreneurship research and policy agenda should be, however, to assess their contribution as drivers of regional growth and development. This research contributes significantly to that aim: The
relationships between location and entrepreneurship (links C and E in Figure 6.1) has been the principal focus in chapter 3 and 4, and the relationship between knowledge, entrepreneurship and innovation (links F and G in Figure 1.1) has been the main research subject in chapter 5. Nevertheless, a more complete understanding of the relationship between innovation and local growth in Chile is still pending for the completion of the whole location-entrepreneurship-innovation-growth chain of causality.

An integrated analysis of the complex interrelationships in this proposed chain of causality seems a well-warranted undertaking. Given an additional investment of time, an empirical assessment of all such relationships is a project within reach of the Chilean data assembled in this thesis. While there are some reduced-form specifications to explain the role of entrepreneurship on regional growth (e.g. Stephens et al., 2013), a more structural, multi-equation statistical approach, explicitly introducing into the empirical model the interactions between location, entrepreneurship, innovation, and growth, would shed greater light on the interrelationships between these mechanisms behind the regional development process. A more challenging endeavor would be to derive from explicit optimization rules a general microeconomic model that not only accounts for all these linkages but provides a theory-driven, testable structure. The models of Fujita and Thiesse (2002; 2003) are notable examples pointing toward a broader theory of location, entrepreneurship, innovation and growth.

Finally, the studies forming this dissertation have considered sectorial differences neither in the effects of location on entrepreneurship, nor in the relationship between entrepreneurship and regional innovation. This is an important element to consider in future work for several reasons. In the case of the spatial determinants of entrepreneurship, it is well-known that economic sectors tend to cluster differently in space (Ellison and Glaeser, 1997; Audretsch and Feldman, 1996). But also, the empirical evidence confirms the differential impacts of location factors for business formation in different economic sectors (Armington and Acs, 2002; Fritsch and Falck, 2007). In terms of applicability to real world situations, the models developed in this present dissertation account for entrepreneurial activity in industries matching the features of the New Economic Geography’s M-sector (Fingleton, 2006; Fingleton and Fischer, 2010); i.e. product differentiation, increasing returns, interregional tradability, monopolistically competitive market structure, and so on.

The relevance of this type of NEG-based modeling is unclear, however, for the case of other industries where these characteristics might not hold. In addition, with regard to the relationship between regional entrepreneurship and innovation, there are differences in knowledge-intensity across economic sectors (Audretsch and Feldman, 1996); and therefore the sectorial composition of regional entrepreneurial activity should affect the efficiency of the entrepreneurship-led knowledge spillovers. The knowledge-matching model developed here would be of more relevance in knowledge-intensive industries. This has a direct spatial implication for the entrepreneurship-innovation relationship, because such industries tend to locate in areas with better R&D infrastructure (Feldman and Florida, 1994).
6.7 Some policy implications for the Chilean case

As discussed in chapter 2, there are three aspects of Chile that makes it an interesting case for the study of location-based dynamics of entrepreneurship and innovation. First, it has shown strong social and political commitment to innovation and entrepreneurship as levers for inclusive growth. Second, there are seemingly high levels of entrepreneurial activity in the country, but the resulting innovative performance appears low. Third, Chile has a linear physical geography, with a diverse economy and with an economic geography characterized by a strong urban primacy. The immediate result is a wide variation in local framework conditions for entrepreneurship and innovation. Although Chile may be seen at first glance as a country with a textbook core-periphery economic geography, results in this dissertation such as the existence of high spatial transaction costs, largely imperfectly-competitive regional markets, a dual nature of regional entrepreneurship or the lack of strong urbanization externalities and path dependencies in local innovation dynamics, all render the geography of entrepreneurship and innovation a far more complex phenomenon.

In chapter 2, it has been shown that conditions supporting general forms of entrepreneurship are largely in place in Chile. With respect to support for innovation, however, the contrary appears to be the case (OECD 2012, 2014). The weakness of the Chilean National Innovation System stands as a major barrier to developing a knowledge-based economy. One immediate recommendation, therefore, is to orient entrepreneurship support policies towards a greater focus on more innovative and productive forms of entrepreneurship. The National Strategy of Innovation for Competitiveness sets a coherent general framework, but there is still a long way to go in terms both of lifting the knowledge creation and absorption capacities of the economy, and of designing more specific instruments to aid potential of entrepreneurs as effective vectors of knowledge and innovation. In this line, a recent diagnosis by the Corporation of Productive Support (CORFO) identified the need for developing a “new model of segmentation” of entrepreneurship support policies in Chile (CORFO, 2014). According to CORFO, this new model should be based on the recognition that entrepreneurs greatly differ in both market knowledge and abilities and also in terms of their degree of product differentiation.

In the regional context, chapter 2 has also exposed the gaps in terms of enabling conditions for innovative entrepreneurship in Chile. This result may on its own justify a stronger regional emphasis to innovation and entrepreneurship policy, particularly from a territorial cohesion perspective. However, according to Moguillansky and Ramírez (2015), current business support policies in the country remain largely spatially-blind. Yet, the extremely concentrated Chilean economic geography along with path dependencies and the “stickiness” of spatio-temporal dynamics of entrepreneurial activity (Andersson and Koster, 2010) pose a significant challenge for place-based policies aimed at leveling the field for entrepreneurs and innovators on the periphery (see Amorós et al., 2013; Felzensztein and Gimmon, 2012).

In chapter 3, the importance of interregional demand linkages for firms’ agglomeration has been verified. More specifically, results indicate that distance to markets is a burden for formal entrepreneurship in Chile. However, it has also been shown that the effects of such linkages on the spatial variation of the number of firms are of short spatial reach.
This result points to the relative importance of local markets and intermediate cities, in contrast to nationally-centralized market integration, for stimulating entrepreneurship in remote areas of the country. On the other hand, the importance of place-specific costs of doing business has also been confirmed. In the light of the results in chapter 5, fostering entrepreneurship in lagging regions seems to be a sensible policy objective. Therefore, to promote such entrepreneurship, decision-makers should consider the use of place-based and spatially-targeted interventions aimed at strengthening the local framework conditions. Some types of interventions suggested in the literature are infrastructure and public service provision (Bartik, 1989), innovation, R&D and human capital programs (Baptista and Mendonça, 2010), and enhanced access to financial services (Naudé et al., 2008). Also, in the light of the results of chapter 3, broad, place-based interventions (OECD, 2009, Barca, 2009; Barca et al., 2012) that would stimulate local economic growth overall (and thus invigorate home markets) should contribute to the goal of spurring local entrepreneurship. These recommendations coincide with a renewed interest for place-based and territorial development policies in Chile (and more generally in Latin America), as documented by influential institutions, such as Corporación Andina de Fomento (CAF, 2010); the United Nations’ Economic Commission for Latin America and The Caribbean (ECLAC, 2010) or the Latin American Centre for Rural Development (RIMISP, 2012).

Chapter 4 confirms the trade-offs between location-based push drivers (here in the form of low wages) and pull drivers (in this case in the form of greater market potential) of entrepreneurship. This suggests that the distinction between entrepreneurship by opportunity and by necessity (Acs, 2006) is relevant for the place-based policies in support of entrepreneurship and innovation in Chile. In this regard, different types of entrepreneurship serve different policy purposes. While in general, economic policy will point at stimulating innovative, highly-productive entrepreneurship (see for instance, Shane, 2009), it is also true that even necessity entrepreneurship may, under some circumstances, be a way out of poverty (Naudé, 2010). Notwithstanding the existence of these different forms of entrepreneurship, the idea that they might deserve distinct policy approaches has not been as yet fully internalized by Chilean decision makers.

On the other hand, this dual nature of entrepreneurship has also a regional policy implication: it is likely that both kinds of entrepreneurship are arranged differently in space (with entrepreneurship by opportunity being relatively more frequent in richer, agglomerated areas\(^91\)). This potential spatial segmentation calls, again, for a stronger place-sensitivity of business support initiatives, which could respond to different local dynamics of entrepreneurship through smart, tailor-made, policy mixes. As indicated in chapter 2, currently there are some entrepreneurship and small business support programs in the country with a regional focus. But in most cases, they are still very much designed under a top-down logic and implemented through a hierarchical architecture (see for instance RIMISP, 2013). In this sense, they are far from being coherent with modern approaches to regional policy, which are based on multi-level governance building, on mobilizing local actors, knowledge and assets and on local public good provision (see for instance McCann and Ortega-Argilés, 2012). CORFO’s Integrated Territorial Programs (PTI), aimed at supporting the coordination of business development projects within a specific territory, could be an example in such direction.

\(^{91}\) Results by Atienza et al. (2015) point to that direction.
The local PTI’s, however, would still lack of a critical mass to kick-start transformative projects involving key regional actors and the development of substantive regional capacities (RIMISP, 2013).

Finally, in chapter 5 the positive effect of entrepreneurship for innovation (measured as invention patent applications) in Chilean local economies has been established. In particular, the results are consistent with the proposed entrepreneurial function of connecting sources of knowledge and market needs. The empirical verification of a knowledge matching mechanism of innovation in the country reinforces the argument that innovation is essentially a relational, locally-embedded phenomenon (Cooke, 1992; Asheim et al., 2011; Rodríguez-Pose and Crescenzi, 2008). Therefore the results support systemic approaches to regional innovation policy (McCann and Ortega-Argilés, 2013), which in this case should place a stronger emphasis on fostering articulation between inventors and local entrepreneurs. This recommendation is broadly consistent with the diagnosis by the Chilean government of an insufficient connection between the academia and the productive sector, which has justified the development of important innovation support programs, such as the Fund for the Support of Scientific and Technological Development (FONDEF) (Álvarez et al., 2012; see also chapter 2). The results indicate, however, that subsidizing coordination efforts would be insufficient if it is not coupled with funding allowing firms to undertake and scale-up innovation projects (Álvarez et al, 2012).

But at the same time, the results also show that innovation is sensitive to contextual factors conditioning knowledge generation and diffusion, in particular to the stock of knowledge inputs (here in the form of public and private R&D investments). Together, both knowledge matching and technological infrastructure justify the implementation of place-based innovation policies that complement the excessively firm-centred current approach to innovation support programs in the country. Such policies should optimally combine strategic technological inputs investments with the development of networks, social capital, and institutions, in combinations that would vary according to the specific characteristics of each region (Rodríguez-Pose and Di Cataldo, 2014; Tödtling and Trippl, 2005; OECD, 2011).