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Political Institutions in Swedish Regions: The Effect on the Innovation Imperative of the Firm

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Abstract

This master essay examines whether regional political institutions affect the imperative of firms to invest in innovation. It uses multilevel modelling techniques to explicitly test the spatial dimension of regional institutional embeddedness of the innovation process using micro-data on manufacturing firms in Sweden. The main argument of this essay is that firms are embedded in a region and that the quality of the political environment of that region matters to the innovation investment imperative. Political institutions, as measured by voting shares, are argued to be signaling mechanisms to firms on the durability and stability of committing investment in innovation as well as a proxy variable for civic engagement in the region that would allow communities to overcome collective action problems which can be important to the innovation process particularly when this process relies on tacit information that are spatially sticky. The thesis found positive albeit statistically insignificant results of the hypotheses apart from size of the firm mattering to the innovation investment schedule of the firm.

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1. Introduction

At the nexus of economic geography and innovation studies is a fundamental claim that institutions matter to the innovation processes of firms. Institutions are said to be spatially sticky to certain localities and constitute the framework conditions in which firms are embedded when they make their location and conduct their activities. One such spatial configuration is the region and one such firm activity is the development of innovation with which firms undertake. Underpinning these processes, shaping and conditioning their outcomes, are the incentives, constraints and mechanisms, generated by these spatially configured institutions. Of the myriad of institutions that seem to matter, political institutions and the quality of which, are believed to be integral to industrial dynamics and firm activities because 'markets are, themselves, a political construction' (Nelson 1994, Gertler 2010). It situates the boundaries of transactions that can be carried out with the use of formal institutions such as laws and policies, as well as signals the prospects of firms in the long-term. Furthermore, signals from the political environment can be instrumental in engendering investments in research and development (R&D) for innovation, for example, which are needed towards achieving firm goals such as the creation of new products or more efficient processes. These signals can stem from such things like the creation of new product standards or the state participating in new international environmental protocols or even active interventionist policies in the market for innovation such as government procurement programs (Edquist and Hommen 1999, Mazzucato 2011). Conversely, transaction costs associated with applying for permits, getting products certified, and compliance with new regulatory standards may inhibit the ability or willingness of firms to invest in research and development. These are just a few examples of the ways in which specific types of institutions affect firm activities. The point is that there are potentially short and long-run consequences of political institutions on the ability of firms to innovate and the activities associated towards this end.

And yet, despite this widely acknowledge interdependence with the political arena and the potential impact of these institutions on the distribution of economic activities across time

and space, these political institutions are treated like black boxes in the economic geography literature or worse, completely relegated to the sidelines. Existing studies in economic geography, which to some extent, do examine political institutions tend to typify political institutions to tendencies of types of innovation to matching firm output (Hall and Soskice 2001). Whilst this typology can be useful but it is problematic because aggregating institutions to this extent can obscure the fact that political institutions are complex and multifarious (Boschma and Capone 2014). Unpacking these political processes and examining more closely to what extent these particular types of institutions affect firm performance in terms of research and development output, is needed.

Furthermore, whilst significant empirical evidence demonstrates theoretically established links between institutions and the innovation processes through various case studies (Edquist 2005), there seems to be a dearth of quantitative approaches dealing in institutions in the economic geography literature with some exceptions (Neffke, Henning et al. 2011). Part of the difficulties in finding an appropriate quantitative approach is that the complexity of the innovation process is not easy to model and measures of abstract things like the quality of political institutions are difficult to construct. Another reason is that institutionalists within the economic geography discipline have tended to prefer qualitative studies to quantitative approaches (Amin 1999). This has made it difficult to generalize these findings and establish the empirical dimension of this theory and the extent of the validity of these approaches in economic geography.

This Master thesis then, aims to fill this research gap by exploring the interactions between firms in their pursuit of innovation and the role of regional political institutions in this process. Specifically, this thesis will interrogate the research question “To what extent do regional political institutions influence firm investment in innovation?” The main aim of this thesis is to quantitatively test the interdependence between regional political institutions and firm investment in innovation. This thesis will take the specific country case of Sweden. Even if nationally configured political institutions do not have much variation across regions in Sweden due to a relatively homogenous and political landscape, there has been an increasing trend of devolution of power to regional governance bodies that give them scope for independence which, in turn, may influence the rates of participation in regional elections.

Additionally, the heterogeneity of firm responses to these political conditions may explain the uneven landscape in the distribution of economic development across space and time. These two things suggest that it is relevant to take Sweden as a country case. The other reason for choosing Sweden is an empirical one. It has some of the highest quality data available. Testing will be done using a multilevel analysis, a very demanding method in terms of data quality, with evidence drawing from firm data from 2008 and 2009 as well as the ULF register data from SCB 2008. A specific regional condition will be focused on which will be the quality of political institutions as measured by shares of voting per region. This thesis argues that the strength of the political institution of elections are captured in voting share because it directly measures the democratic participation in the region which can be reasonably interpreted as a proxy for civic engagement in the region.

In a broader sense, elections can be a signaling mechanism to firms that the political environment is facilitated by a peaceful transition of power which in turn, gives regional governance structures continuity and durability to the extent that firms can invest in something as inherently risky as innovation in the form of research and development investments as measured in this thesis using R&D expenditures. Payoffs from investments in innovation tend to be uncertain and may take time before costs are recouped so a stable political environment signaled by peaceful and democratic transitions of power supported by the electorate, enables this investment in innovation since firms can recoup their costs from these investments in the long run without fear of expropriation or reneging from contracts by the state. One could argue that firms in Sweden do not really need this signaling mechanism because the country is evidently politically and economically stable and have been for decades. This suggest that firms will behave and expect 'business as usual' in spite of voting shares not because of it. This can be because firms in Sweden have internalized the expectation for stability in their output schedule. Put in another way, signaling of the stability of the political environment would, on the face of it, be more applicable in a cross-country analysis case where differences in institutional quality can better demonstrate why an investment in a stable country, as opposed to a war-torn one, would play a greater part in the decision calculus towards investments in firm innovation (La Porta, Lopez-de-Silanes et al. 1999). However, as stable as Sweden is, regions across the country have undergone tremendous changes with respect to its industries which defined the economic and social

structures and character of Swedish regions. Industries such as the paper and textile industries have all but died out in many parts of the Scanian region in the south, for example. These economic upheavals could potentially have consequences for the quality of the political environment and civic attitudes within these regions especially since these communities were tied to these industries for their livelihood. A substantial loss of livelihood could potentially tear communities apart or at the very least reduce the social capital of a community. Even with a functional social safety net from the state through unemployment benefits, a general decline in the labour market opportunities in regions can lead to fragmented communities experiencing hardship. It is worth peering closer into a country that is generally taken for granted as stable because whilst this may be true aggregately and relatively, there may be key differences across its regions due to the uneven pace of economic development landscape. Investigating the signaling mechanism to firms within a stable country like Sweden on cross-regional basis is relevant, if only to confirm that stability holds despite large economic changes across regions. Furthermore, voting participation can be a proxy measure of the general environment for firm activities including investments in innovation. High rates of political participation suggests high levels of civic engagement from society (Putnam 1995). Civic engagement tends to stimulate cooperation, collaboration, and thus, the potential ability to overcome collective action problems. This can be potentially important to the process of innovation for firms. Innovation is enabled when different stakeholders collaborate in society and when tacit information is shared. This behavioral outcome in society is more likely when civic engagement is strong and voting share is one way of measuring this of non-market quality of a region that firms need to take into consideration when investing in R&D. Voting shares at the regional level are taken from the ULF register data collected by the Statistical Bureau of Sweden (SCB).

By using the multilevel approach, elements of the methodology circumvent the limitations of traditional methods in use such as case studies which are not generalizable or ordinary least square regression methods which assume away the spatial qualities of the region. Regions constitute the 'institutional set-up', which is why in this thesis, interaction terms are used in the empirical testing and specifically tests the interdependence of the regional conditions with certain firm attributes. This is done because it is recognized that 'regions' are not merely factors of determination but rather regions provide conditional factors eliciting varying

responses from heterogeneous firms made distinct by differences in absorptive capacity, resources and abilities to appropriate knowledge to generate returns on the innovation process such as research and development investments.

This essay attempts to argue that the regional political environment and the democratic participation of citizens matter to this part of the investment behavior of firms. Multilevel modelling techniques are employed to be able to demonstrate variance in the firm response to regional institutional conditions; moreover, that the characteristics of the firm, particularly size, impact the response of the firm to the regional conditions. Size is an important firm characteristic towards increasing firm investment towards research and development but no statistically significant estimates in the empirical work of this thesis were found when these same firm characteristics were interacted with institutional conditions. The reason for the positive effect of size on R&D firms may be that the more human capital a firm acquires, the more knowledge and capability it has to invest in R&D which confirms the expectation that bigger firms will tend to invest more in R&D. That this thesis did not find statistically significant evidence on the interaction between size and the regional institution of rates of political participation suggests that size is an independent factor for R&D expenditure and does not seem to be conditional on the political institution the firm is situated in, in Sweden. This thesis also found no statistically significant results from interacting the sectorial status of manufacturing firms that is supposed to have high rates of innovation and consequently, may be subject to specific regulatory frameworks, on firm output in R&D and neither in the interaction terms with voting share. This suggests that the manufacturing industry proclivity to innovate does not seem to be dependent on the political institution of voting behavior in Sweden although since sector and the interaction term are both statistically insignificant, this is mere supposition.

Section 2 surveys the research themes and evidences regarding the intersectionality of political institutions and innovation, prevailing in the extant literature. Section 3 explores the relevant conceptual debates surrounding regions and the spatial dimension of institutions as well as the firms and sectors; Section 4 lays out the hypotheses. Section 5 surveys existing methodologies in the literature to demonstrate the point of departure of this essay's empirical methodology. The interpretation of the results is included in this section. Section 6 states the

scope and limitations of the study; Section 7 explores the policy implications and Section 8 finally, concludes the paper and makes recommendations regarding future research directions.

2. Themes on Institutions and Innovation

An emerging consensus in various academic disciplines is that institutions matter in explaining economic outcomes and trajectories. Central to this theoretical and empirical work is the notion that both formal and informal institutions constrain and enable outcomes of behavior of different economic agents. The right mix of institutions may engender a strong innovation milieu since it may provide the right incentives for firms, entrepreneurs, inventors, governmental agents and universities to invest in capacities that enable innovation. Empirical evidence from the institutional economics literature suggests that the society-wide formal institutions such as property rights and a strong legal system may help foster incentives to transact, more generally, and innovate, more specifically (La Porta, Lopez-de-Silanes et al. 1999). Informal institutions underpin the social interactions of people and inform decisions in economic life which may lead to community outcomes that enable innovation such as information sharing and coordination. The outcomes of the interaction of these institutions shape economic outcomes, firm decisions and consequently, innovation allocations. These interactions are then mediated, in varying degrees, by political channels (Farole, Rodríguez-Pose et al. 2010).

This consensus and interdisciplinary interest in institutions have engendered approaches to institutional analysis within economic geography that is wide-ranging and diverse which have included examining the impact of institutions on economic development (Rodríguez-Pose and Storper 2006), the nature and durability of institutions as manifested in path trajectories including dependence, renewal, creation, and plasticity (Martin 2000, Martin and Sunley 2006, Strambach 2010, Neffke, Henning et al. 2011) and in the analysis of regional economic development and innovation systems (Gertler 2010, Isaksen and Trippl 2014). In general, the study of institutions have been concerned with the structures that shape economic life as it is geographically, socially, politically and culturally situated and the processes that tend to

reproduce them over time, such as routines, conventions and networks.

2.1. On Institutions in Economic Geography

Institutions have become increasingly prominent in economic geography in particular, augmenting its theoretical foundations and empirical research agenda in understanding the economic landscape. Whereas previously, economic action was abstracted out from the social, cultural and political context it was situated in, an institutional framework allows the study of economic action as embedded in wider non-market structures (Martin 2000). Institutions are said to be the rules of the game, procedures meant to structure interactions in order to reduce uncertainty in everyday life; encompassing formal institutions such as laws and regulations and informal institutions such as norms, conventions, rituals and mores (North 1990). Institutions are sets of common habits, routines and established practices that regulate the relations between individuals, groups and organizations (Edquist 2005). Formal institutions tend to be codified and are subject to state jurisdiction and power whereas informal institutions are relatively more tacit and more culturally determined; they are more tenacious and durable (North 1990). Both types are believed to engender incentives and constraints that underpin economic action. Institutions help facilitate and shape coordination, cooperation and competition.

2.1.1. A Note on Institutions and Rationality

Since institutions exist to manage the uncertainties of interactions of individuals and organisations, the increasing complexity of situations such as economic development processes, move these actors to negotiate the institutional environment in a way which positively affects them and forwards their interests. These actors use features of the institutional environment such as laws, policies, regulations and constituency events such as elections as signals and interpret the significance of these events towards how it impacts their interests (Nee and Oppen 2012). This is not to say that these actors are perfectly rational entities able to comprehensively process perfect information and are only self-interested as purported by neoclassical economics and New Economic Geography. They are subject to imperfect information with their rationality bounded by their abilities to comprehend complexity and is a function of their socio-political embeddedness with their interests wide-ranging, from rent-seeking to altruism which is a view more in line with Evolutionary,

Institutional and Relational Economic Geography.

2.1.2. On Pinning Down Institutions

Employing the concept of institutions in economic geography is not without its issues which might partly explain why the institutional turn in the field has grown but have not been, for the most part, matched with quantitative empirical work. There is the view that there is little to gain from reducing institutional thought to a series of testable hypotheses or normative assumptions (Amin 2001). The decision on how to use the theory is dependent also on, amongst other things, what researchers regard as 'institutions', the varieties and levels of it. Dominant in economic geography are 'soft institutionalism' emphasizing habituated routines and conventions over policies and regulations, defining a useful distinction: institutions as containers of socio-economic organization or institutions as a process of institutionalization of socioeconomic practices (Amin 2001). By and large, institutions can sometimes be too open an idea that it tends to get over determined where everything can be argued as an institution. Therefore, there is value in clearly delimiting what constitutes an institution.

Institutions are sometimes interspersed with organizations or communities and treated as the convergence of social expectations and the embodiment of norms and traditions, such as governmental bodies, agencies, firms or other groups to which membership is non-trivial (Rodríguez-Pose and Storper 2006). There is an undeniable link between institutions, organizations, social groups and communities but there is value in separating 'the rules from the players' in order to be more precise in the study of institutional dynamics so for the purposes of this thesis, institutions will thus be treated as rules (North 1990). Although there may be disagreement on the demarcation of how far you can take the institutional classification, these strands agree that wider structures beyond the atomistic individual influence economic action and development

Another reason why numerous studies in economic geography have focused almost exclusively on case studies in order to investigate this relationship and whether the theory is right about the institutional framework conditions effect on innovation may be that institutions are notoriously difficult to measure, if data exists at all. But there is a growing amount of interest in the social sciences in constructing institutional indices and attempting to measure these

institutions (Beck, Clarke et al. 2001). It is often used to test their effects on economic development in various dimensions (Knack and Keefer 1995, La Porta, Lopez-de-Silanes et al. 1999, Beck, Clarke et al. 2001, Acemoglu, Johnson et al. 2002). For the most part, the advancements in this field in measuring institutions have not spilled over to economic geography and innovation studies, with some exceptions (Rodríguez-Pose 2013). The important idea to highlight in this literature is the empirical evidence that measuring institutions is analytically robust and can be measured by way of proxy variables in a way that is both theoretically and empirically motivated.

2.1.3. Critique of the Institutional Approach

Critics of the institutional approach in economic geography claim that the use of institutional theory has not been fully articulated, lacks grounding in empirical material and tends to be over-determined because the definition and consequently, the usage is imprecise (Martin and Sunley 2006). Disparate uses of institutional concepts have become problematic (MacKinnon, Cumbers et al. 2002). Moreover, according to this stream, the use of the institutionalist approach in economic geography and in the discipline in general tends to be incomplete because it neglects the political dimension and assumes access to institutional endowments are even across time and space.

This criticism is valid to some extent and it is addressed in this thesis in two main ways: firstly, precise definitions of institutions are adhered to in treating institutions only as rules rather than organizations as well and secondly, by acknowledging that formal institutions are the arena of the state and political institutions are the focus of this work. Political institutions are wide-ranging and diverse, from laws to policies to rules on how we conduct political life. One of the most established political rituals society subscribes to are elections which are guidelines for both political participation and how to transfer governance power within the state. Formal rules that govern political participation such as elections are rather unique relative to other formal institutions. When the democratic participation of individuals coalesce to an extent it satisfies an institutional threshold for political will and constituency, in a certain place and bound by specific geographical parameters, it results to a peaceful transition of power and control over governmental structures including over its coffers and the agenda setting powers of governance; and specific to that place and locality.

2.2. On How the Different 'Turns' Treat Institutions

An institutional perspective contributes to the understanding of economic transformations and development or the lack thereof (Isaksen and Trippel 2014) and this has precipitated the study of institutions in economic geography to accompany various 'turns' in the discipline. The 'institutional/cultural turn' has focused on the cultural construction of institutions and have produced concepts such as institutional thickness and thinness (Amin 1999, Amin and Thrift 2000). These may be theoretically useful but it is difficult to conceptualise and measure 'institutional girth' not to mention this author's doubts on how well this metaphor actually fits the nature of institutions, seemingly conceiving of it as some monolithic object rather than unique combinations of disparate rules and conventions that it actually is. Some other attempts to incorporate institutions to the study of firm innovation output draw from the varieties of capitalism literature (Hall and Soskice 2001). This can be useful but the varieties of capitalism literature narrowly categorise economies according to simplistic typological designations which do not really capture the full breadth of the variations of institutions (Boschma and Capone 2014). Much like the institutional 'thin/thick' literature, these concepts are over stylized and artificially reduce the complexity of institutional analysis in the pedagogical pursuit to understand it.

Political economic geography approaches also espouse the use of institutional analysis (MacKinnon, Cumbers et al. 2009). However, it seems that it privileges the state over other non-state and non-market actors in understanding institutional emergence which is not a self-evident priority. Having said this, however, looking at political institutions is critical to understand the effect of situating firm activities within the political sphere to which this thesis attempts to contribute. Evolutionary economic geography has been criticized for relegating institutions but this has been increasingly inaccurate as the field progresses and with the emergence of research that incorporates institutions as it relates to firm heterogeneity (Boschma and Frenken 2009). The relational turn, on the other hand, purports the study of institutions as largely a product of social interactions (Bathelt and Glückler 2003, Bathelt and Glückler 2013) however social embeddedness tend to be over argued and accounts of individual action seem to be over-socialised. To claim that everything is socially determined is to adopt a definition of the 'social' in a very broad manner to the extent that it may lose its

meaning. Each turn has its strengths and weaknesses in its approach to institutional analysis. One way to reconcile these turns is to approach institutions in an engaged pluralist way which means that a dogmatic adherence to one 'turn' is not adopted but instead the strengths and weaknesses of each turn is considered and is integrated where they can be coherently done so (Hassink, Klaerding et al. 2014). This thesis takes this approach and treats institutions in a way that recognizes the multifarious role it plays the different dimensions of economic life while maintaining that an institution can be specific rules, in this case, a political institution that affect the economic imperative to innovate.

2.3. On the Political Dimension of the Innovation Imperative

This political dimension of the innovation imperative is not very well understood, partly because the notion of political control is treated as static in the innovation approach and endogenised within the institutional framework. One of the prevailing frameworks in studying innovation, the systems of innovation approach, does not account for transfers and transitions of power and control between competing political entities that might have differing agendas and priorities. Despite the fact that this can be important in explaining and understanding the incentives of firms to innovate because when society confers a mandate of governance to a certain group through elections, the agenda setting power of that group becomes an important determinant of the maintenance of certain institutions that influence the decision making capability of the firm towards their proclivity for R&D in innovation. With the previously discussed institutional turn in economic geography as well as calls for more political economy approaches in the field, emerging questions regarding the relationship between political institutions and innovation are justifiably appearing in the extant literature, at differing geographical scales (Hall and Soskice 2001, Tödtling and Trippel 2005, Gertler 2010, Mazzucato 2011, Isaksen and Trippel 2014). Noticeably, there seems to be a recent convergence in this research area between disciplines, economic geography, regional studies, institutional studies and innovation studies, sharing many of the foundations and theoretical concepts, rooted in the use of institutions to analyze the political dimension in the innovation process. The following subsections deconstructs this political dimension of institutions in so far as it relates to the innovation imperative.

2.3.1. On Electoral Participation

The form of institution that will be examined in this thesis is political participation. This is not the only way that individuals connect with the political institutional environment but it is certainly the one that is the most ubiquitous. Under this form, there are multiple ways to participate politically in the public and private sphere: contacting local and national officials, working for political parties and other political organizations, discussing politics with neighbors, attending public meetings, joining election campaigns, signing petitions, speaking out in formal and informal debates and of course, voting which is the most common act of citizenship (Putnam 2001). Voting is, by a substantial margin, the most common form of formal political activity of citizens and it embodies the most fundamental democratic principle of equality. As an institution, it is formal law that mandates citizens to cast their vote which determines successions of power and control in governance. Voting demonstrates, to some extent, civic engagement in your wider community because it exhibits a sense of obligation to society and the belief that a single vote can contribute influence in the public sphere. In fact, voting is a good proxy measure of democratic participation. According to Putnam, people who actually vote are more likely to be interested in politics, to give to charity, to volunteer, to serve on juries (in the American context), to attend school board meetings, to participate in public demonstrations and to cooperate with their fellow citizens on community affairs. It follows then that a large voting turnout for an election can then signal a stable and durable political and social environment. One where its citizens are civically engaged and are interested in wider community issues beyond their personal interest. This institutional quality of the community can enable the overcoming of collective action problems such as the need to cooperate, share common resources and coordinate social concerns. It is sometimes hard to tell whether voting causes community engagement or vice versa, although evidence suggests that the act of voting itself encourages volunteering and other forms of citizenship. Political knowledge and interest in public affairs are critical preconditions for more active forms of involvement. *'If you don't know the rules of the game and the players and don't care about the outcome, you're unlikely to try to playing yourself'* (Putnam 2001).

Voting as a measure of political participation may also exhibit the voting patterns of the agenda of political parties such as the willingness to share resources across different cohorts

(increasing pensions, funding agricultural areas which entails a transfer of resources to other regions, reducing union power, etc.). Often it is the lack of coordination in communities that is at the root of a lack of progress and they become subject to collective action problems. Hence, voting captures dimensions of inter and intra-cohort relationships and can measure the capability of communities to collectivise and cooperate. The theoretical underpinnings developed so far exhibit a clear multilevel structure to them, there is the firm as an entity embedded in a regional setting. If there are effects of the political context on the firms, these effects must be mediated by intervening processes that depend on characteristics of the regional context. The methodology in testing this relationship should then reflect this structure, instead of assuming it away.

2.3.2. On How this Relates to Innovation

Innovation approaches posit that firm participation in the innovation process do not exist in a vacuum but instead interact in an interdependent way with other organizations and institutions. These organizations may be other firms such as suppliers, customers, competitors or non-firm entities such as the state, universities, and government ministries. Institutions shape the behavior of organizations codified by shared laws, rules, norms and routines which collectively create an interplay of incentives and disincentives for innovation. These organizations participate in the research and development of new products and processes up to the commercialization of knowledge and transform them into useful products and processes so innovations can emerge. The innovation concept is wide and includes products as well as process innovation which are new ways of producing goods and services which may be technological or organizational (Edquist 2005). Innovation and the phases of it are an outcome of the interplay of institutions in both public and private sectors whose initiatives and interactions contribute to diffusing new technologies and in reproducing institutions. Economic as well as socio-political forces engender organizations and institutions and other factors in influencing the diffusion and emergence of innovations (Edquist, 1997).

Political institutions such as electoral participation become an important factor to the innovation process in two main ways. Firstly, electoral participation serves as a signal mechanism to the firm that committing to investing in innovation will be situated in a stable political environment which should increase firm likelihood to invest. Product markets pose

uncertainty and a dilemma for firms in that economic actors must make investment and production decisions that necessarily shape long-term firm strategy and performance despite not being able to assess future actual risks. Despite all of these risks and uncertainty, producers must commit themselves and their employees and their resources to a certain level of output over a certain period. In order to overcome this commitment problem, firms rely on visible signals from the political environment that will make these decisions under conditions of uncertainty, viable. These signals affect the decision calculus of both suppliers and demanders as well as non-market actors competitors (Nee and Oppen 2012). There are many types of signals from the political environment but elections are particularly potent because the quality of it represents the extent to which there is a peaceful transition of power and in turn this signals how secure the market for transactions are in a country and this influences the decision of a firm to invest in innovation or not. Secondly, electoral participation is a proxy indicator for the firm in assessing the non-market environment for its investment such as whether the community is civically engaged to the extent that is able to overcome collective action problems that might be important for firm activities such as investing in innovation. It is often said that innovation requires coordination, working together and exchanging tacit information in order to discover processes and generate new ideas. Firms expending money to fund R&D might be more likely to do this if their activities are embedded in an environment where these coordination possibilities and civic engagement exists. Voting turnout is one indicator of this quality.

2.3.3. 'Strong' Political Institutions

Established evidence from literature shows that, in general, strong political institutions should, on the whole, help economies perform better. The definition of what constitutes 'strong' political institutions tend to be defined somewhat arbitrarily because there does not seem to be any real consensus as to what is the threshold. This becomes problematic at best and it might lead to a spurious result, at worst, particularly when strong political institutions may result in lock-in and a disadvantage in generating new input. This is illustrated in the case of state-owned enterprises in China, the performance in innovation have been outstripped by private or hybrid enterprises (Nee and Oppen 2012) because of strong institutions that are able to intervene in the market. This is to say that defining the 'right' threshold of political institutions that is supposed to generate expected positive outcomes is very tricky.

2.3.4. Contingent vs. Deterministic

Furthermore, treating political institutions as a determining factor misses the complexity and heterogeneity of the firm response to institutional conditions. Even if strong political institutions exist, some firms may not perform as well as expected based on its own inherent characteristics such as, for example, the size of the firm or its absorptive capacity (Giuliani 2007). This suggests that the relationship between firm activities and innovation investment in particular is contingent on the characteristics of the firm as well as differing factors that may be unaccounted for such as the spatial qualities of where the firm is embedded in. A broader treatment of this research agenda on political institutions and innovation can be seen as indicative of larger systemic relationship and that this interaction is a general manifestation of the effects of institutions and framework conditions on economic performance and spatial capacity (Storper 1995, Saxenian 1996, MacKinnon, Cumbers et al. 2002, Srholec 2010). This leads to the discussion on the spatial site of this study which are regions.

2.4. The Swedish Electoral System

Elections in Sweden are held every 4 years which was introduced in 1994. It used to be held every three years. This paper samples the 2008 elections. The electoral votes both at the national and regional level. Elected municipal council make all pertinent decisions in their jurisdiction. The election system is party-based, the biggest of which are the Social Democrats, the Green Party, and the Left on the leftwing block and on the right-wing block are the Moderates, the Center Party, the Christian Democrats and the People's Party. The block with the majority would be elected to govern at the national parliament or at the region or at the municipality level. The Swedish political landscape has had a 50 year old tradition of effectively, bipartisan politics (Pettersson-Lidbom 2008).

In each region, there is a county administrative board. Regions are mainly responsible for particular social welfare issues, regional planning and works in conjunction with most public authorities at multiple levels. A bulk of the task of the regional council is devoted to health and medical services which constitute 80% of its expenditures (Nelson 1992). Other services include dental, education, theatres, museums and music and support for the local business sector. Public transport is also one of the regional council's responsibilities, particularly those that connect the municipalities in that region. Finances for the regional council comes from

governmental grants and taxes. An elected assembly at the regional level takes all major political decisions and is accountable for them.

3. The Spatial Dimension in Institutions

Innovation processes are rooted in spatially configured institutions (Boschma and Martin 2010). These intangible assets become endowments to these localities which is why spaces such as regions are considered critical spaces for potential innovation (Belussi and Sammarra, 2005; Boschma 2005). Lundvall (1992) argues that production structures and the 'institutional set-up' are the two most important dimensions that jointly define a system of innovation. Taken more broadly, this approach suggests that innovating firms are embedded in a much wider socio-economic system in which political and cultural influences as well as economic policies help determine the scale, direction and relative success of all innovation activities. What seems to be a theoretical consensus is that the institutions within this framework affect the activities associated with the innovation process. It is also said that the institutional set-up converges in specific locations and are getting pinned down spatially.

These spatial endowments include tacit knowledge and the ability to share and coordinate these inputs. Empirical findings show that in order for firms to compete, success depends increasingly upon the ability to produce new or improved products and process, and of which tacit knowledge constitutes the most important basis for innovation-based value creation (Pavitt, 2002). Using tacit knowledge is said to be a critical source of innovation or at the very least an important variable in the innovation process. Tacit knowledge is not easily 'ubiquified' and traded because it does not lend itself well to codification. Consequently, this type of knowledge is pinned down to specific locations such as regions. The difficulty is that tacit knowledge is 'heavily imbued with meaning arising from the institutional context in which it is produced and this context-specific nature makes it spatially sticky' (Gertler, 2003). This puts regions as important sites for the innovation process as a whole. But it also highlights that these resources are not easily extracted without some level of cooperation and shared meaning. This is why civic engagement within a region can be an important conduit of tacit knowledge which could be invaluable to a firm's decision to invest in innovation.

However, probing the regional institutional landscape presents some difficulties because there

are numerous dimensions that constitute the 'regional landscape'. This is also subject to the definition of 'institutions' that researchers subscribe to. There are empirical findings on the long-term evolution of the economic landscape of Swedish regions which have been tested on data from the technological relatedness of firms and industries, particularly revealing that there are strong tendencies towards path dependencies (Neffke, Henning et al. 2011). Findings show that technological relatedness seems to be a strong reason for firms to embed in regions and conversely, unrelatedness, a reason for exiting regions. Empirical findings seem to indicate that there is technological cohesion in Swedish industries so much so that a technological classification can be premised to be a 'path' and a technological trajectory which, in turn, becomes the quality of the economic landscape of the region. These empirical findings represent an important contribution to how we understand the behavior of firms. The effects on the region from this process, is linked but might be, to some extent, exogenous and could potentially test for more direct measure of the regional condition.

3.1. On Regions vs. Spatial Fetishism

As discussed previously, regions have come into focus as a site for institutional endowments and economic activity not least of all because of the emergence of Emilia-Romagna, Baden Wurttemberg and Silicon Valley as immensely successful hubs of innovation and economic development (Saxenian 1996, Amin 1999). The innovative trajectory of these regions have raised the question on whether their successes can be replicated elsewhere and whether regions can engender innovation in order to prosper. Some regions are said to have strong framework conditions and respond to new opportunities which enable the innovation processes to take place (Cooke, Gomez Uranga et al. 1997). This has led to concepts such as the 'learning region', 'relational assets', 'institutional thickness' which emphasize the importance of embeddedness in local conditions (Storper 1995, Asheim 1996, Saxenian 1996, Cooke, Gomez Uranga et al. 1997, Malmberg and Maskell 1997, Amin 1999, Lundvall, Johnson et al. 2002, MacKinnon, Cumbers et al. 2002, Asheim and Gertler 2005, Tödting and Trippel 2005, Morgan 2007). There can exist an 'innovative milieu' in the region which situate institutional endowments and 'untraded interdependencies' because they tend to be pinned to particular localities which potentially enable firms to capitalize on framework conditions such as a stable political environment with high rates of democratic participation.

Even if these stable framework conditions exist nationally across the board, some regions and some firms may be better suited in using their resources and their human capital in processing these conditions. Research into regions formerly focused on firm-centered and state-centered processes, keeping in line with the legacy of neoclassical economics with particular strategies in renewing lagging regions centered on redistribution and welfare policies but there is increasing empirical evidence to show that its source of local advantage is its institutional endowments (Amin 1999, Asheim and Gertler 2005). This suggests that economic activity should not be isolated from the spatial environment it is embedded in (Srholec 2010). The inherent problem with ignoring the structural conditions of a region is as much a theoretical problem in the literature as it is an empirical one. Ignoring the framework conditions ignores the site of the resources the firm uses which may be shaping its behavior and its incentives. The statistical problem with this is that it leads to underestimation of the standard errors and could result in unwitting invalid statistical tests, particularly in this instance where there is strong impetus from the theoretical implications in the literature to reflect this explicit multilevel structure of the phenomenon of innovation processes.

This focus on regions, is not without criticism (MacLeod 1998, Lovering 1999, MacKinnon, Cumbers et al. 2002, Sunley 2008, Shearmur 2011). This side of the literature explains the focus on regions as one that is less motivated by theory but more as a byproduct of the *'survival instincts of regional groups against being displaced by an increasingly globalizing world where the theory is led by policy rather than the other way around'*. MacKinnon (2002) further explains that the implicit claim that *'regions are entities with causal powers of their own are a form of 'spatial fetishism', privileging one geographical scale over another*. The conceptual weaknesses of regions as entities is the supposed tension of regions having local endowments, the *'ubiquification'* of which needs to be prevented by a group of people bound by shared norms, routines and conventions. And yet at the same time, these same community cannot depend on these internal endowments alone but instead must look for external inputs in order to be able to innovate and to avoid *'lock-in'*. This is said to be the conceptual weakness of regions as entities with the very essence of a region thinly developed as a theory (MacKinnon, Cumbers et al. 2002).

One critique to MacKinnon is that his premise that learning regions and other similar concepts

'share a concern for the creation of sustainable localized advantages in the face of globalisation' seem to confuse theory for policy implications. If those governing regions were interested in constructing a comparative advantage, then this would imply that local advantages such as tacit knowledge need to be sustainable. Regional theories is not prescriptive in this way. Whilst it is true that regions are a political-economic organizations still need to be further developed, there have been progress, if not consensus, in developing regions as a theoretical entity such as for example looking at functional regions, spatial entities not constructed arbitrarily but as a site of economic activities and commuting. This thesis in particular uses functional regions in the empirical testing part to avoid spatial fetishism.

The line of reasoning that regions form characteristics based on the institutional landscape they have is persuasive for two reasons. Firstly, governance determined at the regional level becomes an effective instituted process that is path dependent as shown by prominent studies in economics and economic geography which implies that economic policies and norms of governance will tend to persist creating a convergence of characteristics at the regional level (Knack and Keefer 1995, La Porta, Lopez-de-Silanes et al. 1999, Persson 2002, Persson and Tabellini 2006). Secondly, an interdisciplinary approach in terms of adopting empirical approaches that account for the political dimensions mentioned MacKinnon's critique. Amin (2001) advocates a move towards a more open and plural conception of institutionalism in economic geography. This is why an attempt to use a political dimension in this research agenda to test the effect of the institutional endowment of political institutions. So the political dynamics that Mackinnon (2009) thinks should be part and parcel of the empirical exploration of institutions in a firm is compatible with theoretical foundations of economic geography. Furthermore, the missing elements in the theory that MacKinnon refers to is not a symptom of inherent theoretical problems but a reflection of the general trend in the empirical foci that researchers tend to choose.

Even if these concepts of regions were rejected, accepting that regions are mere political-economic organizations still makes it a unit of analysis fertile for testing. Political-economic organizations share interests and patterns of regulations and strategies and institutions that are not always but often delineated by jurisdiction in the decision-making process. This theoretical problem will be dealt with in this thesis in the following way: drawing from actual

regional infrastructure and testing their effects. Regional economies are developing and Storper argues that the region has acquired a central theoretical status because it has 'untradeable interdependencies' (Storper 1995).

3.2. On the Spatial Quality of Political Institutions

Civic engagement with political institutions is place specific because voting, as part of political life, is spatially bounded (Putnam 2001). Voters tend to be registered according to neighborhoods, municipalities and regions. Civic engagement, as measured by voting, can reveal the capacity of communities to overcome problems that require collaboration and cooperation which firm activities like innovation tend to do. When information and knowledge is shared in a way that does not entail large transaction costs, this might confer efficiency gains on the firm. There were very few studies that actually match levels of democratic participation to regions in order to see both within and between regional differences in democratic participation and instead would totalize these institutions and assume away variability, with some exceptions (Rutten and Boekema 2007, Srholec 2010). Many studies do however attempt to model a spatially-configured institutional landscape but do not quantitatively measure it.

One of the most popular spatial sites for testing is the region, purported by some as the locus of economic activity. Charron et al (2014) uses political institutions data across Europe at the regional level with findings showing that there are large regional differences in some countries and that these differences correlate with levels of economic development. It represents a rather ambitious approach to gathering evidence on the effect of political institutions across different localities. Exploring the differences and similarities between the regionally constituted institutional landscapes would generate interesting observations. A natural control variable would be, though, is to model regions that have similar institutions but with heterogeneous firms so then it is possible to isolate the effects of regional institutions like 'democratic participation' on different types of firms. This is one of the methodological decisions that will be pursued in this Master essay, using political institutions data from Swedish regions. Besides the fact that a multilevel model test of political institutions on Sweden does not seem to have been done yet, this country is quite well known having excellent data and a rather homogenous population with very little within country variation in

its political landscape across regions (Charron et al, 2014). This makes the Swedish case a good bet in testing the relationship between political institutions and research and development for innovation. Studies have conducted this test at different spatial scales, locations and quality – national frameworks, rural areas, developing regions, etc. (La Porta, Lopez-de-Silanes et al. 1999, Rodriguez-Pose 1999, Hall and Soskice 2001). Other units of analysis include firms, R&D units, rural areas, regions, nations (Saxenian 1996, Tödtling and Trippl 2005, Rodríguez-Pose 2013). Conventional macroeconomic approaches that use political institution indicators in growth models tend to miss the nuanced analysis engendered from evaluating measures at the regional level. Empirical evidence from this research is somewhat contentious. Some show that the strength of political institutions has a positive effect on product innovation and economic performance in general whilst others exhibit more caution. Even if there is confirmation that there is some complementarity between R&D and the political environment, some find that the political civic culture of certain industrial districts is an insufficient incentive for innovation because it is an activity which mainly relies on the economic profitability of the innovation.

The changing nature of the innovation process itself, which is geared more towards learning, highlights the growing importance of political institutions that facilitate this process (Mazzucato 2011). The argument here is that innovation has come to be based increasingly on the interactions and knowledge flows between economic entities such as firms (customers, suppliers, competitors), research organizations (universities, other public and private research institutions) and public agencies (technology transfer centers, development agencies). The frequency and quality of these interactions can contribute to generating input for innovation but it is dependent on incentives and constraints which are engendered by the institutions which are spatially located. This affects how firms will plan and invest in research and developments towards this end.

3.3. On Points of Departure

The point of departure then, for this essay is to test the institutional framework conditions of regions on its effects on the innovation process; use research and development expenditures as the response variable; use multilevel modeling to extend traditional estimation techniques, use an uncommonly tested but theoretically relevant variable dimension of political

institutions which would be democratic participation as measured by the percentage of voters per region and finally, perform this test on data from Sweden because of the high quality in data and effective control mechanisms. This paper aims to make several contributions to the literature. Firstly, it aims to contribute empirical evidence on the effects of regionally configured political institutions on the firm, demonstrate a more robust and appropriate estimation method by using multilevel modeling. Secondly, it aims to incorporate more political dimensions in the study of innovation output in regions in order to capture the non-market quality of the region as it impact firm activities.

3.3.1. Previous Work Using the Multilevel Approach

Srholec (2010) tests the effects of framework conditions on the innovation process using variables such as economic crimes, murders and unemployment (and other variables subjected to a factor analysis before being run in the models) attempting to capture the social dimensions of the region exogenous (to some extent, because path dependency studies have shown a feedback loop that generates correlation between interlinked factors) to the firm and focusing on the social dynamics of the region. The econometric method seems robust in testing this relationship and can accommodate the internal logic of the economic geography approach. Using micro data from the Czech Republic, he finds that the quality of the regional innovation system directly influences the likelihood of a firm to innovate and that this effect decreases with the size of the firm as well as the social forces in the region were found to be relevant explanatory factors of innovation (Srholec 2010). The work is persuasive but is short on bridging the theory to the methodology. The factor analysis conducted in the article is a robust method but the data available on the regional conditions (crime, murders, unemployment) is not directly implicated in the theory of regions (Srholec 2010). At the very least, this study attempts to confirm the findings of the article that framework conditions in the region matter to the innovation output.

This study aims to pursue a quantitative approach to measuring the regional condition and one that upholds the internal logic of the economic geography, assumptions like heterogeneity of the firm activities across regions and the institutional environment, differential effects; while addressing the claims that the political dimension have been sidelined by focusing on the institution of democratic participation in elections. There are some studies that test the

claim that innovation is shaped by institutions. But often the variables used as dependent variables are those like patents, instances of reported innovation in products and processes new to the firm and to the market as well as R&D expenditures much like it is used in this thesis. This approach is not without criticism, however. These measures do not capture actual innovation, innovation that which has been commercialized and allowed to interact in the market. It also does not measure the totality and the complexity of the innovation process as a whole. But still, using R&D expenditures has its own limitations and does capture some level of the investments of firms towards innovation and proxy the willingness of firms to engage in this process, albeit in a limited way.

Recent work in the political economics literature, some using regression discontinuity designs, show that there is a causal link between politicians and fiscal spending in government at the national level (Persson and Tabellini 2004) and less in subnational governments (Ferreira and Gyourko 2009). However, to my knowledge, there are few studies in economic geography that specifically looks at the effect of these political dynamics on firm innovation imperative outcomes. Higher fiscal spending, in general, does not automatically imply higher spending and better outcomes from innovation within firms. There seems to be a lacuna of empirical evidence on the impact on innovation and if so, in what ways and to what extent.

3.3.2. On Highlighting Heterogeneity of Firms

Despite the recognition that traditional linear models on innovation and increasingly, the empirical work needed to substantiate the theories in economic geography, the quantitative methodology used to match these discussions have not seemed to have kept apace. Many studies continue to use traditional estimation techniques. This is problematic for several reasons. Firstly, firms are heterogeneous and their differences should not be assumed away in the model. Secondly, the relationship between political institutions and innovation is inherently hierarchical, one is the firm and the other is the region so it doesn't make sense to not reflect in empirical models when testing this relationship. Out of possible models, this essay has chosen multilevel modeling because it is robust to handling these demands relative to more traditional estimation techniques (Rabe-Hesketh and Skrondal 2008, Hox 2010, Srholec 2010). Here follows a detailed discussion of the particularities of this technique.

A crucial ingredient of economic geography is the heterogeneity of firms and current empirical methods at play in the literature seem to violate this key idea in the discipline and either assumes that all firms in one region behave in the same way or all firms are unique. The assumption that all agents act or perform in the same way when subjected to the same regional institutions contradict empirical findings that suggest the opposite. Giuliani (2007), among others, has demonstrated that agents in clusters differ widely in terms of economic power, absorptive capacity and network position, despite the fact that clusters are associated with a particular set of institutions. But this also contradicts the findings that all firms behave differently. *'This variety can be understood from the fact that firms may develop routines in a path-dependent and idiosyncratic manner and territorial institutions are often so general such that specific effects at the firm level can still vary greatly'* (Boschma and Frenken 2009)). An appropriate empirical method needs to be made and relevant data need to be gathered. The method chosen should allow these different levels to interact and allowing for heterogeneity amongst firms as they respond to the regional institutional conditions.

4. Hypotheses

Despite a common region-specific institutional landscape, a fundamental premise of economic geography is the *heterogeneity of firms*. This implies that the response of firms to framework conditions must vary as well. The underlying reason for this variety is explained in Nelson and Winter's (1982) seminal work which moved away from prevailing neoclassical assumptions at the time which postulates that firms are perfectly rational agents; instead this stream of the literature states that firms are instead bounded rational agents which intend to process information and make the best decisions possible but are hardly ever in possession of perfect information so they often make inefficient decisions that do not maximize their interest. Bounded rationality is the root of the heterogeneity of the firm (Essletzbichler 2009). Absorptive capacity is pointed to as one of the reasons for this variability (Giuliani 2007). Firms have different resources and capacities in processing information and signals and this processing power is subject to the complexity of the information. Even with extended networks, firms may not be able to appropriate resources for their own interests because of low absorptive capacity and inadequate technical human capital to transform this resources.

Depending on their characteristics, firms seem to adapt and change in different ways in response to the institutional environment. Given this, this thesis will test the following hypotheses:

H1: The quality of the political institutional environment in the region as measured in voting share positively affects the R&D Expenditures.

H2: The effect of regional political institutions on the firm is mediated by the size of the firm.

H3: The effect of regional political institutions is mediated by the sector the firm belongs to.

In addition to firm size as an important explanatory variable in the behavior of firms, the sector it belongs to seems to be a critical component as well, according to prevailing theories because according to Boschma and Frenken (2009) institutions, particularly spatially-configured institutions which are considered territorial because they tend to retain durable structures of embeddedness within the locality, have a strong impact on the behavior of firms, industry and networking relations. The reason for this is that patterns of institutions emerge for sectors as they are important in organizing and coordinating complex supply chains. Sector-specific institutions have developed over time in order to allow firms to routinize their activities across territorial boundaries and an intuitive way to organize this has been across sectors. Empirical evidence shows that much of the variance in innovative patterns can be explained by sectorial differences. Admittedly, this study captures this dimension in a very crude way by inserting a dummy variable for sector as an explanatory variable but it at least allows the interaction effects between the sector and the regional institution of voting for some results. These hypotheses will be directly taken to the dataset for quantitative testing.

5. Empirical Methodology and Interpretation of Results

Methods in economic geography in testing this institutional relationship with innovation have been largely dominated by case studies and other forms of qualitative studies. These methods are particularly useful when trying to capture the contextual, historical and complex process of innovation taking place in firm, sectors and regions. An excellent example of the

contribution of case studies is the in-depth work of Saxenian (1996) exploring both the success and failure, respectively, of innovation hubs Silicon Valley in California and Route 186 in Massachusetts.

Whilst these findings constitute a significant contribution to the empirical evidence towards the impact of institutions on firm innovation and indispensable in guiding the development of a possible index of indicators, a quantitative approach is a necessary complement to this in order to make these findings robust and generalizable. It is rather difficult modeling the innovation process as it is not a discrete event but a complex and continuous one which includes unobserved and unexpected variability so testing a key component of this process might be useful. An additional difficulty is that any analysis situated within economic geography and innovation studies must conform to the ontological commitments of the discipline when implementing their empirical methodologies otherwise the empirical contribution to the field will be limited or inapplicable. Some attempts to do this mostly come from the Science & Technology literature and they include using traditional estimation methods (Callois and Aubert 2007) using ordinary least square (OLS) regression analysis, logit and probit models, structural equation models (Carmona-Lavado, Cuevas-Rodríguez et al. 2010), two step models (Landry, Amara et al. 2002). These suffer from critical methodological and conceptual issues. Firstly, the relationship between the firm and the region clearly has nesting qualities as implied by theory and is also hierarchical which implies that an appropriate model and data to be used should be hierarchical as well to accurately reflect this nature. There is relatively less within-country variation in Sweden across the political landscape in the region than other countries. What might differ is the economic and industrial landscape due to firm heterogeneity in terms of their strategies, resources and capabilities in their attempt to mediate the regional institutional environment they are situated in. If the political institutional environment is meant to constrain and enable firm behavior and output, then it is important to examine how the variety of firms across the regional landscape responds to the political environment and the institutions that constitute it.

Generally, using proxy variables to capture political institutions is contentious. Political institutionalists tend to use corruption indices, amount of litigation cases for contract enforcement to measure the strength of the property rights system, presence of wars and

revolutions, change in constitutions, size of government and measure the effects of which on country performance (Knack and Keefer 1995, La Porta, Lopez-de-Silanes et al. 1999, Persson, Tabellini et al. 2003, Persson, Roland et al. 2007). Whilst these approaches represent a contribution to the field, it is limited by its reliance on perceptual data. Since this thesis seeks finer grained measure that can capture regional conditions, voting shares, as a direct measure of a political institution, per region as a measure of democratic participation in elections as a political institution will be utilized. Moreover, this regional condition of voting shares can illustrate the spatial configuration of the institutions environment in a certain locality which is why it is relevant to look at regions in such a stable country like Sweden. Voting shares can reveal the quality of civic engagement present in communities that reside in these regions which can impact firm activities, especially ones that require overcoming collective action problems such as non-cooperation and ‘free riding’.

Also, manufacturing firms are typically sampled, possibly because it is a good control factor, as intuitively, the proclivity for innovation would be higher than other industries, controlling for the knowledge base. As for innovation, traditional explanatory variables rely on patents which are used to capture innovation but there are problems associated with such an approach because this does not really capture firm investment but only those that eventually lead to patenting (Landry, Amara et al. 2002). A more appropriate measure of it this is the research and development expenditures of firms because there the process of firm input is observed rather than just the outcomes. This might make more visible how firms respond to the institutional environment.

5.1. On Alternative Data Sources

Similar constructions prevail in different datasets used such as the Quality of Government database as maintained by the Quality of Government Institute at Gothenburg University in Sweden. These surveys, whilst excellent contributions to data sources on institutions, aggregate existing indices as well as adding on more data. It tends to rely on questions posed to people such as how trustworthy is your government, would your government respond to a complaint, do you think your government is corrupt, etc. Constructing proxy variables from answers from questions that may or may not be answered truthfully is problematic and may cast doubt on the quality and scope of the data. Moreover, what these surveys merely sample

are views of political quality rather than an actual measure (Knack and Keefer 1995). There is room in the literature for such perceptual accounts. However, it is also good to use register data that do not rely on the quality of answers of people. This is an advantage of measuring democratic participation in the political institution of elections because it maps the shares of voters going to the polls and is relatively more direct of a measurement than the ones measured above. Furthermore, variables used for political institutions in economic geography needs to incorporate elections to it. The reason for this is that different dimensions of political institutions might have different impact on the innovative processes. For instance, while subsidies for developing or buying electric cars may have a targeted effect on this specific industry it may not affect the market for 3D printers. While corruption in customs and duties may have a strong effect on industries that rely on imports and exports relative to industries which do not. This thesis only examines the dimension of voting but is cognizant of the fact that this is only one dimension of political institutions. Kaasa (2009) shows that civic participation, a dimension of political institutions that has received very little attention in the literature had the strongest positive effect on innovative activity measured by patent applications and yet this dimension is rarely measured and tested in these studies. This is why in this study, voting turnout from each region will be considered as a measure of political institutions.

5.2. An Overview of the Data and Variables

This empirical analysis is based on micro-data from SCB specifically drawing from databases on firms and business as well as voting patterns from register data. Firms having from 10 to more than 250 employees in 2008 were included in the sampling frame. The sample in this data covers 619 firms which had R&D expenditures in 2009 belonging to the manufacturing sector. R&D in 2009 has been taken because I wanted to lag the effect of the signal from the elections to the following year since it is more realistic that firms can process that signal and allocate resources accordingly in the following year. An overview of the micro data is given in:

Table 1. Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
R&D Expenditures	654	35572.3	531436.2	0	1.22e+07
Firm Size	654	643.6453	1563.305	1	19025
Manufacturing	619	.6607431	.47384	0	1
Political Participation	654	.8195688	.0238261	.753	.895

The dependent variable is **R&D Expenditure**, which is a continuous variable that measures the total research and development expenses the firm made in the following year of the election 2009. I am taking the R&D of the firm in 2009 because I expect that the outcome of the signal is lagged in t+1. Besides evidence from expenditures on R&D, the data set provides information on the size, sector and regional location (see Table 1) of the firm. The **SIZE** of the firm refers to the number of employees in the beginning of 2008. **SECTOR** is a dummy variable with a value of 1 for manufacturing firms which dominates the sample.

The regional institution used here is **Political Participation**. This is measured by voting shares of electoral turn out in general elections per region across Sweden in 2008. Table 2 shows that there is a total of 654 observations except for Manufacturing which is 619. The number of regions is mostly 49 (in the output) and there are on average 13 firms reporting R&D expenditures within each region. There are different sample standard deviations reported below, the overall standard deviation

Table 2. Variability amongst the variables

Variable		Mean	Std. Dev.	Min	Max	Observations
R&D Expenditures	overall	35572.3	531436.2	0	1.22e+07	N = 654
	between	14813.57	0		96302.66	n = 49
	within	529748.4	-60730.36		1.21e+07	T-bar = 13.3469
Firm Size	overall	643.6453	1563.305	1	19025	N = 654
	between	390.4536	31		1898.833	n = 49
	within	1538.983	-1238.188		18858.75	T-bar = 13.3469
Manufacturing	overall	.6607431	.47384	0	1	N = 619
	between	.1696881	.3934426		1	n = 48
	within	.424743	-.2483478		1.267301	T-bar = 12.8958
Political Participation	overall	.8195688	.0238261	.753	.895	N = 654
	between	.0193021	.753		.8461818	n = 49
	within	.0205771	.7541612		.9095802	T-bar = 13.3469

The location of firms was identified by using the unique organizational number of the headquarters (HQ) units of surveyed firms. For purposes of matching firms to specific regions, I only considered the HQ in the dataset which is reasonable because they are usually centers for planning and decision-making processes for R&D. The HQ of firms were matched to the specific region they belong to. Even if R&D activities are conducted in places other than the

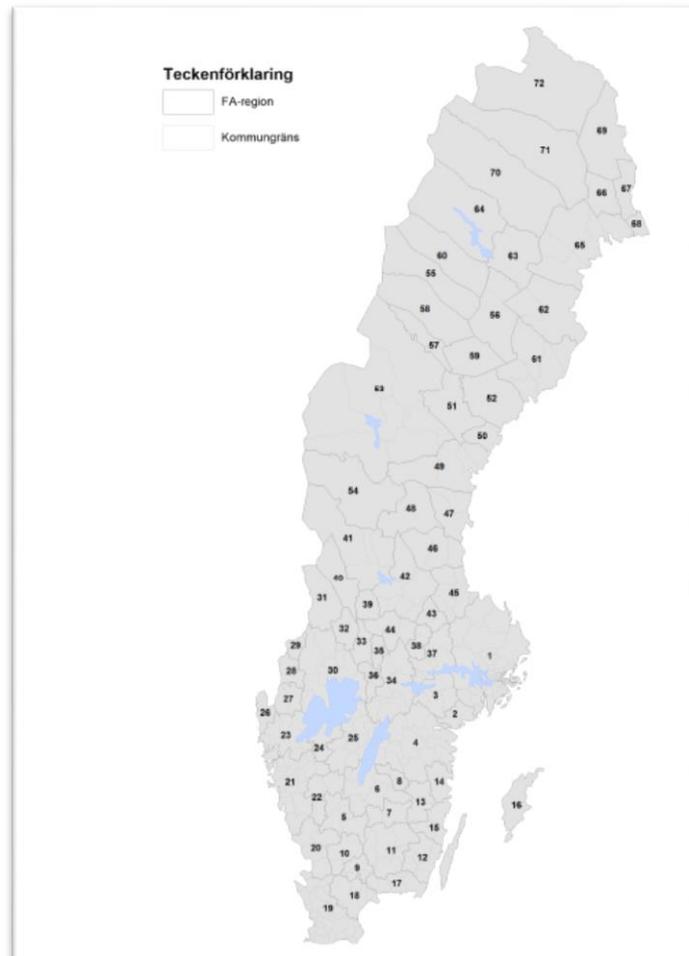
headquarters of the firms, the decision to invest in R&D, 'the innovation imperative' as it were, is still one that is made in the headquarters where the leadership resides. If the argument is that the regional political environment affects this decision, then to attempt to capture this in other branches of the firm might double count this innovation proclivity which might lead to spurious results. Regional classification in this paper follows the Functional Analysis (FA) regional classification system. These current divisions, started from 2005, are based primarily on commuting statistics from 2003. This classification allows for consideration for factors such as trends in commuting and other things that can change travel patterns in a profound way. The number of FA regions is 72 designations (see figure 1 for a map of these regions). Apart from a general breakdown of the FA regions, certain regions have also been put into sub-regions, because in some cases there are several functional parts such as labor markets within the same FA region. They need not be connected to the entire FA region, but only to a common central part of it. The division is mainly intended to be used in regional analysis. FA regions were formerly called local labor market regions (LA regions). The name change was made to reduce the risk of confusion with SCB's local labor markets (LA) (Statistics Sweden, 2011). Whilst any choice of regional classification will be somewhat contentious (Shearmur 2011) because of competing alternatives (such as NUTS or more traditionally geographical oriented systems), this thesis has chosen the FA region system because basing the classification on commuting trends can capture the economic activity of the innovation processes examined here as well as commuting belts link the political governance structures to each other.

According to innovation approaches, as discussed in previous sections, investments in innovation can materialise where there are sufficient signals of stability so firms can appropriate critical resources such as knowledge, routines and agents to generate spillovers and interactions to generate innovation manifested in research and development costs amongst other things (Edquist 2005). This implies that we need to model the spatial conditions in which innovation processes take place. This essay has chosen regions as a potential site for innovation and political participation in terms of voting as a primary regional condition to test, motivated by the theoretical claims in the literature (see Section 2).

If resources are to be shared, then the quality of political institutions in the region, which generally facilitates economic activities need to be measured and tested. The proxy variable

for political participation that will be used here is the percentage of those who voted in the general elections in the region in 2008 which captures the strength of democratic participation of the population which is a type of political institutions.

Figure 1. Map of the FA Regions of Sweden



Source: Statistics Sweden 2011

To clearly designate which variables belong to which level, here is a description:

Level 1 (Firm)

- **R&D Expenditures (R&D):** the firm expenditure on research and development in 2009 (in other words, returns on innovation) and is the response variable of the model.
- **Size (emp08):** size of the firm measured by the number of employees in 2008.
- **Sector (Manufacturing = 1; Other = 0):** dummy variable sector

Level 2 (Region)

- **Region** (FA_HQ_Kommun): regional identifier
- **Political participation** (Generalelection): proxy for political institutions, measured by the percentage of people who voted in the national elections in 2008.

5.3. On the Multilevel Approach

Since the data in this thesis involves two levels, where the firm is nested in the region, a multilevel econometric structure is appropriate to use. One of the contributions of this thesis is to quantitatively reflect this nested character of firms and their activities in the empirical strategy which is not usually done in previous studies. Multilevel structures are extensions of the ordinary least square (OLS) model but in a way it is more dynamic since the complexity of error terms are reflected. The data structures within these types of regressions are hierarchical which means that a level is embedded in another (Rabe-Hesketh and Skrondal 2008). Maximum Likelihood estimates (ML) are used to estimate multilevel models. ML estimation is a type of estimation which finds estimates of the parameters of the model which most likely produce the outcomes for the variances and the co-variances (Rabe-Hesketh and Skrondal 2008). ML estimates perform an iterative process with starting values for the regression coefficients taken from the OLS regression estimates and with zeros for the variance components. In the first iteration, a procedure is used to try to improve on the starting values. The second iteration is performed after the likelihood function is examined. This process goes on until it converges. Although models do not necessarily converge. (Rabe-Hesketh and Skrondal 2008). ML is the joint probability density of observed responses as it is related to the parameters of the model. A parameter estimate that maximise the ML function is what is being searched for in order to make responses look as 'likely as possible', hence the name. ML estimators exhibit ideal properties such as consistency which means that the estimates attained approaches the true values as the sample size increases and efficiency which means that the estimates attained are the smallest possible sampling variance in big samples (Rabe-Hesketh and Skrondal 2008).

A multilevel theory must identify to which levels variables belong and which direct and interaction effects can be expected. For example, interaction effects between firms and the regional level require specification of processes within firms that cause those firms to be

influenced by certain aspects of the regional context. Therefore, multilevel issues must be explained with theories and empirics which reflects this hierarchy as such (Hox 2010). The multilevel regression model is also known as a random coefficient model or variance component model and it is a ‘hierarchical system of regression equations’. It uses a hierarchical data set. This means response variables are measured at the lowest level which in this case is the firm, and ‘the explanatory variables at all existing levels’ (Hox 2010).

5.4. On the Multilevel Regression Procedure

To further motivate the choice of the multilevel regression procedure, I first specify and fit an ordinary least square (OLS) regression model which is a commonly used model in the literature, to explore why an extension to the multilevel model is necessary if it is to capture the research questions at play in this thesis. I then specify three versions of the random intercept models: the null model without explanatory variables and the null model with explanatory variables from Level 1 and 2. In these models, the regression constants (intercepts) can vary among the Level 2 units (regions). I then add further complexity by running the random coefficient model, where the regression coefficients can show variation between contexts. In the final step, the models with explanatory variables at the regional level are fitted with interaction terms (Rabe-Hesketh and Skrondal 2008). So here is the standard specification of the OLS model:

$$Y_{ij} = \beta_1 + \beta_2x_{2ij} + \beta_3x_{3ij} + \beta_4x_{4ij} + \epsilon_{ij}$$

Where Y_{ij} is the continuous variable **R&D expenses**, x_{2ij} is **Political Participation**, x_{3ij} is **Size of the firm** and x_{4ij} is the categorical variable for **Sector** and ϵ_{ij} is the error term. Fitting the OLS regression in Stata, I get the following results:

Table 3. OLS Results

R&D Expenditures	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
Firm Size	203.8689	11.91931	17.10	0.000	180.4612	227.2766
Mean size in employment	-159.5505	70.39687	-2.27	0.024	-297.7992	-21.30174
Manufacturing	-5642.511	39754.51	-0.14	0.887	-83714.33	72429.3
Political Participation	-135794.8	862861.5	-0.16	.875	-1830520	1558930
Mean Political Participation	1043585	1778308	.59	.558	-2448742	4535911
Region	-1678.282	1142.033	-1.47	.142	-3921.061	564.4963
_cons	-702277.7	1269629	-.55	.580	-3195636	1791081

This table includes mean centered (applied on Size and Political Participation) regression coefficients, their standard errors, the t-value, its probability level and the 95% confidence interval for the coefficients. Statistical significance of the regression coefficient is measured by checking the t-statistic which is normally distributed. The statistical hypothesis is:

$$H_0: \beta = 0 \text{ and } H_1: \beta \neq 0$$

The test statistic is attained by dividing the estimated regression coefficient by its standard error. Both firm size and mean size in employment are statistically significant at the 1% level with the other coefficient being insignificant statistically. As can be seen from the table, for each additional employee, it can be expected that the firm's R&D expenditure will increase. Since Manufacturing is a categorical explanatory variable, the regression coefficient is merely the difference in means between Manufacturing and Non-manufacturing sectors. The difference here is negative so firms from the Manufacturing sectors take in about 5642 units less in R&D expenditures than their non-Manufacturing counterparts which is unexpected given that manufacturing firms tend to have complicated production processes which might be susceptible to innovation but also, as said earlier this is not statistically significant. Whereas for political participation, for every unit increase of the population voting (stronger electoral turnout), the firm's R&D expenditure decreases by 13794 units. This is counter to the theoretical argument I present above which is that if there is a signal for stability, the more investment in innovation a firm is supposed to make. This coefficient is not statistically significant. We cannot fully rely on this specification because this model effectively assumes a common residual error variance for both the firm and the region and there is no a priori argument why this should be the case. It is unrealistic to expect that firms and regions will have a common trajectory. It could be the case they have but this cannot be assumed.

Graph 1 shows that there is some linearity in the data points in the sample and a linear regression is potentially useful but limited in studying the effects of regional conditions on the firm's R&D expenditure because of the assumption of common variances of the error term for both levels the firm and the region.

Step 1 is fitting the random intercept models: null model with the intercept only and the model with explanatory variables. The first one is specifying the null intercept-only model as

$$Y_{ij} = \beta_1 + \zeta_{1j} + \epsilon_{ij}$$

Let Y_{ij} be the R&D Expenditures for firm i in region j . The regression coefficient is assumed to be constant and equal to the total mean. Since I cannot assume that firms situated in the same region are independent or that the residuals ϵ_{ij} and $\epsilon_{i', j}$ are independent, I split the residuals into two error components, $\zeta_{1j} + \epsilon_{ij}$. So ζ_{1j} is the Level 2 residual, which represent the deviations of the regional mean from the overall mean. The residual of the model is partitioned into two components representing the variation at the two levels or between ζ_{1j} and within regions ϵ_{ij} (Level 2 unit) variation.

Table 4. Maximum likelihood estimates for R&D expenditures (Results from the Random Intercept).

	Est	(SE)
Fixed part		
Beta	35571.43	20765.16
Random Part		
xtmixed		
sd(_cons)	269.6285	1006.04
sd(Residual)	531029.7	14683.09
Log likelihood	-9549.3888	

This table consists of the results from the fixed and random part. Here sd(_cons) is the estimate of the random-intercept results is at 269.6285 which means that regions vary in their intercepts with this estimated standard deviation. And the sd(Residual) is the estimate of the within region residual standard deviation which is at 531029.7. Since this random intercept model induces correlations among responses for units in the same region, known as the intra-class correlation, I compute it below. The proportion of the variance in Y_{ij} captured from the variance between the Level 2 units is defined as and results in

$$\hat{\rho} = \frac{\sigma_{\zeta}^2}{\sigma_{\zeta}^2 + \sigma_{\epsilon}^2} = 2,81993E+11$$

This is the intra-class correlation coefficient (ICC). The ICC can be considered as a baseline for estimating the variances of the two levels. I now extend the random intercept model by adding the explanatory variables in Level 1 which are fixed parameters, inputting it so Model 2 is generated. Specifying the model:

$$\begin{aligned} Y_{ij} &= \beta_1 + \beta_2 x_{2ij} + \beta_3 x_{3ij} + \zeta_{1j} + \epsilon_{ij} \\ &= (\beta_1 + \zeta_{1j}) + \beta_2 x_{2ij} + \beta_3 x_{3ij} + \epsilon_{ij} \end{aligned}$$

And in variable notation, this is the model:

$$R \& D \text{ Expenditures}_{ij} = (\beta_1 + \zeta_{1j}) + \beta_2 SIZE_{2ij} + \beta_3 SECTOR_{3ij} + \epsilon_{ij}$$

The explanatory variables are x_{2ij} and x_{3ij} where ζ_{1j} and ϵ_{ij} are error components. ζ_{1j} is the error component for companies in the same region which engenders dependence within the regions. This departs from the OLS method because it accounts for the spatial dimension. I let $X_{ij} = (x_{2ij}, \dots, x_{pij})'$ be the vector composed of the predictors with exogenous assumptions being:

$$\begin{aligned} E(\zeta_{1j} | X_{ij}) &= 0 \\ E(\epsilon_{ij} | X_{ij}, \zeta_{1j}) &= 0 \end{aligned}$$

It follows that $E(\epsilon_{ij} | X_{ij}) = 0$. It follows that both ζ_{1j} and ϵ_{ij} are uncorrelated with predictors. The distributional assumption for the model is

$$\begin{aligned} \zeta_{1j} | X_{ij} &\sim N(0, \psi) \\ \epsilon_{ij} | X_{ij} &\sim N(0, \theta) \end{aligned}$$

Here it follows that $\zeta_{1j} \sim N(0, \psi)$ and $\epsilon_{ij} \sim N(0, \theta)$, having a normal distribution, respectively. This model evaluates the effects of both firm-level explanatory variable: SIZE and SECTOR. The estimated regression coefficients are given in Table 5. The coefficient for size shows a positive number which means that SIZE has a positive effect which is statistically significant at the 1% level on the firms R&D expenditures, of those from the same region, controlling for the other covariates. This suggests that size is an important factor for the increase in the research and development investment of the firm.

Table 5. Results from Step 1 and 2.

	Full Model		Null Model		Level 2 covariate	
	Est	(SE)	Est	(SE)	Est	(SE)
Fixed Part						
B1(_cons)	-86129.7	31501.55	35571.43	20765.16	543469.9	716757.5
B2 (size)	199.6267***	11.64808				
B3 (sector)	-5385.487	38227.59				
B4 (Political participation)	4356.279	746102.4			-621951.6	874317.2
Random Part						
sd(_cons)	.0016838		269.6285		12562.82	
sd(Residual)	449172.3		5311029.7		530692.3	
Note: ***is for statistical significance for the 1% level, ** for 5% level and * for 10% level						

The t-statistic is used to test the null hypothesis in the OLS models but in multilevel models, the Wald Statistic with asymptotic chi-square null distributions, with the number of restrictions imposed by the null hypothesis as degrees of freedom or likelihood ratios. Consider the null hypothesis that both the regression coefficients for $SIZE_{2ij}$ and $SECTOR_{3ij}$ are both zero or in other words, that both size and sector have no effect on the firms from specific regions as opposed to the alternative that at least one of the parameters are nonzero.

$$H_0: \beta_2 = \beta_3 = 0$$

I tested whether this null hypothesis of the two estimated covariates are zero and a chi-square Wald statistic of 294.26 at 2 degrees of freedom, is returned with a P-value of 0.000 so the null hypothesis is clearly rejected at 1% level which means that the explanatory variables is not zero which makes them usable in the model.

The standard deviation of the estimated random intercepts are given in Table 5 which can be found in the 'Random part' of the table. The residuals standard deviation estimate of Level 1 is 449172.3. The estimate of the random intercept standard deviation is .0016838. In the fixed part of the table, one can see the estimated regression coefficients. In random part of the table, one can see the estimated standard deviations for the random intercept and Level 1 residuals.

Step 2: Develop the Random intercept model with all the explanatory variables

Wherein the random intercept model which includes all the predictors from both levels is specified:

$$\begin{aligned}
 Y_{ij} &= \beta_1 + \beta_2 x_{2ij} + \beta_3 x_{3ij} + \beta_4 x_{4ij} + \zeta_{1j} + \epsilon_{ij} \\
 &= (\beta_1 + \zeta_{1j}) + \beta_2 x_{2ij} + \beta_3 x_{3ij} + \beta_4 x_{4ij} + \epsilon_{ij} \\
 &= (\beta_1 + \zeta_{1j}) + \beta_2 SIZE_{2ij} + \beta_3 SECTOR_{3ij} + \beta_4 Political\ Participation_{4ij} + \epsilon_{ij}
 \end{aligned}$$

Assumptions from the previous model apply but with the difference that we are now adding the Level 2 predictor variable **Political participation** in the model. The SIZE and SECTOR estimates remain relatively the same as with the previous model. Political participation seems to have a positive effect on firm's R&D Expenditures which is statistically significant. For every percentage increase in the population voting in regions, there is a corresponding 4356.279 increase in the firm R&D expenditures. The estimates are not statistically significant however.

Step 3 wherein the **Random coefficient model** is specified. This means that the mean intercept and slope are estimated along with the co-variability of the intercepts and slopes in regions. R&D expenditures and its relationship with political participation is modelled in line with the previous random intercept model including random intercept ζ_{1j} of regions but extending it to include the region-specific random slope ζ_{2j} for **Political Participation** x_{4ij} :

$$\begin{aligned}
 Y_{ij} &= \beta_1 + \beta_2 x_{2ij} + \beta_3 x_{3ij} + \beta_4 x_{4ij} + \zeta_{1j} + \zeta_{2j} x_{ij} + \epsilon_{ij} \\
 &= (\beta_1 + \zeta_{1j}) + \beta_2 x_{2ij} + \beta_3 x_{3ij} + (\beta_4 + \zeta_{2j}) x_{4ij} + \epsilon_{ij}
 \end{aligned}$$

wherein the predictor x_{ij} is exogenous where the $E(\zeta_{1j}|x_{ij}) = 0$, $E(\zeta_{2j}|x_{ij}) = 0$, $E(\epsilon_{ij}|x_{ij}, \zeta_{1j}, \zeta_{2j}) = 0$. Then ζ_{1j} represents region j 's intercept and how it deviates from the mean intercept β_1 and ζ_{2j} manifesting the deviation of region j 's Political Participation slope from β_4 , the mean slope. All random terms are uncorrelated with x_{ij} and error term ϵ_{ij} are independent regardless of which level, of the regions and or the firms.

These are the estimates -89713.99 and 199.6294 for the population mean intercept and slope. Notice the similarity for the estimates from the previous models, especially Model 1 and 2. The estimated random intercept standard deviation and Level 1 residual standard deviation is much higher than for the random-intercept model. This is due to apparently a worse fit of the for the random coefficient model with the regression lines. Interpretations of the relationship of the covariates with the dependent variable of R&D expenditures are still very similar up to this point to previous models which is that size of the company in terms of the number of its employees tends to drive the increases in investments in R&D expenditures rather than political participation which is the main hypothesis of the thesis. Perhaps the reason why this is the case is because the signals are so entrenched within the economic system that the expectations for a stable and peaceful transition of power within the political sphere no longer directly affects the firm decision in terms of commitment to future output, particularly in research and development costs.

Table 6. Results from Step 3 and 4.

Parameter	Model 1		Model 2		Model 3	
	Random intercept model		Random coefficient		Rand. Coefficient with interaction terms	
	Est	(SE)	Est	(SE)	Est	(SE)
Fixed Part						
B1 (_cons)	-86129.7	31501.55	-89713.99	614762.3	-261432.9	1124194
B2 (size)	199.6267***	11.64808	199.6294***	11.6577	-340.3577	
B3 (sector)	-5385.487	38227.59	-5365.033	38387.77	617697	1348189
B4 (political participation)	4356.279	746102.4	4356.3	746102.4	209171.4	1366385
B5(size*political participation)					665.4115	565.719
B6 (sector*political)					-758698.3	1641152
Random Part						
sd(_cons)	.0016838		322.0586		233.3209	
sd(political participation)			388.5869		281.3933	
sd(Residual)	449172.3		449172.3		448637.3	
Log Likelihood			-8934.7082			
Note: ***is for statistical significance for the 1% level, ** for 5% level and * for 10% level						

Step 4: Random coefficient model with Interaction terms is specified as the following:

$$\begin{aligned}
 Y_{ij} &= \beta_1 + \beta_2 x_{2ij} + \beta_3 x_{3ij} + \beta_4 x_{4ij} + \zeta_{1j} + \zeta_{2j} x_{ij} + \epsilon_{ij} \\
 &= (\beta_1 + \zeta_{1j}) + (\beta_2 + \zeta_{2j}) x_{2ij} + \beta_3 x_{3ij} + \beta_4 x_{4ij} + \beta_5 x_{5ij} + \beta_6 x_{6ij} + \epsilon_{ij}
 \end{aligned}$$

These are the estimates -261432.9 and -340.3577 for the population-mean intercept and slope. They are very dissimilar to previous models. Size, for example, now has a negative effect on research and development expenditures. The model does not seem to react well when interaction terms are added to the model. The reason may be that there is no inherent relationship with between the selected interacted variables. One way to interpret the standard deviations estimated from the random intercept and random slope is to construct intervals where 95% of the region's random intercepts and slopes are expected to lie. For the intercepts -261432.9 plus or minus 1.96 multiplied by 233.3209 which means that 95% of regions have their intercept in the range of -60998216.83 to -60997302.21. So the regional mean of the R&D Expenditures for firms from regions with low political participation vary between these intervals. For slopes we obtain -340.3577 + and - 1.96*(281.3933) giving an interval from -95222.85 to -96325.91. This means that 95% of regions have political participation slopes between -95222.85 to -96325.91. It is useful to form intervals for slopes in order to know the probability that slopes will likely have different signs across varied regions. The range from -95222.85 to -96325.91 is not very wide so it seems that regional political participation generally has the same effect on the regions.

So in terms of the hypothesis set out for testing in this thesis, **H1** which is that the quality of the political institutional environment in the region as measured in voting share positively affects the R&D Expenditures, this was not established because findings were not statistically significant. As for **H2** which is that the effect of regional political institutions on the firm is mediated by the size of the firm was also not established because the interaction terms was not statistically significant. What I did find was that size of the firm in terms of the number of employees drives increases in research and development expenditures. As for **H3** which is that the effect of regional political institutions is mediated by the sector the firm belongs to, this was also not established because the interaction term estimates meant to capture this in the relationship were not statistically significant.

6. Scope and Limitations

This thesis has several limitations and by way of expounding on this, the scope of thesis is

demarcated. These are discussed in the following paragraphs. When identifying firms in the data, only the HQ were matched to the regions in the data, completely ignoring subsidiary firms. This limits the scope of the thesis because subsidiaries could potentially be a rich source of information, particularly if the HQ designates their research activities to their subsidiaries. Due to time constraints and difficulties in matching the subsidiaries to regions, this is not covered in the analysis in this thesis. However, for the most part, it is reasonable to believe that decisions regarding research and development are taken at the management level which is usually at the headquarters so the scope of the thesis remains reasonable for its aims.

An aspect of institutions which is not covered in this thesis is the notion of path dependency or what is believed to be a feedback loop between regions and institutions. Paths are determined by previous trajectories and constructions of institutions so whilst political participation in this period might have an effect on firm output, it is not out of the question that the effect is an outcome from a political signal from another electoral period. Institutions change and are dynamic albeit incrementally at times and these changes can be difficult to observe. These institutional changes are not covered in this thesis. Furthermore, the reasons why institutions do and do not change are also not covered such as the purposive action of actors when they mobilise resources to try to embed their goals and interest within emergent institutions. Firms and other actors are not passive players in the institutional game. They are aware that the framework institutional conditions can have serious consequences and effects over their activities and thus, they try to influence the direction and design of institutional dynamics. Although this was not covered in this thesis, it is in line with the idea of power and the political dimension of the interdependence of firm activities and political institutions. But since there are so many types of political institutions and some are easier to measure than others, this thesis has limited itself in only studying voting shares across regions which at least captures the quality of political participation. And whilst the quality of political participation may have some change effects on the current state of institutions, it is outside the scope of the data and this study. Also, firms may be affecting regional rates of political participation through lobbying, marketing or other types of activities which raises the issue of reverse causality which is not covered or addressed at all in this thesis. It is possible that the reason why there is strong political participation is because of high R&D expenditure of the firm but this doesn't seem likely or at the very least, not self-evident why this would be the case. But

still, the effect of the firm on the region is not explored.

Regional studies tend to raise questions on the choice of what constitutes a region. This thesis acknowledges that boundaries can be fuzzy and that a choice of region can be contentious since there are alternative formulations of region. But it is also important to select and test an existing conception of a region which is what this thesis has attempted to do by using the FA region classification. Testing on other classifications such as the NUTS region, a classification used at the EU level as well as standard geographical classifications could provide an interesting comparison with this study as well as other existing ones that use the FA region classification.

Because of the sheer demands of the multilevel method on the data and the risks of models not converging (which happened in this study when I tried to include the interaction terms between the sector and political participation, the model refused to converge), numerous potential variables were excluded from this study. Also the fact that most of the variables used proved to be statistically insignificant, this type of analysis might benefit from a more robust specification. Furthermore, taking proxy variables of regional conditions were limited because there it is difficult to quantify abstract qualities of the region and even when a proxy variable becomes available, it is still an indirect measurement and could potentially be subject to misspecification. There seems to be very little variation across Swedish regions in the political dimension at least in terms of voting. Whilst it may be interesting to find variation, the fact the firms themselves are heterogeneous did allow this thesis to explore the differences in the way firms respond to general regional framework conditions.

This study primarily drew from the economic geography and new institutional literature as well as regional and innovation studies. Institutional studies have found their way across the breadth of the social sciences but this thesis has chosen to draw only from the previously stated literature even though it probably could have benefited from incorporating work and ideas from the other social science disciplines that are currently working on institutions. What economic geography does have and other disciplines do not is the explicit argument for a spatial dimension of institutions, a framework which this thesis relied on extensively.

A significant limitation of the empirical approach taken in this essay is the use of 'voter turnout' as a proxy variable for political participation. Voting, as a political participation, constitute a very limited aspect of the civic and indeed even electoral activity spectrum individuals can engage in. Citizens have at their disposal different forums and mechanism to express their citizenship such as protesting, attending town hall meetings, circulating and signing petitions, campaigning, etc. These could all be important signals towards the vibrancy or the strength of the political environment. These examples of political participation beyond voting is not tested quantitatively here because of a lack of data or time to collect this data would not be ideal and is therefore beyond the scope of this thesis. Still, having acknowledged that, elections are an interesting point of interaction to study because it happens rather consistently every four years in Sweden at both the national and regional level, with voting as a ubiquitous and common form of political participation and therefore is a good point for testing political participation.

Another limitation are the lags employed in the empirical strategy for when a firm receives the signal from the voting turnout of an election. In this thesis, I lagged this signaling mechanism one year in terms of the dependent variable R&D expenditures of the firm but there is no guarantee how much and long a signal is internalized by the firm. Also, some signals fade or get stronger in the second or third period so it might have been interesting to explore the effects in different time periods but it was not the scope of this thesis.

7. Policy Implications

Geography, firm activities and the political institutional context matters are interdependent and thus are important subjects for a more comprehensive research agenda. Although this thesis and the models used in it proved to have little explanatory power, empirical evidence from the literature does suggest this interdependence have profound implications for policy. Often, policymakers treat firms and economic policy as isolated from the spatial context in which firms are embedded in. Given some of the findings of this paper, it seems that a comprehensive policy should account for the institutional conditions of the region since it can have important implications on firm activities and output. Some of the implications of the study address some of the questions regarding regional innovation policy, particularly those

relating to the construction of regional advantage. If low performing regions are to undergo transformations and renewal, attract qualified human capital and spur innovation clusters that attract firms to locate in these regions, then it seems that it is not only the economic infrastructure that needs to be secured but also the institutional framework, in this case, the political framework of elections and voting. This directly relates to Swedish policy towards regional renewal where some industries, like ones in communications and technology, are reaching its end and clustered regions are weakening. Strategies for renewal need to strongly account for the institutional context. If institutions matter as framework conditions for firm activities which is the bases for economic development, then taking on this institutional framework in economic geography might help address issues involving the unequal development across regions, with some more prosperous than others.

Extrapolating on a wider scale, this thesis has potential policy implications relating to EU policy as well with its increasing trend giving funding and support to different local regions across Europe. The EU should include institutional quality at the regional level when investing in innovation. Relative to Japan and the US, the EU has a poor record of converting scientific and technological know-how into commercially viable products and services, the inability to transfer knowledge from laboratory to industry and from firm to firm is well documented (Morgan 2007). Government investment in the democratic process as it relates to civic mindedness can impact this investment in research and development. Furthermore, the EU lacks a robust networking culture and the disposition to collaborate for mutual ends. When creating policy to stimulate this, one must keep in mind that redirecting policy at the regional level is an important dimension to address. Stimulating the institutional framework in a region is not just a welfare issue but an economic development one as well to the extent that it helps firms mediate uncertainty in future production and innovation. Another issue of the EU is that it sometimes directs its policies at solving symptoms of problems such as unemployment but often underestimates finding the solutions to underlying causes that give rise to the symptoms in the first place (Morgan 2007). Focusing on institutions and even institutional change, could help it addressing systemic and structural problems since institutions tend to underpin economic activities.

This highlights the special role that regional governing bodies' play in economic development

and in generating interest and commitment to innovation. With the previously stated trend of the increasing power and control that national governing bodies have been giving to regions across Sweden, it become all the more important to examine the structural conditions at play in regions. Context seem to matter much when applying development policies and one size fits all regional policies have been shown to be quite ineffective (Tödting and Trippl 2005). There are specific challenges however, because of the special governing structure of Sweden, there are ambiguities and overlaps in the governance duties of municipalities and regions. There seems to be power struggles within it with usually the municipality having the upper hand as they have more resources such as amenities and financing and revenues from taxes (they manage all the land) and thus, have the funding and power to implement policies as they see fit, even if it is at the expense of developing better network links in the whole region rather than just in the municipality. This thesis suggests a more strengthened regional approach to policy making. If regions are important sites of firm activities and investments in innovation, more resources and policy power should be allocated to them in order to enhance the performance of firms in terms of growth and innovation output and economic development in general.

Furthermore, this thesis has implications on how regional innovation policy should be constructed. There needs to be a better accounting for the regional institutions at play which frame the innovative activities of the firm (Tödting and Trippl 2005, Isaksen and Trippl 2014). Institutions can have a wide ranging impact on the effectivity and efficacy of any innovation policy particularly if it does not consider the unique framework conditions which is situated in the regional context. Framework conditions enable and constrain firm behavior and output and as such, must be taken into consideration in the design of any policy.

While effort of research environments such as The Quality of Government Institute in Gothenburg University represents progress in terms of access to repositories of data on institutions, it still remains limited because it is reliant on survey data. Therefore, one of the policy implications of this thesis is one that concerns data collection. The SCB should invest in collecting and constructing an institutional index given the potentially high quality of Swedish data. There should also be scope to expand innovation scoreboards to include more institutional indicators as the empirical evidence on whether institutions matter to innovation

performance is growing.

8. Conclusions

This paper tested whether geography, regions and the institutional framework conditions that underpin the activities of firms matter can confirm earlier findings in the literature (Srholec 2010). In a very limited way, the thesis was able to do this by looking at the size of firms in terms of number of employees, coming out statistically significant the positive way it affects R&D expenditures with differences in regional conditions accounted for. The effects of regional conditions may be mediated by the firm characteristics such as size of the firm and to which industry it belongs to but this thesis was not able to establish this because of statistical insignificance of the interaction terms. As far as methodologies go, multilevel techniques offer a quantitative method that upholds the internal logic of the economic geography framework because it can incorporate the spatial dimension rather than assuming it away as in a more commonly used regression techniques. This is an improvement over standard linear regression techniques but as can be seen in the aforementioned non-convergence of some models in this thesis, this technique is very demanding on the data available. As political participation is not a one dimensional variable but can be captured in different dimensions, there is a need to further test these other dimensions on the innovation processes to really capture its effect. This thesis only tested political participation in terms of voting turnout and the signaling mechanism it provides to firms in mediating future uncertainty, deciding on their output in the future and committing their production schedules and resources towards research and development towards innovation.

The two main arguments from this thesis is that firstly, firms use the regional institutional quality as a signal for their investment schedule and secondly that, firms need to assess the regional institutional quality of civic mindedness in the community in order to realise whether there exists the ability to overcome collective action problems of cooperation, coordination and sharing of tacit knowledge which then become useful for investing in innovation. Throughout the thesis, the second argument seemed to be more applicable to the Swedish case than the first one which, on reflection, is one of the biggest lessons this author picked up on. That no matter how well established an argument like ‘the signaling mechanisms’

argument is and how logical it is, one still needs to consider whether it actually applies to the context in which that argument is being tested on. It may be that one of the reasons the empirical tests did not work is because the argument is not applicable to the Swedish context. Still, the hunch was reasonable and it was well worth testing, if only to reject a well-founded hypothesis.

One of the findings of this thesis is the positive and significant effect of size of the firm in terms of the number of employees firms in most of the models used to test this relationship, as mentioned earlier. So the bigger the firms are, the more it invests in research and development programs. This is interesting because it adds to the notion that human capital in organizations can drive activities towards research, development and innovation. This has some policy implications. If institutions matter in firm activities, particularly those geared towards research and development and in general the innovation output of firms, firm should encourage growth in terms of hiring more employees and focus on developing the human capital of firms. Policy makers should also take into consideration that economic activities should not be abstracted out of the social, cultural and political context they are situated in because even though this thesis was not able to establish this directly, the empirical evidence in the literature suggests that framework conditions of the region are an important consideration for planning, initiating and implementing any policy geared towards improving economies and firm activities that are spatially bounded. Innovation is a complex activity and it is one that cannot be divorced from the context it is situated in.

This thesis mainly contributed, albeit in a limited way, to the body of empirical evidence to support the notion that firm embeddedness in a regional setting constitutes critical influences towards firm output such as innovation in terms of research and development. Further exploration into this area should focus on empirically testing the causal relationship between political as well as other types of institutions and innovation expenditures and output to the firm. Causality is difficult to establish but new methodologies are emerging to handle this increase in explanatory complexity such as natural experiment techniques. Economic geography and innovation studies would benefit from incorporating such advance techniques to strengthen the theoretical foundations of this supposed causal relationship.

Institutions, whether political, social or cultural, are not static even when they seem durable and inert. Institutions change in the long run and sometimes in the short run as well. Future research agendas should focus on studying institutional change and the mechanisms by which they change as it interacts with firm activities. It is also entirely possible that the past investments of firms on innovation can be the reason why some institutions change or need to change. Disruptive technologies can have this effect on the market and in society such as the internet for example. This suggest that there is a feedback process between firm activities and institutional change which might prove to be an important area of research. Institutions also don't change on their own. There are significant resources mobilized in order to influence the direction of change so that they can reflect firm interests more. This is manifested in lobbying, campaigning and funding contributions to the political sphere. This dimension of power and vested interests in the transformation of institutions and the way it can enable or constrain firm activities should also find a place in the future research agenda on this topic. If the grand challenges of this century will find solutions from academic research, then this research agenda must extend towards understanding the inherent complexities of the effects of institutions on economic development, not least of political institutions which are spatially constructed.

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