DE NOVO FIRM GROWTH, INNOVATION AND TAKE-OFF

By

KELECHI NWOKE

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Aviad Pe'er, Ph.D.

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ABSTRACT OF THE DISSERTATION

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Dissertation Director:
Professor Aviad Pe'er

Interest in the benefits and drawbacks that stem from the geographic distribution of firms – meaning the socio-economic environment in which they operate – as a potential source of competitive advantage has increased recently in both the entrepreneurship and strategy literature. How those benefits and drawbacks affect de novo firms (independent new ventures) who are considered a major source of job creation, innovation, and economic growth, is not well understood.

This dissertation aims to shed light on the processes and conditions underlying de novo firm growth, innovativeness, and the likelihood of transition into the high-growth stage. I draw and integrate theories from strategic management, entrepreneurship, and economic geography and examine these issues using a comprehensive longitudinal data of Canadian manufacturing firms.

The insights from my studies are important because they allow us to theoretically and empirically identify and separate the exact locational attributes that affect the growth of new entrants, examine which firms experience the benefits and drawbacks of each

attribute, and provide a more complete and systematic explanation of their growth and the determinants of their innovativeness.

Preface

Young firms are important to any economy, being responsible for the creation of jobs and for the career advancements of citizens. Organizational scholars have been devoted to the study of this group of firms, using empirical research to increase the body of knowledge in regard to these firms. Considering the impact which young firms have on innovativeness and industry growth, more work needs to be done in order for us to have a greater understanding of the factors behind the growth, innovativeness and exceptional performance of young firms such as de novo firms.

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CHAPTER 1

DE NOVO FIRM GROWTH: A PENROSIAN, RESOURCE-BASED AND LOCAL AGGLOMERATION PERSPECTIVE

Abstract

This research involves a synthesis of resource-based theories including the Penrosian theory of the growth of the firm as well as agglomeration theory, in examining de novo firm growth. Using a panel data of Canadian manufacturing firms, I examine the effects of agglomeration factors as well as organizational factors on the growth of de novo firms in regions. Results show that the asset-human capital synergy of a de novo firm is positively related to its growth in regions. Also, in regard to the two components of this synergy, the relative quality of human capital plays a more significant role towards de novo firm growth than the relative level of assets. This work extends the resource-based view through results which show that agglomeration enhances the power of the de novo firm's quality of human capital to achieve organizational growth. This research underscores the importance of assessing a de novo firm’s resource position amongst its peers when examining its growth potential in its region.

1.1. Introduction

Young firms grow, but should we know how? The study of firm and industry effects on organizational performance has fueled a fundamental debate in the field of strategic management (Misangyi et al., 2006; Karniouchina et al., 2013). However, it is clear that both endogenous and exogenous factors impact firm performance, and thus the study of the interactions of both kinds of performance factors, rather than merely their separate studies would enrich our understanding of de novo firm performance. I take this systems theory approach (Scott and Davis, 2006) in this study of new venture growth that examines firm-specific resources and external factors. I examine how external forces of agglomeration, environmental munificence, dynamism and complexity affect the relationship between de novo firm resources and their growth. This will help answer the question of how young firms should grow and where this growth could be better supported – areas where the entrepreneurship literature is lacking (Gilbert et al., 2006). This study is interesting because it examines both exogenous and endogenous factors together, rather than separately, in order to increase our knowledge of young venture growth.

This research addresses the question, how does a de novo firm's relative resource position relate to its growth in regions, and what external factors bear upon this relationship? More specifically, how does the level of agglomeration externalities (which could be considered as an external resource base) in a region interact with de novo firms' assets and human capital (internal resource base) levels to influence their growth? Also, what are the differences in the effects of (i) assets and (ii) human capital on the growth of de novo firms, and how do agglomeration (+), environmental munificence (+), dynamism (-), complexity (-) bear upon these relationships? Furthermore, in terms of young venture

growth, what kinds of resources should be emphasized in the start-up and growth stages of a new venture? I examine on the one hand, how this growth is affected by the de novo firm's relative resource (assets and human capital) position as compared with those of its local peers (although I don't argue that it is always beneficial for firms to grow). On the other hand, I examine the roles played by locational factors like environmental munificence, dynamism, complexity and agglomeration in regard to these resource-growth relationships. On the one hand, resource-based theories such as Penrose's theory of the growth of the firm (Penrose, 1959) and the resource-based view (Wernerfelt, 1984, Barney, 1991) suggest that firms gain a competitive advantage based on the uniqueness of their resources. On the other hand, external environmental forces are known to affect organizational outcomes, and the entrepreneurship and strategy literatures acknowledge the link between the external environment and outcomes regarding young ventures (e.g. Stuart and Sorenson, 2007; Folta, Cooper, & Baik, 2006;) including new venture growth (McCann and Folta, 2008). For example, agglomeration theory (Marshall, 1920; Porter, 1990; Wang et al., 2014) asserts that agglomeration externalities are beneficial to cluster-located firms. Further, three dimensions that characterize the external environment – environmental munificence, environmental dynamism, and environmental complexity – have been widely used in the literature (DeTienne et al., 2008), and have had rigorous development (Aldrich, 1979; Dess and Beard, 1984; DeTienne et al., 2008). Yet, considering that firms and their resources are not isolated but are embedded in environmental locations, we remain uninformed about how external environmental forces act upon the influence of de novo firms' resources (particularly their assets and human capital) on their growth.

This chapter examines new venture growth in regions. However, it does not seek to predict new venture growth, nor does it support nor disapprove of this growth. Further I do not suggest that new ventures should or would seek to grow – in fact, firms may not see any particular advantage in growing, and may be against the idea of increase in size because of administrative problems associated with [an increased] firm size (Penrose, 1959: 100). What I do here rather, is account for the differential outcomes in regard to new venture growth, where exogenous agglomeration factors as well as endogenous organizational factors play a role. Clearly some new ventures fail while others survive and remain small, and yet others grow at different rates. However, there is a gap in the literature in terms of how the resource-based view and agglomeration theory (Chung and Kalnins, 2001; Pe'er et al., 2016; Porter, 1990; Wang et al., 2014), taken in tandem, explain these differential results in de novo firm growth. This research contributes knowledge to fill this gap. I focus on the life cycle stages of new ventures and tease out the effects of tangible resources and capabilities in the goal of young ventures taking advantage of the benefits (and overcome the challenges) of regions in order to promote their growth.

The literature on the growth of firms has focused on two broad categories of resources – financial and human resources (Brush and Chaganti, 1998; Chandler and Hanks, 1994; Cooper et al, 1994; Eisenhardt and Schoonhoven, 1990). However, even though the growth of firms is maintained by investing more financial resources or attracting quality human resources to firms, or even by doing both, an important issue that remains under-explored, especially for young firms, is whether these two forms of resources are equally effectual towards growth when used concurrently or whether, during certain stages

of young venture growth, one is a more dominant or important role-player for growth. Adding to this indefiniteness is the lack of empirical research on how financial and human resources impact new venture growth within the context of the young ventures' existence in agglomeration regions.

The entrepreneurship literature largely examines firm growth as an outcome variable which serves as an indicator of firm performance (e.g., Eisenhardt and Schoonhoven, 1990; Baum, Locke and Smith, 2001), with some authors treating it as an input variable used to achieve other organizational goals such as survival (e.g., Pe'er et al., 2016). This present research examines the interactive effect of both internal organizational factors and external environmental factors on the growth of de novo firms. I use multivariate analyses of longitudinal data on manufacturing industry firms to examine the relationships between their growth and their relative asset levels and quality of human capital, also taking into consideration the differential nature of their regions in terms of their levels of agglomeration, environmental munificence, dynamism, and complexity. The research population is firms with at least one employee and up to seven years of age in the Canadian manufacturing sector between the years 2000 and 2015. These are independent young ventures, otherwise referred to as de novo firms. These de novo firms are not homogeneous, but rather they display heterogeneity in their levels of assets and human capital – two forms of resources critical to the growth of firms. In this work, I contribute to the strategy and entrepreneurship literatures in four ways: first, I show the importance to growth, of both a de novo firm's relative asset level and its relative quality of human capital compared, not with those of large firms, but with those of its peers in its region;

Secondly, taken separately, I compare the de novo firm's relative asset level and its relative quality of human capital and show that the latter plays a more significant role towards this growth; Thirdly, I build on Penrose's idea of the 'interaction between Material and Human Resources' that affects the productive services each one can bring about - a cardinal point in her work on the theory of the growth of the firm (Penrose, 1959: 76). I test this theory by introducing the construct of asset-human capital synergy which captures the interaction between firm-level resources and capabilities, and applying it to de novo firm growth. I extend the resource based view by empirically testing and showing that a de novo firm's asset-human capital synergy is a significant factor explaining its growth in regions; a focal de novo firm increasing this synergy beyond the average obtainable amongst a peer group of competing de novo firms in an region should obtain better growth outcomes. This synergy is thus posited to be valuable for new ventures in their quest for growth. The fourth contribution involves the examination of how positive and negative external environmental factors (agglomeration and environmental munificence, dynamism and complexity) affect the relationship between de novo firm resources (assets and human capital) and growth. I extend both the above-mentioned Penrosian theory as well as agglomeration theory in asserting that exogenous factors such as local agglomeration and environmental munificence, dynamism and complexity are important contingencies that impact the relationship between this critical combination of physical resources (assets) and human resources (human capital) and de novo firm growth. In doing this, I follow the method of Pe'er et al., (2016) who underscore the moderating effects of environmental factors such as local agglomeration and concentration on de novo firm outcomes. My work extends the resource-based view through results which show that agglomeration enhances the power

of the de novo firm's quality of human capital to achieve organizational growth. Additionally, environmental complexity diminishes the effectiveness of a de novo firm's human capital in attaining its growth. These findings have implications for entrepreneurship strategy as they help answer the question of how young firms should attempt to grow.

This chapter proceeds as follows: the next section presents the theoretical foundation for this work. I synthesize the resource-based theories in regard to firm growth, highlighting Penrose's (1959) theory of the growth of the firm, as well as the resource-based view, the dynamic capabilities perspective, and the resource orchestration perspective. Following the examination of the shortcoming pertaining to the Penrosian view, I examine agglomeration theory and the three exogenous dimensions of environmental munificence, dynamism and complexity. Subsequently, in section 1.6, I present hypotheses on de novo firm growth, which are followed by the data and method section 1.7. Next, in section 1.8, the analysis results are presented, followed by the discussion in section 1.9, and then the conclusion.

1.2. Theoretical Background

This research examines the growth of young firms using theoretical lenses of resource-based theories and agglomeration theory. The resource-based theories are a collection of theories which posit that a firm's performance hinges on its collection of internal resources. Although these theories take somewhat different perspectives in

explaining firm performance, they all have the same underlying theme which is that the resources possessed by firms are the basis of firm heterogeneities, and are the underlying causes of differences in performance amongst firms. This work is thus not intended to present these theories as different theories per se, but rather as related theories which, taken together, give a clearer explanation of the role played by resources in shaping the growth of young firms. These theories are Penrose's theory of the growth of the firm (Penrose, 1959), the resource-based view (RBV) of strategic management (Wernerfelt, 1984, Barney, 1991), the dynamic capabilities perspective (Teece et al., 1997, Eisenhardt and Martin, 2000), and the resource orchestration perspective (Sirmon, Hitt, Ireland and Gilbert, 2011; Chirico, Sirmon, Sciascia, and Mazzola, 2011).

The work of Edith Penrose is widely acknowledged as being intellectually foundational to the development of the resource-based view (Locket and Thompson, 2004). I thus use Penrosian arguments as a framework to connect other resource-based theories in order to provide an overall resource-based perspective of the growth of de novo firms.

Penrose (1959) was only concerned with firms that do grow, and specifically the process of growth and the limits to the the rate of growth. In regard to firm growth, she alluded to the search for profit as being the presumed explanation of how and why firms reach the 'most profitable size, though she rejected that explanation (Penrose, 1959:1). Rather, she listed a number of reasons why many firms don't grow, including insufficient capital-raising ability and poor judgement (Penrose, 1959:7). According to her evidence,

firm growth is connected with human attempts to do something, and she urged the explicit recognition of this fact. Yet she did not seek to provide a test for what kind of firm can be predicted to grow but rather to explain the principles that govern the growth as well as the speed and duration of growth of those firms which can grow, and also the kinds of firms that can take advantage of growth opportunities in an economy. This present research toes a similar line since it neither attempts to predict new venture growth nor assumes that all firms would choose to grow, but rather examines the internal and external factors which shape the growth of young firms.

1.2.1. Resources lead to productive services

Penrose highlights the firm as a complex institution which has numerous activities and which makes many significant decisions and affects economic and social life (Penrose, 1959:9). The firm is an administrative organization as well as a collection of productive resources (Penrose, 1959:31), and in her theory of the growth of the firm, Penrose places emphasis on the internal resources of a firm, noting that a firm's resources shape the productive services its management can offer. In this perspective, the firm is a collection of productive resources with different possible uses, and this usage happens through administrative decision (Penrose, 1959:24) – a pointer to the important role of human motivation and conscious human decision in the growth of firms. She presents a view of the firm as one that uses productive resources in order to supply goods and services in the economy according to plans developed and executed within the firm. She groups resources into two broad categories: on the one hand are physical resources, which are tangible items

such as plant, equipment and land; on the other hand are human resources - including skilled and unskilled labor.

Penrose's theory of the growth of the firm anticipated the resource-based view (RBV) and the two are similar in the sense that both of these perspectives acknowledge the importance of resources to firms. As a theoretical foundation with a focus on organizational resources, RBV explains how firms gain and sustain competitive advantage amidst other competing firms (Wernerfelt, 1984; Prahalad and Hamel, 1990; Barney, 1991; Nelson, 1991; Peteraf, 1993; Teece et al., 1997). The resource based view (RBV) posits that firms gain a competitive advantage by acquiring resources that are valuable, rare, inimitable, and non-substitutable (Barney, 1991). This view holds firms to be a bundle of resources and capabilities, and that firms are not homogeneous, but rather are heterogeneous in regard to the resources and capabilities they control (Barney, 1991). Thus the competitive advantage firms have over their competitors results from the heterogeneities among them in terms of resources and capabilities possessed by these firms. By its resource position, a firm can maintain its lead over other firms and make it more difficult for other firms intending to catch up (Wernerfelt, 1984). This concept of resource-dependent performance also applies to the growth of de novo firms in agglomeration areas since such firms also require resources for growth but are constrained by direct competition from other small and medium-sized firms in these regions, even apart from competition from large firms. RBV holds that firms are heterogeneous in nature and that the basis of a firm's competitive advantage are the unique resources it possesses. This view is in line with the earlier Penrosian arguments that the firm's productive services are inherent in its managers, other

personnel and its physical resources (Penrose, 1959:79) and that these productive services of firms are heterogeneous in nature – be they entrepreneurial or managerial services (Penrose, 1959:199, 200) or employee services. They are unique for each firm, including the ones which this present research is concerned with - de novo firms. Yet young ventures are less resource-endowed, and such limited resources affect the survival of young organizations (Stinchcombe, 1965) as well as their growth. A lack of resources will jeopardize their survival and growth since it means that they will be less equipped to take advantage of environmental opportunities or to respond to environmental challenges. However, resources include, but are not limited to tangible resources such as financial capital. The quality of a new venture's human (intangible) resource also impacts its survival and performance. Furthermore, for these resources to lead to competitive advantage for a firm, they must be valuable, rare, inimitable and non substitutable.

A firm's managerial competence depends to a large extent, on the quality of entrepreneurial services at its disposal (Penrose, 1959:35) and for firms seeking growth, the type of entrepreneurial service available to them determines their growth (Penrose, 1959:35). By the above reasoning, we can take for granted that the quality of human capital of a de novo firm has to do with both the quality of its entrepreneurs as well as that of other workers within it, such as managers and by extension, other employees. Interestingly, she suggests that the inputs to the production process are not the resources themselves, but rather, the services which these resources can render are. These services are what the resources can contribute to the firm's productive operations (Penrose, 1959:67). The resources on their own have the potential to be used in different ways and in combination

with different types and amounts of other resources to provide productive services which are functions or activities. With this line of reasoning lies the important assessment of heterogeneity amongst firms, the uniqueness of these firms arising both from the kinds and amounts of resources they possess and the potential for, or actual, combinations of these resources. This resource-based heterogeneity amongst firms is an important factor which can be expected to lead to differential growth outcomes of de novo firms. Penrose (1959) adopts the idea of measurement of firm size based on the present value of its total resources including its personnel. My research goes along this line in measuring firm growth using employee size.

The resource-based view of the heterogeneity of firms and the uniqueness of firms' resources being the basis of competitive advantage are in line with Penrose's arguments that the productive services of the firm are innate in its managers, personnel and physical resources (Penrose, 1959: 79) and that productive services are heterogenous, whether they are entrepreneurial or managerial services (Penrose, 1959: 199, 200) or employee services. Assets, human capital and other resources are unique for each firm, including when it concerns de novo firms attaining high-growth rates. Penrose (1959) puts forth that productive services are functions or activities resulting from individual firm resources or combinations of resources. Resources can contribute these services to the productive operations of the firm (Penrose, 1959: 67), and resources can potentially be used in different ways and by combining them with different amounts and types of other resources so as to provide productive services. As Penrose states, "The amount and kind of productive services obtainable from each class of resource are different…" and, "For any

given scale of operations a firm must possess resources from which it can obtain the productive services appropriate to the amounts and types of product it intends to produce." (Penrose, 1959: 67). These lines of reasoning go along with the important assessment of firm heterogeneity, the uniqueness of firms being inherent in both the kinds and the amounts of resources possessed as well as the competencies to combine these resources. Also, there is the following quote: "Of course, the strategic substitutability of firm resources is always a matter of degree" (Barney, 1991:112). Barney (1991) also presented a hypothetical industry where "firms all have the same amount and kinds of strategically relevant physical, human, and organizational capital" and he posited that in such an industry, enjoying a sustained competitive advantage would be impossible for firms (Barney, 1991). It is thus implied, in accordance with RBV that, for an industry where firms can enjoy a sustained competitive advantage, heterogeneity can include firms which have different amounts and kinds of strategically relevant resources. Additionally, since cost is an entry barrier into an industry (McGee and Thomas, 1986), it follows that an amount of resources will be necessary for would-be entrants to overcome that barrier, and as such differential levels of assets would be at least part of the resource heterogeneity which determines (according to RBV) which of the would-be entrants would have the advantage in regard to entry into the industry or strategic group.

The motivation for profit is the assumption on which Penrose (1959) is based, in her quest to explain the growth of the firm (Penrose, 1959:26). Whereas large businesses would reinvest in the firm as well as pay dividends no higher than necessary to please investors, small businesses owners interested in growth of their firms would elect to

reinvest in their firms and draw conservatively on such profits for their private use (Penrose, 1959:29).

Since Penrose (1959) suggests that the rate and direction of growth of a firm depends on its level of alertness to act on opportunities for profitable investment (Penrose, 1959:30), and that it is the combination of resources, not just the mere possession of them that serve as the inputs to the production process which ostensibly fuels growth, these logics imply that the firm's growth hinges on its ability to adequately combine both tangible and human resources to take advantage of perceived opportunities in the external environment. This reasoning also applies to young firms in regions which have opportunities for the growth of the constituent firms. Penrose (1959) claims an equivalence for growth and profits when considering investment policy as she writes,

> "*If profits are a condition of successful growth, but profits are sought primarily for the sake of the firm, that is, to reinvest in the firm rather than to reimburse owners for the use of their capital or their 'risk bearing', then, from the point of view of investment policy, growth and profits become equivalent as the criteria for the selection of investment programmes. Firms will never invest in expansion for the sake of growth if the return on the investment is negative, for that would be self-defeating*" (Penrose, 1959:30).

Penrose (1959) suggests an equivalence between increasing the long-run profits of an enterprise and increasing its long-run growth rate. However, a slight modification can be made here as touching de novo firms since they may not as yet be making profits but

yet seek growth in say, size of the firm, so as to enable themselves to then be better positioned to obtain profits. She acknowledges the importance of central management but signals that its task is to 'set the tone of the organization' rather than to attempt to understand and run (ostensibly in a hands-on way) the entire organization. She suggests that the ability of a firm to maintain sufficient administrative co-ordination is what sets a limit to its size (Penrose, 1959:20), and this supports the claim of this present research that the quality of human capital of a firm affects its growth.

Penrose (1959) acknowledges positive and negative factors that might influence the growth process of firms, terming them ‘inducements’ and ‘difficulties’ respectively, and noting that they may be external to the firm, or internal to it. In regard to the external factors, although she mentions inducements such as growing demand and technological change, and difficulties such as competition, she does not focus on these factors. (Penrose, 1959:65). As touching internal factors however, a scenario highlighted by Penrose (1959) which is clearly applicable to de novo firms of this research, is when a firm has an entrepreneur with many ideas yet lacks the managerial abilities or technical skills to implement the entrepreneurial ideas, thus creating an impediment to growth (Penrose, 1959:66). In such a case, such a de novo firm will be at a growth disadvantage compared with other peers in the same industry location which have an adequate caliber of human resources to apply to the perceived opportunity in the external environment. This is an example of a de novo firm suffering from a lower quality of human capital than its competing peers. Such a problem goes beyond merely a smaller number of employees in the focal firm, but has to do with the inherent [lack of] competence embodied in this firm

when it comes to capitalizing on an entrepreneurial opportunity in the external environment.

Much has been said in regard to the resource-based view (Wernerfelt, 1984, Barney, 1991) of the organization which connects performance advantages of firms to their superior levels of endowments of resources. For example, resource endowments controlled by the firm are considered to be essential to obtaining sustained competitive advantage (Barney, 1991). The effects of these differential levels of resources has its effects, not just on the growth of established firms, but on that of young ventures as well. Several authors have used the resource-based view as the theoretical foundation for their organization research. For example, Pe'er and Keil, (2013) build on the resource-based view by integrating it with the literature on economic agglomeration. In accordance with the resource-based view, the authors' argument is that a startup firm's level of resources and capabilities affects the firms's likelihood of gaining from the beneficial effects of, and being negatively impacted by the adverse effects of, agglomeration. In acknowledging the heterogeneities in firm resources and capabilities – the major claim of the resource-based view – Pe'er and Keil, (2013) do not focus on the absolute levels of young firms' total assets and quality of human capital, but rather highlight the relative levels of these in comparison with their competitors. Specifically, Pe'er and Keil, (2013) posit that a startup firm's level of total assets compared to its competitors – used as a proxy for tangible and intangible resource endowment, in line with Alcacer and Chung (2007) and Villalonga (2004) – weakens the firm's benefit from agglomeration externalities such as local levels of skilled labor and specialized suppliers. They also argue that the startup firm's quality of human capital

compared to its competitors – which proxies for the firm's competencies – increases the positive effects of local levels of suppliers and buyers and reduces the adverse effects of competition. This present research follows this idea of investigating the effects of young firms' resources and capabilities on organizational outcomes – in this case, growth. Particularly, I follow Pe'er and Keil, (2013) in focusing, not on the absolute levels of de novo firms' total assets and quality of human capital, but rather on the level of their total assets compared to their competitors (as a proxy for tangible and intangible resource endowment) as well as focusing on their quality of human capital compared to their competitors (a proxy for the firm's competencies).

However, the resource-based view and the liability of newness (Stinchcombe, 1965) perspective are two complementary views with regard to the issue of the growth of young firms. They are complementary in the sense that both of these views suggest that, for the new ventures that intend to achieve grow, those of them with superior levels of resource endowments will be better positioned to achieve growth than their counterparts with lower or inferior levels of resource endowments will be. The mechanism for this growth is that the external environment provides the growth opportunities, incentives and resources – all of which are only taken advantage of by those firms with adequate levels of absorptive capacity (Cohen and Levinthal, 1990), assets and human capital.

Expectedly, the attendant resource limitations of budding firms will leave them susceptible to lower growth levels and failure to reach their growth goals than if they had

adequate resources. Yet, in spite of the liability of newness and the presence of incumbent firms that are supposedly better resource-endowed, some young ventures are able to achieve the transition from non-growth (or low rate of growth) to a high rate of growth. So the question becomes: why do some young ventures achieve growth in spite of their limited resource levels as compared to those of older, established incumbents? To answer this question, we consider what is already alluded to in the literature which is that, young firms do not take on their larger, established competitors in the exact same markets, since they lack the wherewithal to do so successfully – be it a lack of distribution channels, lack of supplier or buyer relationships, limitations in finances, limited experience, less social capital, etc. The resource-based view of the firm would put these older firms at a strong competitive advantage in such scenarios due to their superiority in resource endowments. Rather, these young firms survive and thrive by identifying niches underserved by the incumbents, or they create differentiated products (Hitt, Ireland and Hoskisson, 2015: 117) or new business models that give them a foothold in such industries. But the reality is that even these niches become attractive to other would-be new entrants, creating a strategic group (Galbraith and Schendel, 1983; McGee and Thomas, 1986; Porter, 1979) of young firms vying for a share of the sub-market. Thus the primary competition young firms face is not necessarily with their older, established counterparts, but rather with other young ventures with more similar levels of resources, similar strategies and similar scope of focus within the industry. Accordingly, while larger firms might exist in separate strategic groups from a focal young venture in the same industry, other young ventures with their eyes in the same niche as the focal young venture would be considered as being in the same strategic group. This intra-strategic group competition would be of greater intensity (Hitt,

Ireland and Hoskisson, 2015: 60) and have more immediate consequence regarding the growth of young ventures therein than any inter-strategic group competition between the young firm and older established industry firms. An example of these dynamics can be seen in the pharmaceutical industry: whereas big pharmaceutical companies like GlaxoSmithkline and AstraZeneca would be in direct competition with each other, smaller biotechnology firms would be in more intense competition with each other while not being primarily in competition with the 'big Pharma' players.

A de novo firm's resource-based standing amongst its local peers determines whether or not it can achieve growth. This assertion does not imply that the incumbent firms in the same agglomeration area play no role in impacting this growth of young firms, but rather that other young firms in the same industry sub-category or strategic group are a more immediate factor affecting this growth. The predictive power of this peer group derives from the fact that they have closer similarities in terms of resource levels, constraints, competitive rivalry, strategies, as well as industry niches to be exploited, with regard to the focal de novo firm.

This recognition of the stratification of competition among industry firms is important because it helps us focus our analysis and gives us a basis to evaluate the importance of developing novo firm resources. I posit that it would be the firms with greater levels of resources than their peers that would have a better growth performance. In other words, when the average resource levels of peer young ventures in a region is taken into

consideration, those of such young firms with higher-than-average resource levels (as compared to their peers but not necessarily compared to older, established firms) will be better able to implement growth strategies and achieve growth. For young firms in regions, the ones with above-average resource levels can be expected to achieve more growth than their less-resource-endowed peers in these areas. Thus, in examining the role of organizational resources in order to better understand growth, we need only consider the resource levels of peer firms for comparison, without needing a comparison with the resource levels of older, established firms. Going further, we consider resources according to two common, broad categories in which they exist, and through which they affect the high-growth outcomes of old and young firms alike – tangible and intangible resources. These two forms of resources have been resoundingly dealt with as financial capital and human capital in the economics and strategy literatures (Birley, 1987; Cooper et al., 1994; Bamford, Dean, & McDougall, 2000; Lee, Lee, & Pennings, 2001) which use them as indicators of organizational performance, including growth (Eisenhardt and Schoonhoven, 1990; Cooper et al, 1994; Chandler and Hanks, 1994; Brush and Chaganti, 1998). In line with the prior use of these two forms of resources to study growth, I focus on de novo firm assets and quality of human capital as the foundational tangible and intangible resources, respectively, which can inform us on the issue of internal factors relating to growth.

1.2.2. Dynamic Capabilities and De Novo Firm Growth

Penrose did posit however, that a comprehensive theory of the growth of the firm has to account, not only for the changes effectuated by the firm's activities, but also the effect of changes exogenous to the firm (Penrose, 1959:4). This is where the dynamic

capabilities perspective (Teece et al., 1997, Eisenhardt and Martin, 2000) – an extension of the resource-based view – comes in. Penrose anticipated the current dynamic capabilities theory as she acknowledges a 'dynamic interacting process' which supports growth and which has to do with the firm making the best use of available resources. (Penrose, 1959:5). Dynamic capabilities are a firm's capacity and routines to reconfigure and repurpose resources in response to changing conditions in the external environment (Eisenhardt and Martin, 2000). This dynamic capabilities perspective responds to the criticism of the RBV in regard to its descriptive, static nature. The dynamic capabilities perspective allows the explanation of a firm's performance in a way that takes account of the reality of changes occurring in dynamic environments. It takes cognizance of those organizational and strategic routines which managers utilize to make changes to their resource base in order to create new value-creating strategies by making changes to their resource base – changes via the acquisition, release, integration and recombination of resources (Pisano, 1994; Grant, 1996).

A close examination of Penrosian arguments as well as the nature of de novo firms will justify the claim of the importance of dynamic capabilities for such firms. She acknowledges that firm growth could arise as a result of increased demand (which indicates changes in the external environment that call for organizational resource-base changes) but suggests that this growth will cease for the unenterprising firm when such an opportunity declines (Penrose, 1959:34). Yet while large firms might institute a permanent practice of investing resources to find areas for expansion, smaller firms, being more constrained resource-wise may seek only periodically, for growth opportunities (Penrose, 1959:34).

That said, the decision to seek growth opportunities is claimed by Penrose (1959) to be an enterprising one that needs entrepreneurial intuition and imagination (Penrose, 1959:34) – these qualities are definitely relatable to the quality of human capital of such firms. Penrose (1959) cites entrepreneurial versatility (Penrose, 1959:36) as a resource, the lack of which could lead to a failure of the firm to grow. This characteristic, which can be a component of the human capital of a firm can be observed as the possession of imagination, vision or an enterprising nature by the entrepreneur. In this regard, the entrepreneur of a young firm who has a strong imaginative capacity, a good grasp of industry trends and directions as well as good instincts on how to have successful product entries into the market will be valuable to the growth potential of the firm. But even young firms in the same industry will be likely to have differential levels of such entrepreneurial resources, leading to differences in the types and quality of derivative productive services from such resources and consequently, different growth outcomes. Penrose also highlights the ability to raise funds – fund-raising ingenuity – as another entrepreneurial resource which could impact the growth of a firm (Penrose, 1959:37). Drawing a relationship between entrepreneurial ability and a firm's finance, she suggests that organizational challenges attributed to lack of [financial] capital may result from lack of entrepreneurial services since another entrepreneur facing similar circumstances may be able to achieve different outcomes.

However Penrose (1959), in focusing on the internal resources of a firm and the experience and knowledge of its personnel, makes an important point that these factors determine both the firm’s response to changes in, and what it sees in, the external world (Penrose, 1959:80). These internal and external factors both have the potential to affect

organizational growth in their particular ways. Thus an understanding of how the internal and external factors interact to shape the growth of young ventures – which this present research provides – is an important contribution to both entrepreneurship and strategy literatures.

1.2.3. Interaction between Assets and Human Capital

> "…there is an interaction between the two kinds of resources of a firm – its personnel and material resources – which affects the productive services available from each." (Penrose, 1959:76)

Penrose's (1959) concept of productive services – functions or activities of the firm arising from individual resources or the combinations of them – makes room for the analysis of a critical means by which firms take advantage of opportunities in their external environments, provide goods and services, and achieve sustainable growth. This critical means is the combination of physical resources (assets) and human resources (human capital). Penrose (1959) presents this idea as the 'interaction between Material and Human Resources'. Because physical resources will possibly have a range of productive services which they might be used for, the extent to which they are actually used by the firm for productive services would depend on the level of knowledge, experience or skill possessed by the firm's workers. An example would be a young software company which possesses computers with programming languages installed in them. As Penrose (1959) asserts, the type of knowledge that a firm's personnel possesses is closely connected with the services that can be obtained from its material resources. Thus the level of expertise of this software

company's programmers determines the quality of applications and therefore services this firm can provide to users of its products through the synergy (or interaction) between its programmers and its programming computers (an asset-human capital synergy). This young software company would be at a competitive advantage or disadvantage compared with other firms in the same market, depending on how its innovativeness as a result of interacting physical and human resources compares with those of its peers. Further, workers' increasing knowledge, skill, or experience regarding physical resources can be expected to lead to increased or improved levels of productive services, and by extension improved growth potential for the firm.

This Penrosian concept of the combination of resources towards the achievement of organizational goals is one which appeals to the resource orchestration perspective - an extension of the resource based view. Resource orchestration is the organizational practice of acquiring and harnessing the potentials of assets and capabilities towards the firm's targeted performance. A growing field of organization studies, the resource orchestration literature builds on the foundational work on asset orchestration (Helfat et al., 2007) and resource management (Sirmon et al., 2007) – two frameworks that highlight the importance of resources in gaining competitive advantage. The combination of resources and capabilities by firms in an industry is at the heart of resource orchestration. For firms seeking to earn above above-average returns and gain a competitive advantage over the competition, resource orchestration entails the structuring, bundling, and leveraging of resources relevant to the particular industries of these firms (Sirmon et al., 2007; Sirmon et al., 2011). Structuring of resources refers to the activities involved in gaining possession

of the resources needed by the firm, while bundling involves the integration of resources to form capabilities which are foundational to the firm's involvement in its market. The leveraging aspect of resource orchestration entails harnessing and utilizing those capabilities to provide value for the firm's customers as well as value for its stakeholders. Thus it can be understood that neither the presence of capabilities without the assets to work with, nor the availability of assets without the capabilities to deploy them, is sufficient to create value and obtain a competitive advantage. Indeed it has been empirically shown that the three processes of structuring, bundling and leveraging need to be synchronized in order to create value (Sirmon, Gove, & Hitt, 2008). Also, the relative importance of different components of resource orchestration has to do with the life-cycle stage of the firm (Sirmon et al, 2011). In other words, depending on what stage of development a firm is, certain factors of performance will be more salient than they will be for other life-cycle stages. This present research acknowledges the resource orchestration framework – an extension of the resource-based view – and takes into account the importance of the synergy between organizational resources and capabilities in the context of growth of new ventures in regions. I shed light on the assets and human capital which are the foundational resources for a new venture seeking competitive advantage and a strong growth performance. I introduce the construct of asset-human capital synergy which captures the interaction between firm-level resources and capabilities – a synergy that I posit to be valuable for new ventures in their quest for growth.

For young de novo firms in industries, they are generally already at a knowledge disadvantage compared with their established counterparts, thus leading to a possible

competitive disadvantage in providing productive services in that industry area. Yet even amongst peer de novo firms in the same industry area, there would be heterogeneities in their growth potential owing to differential quantities and qualities of physical and human resources, as well as differing levels at which these physical and human resources are brought to interact to take advantage of environmental opportunities to provide goods and services or to deal with external environmental challenges. A firm is essentially a collection of resources (Penrose, 1959:77) and, as entrepreneurs know, the significance of resources and the productive services obtainable from them are functions of knowledge (Penrose, 1959:77), and this underscores the importance of the quality of a young firm's human capital for its growth. Thus we can expect that entrepreneurs with the goal of achieving growth of their firms would aim to overcome liability of newness in the form of knowledge asymmetries by seeking to hire the highest quality of human capital they possibly can, in addition to seeking to improve the quality of knowledge in their firms through tools like training and research. If we consider Penrose's arguments that increased knowledge is a function of prospective profits and that there is an equivalence for growth and profits when considering investment policy, it thus follows that those de novo firms which end up with higher qualities of knowledge-related human capital than their peers – they being the ones able to achieve higher levels of interaction of physical and human resources – will also be the ones with a competitive advantage in providing productive services and consequently achieving growth.

1.3. Insufficient Focus on the External Environment

There are limits to the growth of firms, and according to Penrose, these limits are explainable by three factors: managerial ability; product or factor markets; and uncertainty and risk (Penrose, 1959:43). However, for a more complete view of the importance of the human capital aspect of the limits to growth as far as young ventures are concerned, one should consider the quality of the overall entrepreneurial workforce consisting of the entrepreneur, managers as well as employees. These play a central role in determining whether expansion is possible, and whether it is profitable or not for the firm. Penrose (1959) argues that although there are certain factors (such as cost of resources or declining revenue from products) that might make expansion unprofitable for the firm in certain locations and for certain products, the firm is not limited to those locations or products as a result of supply of resources or product demand in that market. She suggests that as long as there are other profitable opportunities for which more or different resources can be mobilized from the market, the limit to the firm's productive opportunity cannot be found in external conditions of supply and demand, and thus we have to look within the firm [to find the source of limits to the firm's productive opportunity]. In other words, Penrose (1959) suggests that if a firm's productive opportunity, and by extension, growth potential is limited in one business venture, it can mobilize resources for another area of business and so, we cannot look to external factors of demand and supply to explain limitations to a firm's productive opportunity and growth. However, this reasoning is flawed since we know that firms that are failing to grow don't all just simply change course by seeking more or different resources and changing their business focus from where they happily continue life and proceed to achieve growth. Indeed, as Penrose discovered from asking

practitioners why they did not go into new fields when expansion in existing areas was not warranted, the response she received was that these practitioners did not know enough to venture too quickly outside their field. Such inability to quickly diversify business in the event of a non-prospering current business can be associated with knowledge asymmetry between the focal firms and others in the new fields – a resource-based limitation which can be expected to be even greater for de novo firms which, ab initio, are already at lower levels of experience regarding the external environment of their industries and markets. The external environment plays critical roles in affecting business outcomes, some examples of such influencers being agglomeration, competitive dynamics, environmental munificence, environmental dynamism and environmental complexity. Thus it seems reasonable to expect that the growth outcomes of young as well as old firms would be affected by a nexus of endogenous and exogenous factors, and that such an examination of both factors together would give a clearer understanding of the theory of the growth of the firm.

Although Penrose (1959) recognized the influence of the external environment on the growth of the firm, she did not focus on analyzing how specific external environment characteristics affect firm growth, focusing rather on internal organizational resources as it pertains to firm growth. Essentially, she viewed the 'external world' as something the experience of which was part of organizational workers' experience. In her line of reasoning, the external environment is something which shapes the knowledge of a firm's personnel, for example in providing knowledge of markets, external technology or customer preferences. Environmental changes she suggests, affect a firm's growth rate

indirectly – by shaping the entrepreneur's expectations and and perceptions of productive possibilities. While this is true, it does not go far enough in explaining the relationship between the external environment and the growth of firms in general, much less that of de novo firms in particular. The external environment does more than provide knowledge to, and shape perceptions of, entrepreneurs, managers and employees. The external environment is a potent source of influence which enables or hinders the efforts of firms (especially young ones) to achieve success and growth. Its effects need to be studied in order to better understand the growth of firms, including de novo firms which lack the kind of parental support which de alio firms to enjoy.

Thus Penrose considered the environment as an image of the entrepreneur. However, this view of the external environment falls short of what it really is, for though the entrepreneur's perception of the opportunities and challenges of the environment are important factors affecting his/her efforts to mobilize resources for some ends, the environment affects the growth of his/her firm in ways which are in spite of his/her image of it. For example, irrespective of how positive or negative an entrepreneur considers a location to be for their business goals, certain qualities of this environment such as its complexity, competition, or availability of capital will still affect his/her firm's growth – independent of his/her formed image of that environment.

Although Penrose (1959) agrees that an adequate explanation of firm behavior or the prediction of its likelihood of success is not possible by mere examination of the nature

of environmental conditions, I believe that focusing on the internal firm resources alone instead of considering both internal and external factors is an omission which leads to a less clear understanding of the theory of the growth of the firm. Further, considering that young ventures are understood to experience a liability of newness including limitedness in resources, neglecting to consider the important exogenous factor of the environment when studying their growth limits our understanding of how such firms attempt to make up for their own resource disadvantages. Penrose (1959) acknowledges that the environmental factors which affect a firm's growth are a 'complex of external circumstances' although she does not focus on examining this relationship in her analysis, but rather simply refers to external factors as 'market conditions'. Environmental factors which affect the growth of young firms include the co-operation of the capital market, acceptance by potential customers, industry relations, competition, and conditions of demand and supply (Penrose, 1959:205). Though the environmental factors are complex overall, they are important to be understood if we are to gain an improved understanding of the growth of young firms. This present research examines the literature on environmental factors of the following categories: environmental munificence, environmental dynamism, environmental complexity, and agglomeration.

1.4. Exogenous Influencers of De Novo Firm Growth – Agglomeration, Environmental Munificence, Dynamism and Complexity

In order to fill the gap in the arguments of Penrose and resource-based theories concerning the growth of young firms, we need to consider the role played by the external environment. This is important for two reasons: firstly, considering that young firms are less experienced in their industries and less endowed with organizational resources, they will be more susceptible to the negative effects of the external environment which hinder their growth. Thus we need to understand how these negative factors affect them. Secondly, for the same reasons of liabilities of newness (Stinchcombe, 1965) and smallness (Carroll, 1983; Aldrich and Auster, 1986; Baum and Amburgey, 2002) faced by de novo firms, they have a greater need than their established counterparts, to take advantage of the positive factors of the external environment in order to make up for their lack of knowledge and experience and resources. Thus we need to understand how the external environment serves as a supporter of de novo firm growth and which of such firms is better able to reap the benefits of the external environment in order to achieve growth. We turn now to two categories of environmental influencers of organizational outcomes – agglomeration and a trio of environmental factors (munificence, dynamism and complexity).

1.4.1. Agglomeration and de novo firm growth

This study on the growth of new ventures takes into account the context of agglomeration which involves new ventures as well as established firms. Agglomeration is the phenomenon of collocation of firms involved in similar economic activities, within a

geographic area (Krugman, 1991). Agglomeration has been examined in management literature as touching different industries such as manufacturing (e.g., Shaver and Flyer, 2000; Pe'er and Keil, 2013), hotels (e.g., Baum and Haveman, 1997; Chung and Kalnins, 2001; Kalnins and Chung, 2004), biotechnology (e.g., Folta, Cooper and Baik, 2006) and semiconductors (e.g., Almeida and Kogut, 1997). Within such areas of agglomeration, there are ongoing interactions between individuals and firms, leading to the exchange of knowledge and other resources, as well as the provision of goods and services. These areas of agglomeration – which could be regarded as industry clusters – are characterized by inter-firm relationships, the build-up and utilization of social capital, as well as inter-firm rivalry. The location of their businesses being a basic decision which new ventures and established firms alike have to make, such factors as natural advantages (Hoover, 1948), industry-based spillovers and firm-specific preferences end up influencing location choices (Ellison and Glaeser, 1997). According to agglomeration theory, agglomeration externalities provide benefits to firms located in agglomeration areas, and more clustered locations will outlive less clustered ones (Wang et al., 2014).

The organization studies literature provides two main categories of benefits for firms in regard to agglomeration, both of which bring about the motivation for firms to agglomerate, the reward for doing so, or both. The first source of such benefits is the availability of natural advantages in (or close to) the agglomeration location while the second source is agglomeration externalities. Natural advantage is the phenomenon whereby a geographic location, as a result of some natural endowment of resources or characteristics it possesses, serves as an enabler of economic activity for certain types of

firms in a specific industry. Examples of such natural advantage are the suitable climate for the growing of grapes which leads to the wine industry clustering in the area (Ellison and Glaeser. 1999), or the availability of beaches and favorable weather leading to the agglomeration of hotels and resorts in the hospitality industry. The availability of natural advantage is an exogenous factor independent of the presence of other economic actors such as entrepreneurs or incumbent firms (McCann and Folta, 2008), and this reasoning is in line with Marshall (1890/1920) who suggested that the availability of unique physical characteristics of locations was the main reason behind agglomeration. For de novo firms then, locating in areas with such natural advantages aids their growth by providing easier access to critical natural resources, as well as cost savings resulting from shorter transportation distances in regard to acquiring necessary raw materials.

The second source of benefits in regard to the collocation of firms is agglomeration externalities. Agglomeration areas provide agglomeration economies which are the advantages that accrue to firms as a result of being collocated in a geographic area with other firms of similar or related activities. These positive externalities, such as availability of specialized suppliers, knowledge spillovers, network contacts, and skilled labor, could lead to competitive advantage (Alcacer and Chung, 2014) and could provide the motivation for firms to agglomerate. Thus, since agglomeration areas facilitate knowledge spillovers and other agglomeration externalities which positively affect the firms located therein, such locations serve as means that enable de novo firms to make up for their limitations in knowledge, resources and experience. As a complement to their acquisitions of internal assets and capabilities, de novo firms support their growth by locating in agglomerated

areas since agglomeration in such locations provides the benefit of sustaining local businesses (Oakley and Cooper, 1989; Visser, 1999).

The supply of skilled labor is a major agglomeration externality that benefits agglomerated firms. Local agglomeration attracts skilled workers since such workers would naturally gravitate to locations that have need for their skills (Ciccone and Hall, 1996; Henderson, 2003), reducing their job search costs in the process. But importantly, such a local market for skilled workers also benefits the growth strategies of de novo firms since they have both greater access to potential hires as well as lower employee search costs (Folta et al., 2006) than they would have in more isolated areas. Cost savings can then be channeled to other aspects of their production processes. Further, by this constant influx of skilled workers into agglomeration areas, de novo firms can supplement their workforce, mitigate the knowledge asymmetries which constitute parts of their liabilities of newness (Stinchcombe, 1965), as well as further equip themselves for competitive advantage and growth. Also, unlike non-agglomerated areas which may cause de novo firms to hire less qualified workers due to a limited labor pool and may lead to them paying higher wages, agglomerated areas provide these firms the advantage of finding qualified workers and the possibility of keeping wages constant while achieving high growth (Pe'er et al., 2016). A special category of qualified workers which constitutes agglomeration externalities and which sustains de novo firm growth is managers. In her theory of the growth of the firm, Penrose acknowledges that the capacities of the managerial personnel of the firm are a limiting factor for its growth (Penrose, 1959 :45, 46) and indeed she learned that businessmen concurred that managerial capacities did limit growth (Penrose,

1959: 61). Existing management limits the number of new managers that can be hired, the size of the firm's operations, and the rate of acquisition of experience by new hires. According to Penrose, existing managerial resources determine the level of new managerial resources that a firm can absorb, and this in turn limits the amount of growth a firm can undertake (Penrose, 1959: 48). Thus new firms are forced to start on a small organizational scale (Penrose, 1959: 48) - especially de novo firms since they are not founded on the assets and capabilities of existing firms. But local agglomeration can help improve the managerial capacity and hence the growth of de novo firms since the richer labor pool in such areas may enhance the process of securing specialized managerial talent with experience in managing firm growth (Pe'er et al., 2016).

Availability of specialized suppliers is also an agglomeration externality (Marshall, 1920; Folta et al., 2006) which impacts the growth of de novo firms. For such suppliers, the agglomeration of industry firms represents an attractive location in which to engage several firms in supplier-buyer relationships which fuel the production processes of such firms. For de novo firms in these agglomerated areas, the existence of competing suppliers provides them with the opportunity to increase their bargaining power and reduce the costs of acquiring needed production inputs. De novo firms may also receive supplier financing which can significantly boost their cash flow positions – an important advantage considering that cash flow problems are a major cause of firms going bankrupt, and that there is no business without cash flow (Zacharakis, Bygrave and Corbett, 2017). These cost savings coming through suppliers in areas of agglomeration serve to free up cash that can then be invested into the implementation of the de novo firms' growth strategies.

Entrepreneurs also gain agglomeration economies by way of lower search costs of finding suppliers, reduced inventory costs due to local availability of spare parts and out-of-stock items, as well as the opportunity of working with suppliers to test new technology (Folta et al., 2006).

Knowledge spillovers are another set of externalities accruing to agglomerated firms of all sizes and ages, although it appears that they are of particular importance for smaller and younger firms (Acs et al., 1994). This may be because, for young and small firms such as de novo entrants, there exists a knowledge asymmetry between them and their older, established counterparts with more experience and human capital. Being characterized by resource limitations, small firms are thus motivated to rely on external sources for knowledge pertinent to their goals (Almeida and Kogut, 1997). Knowledge spillovers from within agglomerated areas thus become a means for de novo firms to bridge this knowledge gap between them and the incumbent firms and to increase the absorptive capacity (Cohen and Levinthal, 1990) inherent in their workforce. Some mechanisms by which agglomeration fosters knowledge spillovers are the enablement of social networks (Almeida and Kogut, 1997) and collective learning and experimentation (Saxenian, 1994) amongst organizational actors in such areas. Locations such as agglomerated areas that foster information exchange, agreements and expertise acquisition facilitate the formation of social networks and the diffusion of knowledge amongst firms (Jaffe at al., 1993; Saxenian, 1994; Almeida and Kogut, 1997; Folta et al., 2006). Such knowledge spillovers foster de novo firm growth, and as noted by Audretsch (2012), “Entrepreneurship is the vehicle by which (the most radical) ideas are sometimes implemented and commercialized,

and can serve as the conduit for the spillover of new knowledge from the incumbent organization where it is created to a newly founded firm where it is used for innovative activity and ultimately high growth."

1.4.2. Environmental Munificence, Dynamism, Complexity and De Novo Firm Growth

External environments differ in their abilities to support or deter new venture growth. Researching external environmental factors enables the uncovering of location-specific characteristics that affect the growth of de novo firms. Environmental munificence, environmental dynamism, and environmental complexity, may affect the growth of de novo firms in locations with strong or weak agglomeration economies (Aldrich, 1979; Dess and Beard, 1984; DeTienne et al., 2008; DeTienne et al., 2008).

Environmental munificence is the level of endowment of critical resources in an environment which the firms in that environment need for their operations (Castrogiovanni, 1991; Dess and Beard, 1984; Pfeffer and Salancik, 1978; Staw and Szwajkowski, 1975). A regions's potential to support the performance goals of firms within it, as a result of its level of endowment of vital resources (Castrogiovanni, 1991), environmental munificence is characterized by such features as the availability of financing for organizational growth, the existence of external resources for production processes and the presence of social capital to catalyze business operations. An exogenous resource to a growing firm, and an example of an exogenous factor which is likely to impact the growth of young firms is

environmental munificence (Dess and Beard, 1984; Randolph and Dess, 1984; Starbuck, 1976; Tatikonda et al., 2013). Importantly, the phenomenon of environmental munificence is not, and need not be seen as being limited to agglomerated areas consisting of firms in the same or related industries. Geographical regions with organizations in different industries also exhibit munificence. A scenario of a munificent environment leading to a young firm's growth is when government institutions in that environment enact laws or promote incentives which open up opportunities for firms to provide products and achieve growth in the process. An example of munificent environments would be the locations involved in the industrial revolution which had a strong impact on entrepreneurship. An example of a munificent environment on a national scale would be Britain during the industrial revolution in the 18th and 19th centuries where there was rapid industrialization (Broadberry and Gupta, 2005) and high growth rates in industries such as the steam power industry.

Understanding environmental munificence is important for the study of the strategic decisions and actions of organizations (Castrogiovanni, 1991). Environmental munificence has been considered to be likely related to growth (Delmar at al., 2003), and since firms obtain competitive advantage and growth through acquisition and utilization of resources, the analyses of the munificence of industry environments improves our understanding of how firms grow, since these locations serve as sources of resources used by firms for the implementation of their growth strategies. Environmental munificence is the capacity of a location to support the firms located in it (Starbuck, 1976). An important factor which affects organizations (Staw and Szwajkowski, 1975), the munificence of an

environment is the degree to which it can support the sustained growth of its firms (DeTienne et al., 2008). Munificent environments are important for new entrants since the resources obtainable in such locations facilitate the entry of new ventures into those environments (Randolph and Dess, 1984). Highly munificent environments enable entrepreneurs to have flexibility in strategic decision-making (DeTienne et al., 2008). Environments that lack munificence will cause challenges such as stressful conditions for managers (Wiersema and Bantel, 1993: 487) and will likely motivate firms originally in such environments to relocate due to the limited resources for growth obtainable from those low-munificence locations. Although firms seeking to achieve growth do employ different strategies, the growth potential of their associated markets (munificence) may be, as Dess and Beard (1984) suggest, the main determinant of the level of success of those strategies.

Munificence is the degree to which that area is beneficial to firms within it, in terms of resources or other forms of value (Castrogiovanni, 1991). Munificence of an environment is important for the survival and growth of new ventures which may be lacking in required resources such as knowledge and skills, and which they would need to acquire by interacting with other actors in that environment. In their study of the persistence of under-performing firms, DeTienne et al. (2008) found that environmental munificence is a significant factor in entrepreneurs' decision on persistence with an under-performing firm and that, for the entrepreneurs they studied, environmental munificence was actually the most important factor. Their results showed a positive association between perceived environmental munificence and the likelihood of entrepreneurs choosing persistence, in the case of under-performing firms (DeTienne et al., 2008). It is also worth noting that growing

or emerging markets are especially resource-munificent environments, and mistakes in such places are less costly than in other less munificent environments (Castrogiovanni, 1991; Gilbert et al., 2006). Consequently, considering that de novo firms, as a result of having liabilities of newness (Stinchcombe, 1965) and smallness (Carroll, 1983; Aldrich and Auster, 1986; Baum and Amburgey, 2002), have less resources and capabilities than their established counterparts, it is probable that more munificent environments will be of more benefit than less munificent ones, for the growth of such firms. By being located in munificent environments which make an abundance of resources available (Castrogiovanni, 1991), and because of the reduced competition for resources in such locations (Dess and Beard, 1984), de novo firms in areas of environmental munificence will find it easier to acquire needed resources to augment their limited supply. This gives them more opportunities to grow than if they were located in less munificent environments. However, although the resources of munificent environments are similarly available to all de novo firms in those locations, such firms will be differentially capable of taking advantage of those external resources. In line with the absorptive capacity perspective (Cohen and Levinthal, 1990) and the knowledge based view which is aligned with RBV, the ability of de novo firms to take advantage of knowledge and other resources in munificent environments will depend on the previous related knowledge already possessed by the firms.The importance of environmental munificence for de novo firms can be seen from the fact that such young firms look for niches in the market which are underserved by incumbent firms, and such munificent markets provide an opportunity to grow where such a young firm is unable to compete with an incumbent in the latter's own existing areas of specialization or scale of operations. The munificence of an environment can grow, decline

or remain unchanged and according to Castrogiovanni (1991), "Total environmental capacity must be growing if both exploited and unexploited capacity are increasing. Likewise, total capacity must be declining if both are decreasing." (Castrogiovanni, 1991).

The dynamism of an environment has to do with the uncertainty inherent in such an environment, and can be perceived as instability and unpredictability which could characterize such an area (Miller et al, 2006; Tatikonda et al, 2013). Furthermore, de novo firms are subject to retaliatory actions from incumbents which can deter further industry entry by other would-be entrants (Fan, 2010) into such dynamic environments. This dynamism – a quality having to do with change – clearly poses a risk for new ventures already saddled with the limitation of resources, since significant changes in their environments could severely derail their strategies, bringing performance consequences - especially in this case, limits to their growth.

Complexity of an environment can be understood in the sense that there are several factors which impact firm strategizing and performance - such as number of firms (in regard to concentration vs fragmentation) within that environment (Tatikonda et al, 2013). The issue of environmental complexity – an important exogenous factor – is one that is connected with industry competition as a result of industry concentration or dominance of one or more firms in the market (Dess and Beard, 1984; George, 2005). For new ventures, an environment with many small or medium-sized enterprises (SMEs) firms, each having a small market share (a fragmented environment) would be considered to be more

complex than one with a few large firms, each with a sizable market share (a more concentrated environment) in that industry sector (Dess and beard, 1984; Boyd, 1990). These differing levels of complexity will have differing ramifications for the growth performance of new ventures located in the respective environments. For one thing, more complex environments will take a toll on the young venture in terms of time and human capital used to navigate the complex business environment, cultivate business relationships and craft and implement business strategies. A dimension that is characteristic of the external environment, environmental complexity has been widely used in the literature (DeTienne et al., 2008), and has had rigorous development (Aldrich, 1979; Dess and Beard, 1984; DeTienne et al., 2008). In regard to this research, it is expected to negatively impact the outcomes of de novo firms which have the goal of implementing a growth strategy in order to achieve growth.

There are reasons to believe that external environments will vary in their ability to bring about benefits and drawbacks to young venture growth. One of such reasons is that industries exist at different stages of development - with the stage of industry locations ranging from the emergent stage to the stage of decline - each having differing consequences for business opportunities, availability of resources, and competitive rivalry. Past research underscores the phenomenon of industry evolution over a lifecycle (Miles, Snow, and Scharfman, 1993; Agarwal, Sarkar, and Echambadi, 2002; Argyres and Bigelow, 2007) and thus we can expect that industries at different life-cycle stages will have different agglomeration effects on firms. For example, the industry growth stage is dominated by entrepreneurial activities while the mature stage is dominated by routinized

activities (Nelson and Winter, 1982). Eisenhardt and Schoonhoven (1990) posited that there would be differing growth outcomes for new ventures contingent upon the state of the market those ventures were founded in. Depending on whether the founding location is in an emergent, growth-stage, or mature market, the new ventures face differing environmental situations which would differentially impact their growth. Emergent markets have limited demand and young firms could lose out to larger, established firms with more financial might to take advantage of growing demand. Mature markets on the other hand are likely to have stable demand, dominant designs, established supplier-buyer relationships and significant switching costs among consumers, all making for a challenging terrain for new ventures founded therein. Growth markets in contrast are more supportive of new venture growth since they have growing demand, opportunities for innovation and differentiation, change in competitive structure and opportunities for Schumpeterian shocks, all of which make room for new ventures to grow. All-in-all the stage of the market is an important factor which impacts the overall munificence, dynamism or complexity of such industries, while other possible factors are government regulations and business opportunities specially reserved for new ventures. Taken together, these various factors make industries differentially capable of helping or hindering the growth performance of new ventures located within them. Yet it appears that the quality of human and tangible resources on the one hand, taken together with the environmental qualities on the other hand would serve to affect the growth of de novo firms. It can be expected that the greater the positive factors of regions [agglomeration externalities; environmental munificence], the better-motivated entrepreneurs will be to invest their resources towards growth and productivity of their young ventures. Furthermore, the

greater the potential for agglomeration benefits, the more that organizational resources would be beneficial towards new venture growth.

However, while firms that are highly endowed with such resources and capabilities that characterize agglomeration externalities might be motivated to avoid such clustering (as a result of the minimal gains they could derive, being already well-endowed), new ventures would find such clustering to be beneficial (Shaver and Flyer, 2000) since the agglomeration economies would enable them diminish the liabilities of newness which they are prone to. But in regard to new ventures, the following questions are pertinent: what kinds of new ventures are better able to take advantage of the agglomeration externalities and avoid the agglomeration drawbacks within their industries? How do the new venture's life-cycle stage and its resource and capability position relate to its deriving benefits from agglomerating? Pe'er et al (2016) draw on agglomeration theory to argue that local environmental conditions of agglomeration and market concentration influence the relationship between growth rate and survival of de novo firms. I follow a similar line of reasoning to suggest differential effects of resources on the growth of de novo firms contingent upon environmental conditions such as munificence, dynamism, complexity and agglomeration.

Previous work shows the importance of the external environment with regard to young firms. For example, Pe'er et al. (2016) argue that there is a curvilinear relationship between de novo firm growth and probability of failure and they draw upon agglomeration

economic theory to argue that the relationship between de novo firm growth rate and survival hinges on environmental conditions pertaining to the new firm, especially local agglomeration. Pe'er et al. (2016) suggest that the relationship between de novo firm growth and likelihood of failure is weakened by agglomeration since the benefits provided by agglomeration serve as substitutes for growth benefits, and agglomeration acts against the negative effect of high growth rates. Pe'er et al. (2016) also argue that this growth-survival relationship is contingent on the nature and level of competition which arises from local market concentration. They demonstrate the economic significance of the effects of agglomeration and local market structures on the survival of de novo firms, thus highlighting the importance of environmental factors on young firm outcomes.

In expanding the range of the theory that conceptualizes growth as a strategic choice of entrepreneurs by which they achieve other ends such as growth, Pe'er et al., (2016) provide empirical evidence on environmental factors that affect the growth strategies of new firms. Conceptualizing growth as a strategic choice (Peng and Heath, 1996; Peng, 2003) made by entrepreneurs for other purposes such as survival, Pe'er et al. (2016) suggest certain motivations for small firms to choose growth, such as reaching the minimum efficient scale of operations. gaining economies of scale or gaining legitimacy (Baum and Oliver, 1992) with external environmental actors like customers and providers of capital. Although they highlight the benefit of growth in reducing the liability of smallness of firms, Pe'er et al. (2016), also underscore certain downsides that could result from the growth of young firms, such as substantial adjustment costs (Penrose, 1959; Garnsey, 1998), increased complexity which brings managerial challenges (Penrose 1959), loss of

efficiency and demise of the firm. That Pe'er et al. (2016) contend that there will be a decline in the marginal benefits of growth as growth rates increase suggests the importance of understanding the relationships between de novo firm assets, human capital and environmental factors when it comes to implementing a growth strategy.

1.5. Independent New Ventures (De Novo Firms) and Their Life-Cycle Stages

I define new ventures as organizations that have been setup and been in existence up to seven years. However, this research focuses on independent new ventures – de novo firms – setup independent of parental links to already-established firms. Such firms which are setup up by established, older organizations – known as de alio firms, do not fit the target sample for this research by the very fact that their ties to their parent companies serve as a major advantage for them in weathering the challenges of newness and smallness faced by independent startups. However these independent new ventures are not all homogeneous in nature. They range from early stage to the growth stage of their development. Different criteria have been used in the literature to identify firms as being in different stages of development, including age, structure, and growth (Miller and Friesen, 1984). In this research, I use a combined criteria of age and level of increase in firm size (number of employees) to identify young firms as being in the early or growth stage. Early-stage de novo firms are those that are three years old and under, and have not attained a level of growth which is recognized as high-growth by the Organisation for Economic Co-operation and Development (OECD). This high-growth criteria is, “All enterprises with average annualized growth greater than twenty percent per annum, over a three-year period, and with ten or more employees at the beginning of the

observation period" (OECD-Eurostat Manual on Business Demography Statistics [2007]). At these stages, the entrepreneurs have gone beyond having a good business idea and are at the organization stage where resources are acquired, competencies are developed or workers hired, and routines are implemented with the goal of providing value to a target market segment. However, such new ventures are still threatened by liabilities of newness (Stinchcombe, 1965) and smallness (Aldrich and Auster, 1986; Baum and Amburgey, 2002). The uniqueness of these new ventures is captured in their differential levels of resource endowments and their varying qualities of their human resources. The new ventures that are better endowed in terms of resource possession and the combination of such resources with managerial and employee capabilities are the ones most likely to take advantage of the opportunities in the regions to prolong their existence and support their growth in such locations. Competition indeed is local. So also are opportunities and the capacity of a firm to support its growth. But agglomeration areas with strong agglomeration economies should better in supporting the growth of de novo firms with assets and human capital to implement such growth strategies.

New ventures have been identified as being valuable to the individuals that found them as well as to the society as a whole. The innovation and production processes fostered by entrepreneurship play an important part in economic growth (Baumol and Strom, 2007). These new ventures contribute jobs to an economy, thus helping its growth. The growth of the young firm has also attracted interest from practitioners, scholars, and policymakers alike. But what factors affect the growth of new ventures? Whether motivated by the desire for wealth acquisition, prestige, or power, (Baumol and Strom, 2007), many entrepreneurs

have the common goal of having their enterprises grow. Although they utilize different strategies for the realization of this common goal, the attainment of organizational growth enables their continuance in their chosen entrepreneurial paths and serves as a springboard for further opportunities for their existing firms and the possible creation of new ones. However, young ventures are strongly impacted by various influences within their environments (Baumol and Strom, 2007). These external influences which include institutions, norms, and factors of industry locations play a role in enabling or hindering the growth of these young ventures. For example, weak institutions bring about difficulties in identifying growth opportunities and lead to difficulties for new ventures with respect to designing and implementing effective strategies for sales and marketing (Batjargal et al., 2013). On the other hand, the growth of young ventures is enhanced by environments that provide access to relevant information, knowledge spillovers, tangible and intangible resources, social and emotional benefits and other such positive inputs (Granoveter, 1973; Burt, 1992; Stuart and Sorenson, 2007; Batjargal et al., 2013).

A contribution of this research to the strategy literature is the significance in comparing the interaction of both the level of assets and the quality of human resources of an independent new venture to those of its competitors within its region. In this research, I take cognizance of the resource (assets) and capability levels (quality of human capital) of de novo firms, recognizing that a firm's growth performance exists through an interplay between its organizational assets and its capacity to do work. It is well documented that new ventures suffer from a liability of newness as compared with their established counterparts. However, the question could be raised as to how then some of these newer

firms are able to grow if they are out-resourced by their established counterparts. Insight into this issue is provided by the understanding that, primarily, their primary competition is not with older or more established firms but with other new firms in the same industry and the same region (for those in agglomerated areas). In other words, the competition of independent new ventures is primarily with other firms in their own strategic group (Galbraith and Schendel, 1983; McGee and Thomas, 1986; Porter, 1979). A firm's strategic group can be understood in different dimensions - not only in terms of other firms in their sub-industry – large or small – but more specifically, other firms which are their peers (similarly young ventures in their industry as well as in their agglomeration areas). It can thus be seen that those independent new ventures who are as well or better equipped in terms of assets and human resource quality than their peers are poised to have better growth performance.

1.6. Hypotheses

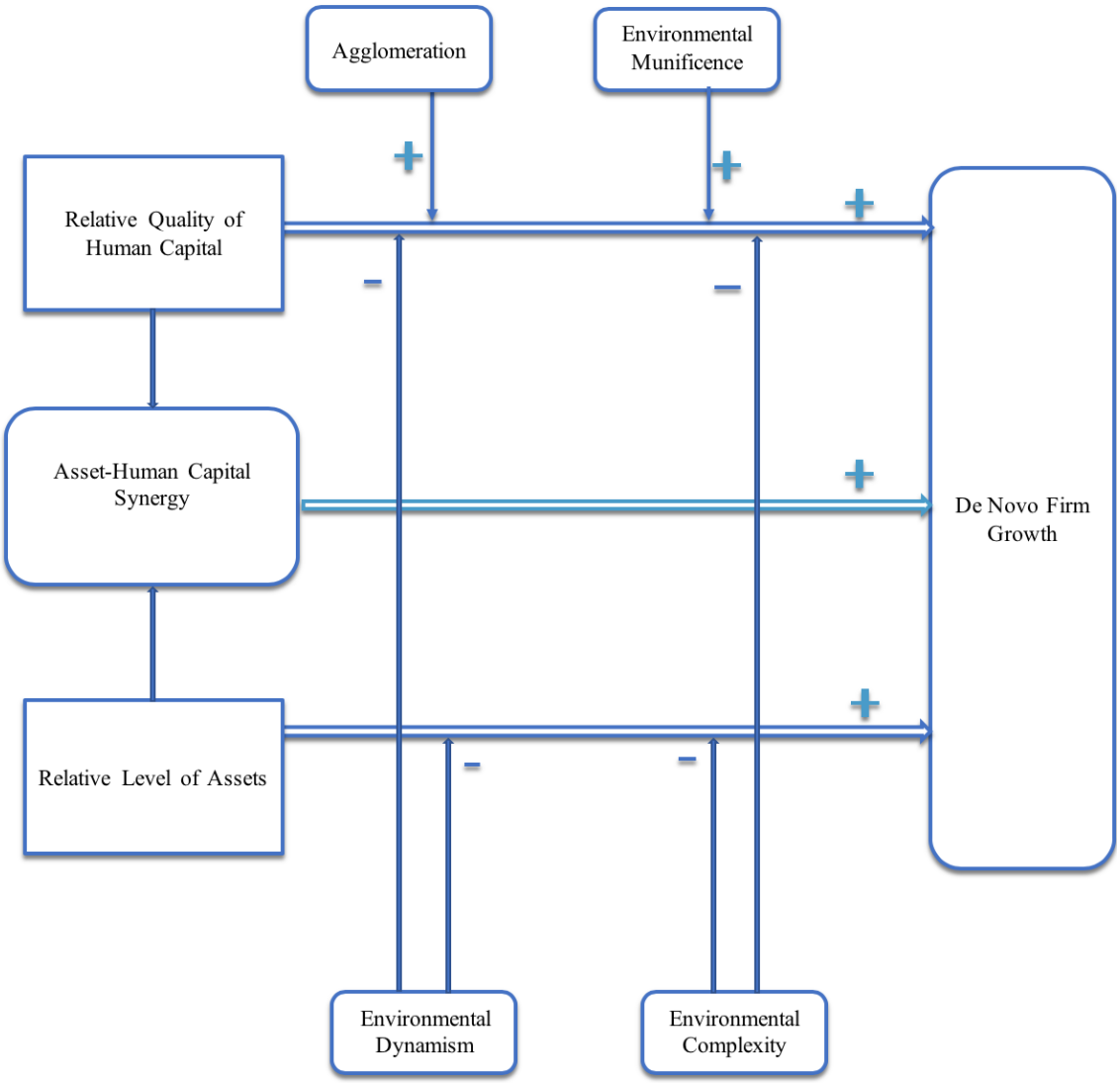

Figure 1.1. Model of De Novo Firm Growth in Regions

1.6.1. Resources, Life-cycle Stages and Growth

The resource-based theories (Barney, 1991; Eisenhardt and Martin, 2000; Nelson, 1991; Penrose, 1959; Peteraf, 1993; Prahalad and Hamel, 1990; Teece et al., 1997; Wernerfelt, 1984) which explain firms' gain of competitive advantage through resources should also serve to explain the growth of young firms, since a firm's competitive advantage in a market is correlated with its growth in market share, size, etc. In her theory of the growth of the firm, Penrose (1959) groups resources into two broad categories – physical, tangible resources such as equipment, on one hand, and human resources like skilled and unskilled labor on the other hand.

In regard to the growth analysis in this research, the focus however, is not on the absolute value of a de novo firm's assets or its total wages paid. Rather the focus is on its relative level of assets as well as its relative quality of human capital, compared to those of other young ventures in the same region as the focal de novo firm. This follows from the reality that the primary competition de novo firms face is not with large, established, incumbent firms but rather with other peer young ventures with similar market focus, resource levels and strategies. Thus a de novo firm's standing amongst its peers in regard to resource levels will be an indicator of its growth performance. The level of its synergy between its assets and human capital as well as its relative level of assets and quality of human capital will be associated with its growth.

Essentially, a firm is a collection of resources (Penrose, 1959:77), and entrepreneurs know that the significance of resources and the productive services they help bring about, are functions of knowledge (Penrose, 1959:77). This importance of knowledge highlights the value of a young firm's quality of human capital for its growth since the successful crafting and implementation of a growth strategy lies with its workers who apply knowledge to opportunities in order to achieve this organizational growth. Previous empirical research supports the theory that there will be better performance by firms with a higher quality of human capital than that of others. Eisenhardt and Schoonhoven (1990) for example, in their paper on the founding management team's impact on new venture growth and survival, indicate that leaders can and do affect the performance of the firm, especially when it comes to young firms. We can thus expect growth-oriented entrepreneurs to seek to improve the knowledge level of their firms by training existing workers or by hiring as high a quality of human capital as they can, in order to achieve the desired growth. Considering Penrose's argument that increased knowledge is a function of prospective profits and that there is an equivalence for growth and profits when considering investment policy, it is logical to expect that the de novo firms with higher qualities of knowledge-related human capital than their industry peers will have a competitive edge in meeting market needs and achieving growth, since these firms will have greater levels of competence in combining physical and human resources for the benefit of customers.

A major means for firms to achieve growth is the introduction of innovations into the market, since these innovations enable innovative firms to capture market share. For firms with an advantage in regard to accessing information, they can be expected to be

more innovative (Rogers, 1995), and these information, innovation and growth advantages should also apply to de novo firms with sufficient human capital to obtain and use relevant information to achieve growth within regions. Indeed the innovative potential, and by extension, the growth potential, of these young firms, are inherent in the capabilities of their workers whose ability to participate in the innovative process is associated with their absorptive capacity (Cohen and Levinthal, 1990). Providers of public knowledge – such as exhibitions, universities and media – are associated with the augmentation and reinforcement of knowledge located in clusters (Porter, 1998; Saxenian, 1994) and this leads to an increased body of knowledge within the region as a whole and within individual firms. However, in line with the resource-based view, it is the agglomeration area-located de novo firms with sufficient quality of human capital (as evidenced by the appropriate level of absorptive capacity) that can absorb such knowledge and take advantage of them for further innovations or exploitation towards growth.

The quality of human capital of a young firm can also be evaluated in terms of the capacity of its managers to obtain and analyze information which enables the firm to assess the risks inherent in its desired area of growth. Business risk is managed by obtaining relevant information, and when sufficient information pertinent to firm performance is obtained by a firm's managers, this aids in inspiring confidence in its workers and partners, thus fueling the process of planning for, and undertaking growth for the firm (see Penrose, 1959 :59,60). The growth of a firm is limited by the capacity of the management to deal with challenges the firm might encounter, including risk, and the greater the risk or uncertainty, the more difficult the managerial task will be (Penrose, 1959:63). Thus the

competence level of managers of de novo firms will likely impact their growth potential. However, previous industry experience can improve the human capital of a young firm's managers, positioning them to better deal with challenges, seize opportunities in industries, and grow their firms. Notably, prior empirical studies have focused on the relationship between founders' human capital and firm growth, with support for the position that founders' industry-specific work experience is an important element that determines firm growth (Colombo and Grilli, 2005; Colombo and Grilli, 2010; Cooper and Bruno, 1977; Feeser and Willard, 1990). Thus for de novo firms, factors like information, absorptive capacity, knowledge and industry-specific work experience will be strong indicators of their quality of human capital, and their level competence in applying this capital to opportunities in their regions should be positively related to their growth.

I argue that even without necessarily comparing the quality of a de novo firm's human capital to those of its larger or established counterparts, its relative quality of human capital compared with just those of its peer young firms in its industry is significantly associated with its growth. This reasoning is supported by the strategic groups view of industries (Galbraith and Schendel, 1983; McGee and Thomas, 1986; Porter, 1979) which highlights sub-sections of industries as comprising of firms with greater similarity in terms of factors like strategies and resources used, and market sectors targeted. Being that young ventures target niches underserved by their larger competitors, there will likely be competition amongst peer young ventures in those locations – young ventures vying for similar markets. Thus, the de novo firms with a higher quality of human capital relative to their competing peers should fare better in achieving growth, in accordance with resource-

based theories (Barney, 1991; Eisenhardt and Martin, 2000; Nelson, 1991; Penrose, 1959; Peteraf, 1993; Prahalad and Hamel, 1990; Teece et al., 1997; Wernerfelt, 1984). This human capital-related growth advantage can come through different means such as greater innovative core competency, greater likelihood of attracting external financing such as VC financing (see Baum and Silverman, 2004) by external actors who assess the higher quality of the entrepreneur/entrepreneurial team. As such, the more the de novo firm's quality of human capital is, beyond the average quality of its peers in its region, the better will be its growth, especially for firms in the early stage. These statements lead to the following hypothesis:

H_G1: There will be a positive relationship between the de novo firm's relative quality of human capital and its growth

Penrose (1959) provides a view of the firm as one which uses productive resources in order to supply services and goods in the external economy in line with created and carried out plans, and she gives two broad categories of resources – physical resources (tangibles such as land, plant and equipment) on one hand, and human resources on the other hand, which include skilled and unskilled labor. Also, the literature on growth has featured two broad categories of resources – financial and human resources (Mishina et al., 2004). Financial resources form part of a firm's overall tangible resources or assets, while human resources can be viewed as its intangible or human capital which also determines its success (or the lack of it) in achieving growth outcomes. This present research examines these two categories of resources, and represents them as assets and human capital in line

with previous research (e.g, Colombo and Grilli, 2010; Helfat et al., 2007; Pe'er and Keil, 2013). The total assets of a firm are reflected in its balance sheet and have to do with the book value of all its financial assets (such as cash, stocks, bonds, accounts receivable), its tangible resources(eg., real estate and production equipment), and its intangible assets such as patents, trademarks and copyrights (Downes and Goodman, 2003; Pe'er and Keil, 2013). Penrose gave a number of reasons why many firms don't grow - one of such reasons being insufficient capital-raising ability (Penrose, 1959:7). Even when the firm possesses valuable capabilities which could be applied towards its growth, such capabilities may be limited in their utilization when there is insufficient financial capital and other resources (Colombo and Grilli, 2010). Thus, de novo firms with insufficient levels of total assets compared with competing peers should have limited or no growth, irrespective of the entrepreneurial ideas of their founding teams.

Young ventures depend on their tangible resources such as funds that facilitate their various operations as well as technology for research, sales, and data management. Indeed, Siegel et al., (1993) found fast-growing firms to be more likely than slow-growing ones to use new, advanced technology. Lack of financial resources - part of the overall assets of firms(Penrose, 1959) - has a negative effect on individuals' self-employment decision and new firm growth, in line with the literature on the financial constraints of activity involving entrepreneurs (Holtz-Eakin et al., 1994; Cabral and Mata, 2003; Moreno and Casillas, 2007). Since financing is critical for expansion, and the lack of it constrains growth (Becchetti and Trovato, 2002), various factors that foster financing constraints for firms - such as lack of collateral and moral hazard - will affect their probability of growth (Lopez-

Garcia and Puente, 2012). Further, Moreno and Casillas (2007) found a number of factors - including higher availability of idle resources and smaller size - which differentiate high-growth firms from firms with moderate-growth or those that are declining, and their finding supports the assertion of the importance of assets for growth of de novo firms. Although overall, young ventures have a liability of newness (Stinchcombe, 1965) whereby they are less endowed with these resources and as a result are at lower levels of performance than than their older, more established competitors (in line with the resource-based view), their primary competition is not with these larger firms, but rather is with other young ventures in their agglomerated or diversified environments. This reasoning is supported by the strategic management concept of strategic groups (Galbraith and Schendel, 1983; McGee and Thomas, 1986; Porter, 1979). Strategic groups are subsets of firms in industries, and these firms have greater similarity in terms of market segments targeted, strategies used, and resources deployed. Importantly, intra-strategic group competition is more intense than inter-strategic group competition (Hitt, Ireland and Hoskisson, 2015: 60). The implication of this for de novo firms is that, those of them with above-average level of total assets than others in their strategic group (in this case, other de novo firms in their regions), will have a competitive advantage in the race to growth. Thus, in accordance with the resource-based view, de novo firms with a relatively higher total level of assets (Pe'er and Keil, 2013) compared to their peers will have a greater performance when it comes to growing.

Besides the direct negative effect of less tangible assets on firm growth, de novo firms with a limited asset base could also be hindered from obtaining loans since they lack collateral (Colombo and Grilli, 2010). Even when their lower level of total assets compels them to rely on personal and family funds (Colombo and Grilli, 2010) for investment into

the firms, such funds might not be sufficient to keep them from the fate of firms with financial limitations which is the hindrance from growing as fast as would have been possible with sufficient financing (Carpenter and Petersen, 2002; Colombo and Grilli, 2010). Thus level of de novo firm total assets should have both direct and indirect effects on the amount of growth they can achieve.

However, as the young firm continues its activities, it could benefit in terms of acceptance of its products or services which might have taken root through implementing its innovation or imitation strategy. Such initial success could then be followed by additional capitalization through venture capitalists, angel investors or an initial public offer (IPO). This external infusion of financial resources suggests that the young venture is moving towards a stage of growth and stability where it has found its niche within the market and is benefiting from increased recognizability and legitimacy. At this point, the exploratory aspect of its early life (possibly marked by environmental analysis and innovation) could be somewhat de-emphasized, shifting the firm to an exploitative mode where it just needs to continue repeating its routines so as to gain a stronger foothold and a larger market share. For the de novo firm then, increased levels of physical assets thus become necessary so as to expand its transactions with suppliers and increase its scale of production, leading to economies of scale and organizational growth. Thus as the young venture moves from the early stage towards the growth stage, its level of assets plays a more significant role towards its growth. The levels of total assets of a de novo firm compared to those of its competing peers in their local areas will have a positive association with the growth prospects of the focal de novo firms. This association can be explained by

the resource-based view, also taking into consideration other perspectives such as the liability of newness (Stinchcombe, 1965) and smallness (Carroll, 1983; Aldrich and Auster, 1986; Baum and Amburgey, 2002) as well as the concept of strategic groups (Galbraith and Schendel, 1983; McGee and Thomas, 1986; Porter, 1979). Being that, according to the strategic groups perspective, their primary competition is with other peer young firms in their industries, de novo firms with assets unmatched by these competitors will likely have the edge in the utilization of assets to overcome challenges and seize opportunities in their external environments. In line with the RBV, the greater levels of total assets will enable these focal young firms to be better than their peers at overcoming the liabilities of newness and smallness that hurt their growth prospects. There are also some rationales given by Pe'er and Keil (2013) in their paper on the impact of resources in regard to the survival of startups which can be adapted to explain the growth of de novo firms. For example, the authors suggest that, while the liabilities of newness and smallness threaten a startup's survival in the face of adversities such as economic shocks and deterrence activities from incumbents, the magnitude of a startup's assets may afford them a period of time [a 'honeymoon' period (Fichman and Levinthal, 1991) or 'adolescence' period] whereby they may still continue operations in spite of poor performance (Pe'er and Keil, 2013). By the same token, the magnitude of a startup's assets will likely enable it overcome adversities and achieve growth, even beyond the capacity of its less asset-endowed competitors to do so, which are in its agglomeration environment. Pe'er and Keil (2013) also suggest an association between having fewer assets early on in life and more difficulty in attracting employees. By this logic, those de novo firms with a level of total assets greater than the average amongst its peers may find it easier to attract employees and should thus achieve

better growth results than those peers. Consequently, there should be both direct and indirect positive effects of relative level of total assets on the growth of de novo firms. All-in-all, in accordance with resource-based theories, de novo firms' relative level of total assets should be positively associated with their growth. Thus, the more the de novo firm's asset level is, beyond the average level of its competing peers in its region, the better will be its growth. The following hypothesis reflects the importance of assets to de novo firm growth:

H_G2: There will be a positive relationship between the de novo firm's relative assets and its growth

Building on the Penrosian concept of the interaction between a firm's personnel and material resources which has an effect on the productive services available from these resources (Penrose, 1959: 76), we should find significance in the combination of a de novo firm's assets and human capital in regard to its achievement of growth. Taken separately though, consideration of the literature would suggest that the quality of a de novo firm's human capital relative to competitors' will be more significant than its level of total assets relative to competitors' in regard to this growth.

The interaction of assets with human resources is critical for the successful implementation of de novo firms' growth strategies. Prior academic research suggests an association between experience and the success of ventures (e.g., Cooper and Bruno, 1977; Roure and Maidique,1986;Siegel et al., 1993; Van de Ven, Hudson and Schroeder, 1987),

supporting the assertion of the importance of the quality of human capital, since experience is one factor that affects this quality. The availability of sufficient capabilities can then be combined with the availability of tangible resources towards the implementation of a de novo firm's growth strategy. Although survival is the basic need that new ventures have, beyond that, they need significant performance in order to be seen as worthwhile. The growth of these firms also hinges on their ability to identify opportunities within their industries and the capabilities to obtain and use resources in order to provide value. The interaction between resources and capabilities are at the heart of the new venture's value creation. By investing in their core competencies through training, quality hiring and partnerships, these new firms can better take advantage of agglomeration benefits and deal with the drawbacks associated with their economic areas. Thus, in accordance with the resource-based view (Wernerfelt, 1984; Prahalad and Hamel, 1990; Barney, 1991; Nelson, 1991; Peteraf, 1993; Teece et al., 1997), the level of new ventures' combined resource and capability levels will increase the positive effects of being in agglomeration areas and will mitigate the negative effects therein. The capability level of the firm reflects the quality of its human resources and affects its performance amidst its competing peers. Being in a strategic group (Galbraith and Schendel, 1983; McGee and Thomas, 1986; Porter, 1979) of fellow new ventures and being engaged in the resulting intra-strategic group competition suggests that it is those young firms with resource and capability levels equal to, or greater than the average resource and capability levels in the region that will fare better in this intra-strategic group competition. The finding by Siegel et al., (1993) that fast-growing firms are more likely than slow-growing ones to use new, advanced technology points to the importance of both assets and quality of human capital for the successful

implementation of de novo firms' growth strategies. Indeed, while advanced technologies represent assets for such firms, utilizing them adequately will require workers with specialized abilities which may not be common amongst other firms, and which should lead to a competitive advantage for the focal de novo firms. Thus, the consideration together, of a de novo firm's relative level of total assets and its relative quality of human capital should be significant in obtaining a better understanding of de novo firm growth, as opposed to just studying these endogenous factors separately. Further, the operationalization of this concept (referred to in this research as assets-human capital synergy) as the interaction between relative assets and relative quality of human capital should be significant factor in the analysis of de novo firm growth.

Having made a case for the importance of assets and human capital being used together, the question remains as to which of these two resources is more significant for the de novo firm's growth. Being that it takes resources to achieve further resource-base improvements, and considering the limitedness of the resource endowments of de novo firms, they are likely to be constrained in how much of such resources they can devote to the further improvement of their resource standing by way of upgraded asset base or increased quality of their human capital. Thus in the presence of scarce resources, it would be helpful for entrepreneurs to know which of the two types of resources – assets or human capital is more significant for their growth strategy so as to prioritize investments towards that resource base. In comparing between the relative importance of assets and human capital for de novo firm growth, the latter should have a greater significance, considering that young entrepreneurial ventures are heavily dependent on the entrepreneurial vision of

the founders and that these firms are known to be less endowed than their established counterparts when it comes to tangible assets. Take new technology-based firms for example: according to Colombo and Grilli (2010), most of these firms' assets are intangible and/or firm-specific, with little collateral value, suggesting that, at such young stages, the quality of human capital is of paramount importance compared to the current level of their tangible assets. At the early stage of an entrepreneurial venture, entrepreneurs have limited amounts of tangible assets such as financial capital, real estate and equipment. At this stage the firm is highly dependent on the entrepreneur's vision and capabilities to gather the required human and other resources that are so far, unavailable but that are required to support growth. At this early stage of the new venture, its ability to attract quality personnel as well as funds from such parties as venture capitalists and banks depends upon the perception of the quality of the entrepreneur's vision, experience and overall capability to bring the entrepreneurial vision to fruition. At this early stage, the entrepreneur is likely to bring into the firm, a limited number of workers to support the entrepreneurial vision and strengthen its implementation. According to the theory of liability of newness (Stinchcombe, 1965), such new firms will be less endowed with resources than their established counterparts. Even if such new ventures were to somehow gain access to vast amounts of tangible resources, there would be limits to their growth due to their limited recognizability and legitimacy as well as limited connections to other players in the industry. Thus, at the earlier stage, the quality of the workforce will be more significant towards the growth of the new venture than will be the level of its physical assets.

Also supporting the position that quality of human capital will be more significant than level of assets for de novo firm growth is the argument that new technology-based firms set up by people with greater human capital have better capabilities than other such firms (Colombo and Grilli, 2010). Also underscoring the relatively greater significance of de novo firms' human capital compared with their assets, new technology-based firms whose entrepreneurial teams are made up of people with greater human capital will have a greater likelihood of attracting VC investments than will other new technology-based firms (Colombo and Grilli, 2010). Even when young firms are unable to attract external financing such as VC financing, the relative importance of their quality of human capital is also observable in that they may be able to carry out entrepreneurial bricolage which they use to create something out of nothing (Baker and Nelson, 2005). For young firms with lower assets levels to be efficient with scarce resources suggests that the main resource they have towards their growth is the human capital of the entrepreneurs. The strength of these de novo firms exists in their flexibility, innovativeness and ability to make do with limited resources – factors which emanate from their human capital. Being less endowed with resources, these entrepreneurs and their workforce resort to a form of bricolage as a strategy toward their firm's growth (Baker and Nelson, 2005). The ability for de novo firms to not only survive but grow on lean resources suggests that, while greater levels of synergy between human capital and assets than those of competitors should lead to de novo firm advantages in achieving growth, it is the current quality of their human capital that would have a greater pre-eminence than the current level of their assets in facilitating their growth. This conclusion is logical since it requires a level of competence to assess the value of, and take advantage of, limited resources, applying them towards opportunities and challenges

in the external environment in order to achieve organizational goals including growth. The below hypotheses follow.

H_G3a: Relative quality of human capital will have a larger impact on growth of de novo firms than relative assets will, especially for early-stage firms

H_G3b: There will be a positive relationship between the de novo firm's relative asset-human capital synergy and its growth

1.6.2. Agglomeration, Resources and Growth.

The choice of the location of a new venture is an important choice entrepreneurs make in the earlier stage of these ventures (Pe'er et al, 2008). Agglomeration areas have been identified as being beneficial for the performance of firms located therein, but such clustering is especially beneficial for new ventures (Shaver and Flyer, 2000) which can take advantage of agglomeration externalities to mitigate the negative effects of the liabilities of newness they are characterized by. However agglomeration areas are not of a homogeneous form and differ in the extent to which they are able to support or deter the growth of young ventures. In accordance with this observation, Eisenhardt and Schoonhoven (1990) posited differing growth outcomes for new ventures depending on the state of the market of their founding. Market concentration is a well-known distinguishing characteristic of agglomeration areas, and these areas could range from low- to high-concentration, with differing consequences for young firms operating therein.

While we can expect, according to previous literature, that characteristics of the external environment, such as agglomeration and competition would impact the outcomes associated with new venture growth (McCann and Folta, 2008), we can also expect these same location characteristics to affect new venture growth itself. In terms of the theorized effects of resources on performance as posited by the resource-based view, it is plausible that this resource-growth relationship would be qualitatively different, contingent upon the idiosyncrasies of environmental characteristics such as agglomeration. The internal resource base (IRB) of the new venture does not work in a vacuum, but rather is applied by the entrepreneurial team to take advantage of opportunities and resources in the agglomerated region, leading to organizational growth. This external resource base (ERB) exists in the form of agglomeration externalities such as a network of suppliers, access to skilled labor, and knowledge spillovers (Audretsch, 2012), and is of greater value to newer, less endowed ventures than it is to older, established firms. Although the de novo firms' organizational assets and human capital will support their growth, as discussed above, the presence of agglomeration externalities will increase the value of these organizational resources and make them go farther in supporting the growth of de novo firms than would be the case if these de novo firms were in more isolated regions. For example, although a de novo firm's employees have a certain quality of human capital, these workers' value should be enhanced through the spillover of relevant industry knowledge from the agglomeration area into the focal de novo firm and this should increase the value of the firm's human capital in regard to achieving growth. But agglomeration areas will have different levels of capacity to support new venture growth, and in accordance with the resource-based view (Wernerfelt, 1984; Prahalad and Hamel, 1990; Barney, 1991; Nelson,

1991; Peteraf, 1993; Teece et al., 1997), we can expect that regions with more agglomeration externalities will be more supportive of new venture growth than will areas of less agglomeration externalities. Thus the level of agglomeration in a location will moderate the relationship between resources and new venture growth performance. The following hypotheses highlight the relationship between level of agglomeration externalities on the one hand and the association between [human and tangible] resources on de novo firm growth on the other hand.

H_G4: The level of agglomeration will positively moderate the relationship between de novo firms' relative quality of human capital (relative assets) and their growth

1.6.3. Environmental Munificence, Dynamism and Complexity and De Novo Firm Growth

Economic geographical areas will have different levels of impact on new venture growth resulting from environmental factors such as munificence, dynamism and complexity. Environmental munificence is the support capacity provided by a location for the survival and success of the businesses located therein. This munificence, being the level of endowment of critical resources in an environment which the firms in that environment need for their operations (Castrogiovanni, 1991; Dess and Beard, 1984; Pfeffer and Salancik, 1978; Staw and Szwajkowski, 1975), should be critical for the growth of young firms, considering their own lack of resources. Environmental munificence is not limited to clusters of firms in the same industry but is also obtainable in a geographical region consisting of firms of diverse industries. Whether a business environment is an

agglomeration area or not, it will still have some level of munificence in the form of potential customers, potential business partners, collaborators for research, government support, natural resources, etc. While a de novo firm primarily depends on its internal assets and human capital for the execution of its growth strategies (Penrose, 1959), being located in an isolated environment without much support in terms of physical or social capital would be more challenging for such a firm, since it will lack the flow of useful ideas, relationships and resources which are conducive for growth. Munificence is the degree to which a location is beneficial to firms within it, in terms of resources or other forms of value (Castrogiovanni, 1991), and in support of the assertion of its importance, previous research has found environmental munificence to be a significant factor in entrepreneurs' decision to persist with an underperforming firm (DeTienne et al., 2008). The importance of environmental munificence for de novo firm growth can be linked with the idea of liabilities of newness (Stinchcombe, 1965) faced by de novo firms. Lacking in internal assets and capabilities, such firms can be expected to attempt to take advantage of the availability of resources in the external environment in order to boost their performance. Though, according to RBV, the de novo firm's greater levels of total assets and quality of human capital relative to those of competing peers will give the focal de novo firm a growth advantage over such competitors, environmental munificence should serve the de novo firm well, by being a means for the improvement of its overall human capital level or the augmentation of its asset base. Markets that are growing or emerging are especially resource-munificent environments, and mistakes in such places are less costly than in other less munificent environments (Castrogiovanni, 1991; Gilbert et al., 2006). Consequently, considering that de novo firms, as a result of having liabilities of newness (Stinchcombe,

1965) and smallness (Carroll, 1983; Aldrich and Auster, 1986; Baum and Amburgey, 2002), have less resources and capabilities than their established counterparts, it is probable that more munificent environments will be of more benefit than less munificent ones, for the growth p of such firms. By being located in munificent environments which make an abundance of resources available (Castrogiovanni, 1991), and because of the reduced competition for resources in such locations (Dess and Beard, 1984), de novo firms in areas of environmental munificence will find it easier to acquire needed resources to augment their limited supply. This should give de novo firms an increased likelihood of increasing the value of their already existing human capital and assets than if they were located in less munificent environments. However, although the resources of munificent environments are similarly available to all de novo firms in those locations, such firms will be differentially capable of taking advantage of those external resources. In line with the absorptive capacity perspective (Cohen and Levinthal, 1990) and the knowledge based view which is aligned with RBV, the ability of de novo firms to take advantage of knowledge and other resources in munificent environments will depend on the previous related knowledge already possessed by the firms. The following hypothesis is thus presented:

Thus, if external environments facilitate the obtainment of resources such as social capital, financial capital, partnerships or other valuable endowments which positively affect the firms located therein, and if the uniqueness of the levels and quality of firm-based factors such as resources and capabilities lead to competitive advantage for firms, it must be that the combination [or the lack thereof] of these environmental as well as internal organizational factors would affect the growth or lack thereof, of de novo firms firms in

these environments. Positive external attributes of environmental munificence will be to the growth advantage of de novo firms. Thus,

H_G5: The level of environmental munificence will positively moderate the positive relationship between de novo firms' relative quality of human capital (relative assets) and their growth

External environments are also places with the potential for high frequency of changes: new entrants constantly make their way into such areas, while other firms exit; company ownerships change while the governing bodies institute regulations which impact organizational operations. Environmental dynamism has to do with the rate and instability of change which an industry environment can have (Child, 1972; Dess and Beard, 1984; Zahra and Bogner, 1999). Reflecting an industry's unpredictability of change (Dess and Beard, 1984), environmental dynamism is observable in different forms such as entry or exit of competing firms, changes in customer needs and preferences and technological changes (Boyd et al., 1993), increase in the size of an industry's firms (Simerly and Li, 2000), as well as changes in modes of competition in industries (Miller and Friesen, 1983). In addition, sociocultural changes could lead to decline in existing market preferences or emergence of new ones; sociopolitical changes such as passing of new laws could positively or negatively impact firm outcomes in a location since they would commit resources towards conformity with such laws. This unpredictability of change affects the decisions of managers to invest in, and the timing of, the introduction of new products (Porter, 1985) – factors which should affect de novo firm growth. With high levels of change in such locations, new ventures which are striving to get accustomed to the

phenomenon of being in such areas might find it hard to cope, especially with their limited resources and experience. Furthermore, managing the changing relationships between supplier, customers, legitimating organizations, partners – though useful - will take valuable time and resources from de novo firms and will reduce their focus on growth activities. Whereas in stable environments, firm performance results from actions that feed off of tacit knowledge which is difficult to imitate and enhances competitiveness (Peteraf, 1993; Winter, 2003), dynamic environments with changes such as demand and supply shifts could lead to reduced market share and margins for less competitive firms (Karna et al. 2016) such as de novo firms. De novo firms are a good example of less competitive firms, compared with their established counterparts and we can expect that, although RBV suggests advantages owing to resources held, the redirection of resources to deal with the challenges of changing environments will reduce the availability of resources for the implementation of de novo firm growth strategies. Environmental dynamism should thus have a negative association with the resources-growth relationship of de novo firms. Thus:

H_G6: The level of environmental dynamism negatively moderates the positive relationship between de novo firms' relative quality of human capital (relative assets) and their growth

Environmental complexity has to do with heterogeneities within a location, industry competition associated with industry concentration or one or more firms dominating in the market (Dess and Beard, 1984; George, 2005), or industries being associated with many different inputs or outputs (Dess and Beard, 1984) – factors which may negatively impact de novo firm growth. The complexity of locations could be

associated with some firms' managers being constrained in their strategic choices (George, 2005), with a possible effect on organizational growth. Also, since uncertainty may hinder the investment of resources towards growth, de novo firms' presence in heterogeneous and complex environments may lead to less growth since managers in such environments will face greater uncertainty and have greater need of the processing of information than will their counterparts in non-complex environments (Duncan, 1972; Tung, 1979). Further, factoring in the dynamic capabilities view of firms (Teece et al., 1997; Eisenhardt and Martin, 2000), even though firms can deal with environmental complexity by reconfiguring their resources towards new capabilities or by re-directing resources to or away from some markets (George, 2005), de novo firms' lack of resource endowments for the above might lead to environmental complexity actually hindering the little they have in terms of assets and capital from contributing to their growth. This view is supported by the observation by George (2005) that the relationship between slack and performance goes negative in more complex than in less complex industry environments - something that can be expected to apply to de novo firms' resource-growth relationships in such environments. Thus we can expect that, although according to RBV, resources should positively affect de novo firm growth, environmental complexity will negatively impact de novo firms' growth through available resources. The below hypothesis follows.

H_G7: The level of environmental complexity negatively moderates the positive relationship between de novo firms' relative quality of human capital (relative assets) and their growth

1.7. Data and Method

This research involves multivariate analysis of data to tease out the relationships between de novo firms' relative level of total assets and relative quality of human capital, environmental factors (including agglomeration), and de novo firm growth.

1.7.1. Data

The data which I requested for, and used in this research is an extraction by Statistics Canada (STATCAN) from different Canadian datasets managed by STATCAN. The sources of this extraction are:

1. **General Index of Financial Information** (GIFI; 2000-2013)

2. **General Business Panel Survey; Linked File Environment** (LFE; 2000-2013)

3. **Survey of Innovation and Business Strategy** (SIBS; 2012 vintage): According to Statistics Canada, "Statistics Canada has undertaken this survey to provide statistical information on the strategic decisions, innovation activities and operational tactics used by Canadian enterprises. The survey also collects information on the involvement of enterprises in global value chains...".

4. **The Canadian Census of Population** (from 1985 till 2011): Canadian census datasets from Statistics Canada was used to measure location-level control variables such as local unemployment and population.

The data obtained and utilized from the GIFI and LFE sources is akin to the T2-LEAP data used by Pe'er and Keil (2013). The T2-LEAP data is a Canadian dataset which covers the early life of all the Canadian manufacturing sector's independent startups over the period of 1984-2010. Every incorporated business in Canada is required to file a T2 corporate income tax return. The T2-LEAP dataset is a merger of two databases of Canadian firms, namely the Longitudinal Employment Analysis Program (LEAP) database, and the Corporate Tax Statistical Universe File (T2SUF) database. The LEAP database contains information with regard to entry and exit of startups, number of employees, location information and NAIC codes for the industry sectors. The T2SUF provides firm-level data such as assets, inventories, sales, and equity. The T2-LEAP database is a valuable one considering that such comprehensive data are not available for most countries (Pe'er and Keil, 2013). Although this T2-LEAP database has been used to study the agglomeration benefits and drawbacks with regard to the survival of startups, this present research went further to study the effects of external and internal variables on the performance of young firms, beyond their survival.

Similar to the T2-LEAP database, the GIFI/LFE extracted dataset, being a longitudinal one, enables the examination of the performance of new ventures over a period of time, and can facilitate event data analysis to help explain the performance of new ventures, given varying levels of firm-specific resources and capabilities. Another advantage of using the GIFI/LFE dataset is that, being a database that covers all the sectors of Canadian manufacturing, it makes for generalizability of the research results it facilitates – something that is lacking in studies based on datasets covering single industries.

Using the T2-LEAP data, previous research showed show that startup survival is positively affected by local levels of skilled labor, suppliers and purchasers, but on the other hand is negatively affected by local competition, and that firms' differential resources and capabilities moderate these relationships (Pe'er and Keil, 2013). This present research contributes to this body of research by delving into the LFE, GIFI and SIBS data and exposing what might be salient aspects of areas with strong agglomeration economies in regard to impacting de novo firms at different lifecycle stages. The subjects in this entire research are de novo new ventures – those which are 7 years old or less, and are not subsidiaries of existing firms (de novo firms). The data covers 279,405 observations, 81,912 firms and a time period of 2000 to 2013.

From the LFE, GIFI, census and SIBS data sources were used for the studies on de novo firms in regions in general. The data extraction process sought from these sources produced customized datasets which I use for the research. The extracted dataset also includes information on the census divisions (CD), census subdivisions (CSD), economic regions (ER) and provinces of the individual firms. The forces behind agglomeration operate at the CSD level and as such I did the analysis at the CSD level. Also featured in the extracted dataset is the birthdate of firms.

1.7.2. Analysis Techniques

This research involved a multivariate analysis to tease out the relationships between de novo firm firm-level independent variables and the growth, also taking into consideration external environmental-level independent variables and control variables. For the analysis, I categorized new ventures vis a vis their lifecycle stages: early stage and growth stage. Different techniques can be used for this categorization: (1) identifying a specific year and noting the startups that were registered in that year and tracking the continued survival or failure throughout the following 5 years (Tatikonda et al, 2013); (2) executing codes to filter out the new ventures according to their stage of development: early stage ($0 < x \leq 3$years) and growth stage ($3<x\leq7$years). For my work, I categorized the new ventures as de novo firms (independent new ventures) in (a) the early stage and (b) the growth stage. Early stage independent new ventures are those less than or equal to three years of age and that have not reached the high-growth stage and are not child-firms of a parent organization. Growth stage firms are those above 3 years of age but less than or equal to 7 years of age and that have attained the high-growth stage. For the analyses of the growth of de novo firms, ordinary least squares regressions of the outcome variable on the firm-level, local environment-level and control variables were carried out. A de novo firm growth model is represented by the following:

$$\text{Growth} = \phi_1 + \phi_2\text{RltvAssets} + \phi_3\text{RltvQHCap} + \phi_4\text{QHCap\_Agglo} + \phi_5\text{Asst\_Agglo} + \phi_6\text{Employees} + \phi_7\text{firmAge} + \phi_8\text{Population} + \phi_9\text{Landarea} + \phi_{10}\text{Unemployment} + \varepsilon$$

Correlations of the independent, dependent and control variables were carried out. Results are presented in the next section, but first, the variables are described.

1.7.3. Dependent variable

Growth.

I use firm growth as my measure of the performance of my target firms – independent new ventures. The growth measure is based in number of employees. To test for firm growth in my panel data, I use the following formula

[[emp(t)/emp(t-1)] -1]x100

where emp is the number of employees in the firm.

1.7.4. Independent variables from Agglomeration Environment

Environmental Munificence [Munificence].

The measures for environmental munificence result from market demand, measure relative rate of growth of the industry, and is operationalized as the averages of NAICS industry's regression coefficients obtained from regressing the industry's sales over a period of 5 years (Dess and Beard, 1984; Tatikonda et al, 2013). The averaging will adjust for the absolute size of the industry and will be done by dividing the regression coefficients by the

mean value of the dependent variables. This measure of environmental munificence is at the industry-CSD level.

Environmental Dynamism [Dynamism].

A measure of instability and unpredictability from a firm's environment, environmental dynamism is measured by averaging the dispersion about the regression curve (error) from the same data and regression used to measure munificence – that is, the regression of the dependent variables of NAICS industry sales on time over the 5-year period (Child, 1974; Snyder and Glueck, 1982; Dess and Beard, 1984; Tatikonda et al, 2013). This measure of environmental dynamism is at the industry-CSD level.

Environmental Complexity [Complexity].

This is measured by regression of terminal-year (year five) market shares (sales) of an NAICS industry's firms on the initial-year (year one) market shares of those firms, following which the computed measures will be multiplied by negative one, and as such, the larger the number, the more complex the environment (Heeley et al, 2006; Tatikonda et al, 2013). This measure of environmental complexity is at the industry-CSD level.

Agglomeration.

In accordance with previous work on regional economics, the likelihood for agglomeration externalities is measured by dividing the number of 3- digit NAICS and census subdivision

(CSD) employees by the number of employees in the same industry in the nation (Glaeser et al, 1992; Porter, 2000; Shaver and Flyer, 2000; Pe'er et al, 2008; Alcacer & Chung, 2014; Pe'er et al, 2016).

1.7.5. Firm-level Independent variables

Relative Assets [RltvAssets].

Relative level of total assets compared to competitors was operationalized by dividing the assets of the new venture by the average assets for all other de novo firms of the same NAICS industry in the same year and the same CSD (Pe'er et al, 2008).

Relative Quality of Human Capital [RltvQHCap].

To ensure the comparison of measures across similar exogenous conditions, a new venture's relative quality of human capital compared to competitors is measured by dividing the new venture's average wage paid by the average wage paid by all other de novo firms in the same year and of the same CSD (Dutta et al., 2005; Pe'er et al, 2008). This variable gives a measure of the new venture's standing within the agglomeration, in terms of its ability to utilize resources (assets) to actualize its value proposition and be productive within its market. Since it is not just a firm's capabilities that matter, but rather its capabilities in comparison with its competitors (i.e., what it is able to do as well as, or better than its competitors) this measure of relative quality of human capital will be useful

to gauge firms' relative productivity potential within their regions. This measure is used for operationalizing the capability level of a firm relative to its peers'.

Asset-Human Capital Synergy[Asst_HCap].

This is the variable which is operationalized as an interaction term between the 'Relative Assets' variable and the 'Relative Quality of human capital' variable.

1.7.6. Control Variables (Firm-level and Location-level)

Firm Size [Employees].

This is measured as the number of employees in the new venture.

Age of Firm (firm-level control: firmAge) I control for age by obtaining the number of years the new venture has been in existence.

Population [csd_Population].

Since large populations can influence new venture performance, this control is in order. The population of census subdivisions (CSDs) in Canada is provided in the Canadian census data, but this information was requested and is included in the data provided by STATCAN for this research. In prior research, population has been measured by taking the natural logarithm of the census subdivision population at time t-1 measured during

census years, and subsequently carrying out linear interpolation between census years (Pe'er et al, 2008).

Unemployment Rate [csd_Unemployment].

Unemployment can be expected to negatively impact the productivity of an industrial region, since the implication is that there will be less manpower for innovations and routine organizational activities. The unemployment rate of census subdivisions (CSDs) in Canada is provided in the Canadian census data, but this information was requested and is included in the data provided by STATCAN for this research. In prior research, census data has been used to measure CSD unemployment rate and there were interpolations between years in which census data exists (Pe'er et al, 2008).

Land Area[csd_Landarea].

I control for land area, taking into consideration the differential levels of availability of land and differences in land prices. The land area of census subdivisions (CSDs) in Canada is provided in the Canadian census data, but this information was requested and is included in the data provided by STATCAN for this research. In prior research, the land area data has been obtained by taking the natural logarithm of the CSD land area (Pe'er et al, 2008).

Local Market Concentration [Conc].

To determine the local level of concentration, I use the Sales-based Herfindahl-Hirschman Index (HHI) measured at the CSD level (Pe'er et al, 2016; Tirole, 1988; Porter, 1980). This measure is obtained by summing the square of market share (sales) of firms in an NAIC sector, and in the CSD in year t-1. High HHI levels reflect a highly concentrated CSD area, composed of fewer, relatively large firms. CSDs with low HHI levels indicate that they are more fragmented, with a large number of smaller firms.

1.7.7. Interaction Terms

I also created two-term interaction variables between relative quality of human capital and relative level of total assets on one hand, and external environmental variables on the other hand (i.e., QHCap_Agglo, QHCap_mun, QHCap_dyn QHCap_cmplx, Asst_Agglo, Asst_mun, Asst_dyn, and Asst_cmplx).

1.7.8. Fixed Effects.

In seeking to demonstrate the effects of the above-mentioned independent variables on the growth of new ventures, a possible problem that could occur is that the models could be affected by endogeneity bias owing to unobservable or omitted variables which could be impacting both the dependent and independent variables. Such omitted variables could be the impact of providers of capital, etc. I used fixed effects to deal with this issue of endogeneity. Year fixed effects as well as fixed effects per NAICS industry are used to control for the effects of the macroeconomy as well as the effects of the industry on new venture growth. Time dummy variables are used to capture the time-related effects that

could impact the performance of firms. I carried out the Hausman test which showed that fixed effects was the appropriate choice, over random effect. More on this Hausman test is in the results section which follows.

1.8. Results

Table G1

Descriptive Statistics for De Novo Firm Growth

Variable	Obs	Mean	Std. Dev.
Growth	201261	21.04261	181.4838
RltvQHCap	153305	1.005828	.7827899
RltvAssets	109896	1.004125	11.52358
Asst_HCap	104430	1.96483	74.11773
Employees	209041	15.8078	89.14247
firmAge	197493	3.08015	1.968482
Agglomeration	215892	.058813	.0917787
Munificence	118654	3.09e+07	1.26e+08
Dynamism	118654	7.39e+07	7.18e+07
Complexity	36894	-.0001655	.0200857
LoConc	279405	.4525617	.4977454
HiConc	279405	.4273546	.4946954
QHCap_Agglo	153305	.0596297	.1713167
Asst_Agglo	109896	.08481	1.522379
QHCap_mun	96788	3.01e+07	1.73e+08
Asst_mun	49347	6.95e+07	1.57e+09
QHCap_dyn	96788	7.46e+07	1.15e+08
Asst_dyn	49347	9.00e+07	1.09e+09
QHCap_cmplx	32413	-.0003501	.0232165
Asst_cmplx	19934	.0008888	.092784
csd_Populatn	275860	473915.7	738284.3
csd_Landarea	275860	712.0821	6547.037
csd_Unemployment	274850	8.877239	4.967389

. Total obs: 279405

Table G1. Descriptive Statistics for De Novo Firm Growth

Table G2. Correlations

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
1. Growth	1.0000																			
2. RltvQHCap	0.0030	1.0000																		
3. RltvAssets	-0.0132	0.0729	1.0000																	
4. Asst_HCap	-0.0077	0.1022	0.8889	1.0000																
5. Employees	-0.0191	0.0513	0.3183	0.2391	1.0000															
6. firmAge	0.0065	-0.0291	-0.0733	-0.0511	-0.0616	1.0000														
7. Agglomeration	-0.0083	0.0098	0.0156	0.0172	0.0361	0.0149	1.0000													
8. Munificence	-0.0072	-0.0210	-0.0149	-0.0058	0.0003	-0.0690	0.4757	1.0000												
9. Dynamism	-0.0146	0.0136	-0.0062	0.0030	0.0040	0.0379	0.7186	0.5414	1.0000											
10. Complexity	-0.0069	-0.0081	0.0093	0.0087	0.0068	0.0170	-0.0333	-0.0107	0.0210	1.0000										
11. LoConc	0.0053	0.0152	0.0077	0.0097	-0.0675	-0.0004	0.2530	0.1940	0.2791	0.0580	1.0000									
12. HiConc	0.0094	-0.0141	-0.0076	-0.0072	0.0737	-0.0121	-0.1734	-0.1336	-0.1971	-0.0902	-0.6984	1.0000								
13. QHCap_Agglo	-0.0032	0.4904	0.0508	0.0704	0.0574	0.0029	0.7341	0.3240	0.5300	-0.0287	0.1941	-0.1329	1.0000							
14. Asst_Agglo	-0.0098	0.0429	0.7528	0.6515	0.2693	-0.0182	0.0895	0.0086	0.0370	0.0036	0.0200	-0.0142	0.1098	1.0000						
15. QHCap_mun	0.0022	0.2122	0.0117	0.0440	0.0118	-0.0631	0.3761	0.8085	0.4342	-0.0166	0.1632	-0.1188	0.4553	0.0282	1.0000					
16. Asst_mun	-0.0033	0.0414	0.4853	0.5790	0.2294	-0.0109	0.0360	0.0777	0.0405	0.0064	0.0177	-0.0135	0.0611	0.3911	0.1332	1.0000				
17. QHCap_dyn	-0.0051	0.6293	0.0400	0.0706	0.0311	0.0149	0.4637	0.3241	0.6473	0.0077	0.1851	-0.1353	0.7980	0.0615	0.4866	0.0657	1.0000			
18. Asst_dyn	-0.0112	0.0612	0.8639	0.8061	0.3415	-0.0232	0.0553	0.0149	0.0570	0.0105	0.0204	-0.0179	0.0889	0.7617	0.0431	0.6227	0.0911	1.0000		
19. QHCap_cmplx	-0.0159	0.0211	0.0116	0.0084	0.0020	0.0196	-0.0290	-0.0140	0.0148	0.8444	0.0505	-0.0764	-0.0227	0.0045	-0.0600	0.0058	0.0432	0.0107	1.0000	
20. Asst_cmplx	0.0000	0.0088	0.1398	0.1141	0.1560	0.0134	-0.0018	0.0036	0.0099	0.1888	-0.0011	0.0006	0.0017	0.1945	0.0035	0.2514	0.0094	0.2718	0.2081	1.0000
21. csd_Populatn	-0.0124	0.0301	0.0181	0.0232	-0.0102	0.0170	0.5644	0.3468	0.5364	-0.0109	0.2099	-0.1579	0.4384	0.0540	0.3008	0.0441	0.3655	0.0550	-0.0084	-0.0009
22. csd_Landarea	0.0146	0.0070	-0.0051	-0.0045	-0.0155	0.0240	-0.0170	0.0042	-0.0237	0.0141	-0.0007	0.0032	-0.0110	-0.0031	0.0087	-0.0003	-0.0113	-0.0039	0.0156	-0.0066
23.csd_Unemploym	-0.0121	-0.0098	-0.0016	0.0018	-0.0269	0.1374	0.1028	-0.0829	0.1380	0.0005	0.0212	0.0006	0.0833	0.0092	-0.0758	-0.0153	0.0914	0.0055	0.0061	-0.0029

	21	22	23
21. csd_Populatn	1.0000		
22. csd_Landarea	0.0063	1.0000	
23. csd_Unemploym	0.1656	-0.0149	1.0000

Table G3. Regression Results for De Novo Firm Growth

	rltv Assets/rltv qual of Human Capital and Growth			Asset-Human Capital Synergy and Growth			External Env factors and Growth		
Growth	G1a early stage	G1b growth stage	G1c all de novo	G2a early stage	G2b growth stage	G2c all de novo	G3a early stage	G3b growth stage	G3c all de novo
RltvQHCap	6.845638***	.8277275	24.96948***						
	(1.923347)	(13.35302)	(.6636241)						
RltvAssets	-.1396481	-.1534908	.2746286***						
	(.2134667)	(.7643216)	(.0734987)						
Asst_HCap				-.0279128	-.0981849	.4577702***			
				(.1075002)	(.4491054)	(.0076169)			
Agglomeration							-.6172136	-67.34382	.8720731
							(40.70844)	(104.9878)	(7.647221)
Munificence							9.66e-09	2.40e-08	9.26e-10
							(2.10e-08)	(6.09e-08)	(3.81e-09)
Dynamism							5.05e-09	-1.43e-07	-1.18e-08
							(5.99e-08)	(1.26e-07)	(9.61e-09)
Complexity							-122.4349	151.7424	-1.709338
							(77.18348)	(139.7001)	(22.64002)
QHCap_Agglo									
Asst_Agglo									
QHCap_mun									
Asst_mun									
QHCap_dyn									
Asst_dyn									
QHCap_cmplx									
Asst_cmplx									
Employees	-.0261767*	-.1005542	-.0211945***	-.0254981*	-.1020773	-.021625***			
	(.0132433)	(.1340437)	(.0048127)	(.0129769)	(.1314807)	(.0045118)			
firmAge	-2.718814†	-8.414457	-2.208893***	-1.994094	-8.418011	-1.443508***			
	(1.51669)	(10.3313)	(.2974343)	(1.503007)	(10.32118)	(.2919445)			
csd_Population	3.92e-07	1.38e-06	-1.32e-06†	5.08e-07	1.41e-06	-1.07e-06	-3.01e-06	9.18e-07	-3.75e-07
	(1.60e-06)	(.0000156)	(7.08e-07)	(1.60e-06)	(.0000156)	(6.97e-07)	(3.62e-06)	(.0000104)	(7.74e-07)
csd_Landarea	.0002893	-.0052943	-.0000156	.000293	-.0052838	4.94e-06	-.0034284	.0001243	.0001033†
	(.0005485)	(.0097164)	(.0002684)	(.0005486)	(.0097054)	(.0002643)	(.0030146)	(.0001995)	(.0000529)
csd_Unemployment	-.2174422	-3.231531	-.1478058	-.2725592	-3.226263	-.2460922†	.6526627	-.2426391	-.1467259†
	(.3297874)	(3.160155)	(.1387233)	(.3295236)	(3.15513)	(.1365804)	(.604113)	(.8498953)	(.0821693)
LoConc									
HiConc									
_cons	11.10896**	116.5185*	-6.380849***	17.07385***	117.4024*	16.82301***	5.227334	51.86445***	10.29779***
	(3.853494)	(58.64726)	(1.749752)	(3.469934)	(57.21655)	(1.615741)	(5.391376)	(10.67014)	(.9213912)
Number of obs	22538	532	67005	22538	532	67005	1536	264	29192
F(a, b)	2.86	0.34	214.48	1.21	0.40	606.64	0.83	1.09	1.79
Prob > F	0.0055	0.9340	0.0000	0.2957	0.8781	0.0000	0.5602	0.3671	0.0850
R-squared	0.0009	0.0046	0.0219	0.0003	0.0046	0.0515	0.0038	0.0291	0.0004
Adj R-squared	0.0006	-0.0087	0.0218	0.0001	-0.0068	0.0514	-0.0008	0.0025	0.0002
Root MSE	196.95	294.26	149.52	197	293.98	147.24	79.726	80.636	71.146

***P<0.001 **P<0.01 *P<0.05 †P<0.1
Standard errors in Parentheses

	Environmental factors and Growth			Agglomeration x relative assets x relative qlty of human capital			Agglomeration x Interactions with munificence dynamism complexity		
	G4a	G4b	G4c	G5a	G5b	G5c	G6a	G6b	G6c
Growth	early stage	growth stage	all de novo	early stage	growth stage	all de novo	early stage	growth stage	all de novo
RltvQHCap				7.812545**	11.58336	4.341454***	1.773166	4.807058	.8290256
				(2.24997)	(21.27908)	(.9345839)	(5.148957)	(10.81833)	(1.104019)
RltvAssets				-.1917061	-1.1519	.5173859***	.1208495	-2.596033	-.088307
Asst_HCap				(.3262515)	(3.809743)	(.1084918)	(.3267935)	(8.151581)	(.1447613)
Agglomeration	38.21917	-80.73525	3.108988						
	(45.38751)	(105.2622)	(7.710871)						
Munificence	5.26e-09	-3.99e-09	-4.38e-10						
	(2.52e-08)	(6.15e-08)	(3.85e-09)						
Dynamism	-4.52e-08	-1.47e-07	-1.26e-08						
	(7.30e-08)	(1.30e-07)	(9.76e-09)						
Complexity	81.27196	141.702	12.42614						
	(140.0706)	(399.9574)	(24.16928)						
QHCap_Agglo				-9.696237	-67.64011	113.6432***			
				(11.74372)	(103.9661)	(3.663283)			
Asst_Agglo				.4136649	5.386295	-1.940807**			
				(2.074171)	(19.76554)	(.6025357)			
QHCap_mun							1.15e-08	-2.01e-08	1.69e-09
							(1.78e-08)	(3.73e-08)	(3.17e-09)
Asst_mun							9.36e-10	-1.11e-07	1.92e-10
							(3.11e-09)	(8.60e-08)	(5.44e-10)
QHCap_dyn							6.35e-09	-4.75e-08	-3.52e-09
							(4.07e-08)	(5.96e-08)	(6.95e-09)
Asst_dyn							2.80e-09	1.39e-07	2.30e-11
							(3.40e-09)	(1.31e-07)	(1.21e-09)
QHCap_cmplx							73.15804	263.0552	-60.01028*
							(112.6468)	(324.1443)	(28.48061)
Asst_cmplx							3.900468	-263.722	5.043969
							(15.65113)	(403.0478)	(6.499375)
Employees	-.0324723	-.0324852	-.0165534**	-.0259519†	-.0788798	-.0203027***	-.0309799	-.0003775	-.0109127*
	(.0271777)	(.0737187)	(.0048305)	(.0132615)	(.1580925)	(.004782)	(.0229163)	(.0786919)	(.0051331)
firmAge	-3.184135	-13.56109*	-.3537598	-2.720963†	-8.20578	-1.921147***	-2.955271	-11.7769*	.3996547
	(1.974804)	(5.778863)	(.3825694)	(1.516739)	(10.35113)	(.2954576)	(2.564756)	(5.831284)	(.4715103)
csd_Population	-2.12e-06	5.19e-06	-2.03e-07	1.06e-06	6.57e-06	-9.73e-06***	-4.00e-06	1.52e-06	-9.06e-07
	(4.59e-06)	(.0000105)	(7.91e-07)	(1.80e-06)	(.0000178)	(7.53e-07)	(3.67e-06)	(7.61e-06)	(7.65e-07)
csd_Landarea	-.003126	.0000989	.0001058*	.0002826	-.00547	.0000974	-.0015528	-.0008686	.0005223†
	(.0034854)	(.0002009)	(.0000528)	(.0005486)	(.0097442)	(.0002665)	(.0031444)	(.0023048)	(.0002913)
csd_Unemployment	1.454753*	-.3607623	-.1473696†	-.2109578	-3.228258	-.2352293†	3.158437***	-.798053	-.1588107
	(.7267936)	(.84805)	(.0835223)	(.3298893)	(3.166263)	(.1377628)	(.7301361)	(1.210483)	(.1262361)
LoConc	6.077204	3.102477	1.850898						
	(7.72999)	(15.48274)	(1.218777)						
HiConc	7.901904	2.333595	3.004254*						
	(8.580646)	(16.82378)	(1.345779)						
_cons	2.983451	117.0143***	10.51462***	10.53513**	107.4049†	9.484054***	-8.573153	93.20734**	7.11454**
	(9.69395)	(32.15944)	(2.232375)	(3.919159)	(60.51878)	(1.811259)	(8.512798)	(32.31316)	(2.685701)
Number of obs	1064	253	28351	22538	532	67005	769	145	16089
F(a, b)	1.08	1.15	2.65	2.30	0.32	276.90	2.05	0.72	1.62
Prob > F	0.3765	0.3267	0.0022	0.0140	0.9695	0.0000	0.0152	0.7395	0.0725
R-squared	0.0111	0.0497	0.0010	0.0009	0.0054	0.0359	0.0341	0.0668	0.0013
Adj R-squared	0.0008	0.0063	0.0006	0.0005	-0.0117	0.0357	0.0174	-0.0258	0.0005
Root MSE	80.514	79.715	70.914	196.96	294.7	148.45	62.081	59.644	68.971

***P<0.001 **P<0.01 *P<0.05 †P<0.1 Standard errors in parentheses

	fixed/random effects	
	G7a	G7b
Growth	fixed effects	random effects
RltvQHCap	2.882031* (1.397158)	.4606569 (1.109834)
RltvAssets	-.0128819 (.1809898)	.3092042* (.1363132)
Asst_HCap		
Agglomeration		
Munificence		
Dynamism		
Complexity		
QHCap_Agglo	13.28008 (9.00785)	128.7765*** (4.756698)
Asst_Agglo	-.3570444 (1.193903)	-.6631683 (.8028699)
QHCap_mun		
Asst_mun		
QHCap_dyn		
Asst_dyn		
QHCap_cmplx		
Asst_cmplx		
Employees	-.0386375† (.022023)	-.0185405* (.0083664)
firmAge	-3.421227*** (.3237051)	-3.006229*** (.2835407)
csd_Population	6.27e-06* (3.08e-06)	-8.59e-06*** (1.33e-06)
csd_Landarea	-.0003186 (.0005537)	-.0000524 (.0003729)
csd_Unemployment	.0676768 (.2286556)	-.1467963 (.1763385)
LoConc		
HiConc		
_cons	13.09506*** (2.988507)	12.44762*** (2.294668)
Number of obs	67005	67005
F(a, b)	15.41	
Prob > F	0.0000	
R-squared	0.0081	0.0351
	Number of groups =24064	Number of groups = 24064 Wald chi2(9)=1635.64 Prob > chi2=0.0000
***P<0.001 **P<0.01 *P<0.05 †P<0.1		Standard errors in parentheses

Table G1 shows the descriptive statistics for the variables used in the de novo firm growth analysis. The data covers 279,405 observations, 81,912 firms and a time period of 2000 to 2013. Table G2 presents the correlations for the variables. Table G3 gives the ordinary least squares regression results of the de novo firm growth analysis. The analysis included the use of both firm-level and location-level control variables in the determination of the impact of the independent variables on de novo firm growth in different environments. Different models provide for the testing of the given hypotheses. Since the interest of this research is on the nuances that characterize the growth phenomenon of de novo firms, specific analyses are carried out for different stages of growth (early stage and growth stage) as well as for young firms in general. The literature includes different criteria for assessing the growth stage of firms (Miller and Friesen, 1984) but in this research, I combine two criteria to operationalize the growth stage of young firms: (1) age, and (2) the attainment of high-growth, the criteria of which is has been provided in this chapter. The 'a' models in Table G3 examine early stage de novo firms only (those which are three years old or less, and have not attained high-growth); the 'b' models are focused on the growth-stage de novo firms (over three years and up to seven years old, and have achieved high-growth); the 'c' models are the analysis results of de novo firms in general, up to seven years old.

The G1 models test for the relationships between de novo firm resources (level of total assets and quality of human capital, relative to competitors) and growth as hypothesized in H_G1 and H_G2. H_G1 posited a positive relationship between a de novo firm's quality of human capital relative to competitors, and growth. This hypothesis is supported by model G1a (with the RltvQHCap coefficient for early-stage de novo firms at

6.845638; P<0.001), as well as by models G1c (with the RltvQHCap coefficient for de novo firms in general at 24.96948; P<0.001), G5a, G5c, G7a. However, a closer examination of the G1 models shows that, while this positive relationship is evident for de novo firms in general (model G1c), it is especially true for firms in the early stage of development (model G1a).

Hypothesis H_G2 which is on relative assets and growth, is also supported by model G1c (RltvAssets at .2746286; P<0.001), as well as models G5c, G7b. Still on a firm's resources, a major focus of this research is to test for the relative importance of assets and human capital in regard to de novo firm growth.

Hypothesis H_G3a is that quality of human capital of de novo firms will have more significant impact on their growth than the level of their assets, especially for early-stage firms. This hypothesis is supported as can be observed from models G5a and G5c (4.341454; P<0.001 for RltvQHCap vs .5173859; P<0.001 for RltvAssets). The greater significance of human capital is evident for de novo firms in general, but a more nuanced result is that this greater significance is especially true for early-stage de novo firms.

I also empirically test for support of Penrose's (1959) idea of the 'interaction between Material and Human Resources' (represented in this research by the asset-human capital synergy construct) - the aligned hypothesis being H_G3b. The interaction term comprised of level of total assets relative to competitors and quality of human capital relative to competitors (Asst_HCap) with the positive and significant (.4577702; P<0.001) coefficient in model G2c providing support for hypothesis H_G3b and this Penrosian

concept, showing that asset-human capital synergy is a significant factor explaining de novo firm growth in regions.

The following results are for the hypothesized moderating effects of external environmental factors on the relationships between resources and de novo firm growth, with the tests having been carried out by including in the regression models, interaction terms involving the respective exogenous variables and relevant endogenous resource variables (models G3a, G3b and G3c show the main effects of environmental factors). Models G5c and G7b support the assertion that local agglomeration positively moderates the relationship between quality of human capital relative to competitors and de novo firm growth (Hypothesis H_G4a); in model G5c, for example, while relative quality of human capital shows a positive and significant coefficient (RltvQHCap at 4.341454; $P<0.001$), the inclusion of the agglomeration variable in the interaction term with relative quality of human capital results in an even larger magnitude coefficient, similarly positive and significant (QHCap_Agglo at 113.6432; $P<0.001$). However, there is no support for the hypothesized moderating effect of local agglomeration on the assets-growth relationship (H_G4b).

With regard to environmental munificence influencing the impact of de novo firm resources (human capital and assets) on growth (hypothesis H_G5), no support was found for these; although in model G6c, there is a change from negative coefficient of relative total assets to a positive coefficient for the agglomeration-relative total assets interaction term, neither coefficient is significant.

The hypothesized negative moderating effects of environmental dynamism (H_G6) are not supported; however, examination of models G6a, G6b and G6c show reduced coefficient magnitudes when environmental dynamism is interacted separately with relative assets and relative quality of human capital (as compared with the coefficients when these variables stand alone), but without significance.

With regard to environmental complexity, model G6c supports the hypothesis that this exogenous factor negatively moderates the positive relationship between de novo firm relative quality of human capital and growth in regions (H_G7(a); the QHCap_cmplx variable is negative [-60.01028] and significant at the $p<0.05$ level). No support is provided with regard to there being a moderating effect of environmental complexity on the assets-growth relationship.

Model G7a shows the fixed effects results. I carried out the Hausman test after doing both the fixed effects and random effects implementations. The resulting Prob>chi2 = 0.0000 (i.e., a significant result) shows that the fixed effects is the one to be used. Model G7a supports hypothesis H_G1 which posited a positive relationship between a de novo firm's quality of human capital relative to competitors, and growth.

For my robustness tests, I used regressions with robust standard errors. Support was found for the hypothesis on the relative quality of human capital-growth relationship (hypothesis H_G1), as well as for hypothesis H_G3a on the the more significant impact of quality of human capital versus level of their assets will. The robustness tests also provided

support for hypothesis H_G3b that a de novo firm's asset-human capital synergy is a significant factor explaining its growth in regions, as well as hypothesis H_G4a on the moderating effect of agglomeration on the relationship between de novo firms' quality of human capital and growth. I also produced a random effects model which provided support for hypothesis H_G4a, as well as hypothesis H_G2 that a de novo firm's level of total assets relative to competitors is positively related with its growth.

1.9. Discussion

A major contribution of this research is to highlight the relative importance of assets and human capital in regard to growth of young firms. Although the resource-based theories (Barney, 1991; Eisenhardt and Martin, 2000; Nelson, 1991; Penrose, 1959; Peteraf, 1993; Prahalad and Hamel, 1990; Teece et al., 1997; Wernerfelt, 1984) present resources as being important for the achievement of organizational outcomes, such as competitive advantage, these perspectives are lacking in terms of empirically identifying what category of resources – assets or human capital is more significant for young, growing firms. As the results of models G5a and G5c show, relative quality of human capital compared to competitors' is shown to be more significant towards the growth of de novo firms than is relative level of total assets compared to competitors'. The importance of this distinguishing information can be observed from the fact that, young firms – renowned for resource limitations (Stinchcombe, 1965) compared to larger firms, and as such being less capable of investing in the improvement of their resource base as the dynamic capabilities perspective (Teece et al., 1997, Eisenhardt and Martin, 2000) would suggest – can benefit

from knowing what category of their resource base they should prioritize the improvement of, for future growth.

The results of this research expose the importance of a de novo firm's relative standing regarding its assets and quality of human capital, not necessarily compared to those of its large, established counterparts in its region, but rather compared to those of its peers – fellow young firms in its agglomeration environment. If we follow the rationale of the strategic groups perspective (Galbraith and Schendel, 1983; McGee and Thomas, 1986; Porter, 1979) which asserts that the competition within strategic groups is more intense than that between strategic groups, it then follows that the primary focus of young firms intent on growing should be on other rival young firms which are more likely to be aiming at the same niches in the industry, using similar resources and employing similar strategies. Such peer rival firms would this be more likely to immediately threaten the growth prospects of the focal de novo firms. Hence, gaining the competitive advantage over these competing peers will require gaining the edge in terms of greater level of total assets and more importantly as the results of this research suggest, higher quality of human capital, than their peers.

A further contribution of this research to the strategy and entrepreneurship literatures is that it is important theoretically and empirically to consider the interactive effects of tangible and intangible resources in the analysis of the performance outcomes of firms, rather than merely considering them separately. In building on, and testing the

Penrosian concept of the 'interaction between Material and Human Resources' (Penrose, 1959: 76), I extend the resource-based view through operationalizing proxy variables which represent de novo firms' tangible resources (assets) and intangible resources (human capital), and interacting these variables to show them as being a significant factor (in the form of an interactive variable called the asset-human capital synergy) explaining the growth of de novo firms in regions. The relationship between this interactive variable and de novo firm growth in regions should also be moderated by the external factors (considering the resulting models which show external factors moderating the relationships between individual resources and growth), though, empirically speaking, the resulting three-way interaction would prove problematic to interpret and has been left out. The implication for practitioners and policymakers is that agglomeration areas are more supportive of the growth of new ventures than areas that are sparsely concentrated. For governments seeking to build clusters of industrial activity for entrepreneurs and young ventures, such agglomeration areas will be better served by being in close proximity to established firms in similar or related industries.

Conclusion

This research shows the benefit of considering together, as opposed to separately, the different resource- based theories, in an attempt to better understand the factors impacting the growth of young firms. Towards a better understanding of the phenomenon of de novo firm growth, I have synthesized in this research, different resource-based theories, namely, Penrose's theory of the growth of the firm, the resource-based view of strategic management, the dynamic capabilities perspective, and the resource orchestration

perspective. Using a dataset on de novo firms in Canada's manufacturing sector, I expose the benefit of having levels of resources (assets and quality of human capital) beyond the average obtainable, not necessarily among larger established firms, but rather among competing firms, in a bid to achieve growth. However, relative quality of human capital compared to competitors' is shown to be more significant towards this growth than is relative level of total assets compared to competitors'. Further, building on Penrose's (1959) idea of the 'Interaction between Material and Human Resources' (Penrose, 1959: 76), I show that asset-human capital synergy is a significant factor explaining the growth of de novo firms. However, the resource-based theories have had little or nothing to say about the role of regions with differing strengths of agglomeration economies in the growth of firms which is posited to be hinged on the heterogeneous internal resource base of firms. Results of these studies show, in extending resource based view, show the role of the external factors in impacting positively or negatively, the relationship between internal organizational resources and de novo firm growth. While agglomeration positively moderates this relationship, environmental complexity diminishes it. What this research does not focus on, but which future research can examine are the mechanisms by which de novo firms appropriate the benefits of agglomeration in order to boost their growth. A further limitation of this research is its focus on the manufacturing industry firms only. Although the events in the manufacturing sector can serve as a bellwether for future situations in other industries, the results of this research may be limited in being representative of other industries, though these results serve to increase the body of knowledge in organization studies.

CHAPTER 2

FACILITATORS AND INHIBITORS OF DE NOVO FIRM INNOVATION

Abstract

While innovativeness of de novo firms is among the most important factors influencing their performance and survival, new ventures face substantial hurdles stemming from their liabilities of smallness, newness, and limited endowment of resources and capabilities. Drawing on agglomeration theory and the resource-based view of the firm, and using a dataset of young firms in the Canadian manufacturing sector, this paper attempts to shed light on the following questions: how do firm specific relative resources and capabilities affect de novo firm innovative output? How do locational characteristics affect de novo firms' innovativeness? And how do those locational characteristics impact the relationship between the firm-specific attributes and the innovative output?

2.1. Introduction

Innovation is the process of conceiving and developing new techniques, technologies, processes or systems which, when adopted, provide some form of value to both the source and adopters of such novelties (Rosenbusch et al., 2011; Damanpour, 1991). Viewed as a means for firms in competition with others to gain a competitive advantage or at least a share of the market, innovation – radical or incremental - is used by firms to make a difference in their performance. This paper investigates how both the environment in which de novo firms operate and firm-specific factors that affect innovativeness. Specifically I ask, how do the de novo firm's relative level of quality of human capital and assets relate to its innovative output? How do locational characteristics – agglomeration and environmental complexity – affect de novo firms' innovativeness? And how do those locational characteristics impact the relationship between the firm-specific attributes and the innovative output of de novo firms?

New ventures have to cope with liabilities of newness (Stinchcombe, 1965) and smallness (Carroll, 1983; Aldrich and Auster, 1986; Baum and Amburgey, 2002). These liabilities put them in a disadvantaged position vis a vis competing incumbents who are likely to operate in a higher production capacity, benefit from economies of scale, have established relationships with key stakeholders, and have access to distribution channels. Identifying a big new idea, is among the frequently discussed alternatives new ventures have to effectively compete in their industries (Rosenbusch et al., 2011). Also, innovation is considered as the key to a firm's survival in hyper-competitive environments (Kim and Maubourgne, 2005). The phenomenon of entrepreneurship is held by scholars to be partly

comprised of innovation (Schumpeter, 1982; Lumpkin and Dess, 1996; Davidsson, 2004; Rosenbusch et al., 2011). Small, new firms in particular, are viewed in the strategy literature as being able to adapt to environmental change faster than the larger incumbents, considering the former's inclination to quick decision-making, nimbleness (Nooteboom, 1994; Vossen, 1998; Rosenbusch et al., 2011), lack of contractual ties, and greater need for the 'next big thing'. Consistent with this view, Schumpeterian shocks in which new ventures' innovations challenge existing product and service positions (which are dominated by incumbents) have the potential of re-routing the attention and patronage of consumers towards the new ventures's offerings. Successful innovations enable new ventures to overcome early liabilities and are likely to positively affect their performance (Rosenbusch et al., 2011).

Opportunities to innovate, however, can be costly and time-consuming and in order to pursue them effectively, most new ventures need more than their endowed levels of resources and capabilities (Van de Ven, 1986; Acs and Audretsch, 1988; Nooteboom, 1994; Vossen, 1998; Rosenbusch et al., 2011). The links between combination of resources and capabilities and performance outcomes is in line with the Penrosian concept of the interaction of material and human resources for productive services (Penrose, 1959: 76). Several questions related to these theories are left unaddressed, such as: what are the combined effects of tangible assets and human resources on de novo firm innovativeness? Do human capital resources have higher impact on innovative outcomes than tangible assets or vice versa?

It is expected that the relationship between innovation and firm performance is affected by environmental factors (Rosenbusch et al., 2011) such as agglomeration economies and environmental complexity. Locations with strong agglomeration, I argue, can reduce the negative effects associated with limited resources and capabilities available to de novo entrants and enhance their innovation outcomes. Operating in areas with strong agglomeration allows de novo entrants to access local externalities such as knowledge spillovers and skilled labor. This access can increase de novo firms' potential to innovate by improving their level of absorptive capacity (Cohen and Levinthal, 1990), grasp of industry opportunities, and collaboration in innovative activity. On the other hand environmental complexity and increased uncertainty could negatively affect de novo firms seeking to engage in information processing, access local resources, and collaborate with local firms in their pursuit of innovation. Yet, our knowledge regarding the effects of agglomeration and environmental complexity on their innovative outcomes is lacking. Moreover, to the best of my knowledge, prior studies have not investigated how those locational characteristics impact the relationship between the firm-specific attributes and the innovative output of de novo firms.

My research focuses on independent new ventures (de novo firms), using a longitudinal dataset of Canadian manufacturing sector firms. By focusing on this demographic of firms which have less exposure to other influences such as time and organizational ties, the resulting indicators of the relationships between various factors and new venture innovation would be less susceptible to being confounded results. In contributing to agglomeration literature, this research shows that agglomeration positively

affects de novo firm introduction of innovations. Results also show that environmental complexity is a negative factor affecting de novo firm innovativeness. Additionally, my work builds on, and extends the resource-based view in showing that environmental complexity diminishes the effectiveness of a de novo firm's human capital in producing innovations, and this moderating effect can be expected to be greater for early-stage de novo firms than for later-stage ones. Still in contribution to the resource-based literature, this research demonstrates that a de novo firm's asset-human capital synergy is a significant factor explaining its innovativeness, suggesting that the consideration of the combined effects of tangible and intangible resources can serve as a means for richer results in innovation research, as opposed to studying only one category of resource at a time.

This chapter proceeds as follows: In the next section, I present the theoretical background for this research, dealing with the environmental and firm-level factors which impact the innovation of young firms. Section 2.3 presents the hypotheses, which are then followed by section 2.4, the data and the method section. The results are provided in section 2.5. Subsequently, in section 2.6, the discussion is presented, followed by the conclusion.

2.2. Theory

2.2.1. Agglomeration

Agglomeration is the well-known phenomenon whereby, within specific geographic locations, firms collocate which produce similar or related goods or services; suppliers to these producers as well as buyers of these products interact; training agencies,

educational institutions and government agencies exist for the purpose of standards-setting, regulation or providing learning related to the businesses going on there (Porter, 1998), all working together to create an ecosystem of a particular sphere of human activity. Agglomeration theory holds that certain agglomeration externalities offer benefits to collocated firms and that less clustered locations will be outlived by more clustered ones (Wang et al., 2014). This theory helps explain the innovativeness of young firms located in areas with levels of agglomeration. The firms located within such areas have the knowledge of which firms there are the strong players and which are the not-so-strong players, and by being in the regions with levels of agglomeration economies, these firms get a sense of what is likely to be the technological trend of the future (Brown and Duguid, 2000). With such knowledge, agglomeration area-located firms are able to determine which innovations to invest in, and which to discard – a determination that is not trivial. Much against the predictions for over a century, that industrial clusters would cease to exist as communications technologies improved (Brown and Duguid, 2000), clusters still remain an important part of organizations and industries and still account for a significant volume of research in the organizational field. Locating within agglomeration areas is advantageous for firms, since these areas reduce search costs for consumers who can increase their options and potentially reduce the price they pay for goods and services by visiting such areas. This benefits the firms located in these areas since their businesses gain visibility by being agglomeration area-located. For innovative firms in clusters, they gain from reduced uncertainty about innovative ideas to pursue (Gilbert et al., 2008) since a dominant design and innovative path to follow might become clear amongst other

collocated firms. In these areas, the agglomeration externalities gained by such firms include knowledge spillovers which serve as inputs to their innovative activities.

Firms may agglomerate in regions in order to take advantage of the availability of customers in an area, and thus, locating in such areas might provide improved visibility for such firms; customers on the other hand would benefit from reduced search costs (Baptista and Swann, 1998) by patronizing such locations. Also customers could provide good ideas for innovations (Von Hippel, 1988). While some studies tend to take a generalized view of agglomeration areas in considering their effects, they actually are distinguishable by different categories such as stage of development and level of concentration. Thus, rather than take a view of agglomeration areas as homogeneous, it is important to study them in greater detail, teasing out different mechanisms that bring about differential performance effects (Bell, 2005). In regard to the performance of innovation, clusters are likely to be differential in terms of their benefits (Ozer and Zhang, 2015) and drawbacks. Past work on agglomeration focuses on the possibility of firms having differing levels of innovation efforts which are correlated to the strength of the cluster (Baptista and Swann, 1998). Since strong clusters have a greater likelihood of attracting new entrants (Baptista and Swann, 1996), and since new entrants are likely to use innovation as a means of entering the market, we can expect regions with strong levels of agglomeration externalities to be associated with higher levels of innovative activity.

The topic of new ventures has been an important one in the discourse on industry clusters (Gilbert et. al., 2008). This specific focus of new ventures in areas with levels of agglomeration externalities, as opposed to generalized studies on firms in such regions, is justified. This is because new ventures differ from their larger established firms in very significant ways and along various dimensions. One of such areas of difference is growth (which is supported by innovations), since established firms seek growth so as to keep up the viability they have already achieved, whereas young firm growth is about obtaining viability (Gilbert et al., 2006). In addition, the size difference means that larger firms will have more workers to potentially be involved in innovative processes. Yet, new firms account for a high proportion of employment or employment growth (Acs and Mueller, 2008; Audretsch, 2012; Fritsch and Mueller, 2004; Mueller, van Stel and Storey, 2008). However, the new ventures' limited experience with innovations could imply a lower absorptive capacity level to draw on for the development of innovations. Also, the limits on the financial and knowledge endowments of new ventures could leave them less capable of benefitting from knowledge spillovers than their established industry incumbents are. Furthermore, a lack of industry ties and legitimacy can lead to fewer opportunities for these new ventures to be involved in co-creating innovative products through collaboration with other firms – an important channel for innovation. These disadvantages make it beneficial for young firms to locate in regions where agglomeration externalities can help make up for the young firms' weaknesses.

2.2.2. Environmental Complexity

Environmental complexity points to the heterogeneity inherent in a location hosting economic activities. This complexity has to do with industry competition owing to industry

concentration or dominance of one or more firms in the market (Dess and Beard, 1984; George, 2005). Environmental complexity refers to the exogenous conditions in the firm's location that ensure that the gap between a firm's strategizing and goal achievements – be they for innovations or other organizational outcomes – are not simple and straightforward, but rather, difficult to grasp and navigate, due to the presence of other players in those locations. Another indicator of environmental complexity is the number of different suppliers, customers and competitors which an organization has to deal with in its environment (Dess and Beard, 1984). The complexity of environments may be associated with managers of some firms being constrained in their strategic choices (George, 2005), which in turn could affect their firms' outcomes, including innovations. In such a heterogeneous and complex environment, managers will be faced with greater uncertainty and will be in greater need of the processing of information than will managers in a non-complex environment (Duncan, 1972; Tung, 1979). Yet, navigating such uncertain environments and dealing with information processing needs might be a challenge for firms looking to innovate - especially for de novo firms which already have limited experience, insufficient assets, and whose labor force would likely have lower competency levels than those of their established counterpart firms.

Highlighting the resource dependence perspective, Dess and Beard (1984) suggest that organizations which compete in industries associated with many different inputs or outputs – a trait of complex environments – should find it more complex to acquire resources or dispose of outputs than will those organizations operating in industries without as many different inputs and outputs. Greater environmental complexity in such a scenario

implies that the involved firms will have more of an information processing burden when it comes to strategizing on what resource inputs they should have, as well as what innovative strategies to pursue. As observed by George (2005), the relationship between slack and performance goes negative in more complex industry environments than in less complex ones. This suggests that environmental complexity could play a negative role for de novo firms seeking to engage in information processing and innovating. Considering de novo firms new in regions, the knowledge asymmetries between them and such players could impact their innovativeness, yet bridging such knowledge gaps could prove challenging. With regard to the complexities of competitive landscapes, slack resources enable firms to adapt, thus affecting the firms' outcomes (George 2005; Levinthal, 1997). Also, considering the dynamic capabilities view of firms (Teece et al., 1997, Eisenhardt and Martin, 2000), environmental complexity can be dealt with by firms reconfiguring their resources to foster new capabilities or by reassigning resources towards or away from certain markets (George, 2005). This suggests however, that a lack of sufficient resources to deal with environmental complexity could lead to the latter negatively impacting organizational outcomes including innovations, especially for young firms.

2.2.3. Resources (Assets), Capabilities (Human Capital), and Resource-Based Theories

The resource-based theories of the firm (Barney, 1991; Eisenhardt and Martin, 2000; Nelson, 1991; Penrose, 1959; Peteraf, 1993; Prahalad and Hamel, 1990; Teece et al., 1997; Wernerfelt, 1984) can help explain innovativeness of de novo firms since these theories explain the basis of the competitive advantage of firms, and since creating

innovations is a major means of firms gaining the edge over their competitors. Taking into consideration the existence of knowledge spillovers and inputs to the innovation process, the implication of these is that the R&D activities of firms do not occur in isolation, but rather are supported by other factors external to the innovating firm (Nelson, 1993; Baptista and Swann, 1998). These external factors do not diminish the importance of internal resources to the innovating firm, however.

Evidently, the human and financial resources of firms are critical for a successful innovation strategy, and as has been highlighted in previous research, different levels of resource commitments are required for differences in technical innovation (Maidique and Patch, 1982; Eisenhardt and Schoonhoven 1990). Yet, even though innovation is valuable for young firms seeking a share of the market, it can be expensive, time-consuming and demanding for new ventures (Van de Ven, 1986) beyond their current capability and endowment levels (Acs and Audretsch, 1988; Nooteboom, 1994; Vossen, 1998; Rosenbusch et al., 2011). Thus, de novo firms with sufficient resources of time, assets and innovative competencies should be in a better position to innovate than others less endowed. The picture therefore, of an effective innovation strategy, is one which has as its components, resource inputs from both the external environment of the innovating firm, as well as its internal resource base. Since, according to agglomeration theory (Pe'er et al., 2016; Wang et al., 2014), externalities such as knowledge spillovers, specialized suppliers and skilled labor facilitate the obtainment of economic gains by collocated firms, and since the resource-based literature suggests competitive advantage for firms with superior resource levels, and considering that these internal and external factors support the

innovation process, we should observe significantly differential levels of innovative output between firms located in different categories of agglomeration areas and possessing different levels of human and physical resources.

2.3. Hypotheses

The interplay between a young venture's assets, human capital and positive as well as negative factors of its environment will have an impact on its eventual innovativeness or the lack thereof in industry locations. Agglomeration locations will generally be amenable to young venture innovation due to the availability of a concentration of customers and skilled labor, as well as when there is a concentration of larger, more established firms – incumbents which are a source of knowledge spillovers for younger firms, even though rivalry is still maintained (Porter, 1990). Established firms have connections to established suppliers whom younger firms could develop relationships with. Also, established firms have a customer base in their environments whom the younger firms can target through their innovative activities and who could be a source of ideas to younger firms, for innovative outputs (Von Hippel, 1988). The above factors of certain regions will provide support to innovation strategies and such locations will be more beneficial than others in terms of providing these agglomeration externalities, will be more attractive for innovative young ventures, and will result in greater innovativeness by these young ventures, providing they are sufficiently endowed with capabilities and tangible resources.

2.3.1. Relative Quality of Human Capital, Tangible Assets, and Innovativeness

The innovation process involves a formal approach to apply time and resources to develop solutions to known problems, but it also has to do with informal exchange of information among firms in agglomeration areas, as well as informal R&D co-operation (von Hippel, 1987). Although de novo firms better positioned for information access can be expected to be more innovative (Rogers, 1995), it is the quality of human resources in those firms - as evidenced by their level of absorptive capacity (Cohen and Levinthal, 1990) in the specific innovation field - that determines the extent to which firms in regions can absorb, synthesize and augment available information, leading to innovative output. Knowledge in clusters undergoes augmentation and reinforcement through providers of public knowledge, such as universities, exhibitions and different media (Porter, 1998; Saxenian, 1994), leading to a greater degree of absorptive capacity at the region level, and through knowledge diffusion, at the firm level as well. However, the ability of de novo firms to take advantage of this industry location-level absorptive capacity towards their own innovations and appropriation of the attendant rewards depends to a large extent, on the quality of the human capital within a focal de novo firm relative to the quality of human capital in other peer firms within the region. This is logical since, in the race for innovations in an innovative industry, organizational actors with more industry experience, knowledge or innovative competencies – factors which determine their firms' quality of human capital – may come up with more innovations than other firms less endowed. Although company executives within a cluster have a shared background and understanding (Paniccia, 1998), those of them with superior innovative capabilities will be better equipped to use the knowledge in the region for innovations. Agglomeration area-located de novo firms which

have relatively higher quality of human resources (compared to those of their peers in the same locations) should have greater innovativeness, in accordance with the resource based theory which posits competitive advantage resulting from a firm's unique resources.

The resource-based view (Wernerfelt, 1984, Barney, 1991) supports the assertion that de novo firms with greater overall quality of human resources than their competing peers in their industry areas will achieve better performance in terms of innovative outputs. Through different theoretical approaches, differing explanations have been given as to why the human capital of founders enhance growth (Colombo and Grilli, 2010). One way whereby the capabilities and experience of entrepreneurs and their teams can lead to better growth performance for their firms than those of their contemporaries is by better innovativeness; innovation has an effect on the performance of new ventures (Rosenbusch et al., 2011). Taking into consideration the competence-based view (which can be regarded as a corollary of the resource-based view), this view asserts that individuals with higher human capital establish more successful firms (Colombo and Grilli, 2010). Such higher quality of human capital of workers in innovative firms arises from the tacit and explicit knowledge gained over time, with such knowledge coming through formal education, apprenticeship, job trainings, etc. De novo firms with these human capital advantages should be better able to scan the industry for innovation opportunities, collaborate with external partners in innovation initiatives, and carry out combinations of knowledge, all of which should lead to more innovation outputs than competing firms with less capabilities. Further, while explicit knowledge is easy to write down, transmit and interpret for the benefit of others, tacit knowledge is difficult to codify in written form or transmit formally.

This should give an innovative advantage to de novo firms whose workers have realized such knowledge through years of working in the same industry or who have had previous opportunities to make innovation-related decisions in similar or related industries. Although innovation is valuable for young firms, it can be expensive, time-consuming and demanding for new ventures (Van de Ven, 1986) beyond their current capability and endowment levels (Acs and Audretsch, 1988; Nooteboom, 1994; Vossen, 1998; Rosenbusch et al., 2011). Thus, de novo firms with an advantage over their peers in terms of overall capabilities pertinent to innovation should have greater innovativeness than other firms that are not as endowed with such human resources. When individuals have attained greater educational heights, have more experience specific to the same industry sector as the focal new venture, and have entrepreneurial human capital resulting from prior managerial or entrepreneurial experience in some other firm(s), they will likely have more specialized knowledge and better entrepreneurial decision-making and will be better positioned to utilize untapped opportunities and execute strategies in the interest of their new firms (Colombo and Grilli, 2010), including innovation strategies. There have been several empirical studies which focused on the relationship between the human capital of founders and growth of firms, and while fewer studies have focused specifically on new technology-based firms, there is support for the view that founders' industry-specific work experience is an important factor with regard to firm growth (Colombo and Grilli, 2005; Colombo and Grilli, 2010; Cooper and Bruno, 1977; Feeser and Willard, 1990). Considering that innovation is an important route towards young firm growth, it should be, in connection with the resource based view and in contribution to innovation literature, that industry-specific work experience and other factors that increase the quality of a de novo

firm's human capital relative to those of its competing peers, will positively affect its innovation output. Thus, the higher a de novo firm's quality of human capital is, above the average of its competing peers, the more its innovative output will be. I hypothesize,

H_I1: There will be a positive relationship between the de novo firm's relative quality of human capital and its innovative output

Indeed innovation research indicates that resource availability and innovation are positively related (Koberg et al., 1996; Damanpour, 1991). Tangible resources are also needed in the process of innovation, and such resources include assets such as labs for experiments, materials for prototypes, computer infrastructure for computer-aided designs, and funds for market research. However, in line with the liabilities of newness perspective (Stinchcombe, 1965), young de novo firms are demonstrably less endowed with such tangible assets. As such, de novo firms that have relatively higher levels of endowments with assets than their peers in their regions will be more productive in terms of creating innovations. Regarding resource differences between firms, larger firms tend to have more resources while smaller firms might be more flexible and entrepreneurial (Park and Luo, 2001), and also, older firms tend to be more resource-endowed while their younger counterparts tend towards being more creative (Lahiri, 2010). Yet with all their advantages in terms of flexibility and creativity – factors that should positively impact the innovativeness of young firms – lack of financial means constrains the growth of young firms in ways that would not be the case had they adequate financing (Carpenter and Petersen, 2002; Colombo and Grilli, 2010). These financial constraints should also hinder

the innovative outputs of de novo firms, but also, the firm's which are better able to overcome such financial constraints should perform better in terms of producing innovation outputs. Even in the case of new technology-based firms built by people with relatively higher quality of human capital than other such firms, lack of financial and other resources may prevent such individuals from fully exploiting their potentials (Colombo and Grilli, 2010). Such asset-related limitations will likely limit the innovative outputs of de novo firms in such a situation while other de novo firms with comparable levels of human capital and with better levels of assets gain the innovative advantage. Clearly, a means of improving the asset levels of young firms is the obtainment of external financing such as venture capital or loans. Obtaining venture capital financing removes the financial constraints that work against growth (Colombo and Grilli, 2010) and can be expected to improve innovative output of de novo firms by fostering the situation where the human capital possessed by entrepreneurs and other organizational actors is combined with acquired assets towards engaging in exploratory and exploitative innovative activities. Venture capital financing – an assets level booster – leads to more rapid growth (Colombo and Grilli, 2010) which, for de novo firms, could happen through the mediating effect of improved innovativeness. Another means whereby de novo firms with greater asset levels than those of their peers in the same region might be advantaged in regard to innovative outputs is the potential to invest more into research and development processes. The availability of more slack financial resources or other assets than competing peers means there will be the potential to commit more assets towards R&D, which in turn could lead to more innovations being created by such firms. In line with RBV, de novo firms that have relatively higher levels of asset endowments than their peers will be more productive in

terms of creating innovations. Thus, the higher a young venture's level of total assets is, above the average of its competing peers, the more its innovative output will be. The hypothesis follows:

H_I2: There will be a positive relationship between the de novo firm's relative assets and its innovative output

Having considered separately, the factors relating to the assets and human capital of de novo firms, the next issues have to do with comparing these factors with each other as well as considering them interactively, with regard to de novo firm innovativeness. Innovation is the process of conceiving and developing new techniques, technologies, processes or systems which, when adopted, provide some form of value to both the source and adopters of such novelties (Rosenbusch et al., 2011; Damanpour, 1991). Thus, innovation is a creative process, meaning that the main resource needed for this knowledge-intensive endeavor (Ozer and Zhang, 2015), is the capacity to conceive of ideas and the capacity to apply knowledge, information and skills to bring those ideas into reality. Consequently, it should be that, compared with organizational [tangible] assets, the quality of a de novo firm's human capital should be more significant towards its innovativeness. For de novo firms to be continually innovative in their regions requires that they continuously acquire and analyze information from the external environment (Quinn and Cameron, 1983; Koberg et al., 1995), yet even with the opportunity to gain knowledge from agglomeration areas, processing potentially relevant knowledge spillovers could still be challenging (Funk, 2014); this highlights the importance of a good quality of human

capital for de novo firm innovativeness. Being that the process of innovation is a creative process and one that bodes on the absorptive capacity (Cohen and Levinthal, 1990) of the individuals so as to bring such innovations to reality, we can expect that the availability of human capital will outweigh the availability of assets in significance for de novo firm innovativeness in regions. Furthermore, building on the idea of the interaction of material and human resources as put forth by Penrose (Penrose, 1959: 76), and applying this idea to the issue of innovations, the combination of the assets and human capital of de novo firms should be a significant factor which can be used to explain the innovativeness of such firms. This Penrosian idea of the interaction of material and human resources is here represented as an asset-human capital synergy. Thus we can expect that de novo firms with higher relative quality of human capital than competing peers as well as greater levels of total assets compared to those of their peers will have greater levels of this synergy between assets and human capital and can thus be expected to have greater innovation outputs than these competing peers. The below hypotheses follow:

H_I3a: Relative quality of human capital will have a larger impact on the innovative output of de novo firms than relative assets will

H_I3b: There will be a positive relationship between the de novo firm's relative asset-human capital synergy and its innovative output

2.3.2. Agglomeration and Innovativeness

According to agglomeration theory (Pe'er et al., 2016; Wang et al., 2014), agglomeration areas will provide the firms located within them with agglomeration externalities which will potentially lead to positive outcomes for these firms. These agglomeration externalities include knowledge spillovers from other firms comprising the region, and the benefits of these knowledge spillovers includes innovation. To firms involved in product innovation, systematically obtaining information from other actors in the region, such as customers, partners, competitors, research institutions or government agencies could be very important for their innovative process (Koberg et al.,1996). This is especially true for young firms in such locations since their knowledge of the industry and the markets alike is limited, compared to those of their established counterparts. Being the knowledge-intensive endeavor that it is (Ozer and Zhang, 2015), innovation is successfully carried out by firms which have the knowledge of pertinent features to include in their products (Jansen, Van Den Bosch and Volberda, 2006; Ozer and Zhang, 2015) as well as product design and commercialization knowledge (Daneels, 2002; Teece, 1992).

Compared to older firms, young firms are more likely to be members of an industrial cluster (McCann and Folta, 2011). Gilbert et al. (2008) support the assertion of the importance of agglomeration for young firms since they found that cluster-located ventures obtain more knowledge environmentally and have higher performance in terms of innovation. Thus agglomeration should positively enhance the innovativeness of de novo firms in such areas. Young de novo firms will be successful innovators to the extent at which they are successful in developing new products and marketing those products (Zhang and Lee, 2013). In considering the benefits of agglomeration to de novo firms'

innovation output level, one would examine the different agglomeration externalities which are impactful to the innovation processes - externalities which include access to suppliers, buyers, knowledge spillovers, and skilled labor. The connections of an innovative de novo firm to its suppliers in its region will be beneficial to its innovative process in different ways. For one, these suppliers can serve innovative firms by giving them knowledge of different product design options (Ozer and Zhang, 2015). This will be helpful towards differentiation strategies through innovating, which are a means for de novo firms to capture a niche in their industry segments. Combining this knowledge with an understanding of buyer preferences (also obtainable via interactions with buyer individuals or firms in the agglomeration area) serves as a means to the development and commercialization of products (Zhang and Lee, 2013) which may lead to a competitive advantage for such young firms. Suppliers in a industry area can also help foster successful innovations by young ventures by offering information about other raw materials and parts which may be used for production (Ozer and Zhang, 2015). This could play a very important role for less resource-endowed firms such as de novo firms since they could make substantial financial savings by using alternative and less expensive parts and processes which still meet the buyers' needs. With regard to buyers in an agglomeration area and how they might impact de novo firm innovativeness, buyer firms provide knowledge having to do with products and outputs (McEvily and Marcus, 2005) and they could serve in the beta testing of the firms' products. Such feedbacks can play important roles in the level of value which the final product offers to eventual buyers – something that could enable young firms gain important market share and recognizability in their industries. Also, by giving insights into present and future customer needs (Ozer and

Zhang, 2015), buyer firms can contribute to the de novo firm's process of deciding on products and features that should be part of their innovative activities.

Since innovation is a knowledge-intensive endeavor (Ozer and Zhang, 2015), it follows that for de novo firms, their innovativeness will be positively impacted by their location in an environment (in this case, an agglomeration environment) that facilitates their acquisition of relevant knowledge that is potentially useful towards producing innovations. Such knowledge spillovers are agglomeration externalities and are very important resources for de novo firms which otherwise, might not possess such knowledge solely from the workers they currently have. The availability of knowledge spillovers can be expected to be a major reason why young and small firms are more likely than older and large ones, respectively, to be members of an industrial cluster (McCann and Folta, 2011; Shaver and Flyer, 2000). Since cluster-located ventures obtain more knowledge from the local environment (Gilbert et al., 2008), and if geographical proximity best facilitates technological knowledge transfer, then locating near the center of manufacturing and research and development activities will be better for de novo firms looking to exploit such knowledge (see Baptista and Swann, 1998). By so doing, such de novo firms can be a part of the firms in industrial centers which bring about more knowledge spillovers and more innovations (Baptista and Swann, 1998). These agglomeration externalities are very important for the innovativeness of de novo firms since they serve as alternative inputs to the innovation process for these firms which are otherwise, less resource-endowed than their established counterparts. Furthermore, agglomeration should impact the value of a de novo firm's own resources with regard to its innovativeness. For example, whereas having

well qualified engineers is by itself a valuable resource for young firms – one that can directly impact the productivity of these firms – exposure to agglomeration externalities such as knowledge spillovers from various sources in the region will enable this human capital to go even further in advancing the innovative agenda of these firms. Thus,

H_I4a: The level of agglomeration will be positively related to de novo firm innovative output

H_I4b: The level of agglomeration will positively moderate the relationship between the de novo firm's relative quality of human capital (relative assets) and its innovative output

2.3.3. Environmental Complexity and Innovativeness

For new ventures in these regions, assimilating these knowledge spillovers (Audretsch, 2012) and creating innovative outputs become their goals, and serve as their strategies for cornering a portion of the market against the larger incumbents. This is because these newer firms, being less endowed resource-wise, capability-wise and experientially, are less able to compete with such incumbents in regard to replication of already-established dominant designs within their industries. But regions are complex environments, with various stakeholders collaborating or otherwise competing with each other, and these organizational activities could either support or hinder the progress of new ventures. The complex external environment is further characterized by the need to decide on an innovation path in light of the several available ones. To be continually innovative,

a firm would need to engage in continuous acquisition and analysis of information from its external environment (Quinn and Cameron, 1983; Koberg et al., 1995). Yet even when firms located in highly concentrated areas are provided with several opportunities to gain new knowledge from spillovers, it could still be challenging for them to process all the knowledge spillovers that are potentially relevant to them (Funk, 2014).

A gap exists in the literature as to how the complexities of regions affect the innovative output of de novo firms (independent new ventures). The specific focus on the effects of environmental complexity on the innovative output of de novo firms in particular is warranted, owing to the fact that these kinds of firms are unattached to, and thus unsupported by older, established parent organizations. Thus there would be a greater urgency on the part of these de novo firms to survive by innovating since they lack the financial and other forms of support from parent firms which could otherwise act as a buffer from consequences of not performing well enough.

However, their success in innovating hinges on the location of their innovative activity as well as on the nature of the innovation process. With regard to location, the external environment influences the evolution of the technological capabilities of ventures (Anderson and Tushman, 1990; Pisano, 1990; Zahra and Bogner, 1999), and linked to the innovation location is the innovation process which has to do with uncertainty, complexity, research, cumulativeness, and learning by doing (Dosi, 1988; Feldman, 1994). Within the agglomeration areas where de novo firms operate as part of the group of innovative firms,

the technical and commercial results produced by innovative efforts are characterized by uncertainty and complexity (Baptista and Swann, 1998) which could be detrimental to the innovativeness of de novo firms. Also, something that concerns innovators in complex environments is that the path to discovery in normal practice is marked by ambiguity and convolutions and could come upon dead ends which however, may be converted to new beginnings (Grinnell, 2009: 4). The uncertainties inherent in locations with environmental complexities might prove difficult to manage for de novo firms looking to innovate, due to the relative inexperience of the entrepreneurs and workers which constitute such firms. For firms that have the capabilities to do so, they can reduce these uncertainties by taking advantage of information exchange channels, like innovator networks (Baptista and Swann, 1998). Innovator networks have the tendency to be localized (Freeman, 1991), and considering that networks could facilitate the exploitation of technological developments as well as problem-solving through shared experiences involving similar technologies (Baptista and Swann, 1998), taking advantage of these might be a way to deal with environmental complexity and foster innovations. However, de novo firms might not be able to take significant advantage of these means, owing in part at least to their lower levels of absorptive capacity (Cohen and Levinthal, 1990) which are necessary to interact in such networks and exploit such technological developments, and so their innovativeness is more likely to be negatively impacted by external factors such as environmental complexity. Another source of knowledge that could positively impact the innovative efforts of firms is buyers. Yet de novo firms in an agglomeration area may not quickly and easily integrate the buyer-sourced knowledge into their innovation process due to the complexity of the knowledge (Danneels, 2002; Ozer and Zhang, 2015) which is not easy to transfer between

firms (Zander and Kogut, 1995). These issues connected to environmental complexity will likely negatively affect the innovativeness of de novo firms which by nature, are not as developed as their established competitors. I posit that the complexities of the external environment would serve as a challenge to the innovative performance of de novo ventures. Although in response to competitive forces, these firms will look to innovate in the attempt to survive and boost their performance within their industries, their novelty in the entrepreneurial race and the various facets of the complex process of innovation in a region will be difficult for new ventures to grapple with. Thus complexities of industry environments will oppose innovativeness amongst young ventures.

Beyond the direct impact of environmental complexity on the level of innovation outputs produced by de novo firms, environmental complexity should also impact the relationship between these firms' capabilities (with respect to their human capital) and their innovative outputs. Both macro-level and micro-level factors affect the innovation in organizations (Damanpour, 1991; Kanter, 1988), with the former including factors such as environmental complexity and organization size, and the latter including creativity and decision-making style of individuals (Koberg et al, 1996). But the impact of individual factors such as technical or relational skills on the innovative output of firms will be contingent on the level of complexity of the external environment, since more complex environments will be more difficult and time-consuming to manage and adapt to. Also the availability of a greater number of actors within a region, that exemplifies greater complexity – such as suppliers, partners, buyers or government agencies – means there will be greater opportunities for complexity, the management of which could negatively impact

the innovative outputs of de novo firms. Environmental complexity will generally be a negative factor for de novo firm innovation. Thus, the following hypothesis:

H_I5a: The level of environmental complexity will be negatively related to de novo firm innovative output

H_I5b: The level of environmental complexity will negatively moderate the relationship between de novo firm's relative quality of human capital (relative assets) and its innovative output

2.4. Data and Method

2.4.1. Data

The data for this innovation research is derived from Statistics Canada's (STATCAN's) Survey of Innovation and Business Strategy (SIBS), the General Index of Financial Information (GIFI), and the General Business Panel Survey; Linked File Environment (LFE). The SIBS contains information on Canadian businesses with regard to their innovation activities, strategic decisions, operational tactics and global value chain activities. A cross-economy survey of businesses and industrial non-profit organizations, the SIBS includes quantitative information (such as innovation counts, total sales and innovation expenditures) as well as qualitative business information like use of advanced technologies and market characteristics. The SIBS is combined with other STATCAN surveys and administrative sources, to increase its analytical potential. STATCAN employs

a linkage process whereby their Linkable File Environment (LFE) uses the single-subject ability of available surveys and administrative data to provide information in regard to business and economic issues. The surveys and administrative data are positioned to support longitudinal and cross sectional analysis, and researchers can have the opportunity to use additional variables for research on entrepreneurship, productivity, competitiveness, etc. STATCAN combines the SIBS data with its General Index of Financial Information (GIFI) which contains firm-level information such as Total Sales, Total Revenue and Salaries and Wages. Overall, the dataset for my innovation analysis was a panel dataset spanning the time period of year 2000 through 2015. The data for the innovation analyses focusing on young firms featured 1459 firms from zero to 7 years old, and 7461 observations, with firm-level and aggregate data useful for agglomeration research.

For the studies on innovation, all of these datasets were needed, and the SIBS data was merged with the LFE and GIFI data since I was to regress the innovation variable on firm-level and location-level variables towards further multivariate analysis. My request was for specific variables of the SIBS data to be extracted and merged with other specified LFE and GIFI variables, forming a unique dataset. The data extraction process sought from these sources produced customized datasets which I used for my research on new ventures. This end-product is a merger of the above-mentioned LFE and GIFI data with the Survey of Innovation and Business Strategy (SIBS) 2012 data. The common field was the company identifiers. I received firm-level data with which to obtain measures of the relative total assets and human capital levels of independent new ventures. Because the SIBS dataset contains indicators of innovations in firms, I intended for this dataset to be merged with

the GIFI/LFE dataset in order to facilitate matching between firm-level indicators of resources and capabilities and innovation indicators. In regard to the innovativeness of new ventures, a number of dynamic capabilities impact a firm's introduction of product innovations. These dynamic capabilities are: acquisition, assimilation, transformation, and deployment (Branzei and Vertinsky, 2006; Zahra and George, 2002). Also, patents are indicators of the innovative capability of firms, and more specifically they can measure the transformation capability aspect of dynamic capabilities (Branzei and Vertinsky, 2006). In my research, I used the innovation counts from the SIBS dataset for the measurement of innovativeness of de novo firms.

2.4.2. Estimation

For my innovation analysis, I used the poisson regression. This method is suitable since the dependent variable is counts of innovations produced by the firms. The model for estimation of new venture innovativeness is represented by the below:

$$\text{Innovativeness} = \Omega_1 + \Omega_2\text{RltvQHCap} + \Omega_3\text{RltvAssets} + \Omega_4\text{Complexity} + \Omega_5\text{Employees} + \Omega_6\text{firmAge} + \Omega_7\text{Population} + \Omega_8\text{Landarea} + \Omega_9\text{Unemployment} + \varepsilon$$

2.4.3. Dependent variable

Innovativeness [totalInnov].

A measure of how innovative the new venture is, innovativeness is operationalized by adding the number of product innovations and the number of process innovations of the

new venture in the year. In regard to this innovation research, focus was on firms that have introduced either zero or one or more product innovations. These introduced innovations serve as indicators of the innovativeness of these de novo firms.

2.4.4. Independent variables from the External Environment

Environmental Complexity [Complexity].

This is measured by regression of terminal-year (year five) market shares (sales) of an NAICS industry's firms on the initial-year (year one) market shares of those firms, following which the computed measures will be multiplied by negative one, and as such, the larger the number, the more complex the environment (Heeley et al, 2006; Tatikonda et al, 2013).

Agglomeration.

As a proxy for agglomeration externalities which exist in a region, I use the Ellison-Glaeser measure (Ellison and Glaeser, 1997; Pe'er et al, 2016). This measure consists of the region's share of total employment in all sectors as well as the region's share of employment in a specific 3-digit NAICS sector.

2.4.5. Firm-level Independent variables

Relative Assets [RltvAssets].

Relative level of total assets compared to competitors was operationalized by dividing the assets of the new venture by the average assets for all other de novo firms of the same NAICS industry in the same year (Pe'er et al, 2008). This measure is valuable in operationalizing the resource level of a firm.

Age Dummy Variables [age1 – age7].

To group de novo firms according to their ages, I created dummy variables for firms of one year old through firms seven years of age. These dummy variables were then useful for examining de novo firm innovativeness with regard to age.

Relative Quality of Human Capital [RltvQHCap].

To ensure the comparison of measures across similar exogenous conditions, a new venture's relative quality of human capital compared to competitors is measured by dividing the new venture's average wage paid by the average wage paid by all other de novo firms in the same year and of the same CSD (Dutta et al., 2005; Pe'er et al, 2008). This variable gives a measure of the new venture's standing within the agglomeration, in terms of its ability to utilize resources (assets) to actualize its value proposition and be productive within its market. Since it is not just a firm's capabilities that matter, but rather its capabilities in comparison with its competitors (i.e., what it is able to do as well as, or better than its competitors) this measure of relative quality of human capital will be useful to gauge firms' relative productivity potential within their regions. This measure will be used for operationalizing the capability level of a firm relative to its peers'.

Asset-human Capital Synergy[Asst_HCap].

This is the moderating variable which is operationalized as an interaction term between the 'Relative Assets' variable and the 'Relative Quality of human capital' variable.

2.4.6. Control Variables (Firm-level and Location-level)

Firm size (Employees).

This is measured as the number of employees in the new venture.

Age of firm (firm-level control: firmAge).

I control for age by obtaining the number of years the new venture has been in existence.

Population [csd_Population].

Since large populations can influence new venture performance, this control is in order. The population of census subdivisions (CSDs) in Canada is provided in the Canadian census data, but this information was requested and is included in the data provided by STATCAN for this research. In prior research, population has been measured by taking the natural logarithm of the census subdivision population at time t-1 measured during census years, and subsequently carrying out linear interpolation between census years (Pe'er et al, 2008).

Unemployment rate [csd_Unemployment].

Unemployment can be expected to negatively impact the productivity of an industrial region, since the implication is that there will be less manpower for innovations and routine organizational activities. The unemployment rate of census subdivisions (CSDs) in Canada is provided in the Canadian census data, but this information was requested and is included in the data provided by STATCAN for this research. In prior research, census data has been used to measure CSD unemployment rate and there were interpolations between years in which census data exists (Pe'er et al, 2008).

Land area[csd_Landarea]. I control for land area, taking into consideration the differential levels of availability of land and differences in land prices. The land area of census subdivisions (CSDs) in Canada is provided in the Canadian census data, but this information was requested and is included in the data provided by STATCAN for this research. In prior research, the land area data has been obtained by taking the natural logarithm of the CSD land area (Pe'er et al, 2008).

2.4.7. Interaction Terms

Two-term interaction variables were also created between relative quality of human capital and relative level of total assets on one hand, and external environmental variables on the other hand (i.e., QHCap_Agglo, QHCap_cmplx, RAsst_Agglo and RAsst_cmplx).

2.5. Results

Presented in table I1 are the descriptive statistics for the variables used in the de novo firm innovation analysis. The data for the actual analyses covers 7461 observations, 1459 firms and a duration of 2000 to 2012. The correlation matrix for the variables are provided in table I2. Table I3 presents the poisson regression results of the de novo firm innovation analysis. The multivariate analysis to tease out the associations between the already-specified independent variables and the innovative output of de novo firms in regions employed both firm-level and location-level control variables. Different models reflecting specific age groups as well as the general de novo firm group provide for the testing of the given hypotheses. These groups are the early stage de novo firms (0 through three years old, represented in the 'a' models), later stage de novo firms (over three through up to seven years old, represented in the 'b' models) and the general de novo firm group (0 through seven years old, represented in the 'c' models). The I1 and I2 models reflect the test for the relationships between de novo firm relative quality of human capital and relative assets – separately and interactively, respectively – and innovative output. Following hypothesis H_I1, having a quality of human capital beyond the average level of those of its competing peers in its region will lead to more innovations by a de novo firm. This hypothesis is supported by model I1a, (as well as models I4a and I5a) where the relative quality of human capital variable, RltvQHCap, is positive and significant (0.2797342, $P<0.001$), though only for the early-stage firms (positive coefficients exist for de novo firms in general in this regard, though they lack significance). Similarly, hypothesis H_I2

is supported by model I1a, as well as models I4a and I5a, suggesting a positive association between focal de novo firms' local level of assets relative to competitors and innovative outputs (in model I5a, the coefficient for RltvAssets is .1053202, $P<0.001$). This research also focuses on determining the relative importance of assets versus human capital for the innovativeness of de novo firms, and examination of model I1a shows the relative quality of human capital variable, RltvQHCap with a greater magnitude than the relative level of total assets variable, RltvAssets, providing support for H_I3a. Models I4a and I5a also support H_I3a. Further, in regard to applying Penrose's (1959) concept of the 'interaction between Material and Human Resources' (Penrose, 1959: 76) to young venture innovativeness, the I2 models reflect the tests for the relationship between asset-human capital synergy and innovation, as hypothesized in H_I3b. Hypothesis H_I3b is supported by model I2a, suggesting that the Penrosian concept represented by the asset-human capital synergy construct in this research is a significant factor for the empirical study of de novo firm innovation.

Having examined the impact of internal organizational factors on de novo firm innovation, the other focus of this research is on the role of external environmental factors with regard to innovation. This focus is apt, being that the external environment influences the evolution of the technological capabilities of ventures (Anderson and Tushman, 1990; Pisano, 1990; Zahra and Bogner, 1999). We consider agglomeration and environmental complexity which are hypothesized to have positive and negative associations, respectively, with de novo firm innovative output in regions. The I3 models look at

agglomeration while the I5 models consider agglomeration interacting with firm resources. While all the I3 models have positive coefficients for agglomeration, models I3b and I3c are significant concerning agglomeration (similar to Models I5b and I5c), supporting hypothesis H_I4a, and suggesting that while agglomeration is generally positive for de novo firm innovativeness, these gains are especially for de novo firms which, though young, are beyond the nascent stage. In regard to the moderating effects of agglomeration, no support is found for hypothesis H_I4b (on moderating the quality of human capital [and level of total assets]-innovativeness relationship). Hypothesis H_I5a posits that environmental complexity is negatively related to the innovative output of de novo firms and this is supported by models I3b and I3c. Environmental complexity is also found to negatively moderate the quality of human capital-innovativeness relationship (hypothesis H_I5b, supported by model I4a). Interestingly, the move from a positive and significant RltvQHCap to a negative and significant interaction term involving complexity (QHCap_cmplx) is only observable for early stage firms. Hypothesis H_I5c is not supported, but model I4c shows a change from a positive RltvAssets coefficient to a negative coefficient when assets is interacted with environmental complexity (RAsst_cmplx) though neither value is significant.

For my robustness tests, I used negative binomial regression. This is appropriate since negative binomial regression is a method for the purpose of modeling count variables. Support was found for hypothesis H_I5a which posited that environmental complexity is negatively related to the innovative output of de novo firms in regions, as well as for hypothesis H_I4a on the positive relationship between agglomeration and de novo firm

innovative output. Further, the positing that, as young firms, increasing de novo firm age will be associated with decreasing significance for innovation output, was generally supported.

Table I1

Descriptive Statistics for De Novo Firm Innovation

Variable	Obs	Mean	Std. Dev.
totalInnov	3892	7.261305	17.24422
RltvQHCap	1013	1.279964	1.038442
RltvAssets	587	76.97588	1565.524
Employees	6809	118.4964	276.8655
Complexity	1096	-.0007616	.0174435
Agglomeration	1096	-1.568423	1.310855
QHCap_cmplx	1013	-.0004515	.0249089
RAsst_cmplx	587	-.0726293	4.44151
QHCap_Agglo	1013	-2.010779	4.117122
RAsst_Agglo	587	-101.6887	2085.028
firmAge	8028	3.209766	2.946023
csd_Population	8007	498067.1	707873.6
csd_Landarea	8007	571.5549	1232.139
csd_Unemployment	7991	8.376836	3.980682

. Total Obs: 8028

Table I1. Descriptive Statistics for De Novo Firm Innovation

Table I2. Correlations

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. totalInnov	1.0000														
2. RltvQHCap	0.0239	1.0000													
3. RltvAssets	0.1038	0.0583	1.0000												
4. Employees	0.3587	0.0706	0.3137	1.0000											
5. Asst_HCap	0.1021	0.0690	0.9964	0.3051	1.0000										
6. Complexity	0.0086	0.0528	-0.2017	-0.0394	-0.1878	1.0000									
7. Agglomeration	-0.0408	0.0677	-0.0094	-0.0563	-0.0084	0.0710	1.0000								
8. QHCap_cmplx	-0.0074	0.0795	-0.2165	-0.0582	-0.2036	0.9106	0.0847	1.0000							
9. RAsst_cmplx	-0.0572	-0.0189	-0.6553	-0.1570	-0.6108	0.3237	0.0176	0.3343	1.0000						
10. QHCap_Agglo	-0.0768	-0.7958	-0.0586	-0.1073	-0.0672	0.0109	0.4991	0.0091	0.0289	1.0000					
11. RAsst_Agglo	-0.1045	-0.0571	-0.9977	-0.3112	-0.9893	0.2128	0.0209	0.2279	0.6906	0.0649	1.0000				
12. firmAge	-0.0271	0.1268	0.0175	-0.1057	0.0173	-0.0197	-0.1165	-0.0357	-0.0384	-0.2035	-0.0209	1.0000			
13. csd_Population	0.0037	0.0564	-0.0968	0.0863	-0.0949	0.1108	0.2974	0.0778	0.0617	0.1233	0.1010	-0.0547	1.0000		
14. csd_Landarea	-0.0477	-0.0299	-0.0750	-0.0930	-0.0773	0.0609	0.0720	0.0451	0.0490	0.0573	0.0766	-0.0260	0.0141	1.0000	
15. csd_Unemployment	0.0562	0.0040	0.0580	-0.0303	0.0558	0.0004	0.1533	-0.0226	-0.0374	0.1003	-0.0570	0.1336	0.1669	0.0639	1.0000

Table I3. Poisson Regression Results for De Novo Firm Innovation

	Assets/Human Capital Relationship with Innovation			Asset-Human capital synergy Relationship with Innovation			Complexity/Agglomeration Relationship with Innovation		
totalInnov	I1a	I1b	I1c	I2a	I2b	I2c	I3a	I3b	I3c
	early stage	later stage	gen de novo	early stage	later stage	gen de novo	early stage	later stage	gen de novo
RltvQHCap	0.2797342***	-.1316624*	.0530472						
	(.0496927)	(.0653049)	(.0387316)						
RltvAssets	.0006498***	-.0006808***	.0000821						
	(.0001413)	(.0001615)	(.0001006)						
Asst_HCap				.0004164***	-.0004884***	.0000368			
				(.0000839)	(.0001046)	(.0000618)			
Complexity	4.169569	1.032256	2.986885				11.57223***	-16.47665***	-12.34168***
	(3.920761)	(2.284746)	(1.850188)				(2.352411)	(.9967766)	(.9554961)
Agglomeration							.0773403	.097165***	.0716976***
							(.0523379)	(.0173059)	(.0161224)
QHCap_cmplx									
RAsst_cmplx									
QHCap_Agglo									
RAsst_Agglo									
Employees	.0004542***	.001194***	.0006815***	.0004628***	.0011599***	.0006851***			
	(.0000287)	(.0000717)	(.0000236)	(.0000282)	(.0000692)	(.0000235)			
firmAge	-.1587838***	.0820722**	.0203116 †	-.1324365***	.0654941*	.0219253*	.0428563*	-.0441841*	-.0062895
	(.0286896)	(.0272014)	(.0103567)	(.0280777)	(.025797)	(.0102346)	(.018508)	(.0192623)	(.0068503)
csd_Population	1.78e-07***	-4.51e-07***	-1.64e-07***	1.95 e-07***	-4.58e-07***	-1.59e-07***	2.15e-07***	-3.22e-07***	2.66e-08
	(3.88e-08)	(4.63e-08)	(2.75e-08)	(3.86e-08)	(4.62e-08)	(2.74e-08)	(2.68e-08)	(3.75e-08)	(2.06e-08)
csd_Landarea	.0000413	-.0001926***	-.0000796**	.000032	-.0001951***	-.0000784**	-.0001293***	-.0002536***	-.0001824***
	(.0000343)	(.0000433)	(.0000259)	(.0000342)	(.0000434)	(.000026)	(.0000306)	(.0000435)	(.0000256)
csd_Unemployment	.0294292***	.0760192***	.0366286***	.0265225***	.0757474***	.0363092***	.0145829**	-.0086187†	-.0121849**
	(.0073109)	(.0072945)	(.0044219)	(.0070496)	(.0072851)	(.0043958)	(.0049892)	(.0049397)	(.0035281)
_cons	1.230618***	1.317385***	1.591981***	1.561731***	1.251048***	1.646586***	1.995073***	2.727944***	2.348897***
	(.1160606)	(.1647399)	(.0790645)	(.0918967)	(.1602393)	(.0633111)	(.0958591)	(.1092636)	(.0460181)
Log likelihood	-756.55016	-1359.5014	-2354.2801	-771.77238	-1361.9669	-2356.5545	-2512.4001	-2679.0011	-5583.6828
Number of obs	131	144	282	131	144	282	244	269	540
LR chi2(8)	607.68	492.96	792.43	577.23	488.02	787.88	142.37	482.89	226.7
Prob > chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.2865	0.1535	0.1441	0.2722	0.1519	0.1432	0.0276	0.0827	0.0199

***P<0.001 **P<0.01 *P<0.05 †P<0.1 Standard errors in parentheses

	Interactions with complexity and assets/human cap			Interactions with Agglomeration and assets/human cap			Increasing age and Innovativeness
totalInnov	I4a	I4b	I4c	I5a	I5b	I5c	I6
	early stage	later stage	gen de novo	early stage	later stage	gen de novo	gen de novo
RltvQHCap	.3722834***	-.1257085†	.0545599	1.021277†	-9.409328***	-3.815392***	
	(.0565023)	(.0652391)	(.0387768)	(.5429281)	(.3803797)	(.219436)	
RltvAssets	.0127228***	-.0011018***	3.03e-06	.1053202***	-.0220171**	.0004861	
	(.0027651)	(.0002617)	(.000127)	(.013702)	(.0084111)	(.0012597)	
Asst_HCap							
Complexity							
Agglomeration				-1.222511*	12.30217***	4.791719***	
				(.4714642)	(.5017698)	(.2967074)	
QHCap_cmplx	-7.244789**	.6953417	1.03962				
	(2.508761)	(1.993364)	(1.409041)				
RAsst_cmplx	2.164239***	-.0091948†	-.0021891				
	(.4926422)	(.0048869)	(.0033631)				
QHCap_Agglo				.6332977	-7.946992***	-3.356074***	
				(.4952863)	(.308102)	(.1827016)	
RAsst_Agglo				.089493***	-.0171323**	-.0002149	
				(.0117986)	(.0063459)	(.0010192)	
Employees	.0002253***	.0012205***	.0006843***				
	(.0000619)	(.000072)	(.0000236)				
firmAge	-.1485423***	.0760384**	.0197993†	-.2769483***	-.1297515***	-.0711867***	
	(.0295344)	(.0274162)	(.0103819)	(.0267035)	(.0293637)	(.0102086)	
csd_Population	1.81e-07***	-4.51e-07***	-1.63e-07***	4.18e-07***	-4.52e-07***	-1.41e-08	-2.33e-08**
	(3.89e-08)	(4.63e-08)	(2.76e-08)	(3.71e-08)	(4.56e-08)	(2.61e-08)	(8.69e-09)
csd_Landarea	-4.92e-08	-.0001935***	-.0000788**	.0000615†	-.0002521***	-.0001251***	-.0002727***
	(.0000357)	(.0000434)	(.000026)	(.0000362)	(.000046)	(.0000267)	(.0000111)
csd_Unemployment	.0280713***	.0768967***	.0369596***	.029686***	.0740546***	.0400829***	.0045151**
	(.0073073)	(.0072878)	(.004428)	(.0077222)	(.0072874)	(.0046854)	(.0015199)
_cons	1.120673***	1.33354***	1.584888***	-.1630513	16.92214***	7.505503***	1.952695***
	(.1186953)	(.164699)	(.0789959)	(.556668)	(.6271904)	(.3569263)	(.0198433)
Log likelihood	-742.05894	-1357.5782	-2355.2321	-842.51376	-1075.5249	-2481.0822	-32815.461
Number of obs	131	144	282	131	144	282	3631
LR chi2(8)	636.66	496.8	790.52	435.75	1060.91	538.82	1157.84
Prob > chi^2	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Pseudo R^2	0.3002	0.1547	0.1437	0.2055	0.3303	0.098	0.0173

***P<0.001 **P<0.01 *P<0.05 †P<0.1 Standard errors in parentheses

2.6. Discussion

This research contributes to the entrepreneurship literature and extends the resource-based view (Wernerfelt, 1984, Barney, 1991) by providing empirical evidence of the relevance of relative levels of assets and human capital – both taken separately, and taken together – on what can be considered as the innovative advantage of de novo firms in regions. Taken separately, the analysis suggests that the quality of a de novo firm's human capital, relative, not necessarily to those of its large, established counterparts, but rather to those of its competing peers, is a factor that significantly impacts its innovation output. That the results regarding relative quality of human capital point especially to early-stage de novo firms is intuitive since for a young firms, the earlier it is in its life-cycle the more it can be expected that its main resource is the intangible resource inherent in its entrepreneurial team and thus its quality of human capital will be have a strong significance in its innovation success. The analysis also shows relative level of total assets compared to competing peers to be significant in regard to its innovation output, suggesting that, for a de novo firm seeking to gain an innovative edge, initially, it may only be necessary to ensure that their asset level is at about or above the average level of other young firms in its region (without being too concerned with the asset levels of its older and larger counterparts), while it devotes more effort to significantly boost its absorptive capacity (Cohen and Levinthal, 1990) and knowledge development. Another contribution of this research is identifying the relative significance of a de novo firm's quality of human capital versus its level of tangible assets, in regard to its innovativeness. The idea of de novo firms focusing on prioritizing human capital development over asset buildup, especially considering the resource limitations and liabilities of newness (Stinchcombe, 1965) of

young firms is supported by the results in models I1a, I4a and I5a which show relative quality of human capital to be more significant than relative level of assets. Connected to the greater significance of quality of human capital is that knowledge is transferred in collocation regions moreso than assets, and as such the same workforce can become more knowledgeable and capable and thus more valuable by being in the agglomeration region, whereas the same assets in a firm might not be upgradeable to increase its value. Considering the value of having a higher relative quality of human capital than competitors, it should be to the advantage of de novo firms to have cross-functional teams with which to better deal with the issues of environmental complexity, facilitation of knowledge diffusion from the agglomeration area into the young firm, and mitigation of the effects of liabilities of newness and smallness. Furthermore, this research contributes to the entrepreneurship and innovation literature by highlighting the value of considering together and not just separately, assets and human capital in regard to innovativeness. The asset-human capital synergy in this research which is related to the Penrosian concept of the interaction between a firm's personnel and material resources (Penrose, 1959: 76) is shown to be a significant factor explaining de novo firm innovativeness in regions. This empirical interaction reflects the reality in practice where intangible assets and tangible assets are combined to yield innovation outputs.

The move from a positive and significant human capital variable (RltvQHCap) to a negative and significant interaction term involving complexity (QHCap_cmplx) is only observable for early stage firms, suggesting greater susceptibility of this group to the negative effects of environmental complexity than would be the case for later stage firms.

This result suggests that, especially for early stage de novo firms, environmental complexity limits the extent to which a young firm's inherent capabilities can go in bringing about innovation outputs in an industry. This might be because the nascent entrepreneur or entrepreneurial team is not as competent in navigating the labyrinth comprising multiple players, industry standards, social or other networks which have an impact on a firm's innovativeness. Overcoming the negative effects of this environmental complexity will require, it appears, an improvement in the de novo firm's overall absorptive capacity (Cohen and Levinthal, 1990) through training, partnerships or skilled hires so as to reduce its knowledge asymmetries in the innovation community, leading to improved capability in dealing with complexities hindering innovation in its industry.

Conclusion

This research focuses on factors – endogenous and exogenous, positive or negative – which impact the innovative outputs of de novo firms which are firms setup independent of large or established patent firms. Young firms are more likely than older firms, to be members of an industry cluster, and being new to their agglomeration areas, the ability to introduce new innovations serves as a means for these young firms to obtain legitimacy, market share and growth. For these firms, being successful innovators hinges on the abilities to develop and market new products, and this has to do with having the relevant human capital and assets that need to be combined for such innovative outcomes, where desirable. Yet the external environment has an important role to play. Building on agglomeration theory and resource-based theories, and using a dataset on de novo firms in

Canada's manufacturing sector, this research shows that while agglomeration externalities are a positive factor for the innovativeness on such firms, environmental complexity is a negative moderating factor for the relationship between a de novo firm's quality of human capital and innovativeness. Also, considering physical assets versus human capital, the latter will be more significant towards de novo firm innovativeness. With regard to limitations of this research, the data is not able to identify the entrepreneurs behind the young firms' innovative outputs or what their motivations are – data which could undoubtedly contribute to our understanding of de novo firm success in innovations, or the lack of it, in regions. Future research can study how these entrepreneurial factors interact with the environmental factors mentioned in this research, in regard to de novo firm innovativeness. Also, what this research doesn't focus on, but which future research can focus on, is determining whether relocations to different external environment conditions are more or less important to the innovativeness of young ventures than changes to their internal resource conditions are. However this research contributes to the innovation literature, as well as extends agglomeration and resource-based theories in empirically examining the interplay between specific exogenous and endogenous factors of de novo firms.

CHAPTER 3

DE NOVO FIRM TAKE-OFF INTO HIGH-GROWTH: THE EFFECTS OF AGGLOMERATION, MARKET CONCENTRATION, ENVIRONMENTAL DYNAMISM AND COMPLEXITY

Abstract

This research focuses on factors impacting the transition of de novo firms (independent new ventures) from their early stage to a high-growth stage, and empirically assesses the likelihood of this take-off into high-growth. Much has been said about the limitations new ventures face to their growth. Liabilities of newness and liabilities of smallness lie at the root of the lower levels of performance of new ventures compared with those of their established counterparts located in regions. This research teases out factors that predict new venture transition from the early stage into the high-growth stage. This empirical study shows that the likelihood of take-off of young firms to the high-growth stage in a focal agglomeration area is predicted to be more than that for an agglomeration area that is lower in the level of its agglomeration variable. Also, environmental dynamism is shown to be a predictor of de novo firm likelihood of take-off into high-growth.

3.1. Introduction

Dramatic growth of young firms is an understudied topic in entrepreneurship and strategy literatures. The focus of this research is on the determinants of the probability of de novo firms achieving take-off into the high-growth stage, after their inception. High-growth of incumbent firms are a phenomenon concerning which not much is known, with high-growth de novo firms being even less known about, yet such firms contribute a considerable proportion to job creation (Audretsch, 2012). What then, is the likelihood of a de novo firm achieving take-off into a high-growth stage, and what could be associated with such an occurrence? Considering the high mortality rates of new entrants, survivor de novo firms would be viewed as having growth potential, those that achieve average growth, as exemplary, while the ones that attain a high growth rate at a young age would be exceptional. Strategy literature has long recognized the risks associated with new ventures in addition to their susceptibility to poor performance or failure during their early years (Stinchcombe, 1965; Fan, 2010; Pe'er et al, 2016). A major aspect of the performance of new ventures is their growth, which brings with it various benefits and drawbacks. Per strategy literature, survival of firms is an expected benefit from firm growth (Mata and Portugal, 2002). The literature also suggests that growth rate of firms has a positive, linear relationship with survival (Buederal, Preisendoerfer, & Ziegler, 1992; Mata, Portugal, and Guimaraes, 1995; Agarwal, 1997; Cefis and Marsili, 2005; Mata and Portugal, 2002). While growth theories in entrepreneurship and finance suggest that there are limits to growth rate and that there might be thresholds beyond which a firm's growth rate might lead to diminishing returns in terms of firm survival (Penrose, 1959; Higgins, 1977; Churchill and Mullins, 2001; Pierce and Aguinis, 2013), growth is still held as a viable

strategy for overcoming new ventures' liability of newness. According to prior research, growth is beneficial in mitigating the negative effects associated with small firm size (Mata and Portugal. 2002; Pe'er et al, 2016). Yet management research suggests that high growth rates are risky and rates of failure are high, especially for young ventures (Aldrich, 1999; Hannan and Freeman, 1989). Therefore, a better understanding of the exogenous factors affecting young ventures' attainment of high-growth can help in improving the growth process in a way that maximizes the benefits and reduces the risks of such growth.

This research addresses the question, how do agglomeration, environmental dynamism and environmental complexity relate to a de novo firm's likelihood of take-off into the high-growth stage? Considering the life-cycle stages of organizational development (Miller and Friesen, 1984), different possible growth trajectories could emerge between the nascent stage and the mature stage of firms. Young firms starting out small could remain small, decline, die, achieve little growth or attain dramatic, high rates of growth. These outcomes might be strategic (for example, one young venture might plan to grow while another could decide to remain small) or they might result from certain exogenous or endogenous factors with potential impact on firms in regard to achieving high-growth or not. In regard to endogenous factors, firm age and size have been identified as being linked to growth (Delmar et al., 2003; Audretsch, 2012). Research regarding exogenous factors, however, is lacking.

The entrepreneurship and strategy literatures recognize the relationship between the external environment and young venture outcomes (e.g. Stuart and Sorenson, 2003; Folta,

Cooper, & Baik, 2006;). For example, it is believed that environmental characteristics such as agglomeration of industry activity and local competition can affect the gains and drawbacks that de novo firms experience as a result of growth (McCann and Folta, 2008). Also, as Pe'er et al. (2016) find, the relationship between de novo firm growth and probability of failure is moderated by agglomeration, since the latter provides several benefits to these firms as well as mitigates the cost of high growth rates. Yet there is a lack of studies that links specific environmental characteristics to the take-off to high-growth by young firms, quite unlike the availability of work concerned with the relationships between firm-specific characteristics and the growth of firms (Geroski, 1995; Sutton, 1997; Caves, 1998; Audretsch, 2012). More specifically, not much has been done to examine the role of agglomeration in the transition of new ventures from the early to the high-growth stage – a gap in the management literature. The marketing literature however, considers the transition from the introduction to the growth stages of new products, referring to this point of transition as the take-off of the new product (Golder and Tellis, 1997). Yet, just as sales take-off is critical for industry analysts and managers (Golder and Tellis, 1997), its parallel – take-off of firms to high-growth – is critical for entrepreneurs and investors with such high-growth goals.

Although the industrial organization literature provides the explanation for heightened demand amongst collocated firms, and agglomeration literature presents agglomeration as a potential source of advantage for businesses, we remain uninformed about the potential heterogeneities in the capacities of regions to provide agglomeration externalities to spur young venture transition to high-growth. For instance, as Chung and

Kalnins (2001) indicate, hotel managers acknowledge the agglomeration benefits of sharing customers when there is excess demand, with examples being the referral agreements amongst hotels, and also that having more motels in an area leads to more traffic being pulled in from the interstate, but it is not clear whether such agglomeration benefits pertain only to established firms, whether they also support new ventures' high-growth transitions, or which kind of differential effects on high-growth transition can be expected from agglomeration areas with differing levels of externalities. There is a need for more research to uncover location-specific characteristic that affect the transition of de novo firms to the high-growth stage. As a case in point, while environmental munificence has been theorized to be likely related to growth (Delmar at al., 2003), this author is unaware of empirical studies that have tested for the relationship between environmental dynamism and complexity and the likelihood of young ventures actually achieving high-growth. This paucity of research on the relationship between locational factors and the high-growth of young firms limits the understanding of what are the environmental deterrents and enablers of high-growth which de novo firms need to overcome or take advantage of.

This research contributes to the strategy and entrepreneurship literatures by extending agglomeration theory (Chung and Kalnins, 2001; Marshall, 1920; Pe'er et al., 2016; Porter, 1990; Wang et al., 2014). Extending agglomeration theory, this research shows that agglomeration will positively influence the probability of de novo firms' take-off into the high-growth stage. I also contribute to the strategy and entrepreneurship literatures by empirically showing that there is a negative impact of environmental dynamism on the likelihood of de novo firm take-off.

This chapter proceeds as follows: the next section examines the literature on high-growth as well as presents the importance of the phenomenon. In section 3.3, I present the theoretical background, and then the hypotheses in section 3.4. Section 3.5 is on the data and method for the analyses, and I make a case for the use of event history analysis for this research. I subsequently present the results in section 3.6. Section 3.7 presents the discussion, which is followed by the conclusion.

3.2. Literature Review and Importance of High-Growth

High-growth is distinct from normal growth, with regard to firms, and it deserves further empirical investigation. Normal growth is the basic increase in an aspect of the organization (such as size, output or profits) from one period to another, with such outcomes possibly being unremarkable. In the case of high-growth however, there is a significant increase in outcomes for the firms in question. High-growth of firms is recognized as an extraordinary growth compared with the average growth of other same-industry firms (Moreno and Casillas, 2007). Considering the episodic and highly uneven nature of firm growth, it is extremely difficult to determine when the acceleration in the growth of a firm is about to occur (Garnsey et al., 2006; Mason and Brown, 2013). The emergence of high-growth firms may happen after an important triggering event such as company acquisition, new product introduction or when the firm gains new managerial capability (Mason and Brown, 2013). As noted by Audretsch (2012), “In terms of what type of firm actually constitutes being ‘high growth’, the OECD offers very specific and definitive guidelines, which are increasingly being adapted as the standard in the literature. In particular, the

OECD-Eurostat Manual on Business Demography Statistics (2007) defines a 'high-growth enterprise' as 'All enterprises with average annualized growth greater than twenty percent per annum, over a three-year period, and with ten or more employees at the beginning of the observation period. Growth is thus measured by the number of employees and by turnover.'"(Audretsch, 2012). In regard to antecedents of the high-growth phenomenon, a means for the emergence of high-growth firms, in line with knowledge spillover theory (Acs, Audretsch and Feldman, 1994; Gilbert et al., 2008; Krugman, 1991), is the spillover of new knowledge from incumbent firms to new firms, when for example, such knowledge is generated but not fully exploited by the incumbent firm (Audretsch, 2012), creating entrepreneurial opportunities for another actor. Taking advantage of such entrepreneurial opportunities could then lead to the formation of de novo firms which, under the right conditions may go on to achieve high-growth.

A justification for studying high-growth of firms in particular, as opposed to merely studying average growth or growth in general, can be seen from the fact that there are non-linearities in the growth of firms (Lopez-Garcia and Puente, 2012), and as such, factors explaining one kind of growth phenomenon might not be significant in explaining the other. For example, in their study of what makes a high-growth firm, Lopez-Garcia and Puente (2012) found that access to credit and newness are explanatory factors for firm growth, yet are not significant factors in determining fast employment growth. Although their focus was not exclusively on young firms as this research is, Lopez-Garcia and Puente (2012) did however find the hiring of qualified personnel to be important with regard to determining fast growth.

In recognition of the importance of high-growth of firms, the OECD has provided a definition for this phenomena, as given above, and the OECD guidelines in regard to what firms are high-growth firms are increasingly being used as the standard within the literature (Audretsch, 2012). Growth however, is a different phenomenon for established firms than it is for young ventures, since for the former, growth sustains their already-existing viability while for new ventures, growth is a means to obtain viability (Gilbert et al., 2006)). Large firms may typically not see high-growth rates and may not need such levels of growth to be profitable. On the other hand, it is important to focus on high-growth of young firms in particular, considering the association which past research has found between these two phenomena. Considering the general population of firms and firm characteristics, high-growth firms will likely be younger and smaller ones (Audretsch, 2012). Also, as asserted by prior literature, there is a negative relationship between growth rates and firm size (Audretsch, Santarelli and Vivarelli, 1999), justifying the investigation of the likelihood of transition of young firms to such high-growth. Unlike the case of young firms, the critical mass of employees that large firms have already achieved is sufficient for them to continue to exploit the market opportunities in the industries to which they have already become accustomed, and in markets where they have already acquired significant market shares. Indeed, such firms might even shed employees through divestitures or downsizing as a strategy to improve profitability, especially in mature industry cycle stages. On the other hand, new firms contribute a high proportion of employment or employment growth (Acs and Mueller, 2008; Audretsch, 2012; Fritsch and Mueller, 2004; Mueller, van Stel and Storey, 2008). Moreover, for young firms which seek a strong position in their industries,

high rates of employee growth could signal that their products are attaining legitimacy and attracting demand within their markets. For these firms, a high-growth rate suggests that their survival up to this point is non-trivial and not fleeting, and that they are moving further away from that probability of failure which plagues so many new ventures. Further, in the case of entrepreneurs seeking to implement their exit strategy via the acquisition of their startups, breaking through the high-growth threshold may position them as preferred acquisition targets over their lower growth counterparts. High-growth firms grow in different ways, with different growth patterns exhibited (Delmar et al., 2003; Penrose, 1959; Stinchcombe, 1965). However, the tendency is for high-growth firms to be of a younger age than the average, and also for such firms, newness appears to be more important than smallness (Lopez-Garcia and Puente, 2012). Gazelles - rapidly growing firms - are on average, younger and smaller than other firms although young age is more associated with this rapid growth than is small size (Henrekson and Johansson, 2010). Also, Delmar at al. (2003) find organic growth to have more of an association with young and small firms though they conclude that rapid growth is determined by age and not size and that the formation and early growth of new firms play a crucial role in regard to net employment growth.

Still on high-growth startups, the higher their growth rates, the greater the likelihood that they will get venture capital financing (Zacharakis et al., 2017). Consistent with this, entrepreneurs whose ventures experience high growth have the opportunity of having their firms being valued higher. Such firms indicate they have the ability to use their assets and human capital for strong growth performance, which is a desirable indicator for

business angels and venture capitalists. When the phenomenon of high growth occurs, this signals to these investors that there are customers who are satisfied with the goods or services offered by these young ventures. The emergence of a high-growth firm also indicates the presence of an entrepreneur or entrepreneurial team with the competence to manage such a firm in the midst of other firms and circumstances in the external environment. Achieving high-growth is also beneficial for young firms targeting an IPO. Also, young firms have more flexibility than, but not as many rigid routines as, older firms, enabling the former to find and take advantage of new growth opportunities (Moreno and Casillas, 2007).

The literature acknowledges the relationship between how firms grow and environmental and organizational factors like industry affiliation, firm age and firm size (e.g. Delmar et al., 2003). An example of work on these two categories of growth factors, Moreno and Casillas (2007) deal with endogenous and exogenous factors that differentiate between high-growth and non-high-growth firms, and they suggest that this strong growth occurs within a very short, four to five year period of time. Regarding exogenous factors and firm growth, the strategy literature emphasizes the role of the external environment in organizational outcomes including growth (see Chandler, 1962; Child, 1972; Porter, 1980; Romanelli & Schoonhoven, 2001; Brush & Chaganti, 1998; Covin, Slevin, & Covin, 1990; Eisenhardt & Schoonhoven, 1990; Chandler & Hanks, 1994; Robinson & McDougall, 2001). One may appreciate the external environment from the fact that firms need a match between environmental demands and internal management resources in order to facilitate their survival and performance (Venkatraman, 1990).

The high-growth of firms can be expected to depend on firm-level factors (see Audretsch, 2012). For example, Moreno and Casillas (2007) found a number of factors - including higher availability of idle resources and smaller size - which differentiate high-growth firms from firms with moderate-growth or those that are declining. Besides internal factors of firms however, their location in differentially characterized environments suggests the possibility of differential effects on their likelihood of achieving high-growth. In regard to de novo firms which are independent new ventures without parent firms, it becomes particularly worthwhile to study how their environmental factors impact their likelihood of achieving high growth, considering the unavailability of parent firm boost of their resource base in the event of the former's lack of resources. The external environment is critical for such firm's since it serves as a possible source for the inflow of resources necessary to support a high-growth strategy. For example, lack of financial resources (Penrose, 1959: 37) - part of the overall assets of firms - has a negative effect on individuals' self-employment decision and new firm growth, in line with the literature on the financial constraints of activity involving entrepreneurs (Holtz-Eakin et al., 1994; Cabral and Mata, 2003; Moreno and Casillas, 2007). Additionally, previous work indicates that high-growth firms appear to invest more time and money to train their staff and to employ more qualified workers than other firms (Barringer et al., 2005; Lopez-Garcia and Puente, 2012; EIM, 2006). Also, prior academic research suggests an association between experience (a factor which impacts the quality of a firm's human capital) and the success of ventures (e.g., Cooper and Bruno, 1977; Roure and Maidique,1986; Siegel et al., 1993; Van de Ven, Hudson and Schroeder, 1987). Environments which support or challenge the supply of such resources and experience should support or challenge a de novo firm's high-growth transition, respectively. Notably,

using two pools of companies including one consisting of companies that were relatively young and small, Siegel et al. (1993) studied distinguishing characteristics between high-growth and low-growth firms. They found that having experience in a similar industry to the firm's was a discriminating factor between low-growth and high-growth - a factor that both supports the assertion of the importance of the human resources of a de novo firm's workers to its growth, as well as highlights the influence of the external environment on de novo firm transition to high-growth. Also, Using data from the Bank of Spain Firm Demography database (BSFDD), Lopez-Garcia and Puente (2012) found that gazelles appear to pay a higher wage premium than other firms – a finding that supports the idea that locating in such an area might impact the level of wages paid, and quality of employee service gained by aspiring young high-growth firms.

However, in spite of the identification of high-growth as distinct from general or normal growth, and the acknowledgement of its importance, the strategy and entrepreneurship literature are lacking in predicting the take-off off of young ventures from a state of non-high-growth to one of high-growth. Specifically, I argue that lack of studies linking environmental factors to the likelihood of young venture transition into a high-growth stage, limits our understanding of the phenomena and consequently, our ability to recommend strategies for high-growth of young firms. This research aims to fill this knowledge gap, and by so doing contribute to the strategy and entrepreneurship literature on firm growth.

3.3. Theory

In focusing on predicting the likelihood of de novo firm take-off into the high-growth stage, agglomeration theory can help explain the aspect of these firms' transitions which hinge on exogenous factors (Pe'er et al., 2016; Wang et al., 2014), while, in line with the fact that high-growth of firms can be expected not to be independent of firm-level factors (see Audretsch, 2012), resource-based theories can be relied on to address the importance of endogenous factors in predicting such take-off.

The external environment plays a very important role in determining the outcomes of firms, be it survival, growth or any kind of performance. Supporting this assertion, past theoretical work acknowledges that certain factors including industry affiliation impact a firm's growth pattern (Penrose, 1959; Stinchcombe, 1965). Opportunities for market development exist in the environment for young firms looking to do business in a particular industry; suppliers which are important for a firm's supply chain are found there; various customer segments exist in the external environment which when courted, fuel high rates of growth for de novo firms. Beyond positive influences however, a firm's location also presents drawbacks which hinder the success of firms, especially young firms. Incumbent firms exist which take retaliatory actions to the competitive actions of new entrants; other peer young firms targeting similar niches affect the potential for above-average returns of de novo firms; established relationships between customers and incumbents create switching costs which make it challenging for new entrants to gain market share and achieve growth in their industries. The reality of these positive and negative aspects of the external environment make it necessary to study them in order to gain a better

understanding of what it takes for a de novo firm to grow in general, and to transition from little or no growth to high-growth in particular. The study of the impact of locational factors on the take-off of firms into a high rate of growth is particularly important for the case of young de novo firms, considering that, in accordance with the resource-based view (Wernerfelt, 1984; Prahalad and Hamel, 1990; Barney, 1991; Nelson, 1991), such young firms are at a competitive disadvantage compared to their established counterparts, owing to their inferiority in internal resource endowments (Stinchcombe, 1965). These de novo firms are more likely to be in need of the positive aspects of the external environment to make up for their lack of resources than are large, incumbent firms. Also, de novo firms are more likely to be impacted by the negative aspects of the external environment such as competitive rivalry, since these firms are less experienced and less resource-endowed to respond to these environmental challenges to their high-growth take-off than their established counterparts are. Furthermore, being that de novo firms do not have parental ties that can mitigate their liabilities of newness (Stinchcombe, 1965), they are at a disadvantage compared to de alio firms with parental support, when it comes to taking advantage of the benefits of, and overcoming the drawbacks of, the external environment, in order to achieve high growth rates. Studying locational characteristics such as agglomeration, environmental munificence, environmental dynamism and environmental complexity can improve our understanding of the external environment and its role in helping or hindering a young firm's transition to high-growth.

3.3.1. Agglomeration, Local Market Structure and High-Growth

A cluster is an agglomeration of firms and institutions with similar or related activities within a specific geographic location (Porter, 1990). This spatial concentration of industry activities leads to benefits – or agglomeration economies – for the collocated firms (Marshall, 1920). The key benefits are: 1) production efficiencies due to specialized suppliers, skilled labor, and technological and knowledge spillovers (Jaffe et al., 1993; Audretsch and Feldman, 1996; Audretsch and Keilbach, 2007); 2) enhanced demand for the products or services produced due to reduced consumer search costs (Chung and Kalnins, 2001). The entrepreneurship literature demonstrates that clusters particularly attract entrance and reduce survival of de novo firms (e.g., Pe'er et al, 2008). Those firms can take advantage of resources in the external environment while experiencing lower liabilities of smallness and newness. In addition,, the likelihood of growth is greater for entrepreneurs who network with other entrepreneurs (Bruederl and Preisendoerfer, 1998), and are highly connected with other firms and institutions through mechanisms such as strategic alliances and supply chains (BERR, 2008, Audretsch, 2012) – benefits which agglomeration areas may provide. Also, high-growth markets are associated with high-growth firms, and are a factor distinguishing such firms from low-growth ones (Siegel et al., 1993). Locations with strong agglomeration are potential high-growth market locations which can support increased growth for young firms.

Natural advantages (Ellison and Glaeser, 1997; Ellison and Glaeser. 1999; Hoover, 1948; Hoover, 1948) are also possible features of agglomeration areas. Along with spillovers, natural advantages lead to the clustering of firms (Ellison and Glaeser, 1997.

Examples of natural advantage pertain to regions with beaches that favor the collocation of firms in the hotel and resorts industry, or an agricultural region that favors the growth of grapes which in turn supports the agglomeration of firms in the wine industry. According to agglomeration theory (Marshall, 1920; Porter, 1990; Wang et al., 2014), the agglomeration of firms provides the above benefits to the collocated firms.

The structure, or industrial composition of the location influences the level of competition and hence growth potential of local firms. Low concentrated (or fragmented) local markets are composed by large number of small and medium-sized firms and hence considered more competitive for de novo firms than highly concentrated local market with a few large firms, each with a sizable market share (Hotelling, 1929; Pe'er et al., 2016; Porter, 1980; Schmalensee, 1978). Concentrated markets provide opportunities for new entrants to find a niche in the market for their goods or services that incumbents find less attractive.

3.3.2. Environmental Dynamism and Complexity

Environmental dynamism pertains to the rate and instability of change obtainable in an industry environment (Child, 1972; Dess and Beard, 1984; Zahra and Bogner, 1999). Reflecting an industry's unpredictability of change (Dess and Beard, 1984), environmental dynamism is observable in different forms such as entry or exit of competing firms, changes in customer needs and preferences and technological changes (Boyd et al., 1993), increase in the size of an industry's firms (Simerly and Li, 2000), as well as changes in

modes of competition in industries (Miller and Friesen, 1983). In addition, sociocultural changes could lead to decline in existing market preferences or emergence of new ones; sociopolitical changes such as passing of new laws could positively or negatively impact firm outcomes in a location since they would commit resources towards conformity with such laws. This unpredictability of change affects the decisions of managers to invest in, and the timing of, the introduction of new products (Porter, 1985). Prior empirical studies have documented the effects of environmental dynamism on firm performance (e.g, Ali, 1994; Utterback, 1994; Zahra and Bogner, 1999). Zahra and Bogner (1999) for example, find that in a dynamic environment, there will be a positive association between the development and introduction of new products and new venture profits as well as growth of market share, although we can expect this association to be contingent on these firms possessing sufficient resources and capabilities. Whereas in stable environments, firm performance results from actions that feed off of tacit knowledge which is difficult to imitate and enhances competitiveness (Peteraf, 1993; Winter, 2003), dynamic environments with changes such as demand and supply shifts could lead to reduced market share and margins for less competitive firms (Karna et al. 2016).

Dealing with the turbulence associated with environmental dynamism requires organizational assets and human capital. In accordance with the dynamic capabilities perspective, firms in rapidly changing environments would need to be able to carry out integration, building and reconfiguration of their competences (Teece et al., 1997) so as not to suffer consequences such as creative destruction of their competences, lack of growth or demise. The consequence of dynamic industry environments is that they require

firms to adapt their current organizational routines and bring their resource base up-to-date (Karna et al., 2016). Firms spend time attempting to understand where their industries are headed in the short and long terms, and they adopt proactive strategies to get ahead of the anticipated changes, or they act in a reactionary fashion to adapt after changes in the environment have taken place. Either strategy is risky since investments in anticipation of future outcomes may be met by markets not changing as expected while firms with reactive strategies might be upstaged by first or early movers in dynamic markets. Increasing environmental dynamism reduces the knowledge that is available for making decisions (Milliken, 1987; Simerly and Li, 2000) and young firms are particularly subject to changes in the environment since they may not have sufficient resources or partnerships to quickly adapt to industry changes, thus leading to their slowed growth, inability to achieve high-growth, or even demise.

Environmental complexity pertains to industry competition resulting from industry concentration or dominance of one or more firms in the market (Dess and Beard, 1984; George, 2005). This complexity has to do with the types of firms located in the given geographical location where the focal firms operate. A diverse, low concentration location that is highly populated by small and medium-sized firms would be more complex for a young firm to navigate than would a location which is highly concentrated with a handful of large organizations in the same industry. In regard to resources and their potential for high-growth outcomes, the observation that the slack-performance relationship goes negative in more complex industry environments than in less complex ones (George, 2005) suggests that environmental complexity could negatively impact the implementation of a

de novo firm's high-growth strategy, also considering the relative inexperience such entrepreneurs might have in dealing with complex environments as well as the liabilities of newness (Stinchcombe, 1965) they face. Indeed being in a heterogeneous and complex environments, managers will be exposed to greater uncertainty and will have greater need of the processing of information than their counterparts in a non-complex environment will (Duncan, 1972; Tung, 1979). Environmental complexity is also indicated by the number of different suppliers, customers and competitors that organizations have to deal with in their environments (Dess and Beard, 1984). Apart from this environmental complexity however, a lack of financial resources (a component of a firm's total assets) negatively affects new firm growth and the self-employment decision of individuals, in accordance with the literature on the financial constraints of activity involving entrepreneurs (Holtz-Eakin et al., 1994; Cabral and Mata, 2003; Moreno and Casillas, 2007). But the literature suggests that environmental complexity will not make this assets-constrained status of de novo firms better. For example, Dess and Beard (1984) highlight the resource dependence perspective and suggest that organizations that compete in industries having to do with many different inputs or outputs – a characteristic of complex environments – should find the acquisition of resources or the disposal of outputs more complex than will those organizations that operate in industries which don't have as many different inputs and outputs, i.e., less complex industries. This environmental complexity should thus be a negative factor for young ventures' transition to the high-growth stage.

3.4. Hypotheses

Although it is difficult to predict the timing of commercial take-off of young firms in emerging markets (Eisenhardt and Schoonhoven, 1990), understanding the environmental factors that facilitate such take-off would be beneficial to young ventures aiming to implement a high-growth strategy. For de novo firms, achieving take-off from the early stage to the high-growth stage can be beneficial but challenging. The extant literature focuses on both the benefits and drawbacks of organizational growth. On the one hand, growth brings such benefits as increased revenues, economies of scope and scale (Chandler, 1990), as well as opportunities for enhanced survivability and executive compensation (Lambert, Larcker and Weigelt, 1991; Tosi et al., 2000). On the other hand, growth adds complexity to the organization, bringing about greater management challenges (Covin and Slevin, 1997; Penrose, 1959) and exposure to risks. Indeed, high-growth firms are susceptible to failure arising from managerial inability to deal with the complexity brought about by growth (Mishina et al., 2004). Thus, in regard to the phenomenon of growth, efforts at starting a venture could lead to the dilemma of whether or not to choose growth, and how and where to grow (Mishina et al., 2004). This is an important decision for de novo firms. It will in turn impact their choice of what resources (human or assets) they should acquire, as well as how much and when to deploy such resources in order to achieve high growth rates. Although some studies posit that growth is unrelated to resource differences, others have connected growth to the resources controlled by the firm. The resource-based theory of growth suggests that the complexity of growth be assessed in light of the resources of the firm available to manage this complexity (Mishina et al., 2004), since it is these resources that support such growth.

However, strategic management literature emphasizes the role of the external environment in organizational outcomes including growth (see Chandler, 1962; Child, 1972; Porter, 1980; Romanelli & Schoonhoven, 2001; Brush & Chaganti, 1998; Covin, Slevin, & Covin, 1990; Eisenhardt & Schoonhoven, 1990; Chandler & Hanks, 1994; Robinson & McDougall, 2001). The external environment can be appreciated from the fact that firms need a match between environmental demands and internal management resources in order to facilitate its survival and performance (Venkatraman, 1990). Considering the importance external environmental factors, I examine the impact of three exogenous factors on the probability of de novo firm take-off into the high-growth.

3.4.1. Agglomeration and Probability of Take-off into the High-Growth Stage

In connecting agglomeration theory to the growth of young ventures, it is expected that the availability of agglomeration externalities plays a role in predicting de novo firm take-off into the high-growth stage.

New entrants are attracted to agglomeration areas (Stuart and Sorenson, 2003; Kalnins and Chung, 2004), and agglomeration provides opportunities for de novo firms to transition to high-growth. The transition to high-growth is supported by the young firms' utilization of available agglomeration externalities to make up for their lack of resources and to take advantage of growth opportunities in their external environments. While de novo firms face severe resource constraints that likely constrain their ability to

reach high-growth levels organically, collocation with specialized suppliers, buyers and large competitors may generate opportunities for collaboration and resource sharing which support high-growth through access to resources of others (Rosenthal and Strange, 2001; Folta et al., 2006).

Prior research highlights the positive effect of agglomeration regarding firm outcomes (e.g., Pe'er et al.,2016). In accordance with agglomeration theory, agglomeration externalities include access to specialized suppliers, pools of buyers, knowledge spillovers, network contacts, and skilled labor. Pe'er et al. (2016) for example, argue that the relationship between a de novo firm's growth rate and its probability of failure is weakened by agglomeration since agglomeration provides benefits that substitute for growth benefits or that mitigate the negative effects of high growth rates. Their arguments for the effect of agglomeration on this relationship hinges on the presence of agglomeration externalities such as those mentioned above. As Pe'er et al. (2016) note, agglomerated areas attract specialized suppliers such as consultants and equipment suppliers (Rosenthal and Strange, 2001; Folta et al., 2006) and thus, de novo firms can forge relationships with these suppliers – relationships which help reduce their likelihood of failure, reduce their need for their own attainment of the minimum efficient scale of operations in order to obtain survival benefits, as well as increase access to information critical to faster growth. Suppliers support the transition to high growth by sharing knowledge, reducing R&D costs, and may reduce the young firms' search costs for critical inputs to their production processes. The presence of several suppliers might also increase the likelihood for incentives like seller financing, supplier discounts and improved bargaining power for de

novo firms, all of which will lead to more funds being available for de novo firms to increase supply of goods and services which in turn, promote their advancement towards high-growth.

Agglomeration externalities include access to skilled labor and knowledge spillovers (Audretsch, 2012), making such areas supportive of high-growth of de novo firms. Local agglomeration attracts skilled workers since such workers would naturally gravitate to locations that have need for their skills (Ciccone and Hall, 1996; Henderson, 2003). Agglomeration areas are valuable in this regard since they have experienced workers looking for new opportunities as well as entrepreneurs well-versed with the intricacies of growing a firm. For de novo firms with limited human resources, this means they have a one-stop location from which to build up their founding teams or shore up their workforce – vital resources for executing a high-growth strategy. In regard to the richer labor pool provided by agglomerated areas, as Pe'er et al. (2016) show, this serves the de novo firm in two ways: firstly, it serves as a source from which de novo firms can hire qualified personnel even when they don't have the attractiveness and hiring advantage which a growing firm has in the labor market; secondly, the richer labor pool of agglomerated areas moderates the negative relationship between high growth rates and probability of failure – a survival hazard of growth as a result of labor-related adjustment costs (Penrose, 1959; Garnsey, 1998; Pe'er et al., 2016). These arguments on the benefits of agglomeration externalities for the survival of de novo firms can also be adapted to explain the impact of the external environment on the likelihood of de novo firm transition to high-growth. By being part of an area with strong agglomeration economies, a de novo

firm with a growth potential can acquire new talent with little or no learning curve for their routines, thus reducing the impact of liability of newness (Stinchcombe, 1965) and saving itself time and resources which would otherwise be spent on training new hires. Such access to skilled labor positively affects a young venture's chances of achieving high-growth since it will find it easier to acquire the human capital necessary to meet increased demand in the market or to champion innovative strategies that lead to market share gains and high-growth.

Being situated in areas with natural advantages (Ellison and Glaeser,1999; Hoover, 1948) should give high-growth advantages not available to firms far from such locations. Such natural advantages as proximity to vineyards for the wine industry or corn plantations for the food industry should reduce transportation costs which could lead to significant financial advantages for young firms seeking to increase their growth. Relatedly, an example of the attractiveness to new firms, of areas with an existing concentration of same-industry incumbents, is the case of a higher density of higher-end hotels which has been shown to increase the probability that new hotels will choose that location (Kalnins and Chung, 2004). Being in such locations may increase de novo firm growth rates by giving them access to a potential customer base that has already been built up by incumbent firms – a high-growth advantage that may not be available to young firms in non-agglomerated regions. Furthermore, heightened demand – another benefit of agglomeration – makes it easier for growing firms to fulfill customer needs than it would be if they had to spend resources seeking and courting customers. Thus in this sense, the reduced search costs which collocation regions afford to potential customers work to the advantage of de novo

firms in such areas since they can both save on time and expenses they would otherwise make in attempting to reach buyers, as well capitalize on customers who have already identified these regions as locations to visit to obtain desired products or services. This heightened demand should facilitate quicker access to the quantity of customers that will be the basis for high growth of young firms. A noteworthy case in point is that of new hotels which, as has been found, tend to locate in geographic proximity to incumbents with similar prices but different sizes (Baum and Haveman, 1997). Increased demand in such regions should positively impact young firms' growth rates.

Knowledge spillovers (Audretsch, 2012) in agglomeration areas are another important aspect of agglomeration externalities which should provide high-growth advantages for de novo firms in such regions compared to young firms in more isolated regions. The high-growth mechanism of transfers of knowledge arises through hiring of experienced workers from agglomerated industry areas and collaboration with large, incumbent firms (as is the case in the partnerships between smaller biotech firms and big pharmaceutical firms). Such spillovers can also come through young firms' interactions with suppliers, customers, incubators, and universities. By interacting with these players within their external environments, de novo firms gain knowledge of future industry directions as well as institutional practices they can imitate. They also gain understanding of customer preferences, underserved market niches and opportunities for product and process innovations which should boost their growth by making products available as a result of the relevant knowledge transferred. For de novo firms which lack the kinds of big budgets set aside by large firms for research and development, the availability of

knowledge spillovers helps mitigate these disadvantages by facilitating their collaborative strategies with more resource-endowed firms. In lieu of large R&D budgets, young firms, by gaining relevant knowledge in regard to aspects of the industry that are ripe for creative destruction, focus their research and innovative efforts towards products that will give them strong growth potentials. Although not all firms are equally able to benefit from these externalities (Chung and Kalnins, 2001), capitalizing on such knowledge spillovers in agglomeration regions and turning them into needed products is an opportunity for de novo firms to promote their transition to high rates of growth.

The availability of these agglomeration externalities will be to the benefit of de novo firms in these areas which are less endowed with resources of their own. The presence of agglomeration externalities should increase the likelihood of a de novo firm transitioning from non-high growth into high-growth. The below hypothesis follows.

H_T1: The level of agglomeration in a region is positively related to the rate of de novo firm take-off into the high-growth stage

Location choice is an important early decision entrepreneurs make (Pe'er et al, 2008). For new ventures, a location which has many small or medium-sized enterprises (SMEs) firms, with each of them having a small market share (a fragmented environment) would be seen as being more challenging to handle than another location with a few large firms, each with a sizable market share (a more concentrated environment) in that industry sector (Dess and beard, 1984; Boyd, 1990). High market concentration areas have a smaller

proportion of smaller firms and a significant number of larger firms with more market share. In this environment de novo entrants are more likely to identify a niche position with opportunities or introduce novel products or services that are not pursued by incumbents. Furthermore, location in a highly concentrated market may enhance visibility for de novo firms, creating opportunities for partnerships with incumbent firms that could boost new venture growth performance. On the contrary, low market concentration areas –consisting of large numbers of other smaller firms – have higher levels of intra-strategic group competitiveness (Galbraith and Schendel, 1983; McGee and Thomas, 1986; Porter, 1979), hence leading to lower growth rates and reduced likelihood of attaining a transition to a high-growth stage. The hypothesis follows.

H_T2: The level of local market concentration in a region is positively related to the rate of de novo firm take-off into the high-growth

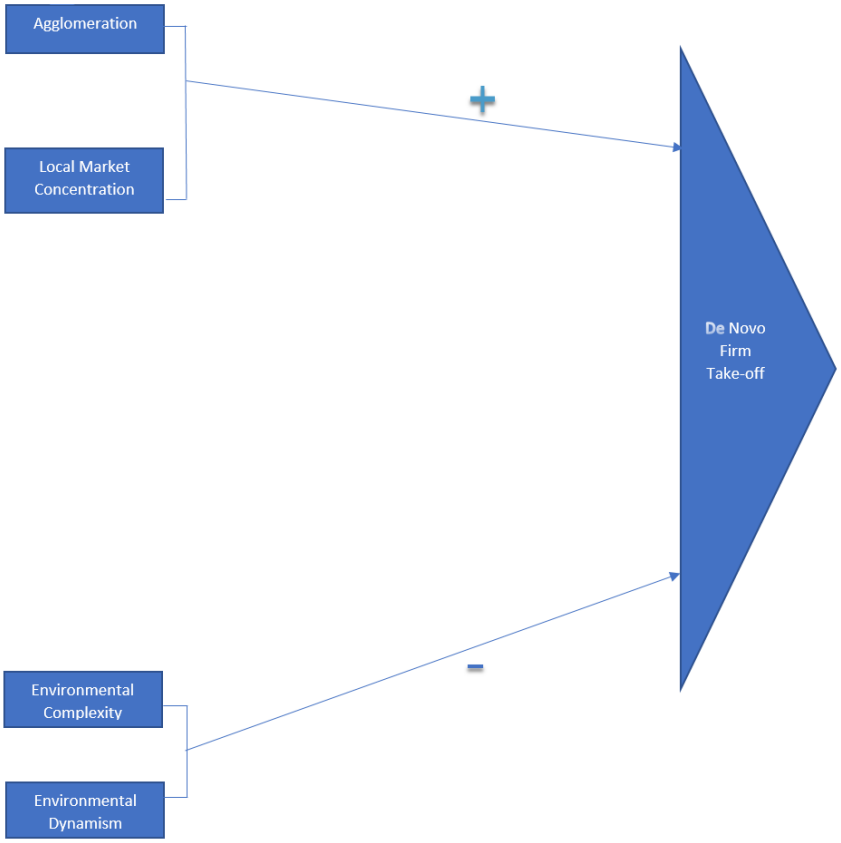

Figure 3.1. Model of De Novo Firm Take-off

3.4.2. Environmental Dynamism, Environmental Complexity and Probability of Take-off into High-growth

Various influences within the environment strongly impact young ventures (Baumol and Strom, 2007). These external influences which include institutions, norms, and factors of industry agglomeration areas play a role in helping or hampering the growth of these young ventures. For example, weak institutions are associated with difficulties in identifying growth opportunities and lead to difficulties for new ventures with respect to designing and implementing effective strategies for sales and marketing (Batjargal et al., 2013). On the other hand, young venture growth is enhanced by environments that provide access to relevant information, knowledge spillovers, tangible and intangible resources, social and emotional benefits and other such positive inputs (Granoveter, 1973; Burt, 1992; Stuart and Sorensen, 2007; Batjargal et al., 2013).

For de novo firms, it is expected that take-off into the high-growth stage will be more likely when (a) environmental dynamism is low than when it is high, and (b) environmental complexity is low than when it is high. The new ventures' founding environments provide them with external resource opportunities while their top management teams and other workers exploit these opportunities and achieve growth for the firm through their adopted strategies (Eisenhardt and Schoonhoven, 1990). However these environments differ in their abilities to support or deter new venture high-growth rates, giving the ventures' workers (top management and employees) differential levels of opportunities to take advantage of, and challenges to overcome. All these will lead to varied outcomes for young ventures in regard to take-off to a high-growth stage.

Environmental dynamism of a location has to do with the proneness to change which may affects the outcomes of the firms in such a location. Changes could come in the form of turnover – exits of incumbent firms and entry of new ones, sociocultural changes which could lead to shifts in customer preferences or sociopolitical changes such as passing of new laws. Environmental dynamism is characterized by instability and turbulence (Aldrich, 1979; Dess and Beard, 1984) and negatively impacts firm performance. For example, a capabilities-based perspective suggests that environmental change could be competence-destroying (Winter, 2003) and could result in reduced marginal returns to investments in a firm's capabilities (Karna et al., 2016). For young firms which have limited competences to rely on for increased growth, and which may have never gained any profitable returns, such environmental changes may place their survival and high-growth efforts in jeopardy. Dealing with the turbulence associated with environmental dynamism requires organizational assets and human capital. In accordance with the dynamic capabilities perspective, firms in rapidly changing environments would need to be able to carry out integration, building and reconfiguration of their competences (Teece et al., 1997) so as not to suffer consequences such as decay or even destruction of their competences, lack of growth, or demise. Yet the lack of such organizational assets and human capital by de novo firms means that they are less likely to be able to protect themselves from the harmful effects of such environmental changes, and consequently may have their high-growth potential severely diminished. Whereas in stable environments, firm performance results from actions that feed off of tacit knowledge which is difficult to imitate and enhances competitiveness (Peteraf, 1993; Winter, 2003), dynamic

environments with changes such as demand and supply shifts could lead to reduced market share and margins for less competitive firms (Karna et al. 2016). Thus a further consequence of dynamic industry environments is that they require firms to adapt their current organizational routines and bring their resource base up-to-date (Karna et al., 2016). De novo firms – which are unable to adequately do these, run the risk of jeopardizing their attainment of high-growth or even their existence. Since predictability of environmental dynamism is low, firms in that environment operate in high uncertainty regarding their key stakeholders, which further enhances the challenges of achieving high growth (Dess and Beard, 1984). Low predictability is particularly challenging for de novo firms which, although generally more agile than established firms, may lack the resources to implement several strategies simultaneously or to invest in a new direction as a result of change in the industry, causing them to miss out on opportunities to increase their growth rates.

Prior empirical studies have documented the effects of environmental dynamism on firm performance (e.g, Ali, 1994; Utterback, 1994; Zahra and Bogner, 1999). Important implications of environmental dynamism for de novo firm transition to high-growth may involve rapid technological change and the speed at which new ideas and technologies spread, which may be challenging for de novo firms (Bettis and Hitt, 1995; Zahra and Bogner, 1999). Especially in hi-tech industries, de novo firms may not be able to cope with the rate of change of industry standards or the threat of competitors with the potential to introduce competence-destroying innovations. De novo firms which lack the necessary resources for such innovative strategies will be unable to achieve such growth. These young firms could thus have their market share and transition to high growth negatively

impacted since the scarce resources that could have been deployed towards implementing their growth strategies would then be diverted towards adapting to the dynamism in the environments just to remain viable businesses.

Further, empirical studies have demonstrated the association between environmental dynamism and environmental uncertainty (e.g., Duncan, 1972; Tung, 1979; Milliken, 1990). Environmental changes challenge the level of actionable knowledge possessed by firms since their inability to assess the current and future state of the industry increases (Simerly and Li, 2000). For de novo firms which are likely to have less industry knowledge than incumbents, this uncertainty may be more detrimental than for more experienced incumbents. The industry knowledge asymmetry between de novo firms and incumbents may reduce their ability to respond to new technological changes, understanding of, and responding, to competitive strategies of rivals, and ability to assess the bundle of resources and capabilities of their rivals (Smith et al., 1993). Increasing environmental dynamism reduces the knowledge that is available for making decisions (Milliken, 1987; Simerly and Li, 2000), and also, these responses to environmental dynamism require assets, capabilities, experience, and the development of creative and innovative strategies by managers (D'Aveni, 1994; Thompson, 1967).

In light of these, de novo firms are especially disadvantaged in dealing with high levels of environmental dynamism, owing to different factors. First, they lack the resources to commit towards new strategies necessitated by environmental changes. They also lack industry experience which gives incumbents the competitive advantage in dealing with

environmental changes and challenges. Secondly, de novo firms do not have the parental support that de alio firms have allowing them to experiment with different responses when facing uncertainty. As such, environmental dynamism is expected to hinder de novo firms from transitioning to a high-growth stage. The hypothesis follows.

H_T3: The level of environmental dynamism in a region is negatively related to the rate of de novo firm take-off into the high-growth stage

Environmental complexity refers to the heterogeneity of economic activity in a region. High regional complexity may indicate that a firm has to interact with a large number of different suppliers, customers and competitors (Dess and Beard, 1984). Heterogeneous and complex environment increase managerial information processing challenges (Duncan, 1972; Tung, 1979). While mature incumbents likely have in-house experience and external network relationships that support coping with those challenges, de novo firms with fewer means will likely be more engrossed attempting to response to environmental complexities, further reducing the resources they can devote towards crafting and implementing a high-growth strategy. Building on the resource dependence perspective (Dess and Beard, 1984), I argue that high growth oriented de novo firms located in high complex environments are likely to find the acquisition of resources or the disposal of outputs more complicated than their counterparts in regions with lower environmental complexity .. Environmental complexity amplifies the challenges of innovation based high-growth, hence constraining strategic choices (George, 2005) and reducing the likelihood of pursuing and benefitting from innovations. The hypothesis follows.

H_T4: The level of environmental complexity in a region is negatively related to the rate of de novo firm take-off into the high-growth stage

3.5. Data and Method

3.5.1. Data

The dataset for this research is a panel dataset from Statistics Canada (STATCAN). The data spans a 13-year period, from 2000 to 2013, and was derived from the General Index of Financial Information (GIFI) and the General Business Panel Survey; Linked File Environment (LFE). The STATCAN database tracks firms from birth throughout their life and growth and unto their death/failure, and thus is suitable for event data analysis focused predicting the likelihood of transition of firms from one state to another. The analysis data were on the manufacturing sector firms (3-digit NAICS 311 through 339) and the population of 81,912 firms in this dataset consists of firms that are either corporations, or firms with employees. Being that this is a study in the take-off of independent young firms, the analysis focused on de novo firms 7 years or less in age. The external environmental data was sourced from the Canadian census. The Canadian census takes place every 5 years, and the census data for this research was made available by STATCAN using SGC codes from the 1996, 2001, 2006 and 2011 Canadian censuses, with the analysis data having information corresponding to the relevant census.

3.5.2. Measuring De Novo Firm Take-off into High-Growth

Although this author is unaware of any definition of de novo firm take-off in the strategy or entrepreneurship literature, the name itself implies the start of a new phase in

the sales or employment history of a firm, as evidenced by dramatic growth. Accordingly, the conceptual definition of take-off is here given as the point of transition from the stage of non-high-growth after the birth of a firm to the high-growth stage of its development life cycle.

Since a widely-accepted definition of high-growth is that provided by the OECD as "All enterprises with average annualized growth greater than twenty percent per annum, over a three-year period, and with ten or more employees at the beginning of the observation period", the threshold for take-off in this research work is the first year in that three-year period where the de novo firm first attained the specified growth rate since its birth. This operational definition of a firm's take-off and the OECD definition of high-growth are consistent with each other and can be used as heuristics in the study of high-growth transitions across all categories of firms. The base level of 10 employees at the beginning of the observation period serves as a check against a spurious identification of a firm as a high-growth firm due to a scenario where there is a small base level of employment size followed by the occurrence of a relatively large percentage increase in size, yet without true high-growth having taken place. An example of such a bogus claim of high-growth would be a move from a base level of two employees to four employees in three years. I identify if the de novo firms had an average annualized employee growth rate greater than 20% per annum over 3 years, given that the number of employees in the first year of the three years is at least 10 (which is the OECD criteria for high-growth enterprises). Such firms are the 'take-off' firms and I define the take-off year as the first

year of this three year period. The time to take-off is here defined as the number of years from the birth of the firm up to and including the take-off year.

Different measures of firm growth are used in the literature (Brush and Vanderwerf, 1992; Davidsson and Wiklund, 2000; Delmar, 1997; Delmar et al., 2003), although for empirical research on growth, employment and sales are the most widely used measures (Delmar, 1997). With regard to high-growth specifically, different criteria exist in the literature for identifying high-growth firms, For example, Delmar et al. (2003) recognize such firms to be those firms among all others which are the in top 10% with regard to an annual average in at least one of six sales or employment categories. 'Gazelles' - another category of firms dealt with in the literature - are identified as enterprises that are up to five years of age and that have average annualized growth of over twenty percent per annum during a three-year period, with at least ten employees at the start of the observation period (Audretsch, 2012). Lopez-Garcia and Puente (2012) identify high-growth firms as those among the 10% of firms with the highest value of an employment-based indicator. The dataset used by Lopez-Garcia and Puente (2012) did not have information on age of firm, and their synonymous use of the terms Gazelles and high-growth firms was independent of firm age. Though they did not focus exclusively on young firms as this research does, Lopez-Garcia and Puente (2012) found that human capital plays a positive role for extreme growth. Siegel et al. (1993) define high-growth as a doubling of sales in the period of the three most recent years of a firm's operation. Moreno and Casillas (2007) use sales growth in determining high-growth firms; they characterize high-growth firms as those with growth higher than 100%, within a relatively short period of time – normally 3 to 4 years.

For this research, I follow previous literature as well the OECD standard that focus on employment as the basis for defining high-growth firms. Since younger firms' growth is more likely to be organic than acquisition growth (Delmar et al., 2003; Mason and Brown, 2013; Penrose, 1959), and this growth is witnessed in natural increase in employment size, it is apt to use employee size as the measure for de novo firm transition to high-growth. An advantage of the use of employment over the use of sales as a growth indicator is that employment is not sensitive to inflation and currency exchange rates, whereas sales are (Delmar et al., 2003). Also, turnover measures of growth can lead to comparability issues, considering the lack of a general agreement on the way to deflate turnover plus the different criteria for measuring turnover (Lopez-Garcia and Puente, 2012). An employment-based measure of growth is a thing of value for a resource-based or knowledge-based view of the firm, and if firms are recognized as bundles of resources, it is fitting for an analysis of firm growth to focus on the buildup of resources, e.g., employees (Delmar et al., 2003).

3.5.3. Dependent Variable

Take-off: A dichotomous variable with the value of 1 for de novo firms that have achieved take-off into the high-growth stage, and '0' for non-take-off firms (see the section above on measuring de novo firm take-off into high-growth) .

In this research, I consider growth in terms of the new venture's transition from an early stage to a stage of high growth. I follow the Organisation for Economic Co-operation and Development (OECD) definition of high-growth firms which is,

> "All enterprises with average annualized growth greater than twenty percent per annum, over a three-year period, and with ten or more employees at the beginning of the observation period".
>
> _OECD-Eurostat Manual on Business Demography Statistics (2007)

Prior literature has also used a similar definition of high-growth firms (e.g., Deschryvere, 2008). This definition of high-growth firms compares with that for gazelle firms which is essentially the same as the above for high growth firms except that gazelles are enterprises up to five years old (Audretsch, 2012). The dimension for high-growth used in this research is change in number of employees, but rather than examine what might be considered as normal growth of a new venture, this research focuses on a special type of growth – high rate of growth of de novo firms.

In my analysis, I test for de novo firm high growth in my panel data. I identify if they had an average annualized employee growth rate greater than 20% per annum over 3 years, given that the number of employees in the first year of the three years is at least 10 (which is the the OECD criteria for high-growth enterprises). I test every three year period, all the way through the final period, or until the firm is identified as having this growth rate, or until the firm exits the dataset (e.g dies). The growth rate is calculated as follows:

$$[[emp(t-1)/emp(t-2)] -1]x100$$

where emp(t-2) and emp(t-1) are firm employment sizes for consecutive years.

The analysis involves identifying only the first instance of this average of 20% growth rate over 3 years, from the birth of the firm. So if a firm is identified for the first time since birth as having this growth rate, it will be marked as a 'takeoff' firm. The take-off year is the first year of the identified three-year period where the firm experienced high-growth. The take-off variable is then created in the panel data.

3.5.4. Predictor Variables

Agglomeration

In accordance with previous work on regional economics, agglomeration externalities will be measured by dividing the number of 3-digit NAICS and census subdivision (CSD) employees by the number of employees in the same industry in the nation (Glaeser et al, 1992; Porter, 2000; Shaver and Flyer, 2000; Pe'er et al, 2008; Alcacer & Chung, 2014; Pe'er et al, 2016).

Local Market Concentration [Concentration]

To determine the level of local market concentration of a location I use a measure well-featured in the industrial organization research - the Sales-based Herfindahl-Hirschman Index (HHI) measured at the CSD level (Pe'er et al, 2016; Tirole, 1988; Porter, 1980). This measure is obtained by summing the square of market share (sales) of firms in an NAICS sector and in the region, in the given year. High HHI levels reflect a highly

concentrated market structure, composed of fewer, relatively large firms. Areas with low HHI levels indicate that they are more fragmented, with a large number of smaller firms.

Environmental dynamism [**Dynamism**].

A measure of instability and unpredictability from a firm's environment, environmental dynamism is measured by averaging the dispersion about the regression curve (error) from the same data and regression used to measure munificence – that is, the regression of the dependent variables of NAIC industry sales on time over the 5-year period (Child, 1974; Snyder and Glueck, 1982; Dess and Beard, 1984; Tatikonda et al, 2013). This measure of environmental dynamism is at the industry-CSD level.

Environmental complexity [**Complexity**].

This is measured by regression of terminal-year (year five) market shares (sales) of a NAICS industry's firms on the initial-year (year one) market shares of those firms, following which the computed measures will be multiplied by negative one, and as such, the larger the number, the more complex the environment (Heeley et al, 2006; Tatikonda et al, 2013). This measure of environmental complexity is at the industry-CSD level.

3.5.5. Control Variables (Firm-level and Region-level)

Firm Age

The data contains information about firm birth. Age is controlled for, by obtaining the number of years the new venture has been in existence.

Firm size (# of employees) [Employees].

This is measured as the number of employees in the new venture.

Population [csd_Population].

Since large populations can influence new venture performance, this control is in order. This data as obtained from STATCAN will be a measure of the population of each Canadian census subdivision (CSD) concerned with the study. Population was also a control variable used by (Pe'er et al, 2008).

Unemployment rate [csd_Unemployment].

Unemployment can be expected to negatively impact the productivity of an region, since the implication is that there will be less manpower for innovations and routine organizational activities. STATCAN data will be used as a measure of CSD unemployment rate. This control variable was also used by (Pe'er et al, 2008).

Land area [csd_Landarea].

I control for land area (see Pe'er et al, 2008), taking into consideration the differential levels of availability of land and differences in land prices.

3.5.6. Event History Analysis

As mentioned in the introduction, the focus of this research is on the determinants of the probability of de novo firms achieving take-off into the high-growth stage, after their

inception. Estimating this probability of take-off is something that cannot be done by standard methods of linear estimation (Lopez-Garcia and Puente, 2012). While general studies on general or average growth have no time component to the growth process (they merely identify factors that have significant positive or negative relationships with firm growth) transition rate analysis of firm take-off into high-growth – using a hazard model, for example – gives the advantage of analyzing time-based events, can be used to give estimates of how much time it takes a newly formed firm to achieve this take-off and also identifies correlates of this take-off. This event history analysis, using the hazard model for example, is very useful in predicting take-off of de novo firms after inception, from a non-high-growth stage to a high-growth stage.

Transition rate (or hazard rate or failure rate) involves the probability of individual units changing from one state to another, and a local description of the development of a process is allowed for by the transition rate (Blossfeld et al., 2007 :36). The following expression,

$$\Pr(t \leq T < t' \mid T \geq t) \qquad t < t'$$

is the probability of a transition event occurring in the time interval from t to t', given that no such event has previously occurred, and where T is the duration from time t0 till a transition from the individual's origin state to its destination state (Blossfeld et al., 2007: 32). To specify the rates of takeoff into high growth as a function of time constant (X_1)

and time-dependent covariates ($X_2(t)$) in an exponential model, the following mathematical model applies:

$$r(t) = \exp (X_1 \beta_1 + X_2(t) \beta_2)$$

3.5.7. Estimation

For my take-off analyses, I estimate the hazard model (transition rate model) using the exponential survival distribution model (parametric survival model) (Blossfeld et al., 2007: 96). These analyses involve time-dependent transition rates. For the transition rate model, the event will be the transition from non-high-growth (state 0) to high-growth (state 1) in the (0,1) state space. All firm-year observations are included, not just those that experienced transition, but as opposed to ordinary regression results which focus on all subjects in general, the results of transition rate analysis focus on the probability of subjects experiencing the event being studied - in this case probability of transition from non-high-growth to high-growth.

3.6. Results

Table T1 presents the descriptive statistics for the variables used in the event history analysis to predict de novo firm transition from non-high growth to high-growth analysis. The data covers 279,405 firm-year observations and 81,912 firms over a duration of 13 years from 2000 to 2013. Out of the total number of firms, 6,058 were identified as take-off de novo firms – about 7.4%. The correlation matrix for the variables are provided in table T2. Table T3 presents the results of the transition rate model for de novo firm

transition to high-growth. The multivariate event data analysis involves predictor variables as well as firm-level and -level control variables. Models were used to test the hypotheses. Model T1 focuses on external environmental factors which are predicted to have an impact on de novo firm take-off into high growth stage. Models T1 and T2 show agglomeration with a positive and significant coefficient, supporting hypothesis H_T1, and suggesting that de novo firms in locations with stronger agglomeration externalities have a higher likelihood of take-off into the high-growth stage. Model T1 shows agglomeration to have a positive and significant coefficient of 1.683474 at the $P<0.1$ level. From model T1, a one-unit difference in the agglomeration variable corresponds to a hazard ratio of exp(1.683474) = 5.384, which indicates that the likelihood of take-off to the high-growth stage in a region is predicted to be roughly 5 times that for another region that is one unit less in the level of its agglomeration variable. In other words, locations with stronger agglomeration are predicted to have a greater likelihood of de novo firm take-off. Model T2 shows agglomeration to have a positive and significant coefficient of 4.860102 at the $P<0.001$ level. Model T5 shows that the local market concentration variable (Concentration) is positive (.3818464) and significant at the $P<0.01$ level, supporting hypothesis H_T2 and allowing for the prediction that de novo firms in areas with high market concentration will have a higher likelihood of take-off than those in low concentration areas. Specifically, considering a sales-based Herfindahl-Hirschman Index (HHI) as a unit of measure for local market concentration, the likelihood of de novo firm take-off to the high-growth stage in a focal area is predicted to be roughly 1.5 times [exp(.3818464) =1.465] that for an area that is one unit less in the level of its local market concentration variable. Environmental dynamism is shown to be a negative factor for the likelihood of de novo firm take-off into

high growth, considering model T1 with a negative and significant coefficient of -5.03e-09, P<0.001. Thus model T1 (as well as models T2 and T3) supports hypothesis H_T3. Thus hypothesis H_T3 is supported. Hypothesis H_T4 on environmental complexity is not supported.

I did robustness checks using Cox regressions. Cox models are semi parametric models (Blossfeld et al., 2007: 128) used for event data analysis. Support was found for the hypothesized relationship between local market concentration and probability of de novo firm take-off into the high-growth stage. There was also support for the hypothesized negative association between environmental dynamism and probability of take-off. The hypothesis on environmental complexity being negatively associated with probability of de novo firm take-off into the high-growth stage in regions was not supported by the robustness test.

Table T1

Descriptive Statistics for De Novo Firm Take-off

Variable	Obs	Mean	Std. Dev.
take_off	279405	.0216818	.1456426
firmAge	279405	3.528523	2.240427
Employees	274381	16.12489	87.70614
Agglomeration	279405	.0595266	.0936167
Dynamism	157850	7.42e+07	7.27e+07
Complexity	63332	-.0001617	.0192757
Concentration	279405	.2046604	.2151393
csd_Population	275860	473915.7	738284.3
csd_Landarea	275860	712.0821	6547.037
csd_Unemployment	274850	8.877239	4.967389

Table T1. Descriptive Statistics for De Novo Firm Take-off

Table T2. Correlations

	1	2	3	4	5	6	7	8	9
1. take_off	1.0000								
2. firmAge	-0.0193	1.0000							
3. Employees	-0.0050	-0.0295	1.0000						
4. Agglomeration	0.0009	0.0056	0.0324	1.0000					
5. Dynamism	-0.0068	0.0356	0.0016	0.7010	1.0000				
6. Complexity	-0.0013	0.0096	0.0020	-0.0276	0.0237	1.0000			
7. csd_Populatn	0.0017	0.0060	-0.0064	0.5783	0.5473	-0.0025	1.0000		
8. csd_Landarea	0.0030	0.0157	-0.0144	-0.0205	-0.0233	0.0086	0.0016	1.0000	
9. csd_Unemploym	-0.0041	0.1243	-0.0155	0.1066	0.1388	0.0132	0.1536	-0.0180	1.0000

Table T3. Transition rate Models for De Novo Firm Take-off

	Agglo/Dynam/ Complexand Take-Off	Agglo/Dynam /Complex) and Take-Off	Dynamism andTake-off	Complexity and Take-off	Concentration and Take-off
Takeoff	T1	T2	T3	T4	T5
Agglomeration	1.683474† (.8677552)	4.860102*** (1.076179)			
Concentration					.3818464** (.1200601)
Dynamism	-5.03e-09*** (1.13e-09)	-6.53e-09*** (1.10e-09)	-2.30e-09*** (4.42e-10)		
Complexity	2.022343 (2.043482)	7.84319** (2.692513)		2.884106 (6.244553)	
QHCap_Agglo		-1.51484* (.7313494)			
QHCap_dyn			6.74e-10*** (8.50e-11)		
QHCap_cmplx				3.267339 (4.789845)	
RltvQHCap					.0853548*** (.0047561)
RltvAssets					.0030177 (.0022084)
Asst_HCap					
Munificence	9.37e-11 (8.37e-11)	1.28e-11 (1.26e-10)			
Employees	-.0418788*** (.002288)	-.0516591*** (.0025998)	-.0008239* (.0003392)	-.05055*** (.0025962)	-.0014891*** (.0003342)
firmAge					
csd_Population	1.34e-07 (8.66e-08)	1.13e-07 (8.64e-08)	3.67e-08 (4.29e-08)	-5.57e-08 (6.19e-08)	-3.83e-08 (2.88e-08)
csd_Landarea	8.99e-06*** (2.36e-06)	9.12e-06*** (2.29e-06)	4.26e-06† (2.58e-06)	9.72e-06*** (2.27e-06)	-.0000119 (.000015)
csd_Unemployment	.0615008*** (.0055825)	.0641966*** (.0053566)	-.0102585* (.0049728)	.0663668*** (.0052457)	.0151981** (.005305)
_cons	-6.731348*** (.0928802)	-6.345259*** (.0962061)	-9.889132*** (.0520719)	-6.620943*** (.0856809)	-9.724832*** (.0565913)
Log likelihood	-243.87412	-136.36048	-6686.9494	-157.66633	-5817.6729
Number of subjects	23650	21026	43556	21026	32993
Number of failures(Takeoffs)	524	514	1924	514	2009
Number of obs	52526	46334	119023	46334	92020
LR chi2	774.74	939.92	66.20	897.31	147.07
Prob > chi^2	0.0000	0.0000	0.0000	0.0000	0.0000

***P<0.001 **P<0.01 *P<0.05 †P<0.1 Standard errors in parentheses

Takeoff	T6	T7
Agglomeration		
Concentration		
Dynamism		
Complexity		
QHCap_Agglo		
QHCap_dyn		
QHCap_cmplx		
RltvQHCap	.0782279*** (.0055513)	
RltvAssets	-.0015411 (.0027622)	
Asst_HCap		.0004325*** (.000056)
Munificence		
Employees	-.0025264*** (.0004092)	-.0025291*** (.0003896)
firmAge	.2965239*** (.008364)	.2992932*** (.0083299)
csd_Population	-4.25e-08 (2.79e-08)	-3.68e-08 (2.78e-08)
csd_Landarea	-.0000116 (.0000148)	-.0000116 (.0000148)
csd_Unemployment	.0088269 (.0055629)	.0077089 (.0055737)
_cons	-10.07668*** (.0563051)	-10.00938*** (.0561416)
Log likelihood	-5294.3766	-5321.74
Number of subjects	32993	32993
Number of failures(Takeoffs)	2009	2009
Number of obs	92020	92020
LR chi2	1193.66	1138.94
Prob > chi^2	0.0000	0.0000

***P<0.001 **P<0.01 *P<0.05 †P<0.1 Standard errors in parentheses

3.7. Discussion and Conclusion

A performance pattern observed for certain firms is a dramatic increase or take-off in an organizational outcome such as employee size or sales at some point in their life cycle. An example of what could fuel such firm growth is a dramatic increase in sales of very new household consumer products which would appear as a sales curve with an elbow-shaped discontinuity (Golder and Tellis, 1997) highlighting the remarkable increase. Although high-growth firms are important for different reasons including their potential for job creation and employment reduction, not much is known about the phenomenon of high-growth, especially as touching young ventures (Audretsch, 2012). This chapter examines external factors which determine a new venture's likelihood of take-off from the early stage to a high-growth stage. This is in line with the organization studies literature which acknowledges the relationship between how firms grow and environmental and organizational factors like industry affiliation, firm age and firm size (e.g. Delmar et al., 2003).

The results demonstrate the positive effects of agglomeration on the likelihood of de novo firm take-off into the high-growth stage. The capacity of these locations to provide externalities such as knowledge spillovers and access to to specialized suppliers makes them a valuable external resource to support high-growth strategies of young firms. Further, firms involved in agglomeration reduce consumer search costs, enabling customers to know of their offers and making it more likely that customers will visit such clusters (Chung and Kalnins, 2001). This benefits young firms in such agglomeration areas since their growth can be fueled by the increased demand caused by agglomeration. Being that locations have different potentials in regard to agglomeration economies, de novo firm

take-off into the high-growth stage should have differential degrees of likelihood, contingent on the strength of the agglomeration externalities provided by their areas of location. Considering that a firm's primary competition is with other firms in its strategic group (e.g., Hitt, Ireland and Hoskisson, 2015), the competition among high growth firms over local externalities should be lower in areas with strong agglomeration externalities, hence supporting their increased growth rates. Heterogeneity in resources and capabilities across de novo firms, which was not the focus of this research, however, will determine the degree to which they can benefit from local agglomeration externalities such as knowledge spillovers and access to specialized suppliers.

De novo firms in locations with low level same-industry concentration will face higher growth challenges and therefore are less likely to achieve high-growth stage. I find that highly concentrated market structure positively affects the likelihood of transition to high-growth. This suggests that for de novo firms, environments with a concentration of large established firms with not many smaller firms will be more conducive for the attainment of high-growth. Conversely, when a location is low in market concentration – with a large population of smaller firms – this should make competition stiffer for the focal de novo firm. With a concentration of large firms in an industry location, there is the possibility of the de novo firm having opportunities to target market niches underserved by the large incumbents, creating room for young ventures' accelerated growth, providing they are relatively sufficiently endowed with the needed resources.

As hypothesized, strong environmental dynamism negatively affect the likelihood of de novo firms transitioning to high-growth stage. The challenges of de novo firms operating in locations characterized by frequent change emphasize the relevance of human factors such as industry knowledge, experience and training within their workforce for adequately dealing with the rate and instability of change in dynamic industry environments. The significant influence of environmental change on firms is exemplified in the recent announcement by Ford – a major American car manufacturer – that it will discontinue the production of popular models excluding SUVs and the Mustang. This decision follows the changing trend in customers preference for big cars as well as the current favorable fuel prices. On the contrary, Tesla – a younger m is ill facing challenges to its growth and profitability in the changing auto industry. Ford has the advantage of strong alternatives in the market, while Tesla is more limited. With the possibility of dynamic environments leading to a smaller market share and margins for firms that are not as competitive as others (Karna et al. 2016), it becomes necessary for entrepreneurs – which may already dealing with the challenge of establishing their new firms in the industry – to invest in skilled labor, or industry relations to better their chances of strong growth performance in unstable regions. The negative effect of environmental dynamism against this take-of, as suggested by this research, is also noteworthy for both the academia and practitioners.

However, this research focused on firms in the manufacturing sector only, and so its generalizability could be limited. Future research can examine how agglomeration and environmental dynamism and complexity interact with young firms' internal resources to

affect their attainment of high growth. This research however, helps to fill the above-mentioned gap, and by so doing contributes to the strategy and entrepreneurship literature on firm growth. It extends agglomeration theory as it reveals the positive influence of agglomeration on a de novo firm's likelihood of take-off into high-growth as a result of agglomeration externalities available to firms in such regions.

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