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Laure-Anne Parpaleix

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Innovation and growth potential: managing investment in middle market companies

In recent years, economic growth has turned into a key challenge for both public politics and private actors thus leading to extensive discussions about growth determinants. Innovation early stood out as one of the main growth driver. Nevertheless, despite of prolific empirical economic studies, correlation tests between innovation and growth remains inconclusive. Based on recent management researches findings, my research aims at investigating new factors to explain these empirical discrepancies as well as the link between investment and innovation policies. It will be conducted in partnership with Bpifrance, a state-owned organism backing national public policies by assisting companies through different types of investments. Bpifrance provide an appropriate field of research as its main mission is to ensure firms forthcoming competitiveness through investment, growth and innovation. Beyond a better understanding of the growth trajectories, I expect to develop new management devices for investors such as Bpifrance, whose aim is to identify how to better contribute to the firms' and the national economic growth. My research focuses on middle market companies, a single category hiding a large diversity of innovation and growth patterns. As the focus on middle market companies is fairly new, little is known about their specific innovative capabilities and growth potential, thus making it hard for public actors to tailor appropriate policies. Both theoretical and managerial findings are expected among which a better understanding of the determinants of growth and the role of innovation capabilities in firms' growth trajectories; original growth and investments models with parameters linked to the description of innovation capabilities; and devices to steer the adjusted investment strategies.

Key words: innovation management, economic growth, capital investment

Introduction

Economic growth which is a key challenge for public politics and private actors has turned into an intensive research topic in both economy and management. Many policies aim at ensuring a financing continuum for every key phase of business development and route investment in favor of strategic projects (e.g. export, innovation, and buyout). Sustaining growth is often at the heart of these policies. Therefore, search for a better understanding of growth determinants has been extensively discussed in numerous theoretical and empirical studies (Coad 2007). Yet, although a wide list of potential growth process inputs has been established, correlations based on static and in retrospect input-output economic models remains inconclusive (Gupta, Guha et al. 2013). Besides, growth dynamic mechanism still need for further investigation (e.g. continuous innovation provides non persistent and unpredictable growth (Coad, Cowling et al. 2014)). Because of this failure in understanding growth drivers, investors lack of managing strategies allowing them to guide their investing policies.

Among the potential growth factor, innovation has gradually become increasingly explored. Although the study of the impact of innovation on economic growth has produced a voluminous and diverse literature (Cameron 1998), a precise relationship has yet to be unequivocally established (Demirel and Mazzucato 2009). Besides, characterizing the relationship between firm innovativeness and growth raises the stake of identifying accurate and appropriate measurements for both growth and innovation. My thesis major challenges lie in exploring the relationship between innovation and growth as well as the link between investment and innovation policies.

Relevance of my dissertation

My PhD is carried out in partnership with Bpifrance, a state-owned organism backing national public policies by assisting companies through different types of investments.

First, Bpifrance provide an appropriate field of research as its main mission is to ensure firms forthcoming competitiveness through investment, growth and innovation. One of Bpifrance current strategic challenge is the support of French firms' growth strategies through a unique state-owned venture capital fund. Bpifrance doctrine states that it should "behave like a prudent investor operating under market conditions to serve public interest". Therefore, the venture capital fund has both to meet financial performances and to carry out a public service mission. A broad consensus suggests that innovative capabilities are one of the main sources of firm's economic growth. In line with this thesis, Bpifrance investors challenge lies in identifying firms with high-growth potential thanks to an analysis of their innovative capabilities. Thus, the aim is to provide investors with management strategies and devices helping them to invest in innovation capabilities.

Secondly, Bpifrance work in close partnership with middle market companies. This firm category is of particular interests for my thesis as it is a quite new one so the relationship between innovation and growth has been little examined and stays even more mysterious. One of Bpifrance venture capital fund; it is directed towards middle market companies. In 2008 a French law created this new business category to reach more precise analysis on these firms considered as valuable assets for French economy. It gathers companies employing between 250 and 5 000 workers with an annual turnover below 1.5 billion euro. In-between SMEs and large firms, French middle market companies' category, as German Mittelstand, gathers long lasting firms with entrenched innovation capabilities that should drive value generation and employment opportunities. However, this single category hides a large diversity of innovation and growth patterns. These various potential growth dynamics could explain why middle market companies growth lack of steadiness and persistence. Growth process remains tricky to characterize and monitor with current statistic tools used for SMEs and large firms, hence the need to adjust current tools.

Therefore, the purpose of my research is to answer to the following questions raised by the above assessment:

- Are innovation capabilities an accurate indicator of growth potential? How to characterize both innovation capabilities and growth (i.e. indicators, measurement methodology)?
- How can investment reach greater impact on firm growth? How to shape investments tools (i.e. innovative firms' selection mechanisms, financial vehicles) and steering process accordingly?

Theoretical framework

Despite abundant literature on the relationship between innovation and growth, economic researches remain inconclusive.

Since Adam Smith first theory on macro-economic growth (Smith 1776), there has been extensive academic research on its causes and consequences. Various disciplines contribute to model economic growth including economy (macro, micro and political economy), management (Teece 2007), finance (Timmons and Bygrave 1986), law (Levine 1997) and psychology (entrepreneurship literature). Nevertheless, economic growth remains an intellectual puzzle.

Historically, economists were the first to identify and explore technological progress as a driver of economic growth through macro-economic frameworks. Over time, various theories refined causal links between technological progress and growth rate at different level of analysis. Gradually, a shift happened from theories developed at an aggregate scale to a firm and an individual scale. Recent researches in management focused on the relationship between innovation and growth at the firm level.

In 1776, Adam Smith laid the founding principles of the classical growth model. Growth of the labor force and capital accumulation is measured by the increase of a production function with three variables ($Y = f(N, L, K)$): land (N), labor (L) and capital (K). Later, David Ricardo (Ricardo 1817) identified technical progress as an additional variable ($Y = f(N, L, K, S)$). Classical economists were interested in political economy and theories of distribution. Thus they developed macro-economic growth theories to better understand world economy and nations comparative advantages. Later, neoclassical theorists, Solow and Swan (Solow 1956) modeled growth as an aggregate production function ($Y(t) = F[K(t), L(t), A(t)]$) using two factors of production: labor (L) and capital (K) adjusted by the total factor productivity, broad notion related to technological progress (A). This dynamic model assumes that economy admits one representative firm characterized by a unique aggregate production function (Y) contributing to the path towards a constant growth rate in the long run. Technological progress is considered as an exogenous and undefined variable which is often refers as the "black-box problem". Since the 60's, literature on endogenous technical change

further developed neoclassical models of economic growth (Schneider and Ziesemer 1994). Arrow's model (Arrow 1962) of learning-by-doing focuses on introducing common knowledge as a positive externality in the production function. In the 80's, the new endogenous growth model of Romer (Romer 1986) and Lucas further developed the analysis of innovative activity trying to understand the economic forces underlying technological progress. Technological progress, previously defined as a productivity factor, is described as a number of ideas, or the stock of knowledge accumulated up until time, later referred as human capital. In their theory, technological change is no more automatic as in the neoclassical theories but it arises because of intentional actions.

These three major economic growth models (classical, Solow and endogenous) refine the causal links between technological progress and growth. However, these theories remain at a macro-economic level and define a unique representative firm to depict capital accumulation. Through the process of creative destruction, Schumpeter was one of the first economists to assign a leading role in economic growth to individual firms through the innovative entrepreneur. While previous economists assumed an aggregate production function for a unique final good, in his model, Schumpeter supposes heterogeneous firms in interaction that drive aggregate economic growth by their ability to introduce innovation to the market. Nelson and Winter (Nelson and Winter 1982) built on Schumpeter's ideas and borrow from biology the concept of natural selection to shape the framework of an evolutionary theory of firm behavior. As opposed to neoclassical models, although firms are motivated by profit, they are not concerned with maximizing it and no hypothetical state of industry equilibrium is assumed. They study firm's innovation dynamics and are interested in the differing patterns across industry. Their contributions led to subsequent work on cross-industry comparisons of industrial dynamics. Nelson and Winter search economic growth determinants at the atomistic scale of people in the firm. Therefore, their approach has been a source of inspiration for later work in psychology and other social sciences.

Some researchers have focused on refining mechanisms underlining creative capacity at firm. Knowledge spillover theory on ideas diffusion leading to collective growth is part of a flourishing economic literature (Audretsch and Feldman 1996) on the impact of R&D side effects and eco-systems on firm's growth.

This theoretical framework review highlights two parallel phenomenon regarding the growth process analysis. First, economic theories have gradually shifted from macroeconomics to microeconomics. Both Schumpeter and the evolutionally theories introduce individuality in the innovation-growth mechanism while older ones (classical, Solow and endogenous models) assumed collective macroeconomic progress. Secondly, innovation has been progressively recognized as the main source of growth.

While theoretically, economic approach assumes that innovation fosters firm performance, quantitative researches remain inconclusive (Demirel and Mazzucato 2009). Most of quantitative studies focus on correlation tests either test if growth followed a random walk (literature on Gibrat's Law (Mansfield 1962)) or to evaluate the impact of endogenous (i.e.

patent granted, R&D expenditure, new product) and exogenous indicators (i.e. spillovers, clusters). Although some studies highlight a positive correlation between innovative activities and growth, its conclusions often cannot be duplicated. Besides, others (e.g. (Brouwer, Kleinknecht et al. 1993)) demonstrate that innovation and growth remains unrelated. Establishing a correlation between innovation capabilities and growth potential raises stakes in identifying accurate and appropriate measurements for both growth and innovation. Management literature should contribute to overcome these issues:

- Heterogeneity of growth measure is a first obstacle (Delmar 1997, Delmar, Davidsson et al. 2003). It reflects both a technical issue (i.e. time period, firm size, type of industry) and a debate about the nature of targeted growth (i.e. sales, employment, market share, goodwill).
- Similarly, measuring innovation is one of central methodological issues. The question is: how to find accurate measures of innovation and examine its impact on firm's performance? Innovation is often measured in retrospect through R&D spending or number of patents. Both are quantitative indicators failing in differentiating how disruptive innovations are.

New approaches for research on relationships between investment and innovation

Theories on public action often assume a correlation between R&D investments, innovation outcomes and growth. However current economic studies, aiming at defining in retrospect a correlation between inputs and outputs, are not sufficient to demonstrate such a relationship. The difficulty to demonstrate the impact of R&D investment on companies' innovation and growth is known as "the R&D paradox" (Le Masson, Weil et al. 2010). An analysis of top 700 international companies' investments in industry demonstrated no correlation between R&D expenditures and firms growth rates of turnover. Other studies confirm those results whatever timescales, performance indicators or sectors used (Jaruzelski and Dehoff 2005). For example, among the most innovative companies, some, like Apple in 2010, have reached high-growth rates spending less in R&D than the average firm in their field. Therefore, taking into account the intensity of R&D investment only seems too restrictive. Beyond the initial financial inputs, appropriate design management and governance models seem necessary to support firms' innovation capabilities and assess innovation potential beforehand.

One hypothesis is that recent researches on innovative design regimes (Hatchuel and Weil 2003) would help reviewing traditional economic indicators and develop new ones tailored for measuring beforehand firms innovation dynamics thus helping to guide future growth and investments strategies.

Effects of growth support policies through investments can now be reviewed in the light of recent literature on design theories and innovation capabilities. For example, literature discusses the coupling between investment and innovation by questioning how a firm capital

structure influences its innovative projects performance. Several studies advocate that venture capital funded R&D generates substantial increase in innovative outputs compared to corporate R&D without debating on causes of this productivity differential. Compared to corporate R&D or relationship lending, venture capital main asset relies in its ability to combine an initial financial input and support throughout the project lifetime. Capital venture, by interfering in firms at critical stages of development affects their design management and governance models. Then, different hypothesis could be investigated to explain R&D investment performance differential, for example whether it is due to strict project selection mechanisms ex-ante, to closer ex-post monitoring or to specific innovation management methods (Engel 2011).

Methodological approaches

My research will be conducted along multiple paths:

- Contextualization through historical cases of public policies strategies that have supported firm growth. The aim is to size a public operator's specific assets for sustaining firms' growth compared to external private partners or internal corporate capabilities.
- Design of new growth models to better tackle the prolific economic and management literatures in order to detect new hypothesis based, among others, on recent researches about innovation capability.
- Characterization of innovation capabilities through multiple bodies of literatures and empirical cases. Both economic literature and management literature on dynamic capabilities theories (O'Connor 2008) argue on relationships between innovation and growth. Besides, cases study of financed firms, notably through Bpifrance records, in the light of design theories (e.g. Concept-Knowledge theory (Hatchuel 1996)), will contribute to model innovation capabilities and suggest news indicators. Qualitative studies enable the focus on surprising cases that are essential to single innovation parameters out.
- Understanding of the impact of investments on innovation and growth to adjust investments tools and steering processes through finance, innovation management and public action policies literatures. At the same time, I will conduct empirical analysis of investors' reasoning (notably when assessing firms' innovation capabilities, forecasting potential growth or shaping strategic guidance).
- In parallel of the above mentioned qualitative analysis, quantitative tests based on multiple databases provided by Bpifrance, completed if necessary by external sets of data (INSEE, CASD Community innovation survey and social data statements) will contribute to refine hypothesis on the coupling between investment, innovation and growth.

Expected empirical findings and implications for future research and for practitioners

On one hand, I expect the following theoretical implications:

- A better understanding of the determinants of growth and the role of innovation capabilities in firms' growth trajectories.
- Original model with parameters linked to the description of innovation capabilities.
- Clarification of diverging firms growth objectives which are not always in line with public interest and its potential impact on innovation and investments strategy.

On the other hand, I aim at managerial implications regarding tools to steer the investment strategies (i.e. innovative firms' selection mechanisms, financial vehicles). Besides, I also expect findings regarding public policies as this research will question the hypothesis that the best strategy to serve public interest, as a state-owned venture capital fund, is maximizing a few individual firms' growth. I wish to examine potential alternative investment tools serving general interest.

Questions to focus upon at the Doctoral Colloquium

First issue that could be discussed at the doctoral colloquium is investors' theory for dealing with firms innovation capabilities. Investors are used to create well balanced risk portfolios but lack of criteria to assess the potential of financed project based on their innovation capabilities. Can findings on dynamic capabilities be adapted to determine firm's innovation capabilities from an investor external point of view?

A second question to focus upon tackles Bpifrance investment fund innovative mission of "behaving like a prudent investor operating under market conditions to serve public interest". Here to invest and how to tailor innovative investment strategies that both generate financial returns and serve public interests?

Depending on my findings up until the doctoral colloquium, a last question to focus upon could be the role of innovation capabilities in firms' growth trajectories in light with growth models that I am currently defining based both on literature and empirical findings.

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