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Linking Entrepreneurial Strategy and Firm Growth

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ABSTRACT

The growth of young, technology-based firms has received considerable attention in the literature given their importance for the generation and creation of economic wealth. Taking a strategic management perspective, we link the entrepreneurial strategy deployed by young, technology-based firms with firm growth. In line with recent research, we consider both revenue and employment growth as they reflect different underlying value creation processes. Using a unique European dataset of research-based spin-offs, we find that firms emphasizing a product and co-optive strategy are positively associated with growth in revenues. The latter strategy also has a positive influence on the creation of additional employment. Contrary to expectation, however, we find that firms pursuing a technology strategy do not grow fast in employment. Our study sheds new light on the relationship between entrepreneurial strategy and firm growth in revenues and employment.

INTRODUCTION

Young, technology-based firms have received considerable attention in the literature as a result of their importance for the generation and creation of economic wealth. A dominant literature stream addressing the growth of new ventures is the resource-based view (Wernerfelt, 1984). This literature pictures the organization as a bundle of resources: physical capital resources, human capital resources, and organizational capital resources. Resources that are valuable, rare, imperfectly imitable, and not substitutable may provide the firm with competitive advantages (Barney, 1991). Researchers using the resource-based perspective have linked the extent to which firms have or leverage resources is associated with firm growth. A common finding in these studies is the influence of the entrepreneurial team’s experience on spurring the growth of the firm (e.g. Heirman and Clarysse, 2005). Arguably, resources are only one part of the story. Firms employ resources to attain organizational goals, i.e. they deploy a strategy. Besides resources, the strategy of entrepreneurial firms has an important influence on their subsequent growth (Feeser & Willard, 1990).

Previous studies on the relationship between new venture strategy and firm growth draw on the frameworks developed by Porter (1980) and Miles and Snow (1978). The former approach distinguishes between three generic strategies firms may adopt: cost leadership, differentiation, and focus strategy. The latter uses the firm’s response to the environment as a
point of departure and developed a taxonomy consisting of four generic strategies: prospectors, defenders, analyzers and reactors. Sandberg and Hofer (1987) used longitudinal case histories of 17 new ventures to study how new venture strategy influences the success of firms. They found that entrepreneurs should build their competitive advantage around a unique product or service. Similarly, Baum et al (2001) found that firms following differentiation strategies through quality and/or innovation achieve higher growth than firms employing low cost or focus strategies. In contrast, Siegel et al (1993) found that a focused strategy had a positive influence on firm growth. These typologies have been developed to explain the performance of primarily large, established firms, which may cause the mixed findings. Researchers have therefore developed alternative schemes that take the specific context of small, new ventures into account. They argue that the strategy of the new venture is dependent on its position in the supply chain (Carter et al, 1994), and its scope and market coverage (McDougall & Robinson, 1990). The focus in this stream of literature is on how firms build competitive advantages to enter the product market.

More recently, researchers have found that firms may also market technology (Arora et al, 2001). Firms targeting technology markets build agreements with existing firms to commercialize intellectual property through licensing or through the acquisition of the firm by an incumbent. These firms specialize in developing technology without having to invest in downstream capabilities and assets. In contrast, firms targeting products markets build assets in the market and offer an integrated value proposition to persuade customers (Gans and Stern, 2003). The extent to which technology-based ventures can profit from innovation through the technology or product market is contingent on the commercialization environment in which these firms operate. Two key elements shape the strategy of technology-based ventures: the strength of the appropriability regime and the extent to which complementary assets are controlled by incumbents (Teece, 1986). Gans, Hsu and Stern (2002) examined whether firms earn rents through product market competition or via collaboration in technology markets using a sample of start-up innovators active in different industries. They found that strong intellectual property regimes facilitate markets for technology. Firms in environments where the protection of technology via patents is difficult and the investment cost in downstream complementary assets is low are more likely to commercialize their innovations through product markets. Clarysse et al (2007) elaborate on this model and argue that technology-based firms may target technology markets, even if the appropriability regime is weak. These firms will develop a co-optive strategy combining elements of a strategy to enter product and technology markets. So far, empirical studies have addressed the factors
that determine market choice without examining the effects of the commercialization strategy on firm outcomes such as performance. This is an important omission in the literature since there seems little point in engaging in effort to decide on market choices if it makes a difference.

In this paper, we extend previous literature by focusing on the relationship between entrepreneurial strategy and firm performance. We build on the framework developed by Clarysse et al (2007) and consider three viable commercialization strategies for young, technology-based firms: product strategy, technology strategy and co-optive strategy. We propose that the extent to which the firm grows in revenue and/or employment is dependent on the strategy deployed. More specifically, we propose that revenue growth is the result of a product strategy while employment growth is the result of a technology strategy. We further propose that firms with an emphasis on a co-optive strategy will grow in both revenues and employment. We test these hypotheses using a unique hand-collected dataset of 80 research-based spin-offs in five countries.

By addressing the influence of different entrepreneurial strategies on growth in revenues and employment, we make several contributions to the literature. First, current research in the strategic management literature has mainly focused on how firms target product markets. We extend this literature by incorporating the technology market as a target. Second, studies in this literature stream typically operationalize firm performance using financial indicators such as revenue growth. Revenue growth represents the firm’s success in its ability to market products. We use employment growth as a performance indicator in the context of entrepreneurial strategy as a proxy for the accumulation of resources and knowledge (Kogut and Zander, 1992). Third, we also contribute to the literature on new venture growth. Researchers have argued that it is important to differentiate the dominant types of growth (Delmar et al, 2003). Growth can be measured along several indicators such as total assets, profits, employees, and revenues. Growing on one dimension does not necessarily mean that companies grow on the other. Chandler et al., (2008) have for instance shown that growth in revenues is not highly correlated with growth in employees. Because of these apparent differences in the dominant type of growth, scholars have argued that research should focus on the differences in dominant type and the determinants of these differences. New venture growth is considered to be multidimensional construct that represent different underlying
value creation processes. Previous studies on firm growth have used revenue and employment growth interchangeably but have not conceptualized these differences. By explicating the role of entrepreneurial strategy, we offer theoretical insights into the mechanisms underlying revenue and employment growth.

The remainder of the paper is organized as follows. First we develop hypotheses that link the different entrepreneurial strategies with revenue and employment growth. Next we describe the sample and measures used in our study. Then we present the results of the hypothesis tests. We conclude our paper with a discussion of our findings and provide some avenues for future research.

THEORETICAL FRAMEWORK and HYPOTHESES

Relationship between product strategy and firm growth
Firms with a product market-focused strategy develop capabilities and access complementary assets to offer an integrated value proposition to customers. These firms build their competitive advantage on superior product characteristics and target niche markets. Since product strategies are primarily found in environments which provide limited intellectual property protection, firms will have to establish a strong market presence by entering numerous market segments in broad geographical markets (McDougall and Robinson, 1990). To achieve this vital fast commercialization, firms with a product strategy position themselves in the middle of the supply chain and create large networks of distributors or resellers (Carter et al, 1994). This provides the firm with the possibility to achieve a high sales volume with a limited staff. This leads to the following hypothesis:

H1: A product strategy will be positively associated with revenue growth, but not with employment growth

Relationship between technology strategy and firm growth
Technology strategy is viable in environments where intellectual property rights are efficient and incumbents control the complementary assets necessary for commercialization. These environments, like the biotechnology industry, are characterized by technological complexity and highly specialized skills and know-how. New, innovative firms have strong research and development competencies, while marketing and sales skills are the core competences of the
large, established companies. New, innovative firms need to collaborate with large established players, since the latter own the necessary complementary assets to bring new products to the market (Arora and Gambardella). As a result, new, innovative firms can focus their efforts on building a strong, pervasive technology platform whereas the large companies have the cash needed for worldwide product roll-out. These new, innovative firms typically start with an immature technology which is at an early stage of the development cycle. This makes product sales in the first years after start-up unlikely. It is possible that for firms with an emphasis on a technology strategy, growth in employment will occur before any sales are generated. We therefore hypothesize:

112: A technology strategy will be positively associated with employment growth, but not with revenue growth

Relationship between co-optive strategy and firm growth

The above discussion seems to imply that firms have a dichotomous choice between product or technology markets. When the appropriability regime is high, firms can enter technology markets, otherwise firms have to launch products (Gans et al, 2002). However, firms may develop new, pervasive technologies in environments where intellectual property regimes are inefficient as a protection mechanism. For example, the IT sector has been characterized by new firms that develop platforms technologies that gave rise to new markets (Zittrain, 2005). The environment prevents such firms from appropriating rents through licensing agreements with incumbent firms. Therefore, they will have to further develop the technology into novel customer value and enter product markets. Clarysse et al (2007) labeled these firms as following a co-optive strategy. Firms with a co-optive strategy develop multipurpose technologies and simultaneously unfold a product pipeline to create market share as a form of protection. Consequently, these firms will have to build the critical mass necessary for developing the technology and set up an aggressive niche strategy to commercialize products. These arguments lead to the following hypothesis:

113: A co-optive strategy will be positively associated with both revenue and employment growth.
Summarizing, we argue that there will be different effects of product, technology and co-optive strategies on revenue and employment growth, respectively. First we hypothesized that revenue growth is the result of product and co-optive strategies. Second, we hypothesized that firms with an emphasis on technology and co-optive strategies will enjoy employment growth. Figure 1 shows the link between entrepreneurial strategy and firm growth.

**METHODS**

**Sample**

To test our hypotheses, we use a unique hand-collected sample of 80 research-based spin-offs in five European countries: Italy, Portugal, France, Slovenia, Belgium, and the UK. Research-based spin-offs are defined as entrepreneurial firms that develop and commercialize technologies which originated at universities or public research organizations (Wright et al., 2007). The data were collected in 2007 and the research-based spin-offs in our sample were founded between 1995 and 2002. Several reasons guided our thinking in setting the upper and lower age limit for defining the sample frame. Given the focus on growth, we need to include companies that already have some history so we set the lower bound for the research-based spin-off’s founding year at 2002. In earlier research (Moray and Clarysse, 2004), it has been shown that companies exit between nine and eleven years after their formal incorporation. Therefore, we set the upper bound of the firm’s founding at 1995. The period from the mid-1990s is characterized by a professionalization of technology transfer offices in continental Europe as a result of government actions stimulating entrepreneurial activity (Wright et al, 2007).
We use the legal form of the companies as a proxy for growth orientation. When established, organizations have different options of how to be incorporated. The legal form of incorporation has an influence on the amount of issued capital and the flexibility to attract external financing. For example in Belgium, firms that are incorporated as NV require a higher amount of issued capital but offer more possibilities to increase the capital provided by external investors. Setting up a company as an NV arguably indicates the company’s intention to raise external capital. Given our focus on growth, we therefore sampled research-based start-ups that are incorporated as NV in Belgium or an equivalent legal form in the other countries.

Data
We used two sources to collect the data for our study. First, we consulted financial databases, which are publicly available through Bureau van Dijk, to collect data on revenue and employment growth. Data on the firm’s strategy was collected during face-to-face interviews with the founder or top management of the firm. In line with the strategic management key informant literature (Kumar et al., 1993), we targeted founders or top management as they are best qualified to assess strategy given the unavailability of archival data.

Measures

**Dependent variables. Growth in revenue and employment**
The dependent variable in this paper is the growth of the research-based spin-off in revenues and employment. We study the firm’s growth using revenues and employment in 2006 as dependent variable, controlling for the initial revenue and employment. By including the lagged form as an independent variable, we control for possible autocorrelation (Fombrun and Ginsberg, 1990).

**Independent variables. Entrepreneurial strategy**
We build on recent work by Clarysse et al (2007) to measure the entrepreneurial strategies deployed by the research-based spin-offs. These authors distinguish between three types of entrepreneurial strategies: product, technology, and co-optive strategies. We developed a list

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1 We further performed the Harmon’s one factor test, which resulted in seven factors with eigenvalues greater than one (Podsakoff & Organ, 1986). Since more than one factor occurs with the first factor only accounting for 16% of the variance, common method bias is not a problem in our data.
of several 7-point Likert scale questions based on the specific characteristics of each entrepreneurial strategy. We further complemented this list with questions stemming from previous operationalizations of entrepreneurial strategy (e.g. McDougall and Robinson, 1990). The list of strategy items was refined during several rounds of discussions with leading entrepreneurship scholars. The final list of ten items was then pretested with several founders and CEOs of research-based start-ups. The responses were subjected to factor analysis using varimax normalized rotation, a structure of three underlying factors with eigenvalue greater than one emerged, explaining 63.0% of the variance. The result of this analysis can be found in table 1.

Table 1: Factor analysis of strategy items

<table>
<thead>
<tr>
<th>Strategy item 1</th>
<th>Strategy item 2</th>
<th>Strategy item 3</th>
<th>Strategy item 4</th>
<th>Strategy item 5</th>
<th>Strategy item 6</th>
<th>Strategy item 7</th>
<th>Strategy item 8</th>
<th>Strategy item 9</th>
<th>Strategy item 10</th>
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<tbody>
<tr>
<td>Factor 1</td>
<td>Factor 2</td>
<td>Factor 3</td>
<td>Factor 1</td>
<td>Factor 2</td>
<td>Factor 3</td>
<td>Factor 1</td>
<td>Factor 2</td>
<td>Factor 3</td>
<td>Factor 1</td>
</tr>
<tr>
<td>.83</td>
<td>.21</td>
<td>-.02</td>
<td>.89</td>
<td>-.14</td>
<td>.08</td>
<td>.15</td>
<td>.79</td>
<td>-.06</td>
<td>.00</td>
</tr>
<tr>
<td>.89</td>
<td>-.14</td>
<td>.08</td>
<td>-.06</td>
<td>.74</td>
<td>.11</td>
<td>.16</td>
<td>.00</td>
<td>.85</td>
<td>.04</td>
</tr>
<tr>
<td>.15</td>
<td>.79</td>
<td>-.06</td>
<td>.74</td>
<td>.11</td>
<td>.00</td>
<td>.43</td>
<td>.32</td>
<td>-.11</td>
<td>.89</td>
</tr>
<tr>
<td>-.06</td>
<td>.74</td>
<td>.11</td>
<td>.43</td>
<td>.32</td>
<td>-.11</td>
<td>-.66</td>
<td>.42</td>
<td>-.11</td>
<td>.04</td>
</tr>
<tr>
<td>.16</td>
<td>.00</td>
<td>.85</td>
<td>-.66</td>
<td>.42</td>
<td>-.11</td>
<td>.01</td>
<td>-.21</td>
<td>.63</td>
<td>.89</td>
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<tr>
<td>.43</td>
<td>.32</td>
<td>-.11</td>
<td>.01</td>
<td>-.21</td>
<td>.63</td>
<td>-.17</td>
<td>.66</td>
<td>-.26</td>
<td>.26</td>
</tr>
<tr>
<td>Eigenvalue</td>
<td>2.68</td>
<td>1.93</td>
<td>1.69</td>
<td></td>
<td></td>
<td></td>
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</table>

We calculated the first strategy item by combing the items one, two and the inverse of eight (alpha = .75). Firms emphasizing this strategy expand their activities through acquisitions. We label this strategy variable as co-optive strategy (Clarysse et al, 2007). The second strategy variable consists of the items three, four and ten (alpha = .63). Firms with an emphasis on this strategy have a business model based on product sales. These firms invest in marketing and sales and develop distribution channels. This strategy, which is very much in line with the niche perspective (Carter et al, 1994), is labeled product strategy. The final factor, items five, seven and nine, compromises activities such as the development of
technology platforms and building strong IP positions (alpha = .71). We label this strategy variable as technology strategy.

Control variables

*Macro-level. country and sector*
The institutional environment in which the firm operates influences the extent to which the research-based spin-off can accumulate resources (REF). The country where the research-based spin-off is located captures the institutional environment: Italy (n=13), Portugal (n=6), France (n=20), Slovenia (n=4), Belgium (n=15), and UK (n=22). Previous research has also shown that the industry in which the firm competes influences its propensity to grow (REF). We grouped our firms in the following industry sectors: ICT (n=23), Electronics (n=10), Instrumentation (n=16), Biotechnology (n=24), and Others (n=7)

*Firm-level. age and start-up size*
Older firms might have more experience and resources which are typically accumulated over time. This advantage of older firms might enable them to sustain growth. Previous research shows that the founding conditions of the firm have an imprinting effect on later growth and performance (Boeker, 1989). The initial resources of the firm at start-up have an important influence on current capabilities and opportunities (Barney, 1991). We therefore include firm age and initial size as control variables. Firm age is the number of years since founding. Initial size is operationalized as revenues and employment in the first year in the models on revenue and employment growth, respectively.

*Team-level. commercial experience of the founding team*
An organization’s development and success are greatly influenced by its founders (Eisenhardt & Schoonhoven, 1990). Firms created by founders which have prior commercial experience are associated with faster growth in revenue and employment (Heirman and Clarysse, 2005). This variable reflects the number of founders with prior commercial experience.

**RESULTS**

Table 2 represents summary statistics and correlations among the variables. The different entrepreneurial strategies are not correlated. This indicates that the research-based spin-offs
place an emphasis on one of the entrepreneurial strategies: product, technology or co-optive strategy. Table 2 shows that younger firms place a higher emphasis on technology strategy than younger firms. The table further shows that founder teams with commercial experience tend to follow more acquisitive strategies. The commercial experience of the founding team is also coupled with the initial revenues of the firms in our sample. The hypotheses were tested using multiple regression analysis. We examined the variation inflation factors for all independent variables in the models (Table 3) and found that all factors are well below the 10 cut-off (Neter et al, 1990).

Table 2: Means, standard deviations and correlations of the independent variables

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>s.d.</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Product strategy</td>
<td>4.62</td>
<td>1.66</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Technology strategy</td>
<td>4.86</td>
<td>1.65</td>
<td>.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Co-optive strategy</td>
<td>2.37</td>
<td>1.45</td>
<td>-.07</td>
<td>.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Age</td>
<td>7.25</td>
<td>2.09</td>
<td>.12</td>
<td>-.52*</td>
<td>-.11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Initial employment</td>
<td>3.77</td>
<td>5.86</td>
<td>.19</td>
<td>.04</td>
<td>.17</td>
<td>.06</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Initial revenues</td>
<td>105.51</td>
<td>274.24</td>
<td>.17</td>
<td>-.06</td>
<td>.12</td>
<td>.09</td>
<td>.79*</td>
<td></td>
</tr>
<tr>
<td>7 ComExp FT</td>
<td>0.36</td>
<td>0.68</td>
<td>.10</td>
<td>.14</td>
<td>.27*</td>
<td>-.08</td>
<td>.12</td>
<td>.25*</td>
</tr>
</tbody>
</table>

*Correlation is significant at the 0.05 level (2-tailed).

The results of the hypotheses tests are summarized in table 3. In the first hypothesis we argued that product strategy will be positively associated with revenue growth, but not with employment growth. This hypothesis received strong support. Table 3 indicates that product strategy was related to revenue growth (beta = .28, p < .05). We further observe that the control variables have weak relationships with growth in revenues. Age of the company has a positive association with revenue growth. The initial size is also positively related to change in revenue growth. At the macro-level, the country dummy of Belgium shows a negative association with our dependent variable.

The second hypothesis deals with the relationship between entrepreneurial strategy and employment growth. Specifically, we hypothesized that technology strategies are positively associated with employment growth but not sales growth. The results show that this
hypothesis is not supported. A technology strategy is not significantly associated with employment growth, although we do find evidence that it is negatively associated with revenue growth.

Both firm level control variables age and size are positively and significantly associated with employment growth. We also see stronger effects from the control variables at the macro-level. The sector dummies for ICT and electronics are positively related to employment growth. Further, the country dummy of Portugal shows a significant positive relationship with growth in employment.

Our third hypothesis stated that co-optive strategies are positively associated with revenue and employment growth. The results show that co-optive strategy is significantly and positively related to growth in both revenues (beta = .26, p < .05) and employment (beta = .30, p < .01), supporting hypothesis 3.

Table 3: Results of the multiple regression analysis

<table>
<thead>
<tr>
<th></th>
<th>Revenue growth</th>
<th>Employment growth</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Model 1</td>
<td>Model 2</td>
</tr>
<tr>
<td><strong>Control variables</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>.17 (.15)</td>
<td>.02 (.16)</td>
</tr>
<tr>
<td>Portugal</td>
<td>.04 (.12)</td>
<td>-.04 (.12)</td>
</tr>
<tr>
<td>France</td>
<td>.05 (.13)</td>
<td>-.12 (.12)</td>
</tr>
<tr>
<td>Slovenia</td>
<td>-.04 (.12)</td>
<td>-.13 (.14)</td>
</tr>
<tr>
<td>Belgium</td>
<td>-.03 (.13)</td>
<td>-.27* (.15)</td>
</tr>
<tr>
<td>ICT</td>
<td>.29 (.20)</td>
<td>.21 (.19)</td>
</tr>
<tr>
<td>Electronics</td>
<td>.08 (.16)</td>
<td>.10 (.15)</td>
</tr>
<tr>
<td>Instrumentation</td>
<td>.18 (.18)</td>
<td>.12 (.18)</td>
</tr>
<tr>
<td>Biotechnology</td>
<td>.19 (.19)</td>
<td>.26* (.19)</td>
</tr>
<tr>
<td>Age</td>
<td>.30** (.12)</td>
<td>.27* (.12)</td>
</tr>
<tr>
<td>Initial size</td>
<td>.22* (.12)</td>
<td>.20* (.11)</td>
</tr>
<tr>
<td>ComExp FT</td>
<td>.18k (.11)</td>
<td>.16k (.11)</td>
</tr>
<tr>
<td>Independent variables</td>
<td></td>
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<tr>
<td>-----------------------</td>
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</tr>
</tbody>
</table>
Product strategy | .28* (.14) | .00 (.13)
Technology strategy | -.25* (.14) | -.02 (.13)
Co-optive strategy | .26* (.11) | .30 ** (.11)

Adjusted R² | .12 | .20 | .25 | .30
F | 1.98* | 2.34** | 3.17*** | 3.31***
Df | 67 | 64 | 67 | 64
Range of VIF | 1.16 – 3.49 | 1.21 – 3.75 | 1.16 – 3.52 | 1.20 – 3.74

The coefficients are standardized and standard errors in parentheses. * * * p < .001, * * p < .01, * p < .05, + p < .10; one-tailed. We used the UK and Others as the default country and industry sector respectively.

Robustness checks
We conducted a series of checks to further evaluate our results. More specifically, we performed additional analysis using 1) alternative calculations of growth and 2) different conceptualization of the industry sector in which the firm competes. Based on previous research (e.g. Delmar et al, 2003), we measured growth as the annual absolute revenue growth and annual absolute employment growth. These alternative dependent variables were calculated as the number of revenues in 2006 (thousands Euro) minus the amount of initial revenues (thousands Euro) divided by the age of the company². The results of our hypotheses test remain the same. We further checked the robustness of our growth model by used a three-year lag of firm size. The direction and significance of the coefficients of the control and independent variables do not change. Next we conceptualized the industry sector by appropriability regime and the complementary assets (Teece, 1986). The appropriability regime measures how effective and possible it is in the sector to protect the technology on a 7-point Likert scale. A high score indicates a sector characterized by a strong appropriability regime. We created a two-item measure assessing whether complementary assets are controlled by incumbents (α = . 70) (Gans et al, 2002). A high score indicates that the market for complementary assets is controlled by incumbents. Product strategy becomes weakly, positively associated with revenue growth whereas the other results remain robust. Overall, we obtain essentially the same results with these alternative models.

² Similar method was used to calculate the annual absolute growth in employment.
DISCUSSION

Our analysis has shown that growth in research based spin-offs is multidimensional and that this reflects heterogeneity in the strategy of research based spin-offs. We found revenue growth to be positively associated with product and co-optive strategies while a technology strategy has a negative effect on revenue growth. We also showed that employment growth is positively associated with a co-optive strategy, while there is no significant relationship between product and technology strategies and employment growth.

Our study helps extend the literature in several ways. With respect to the strategy literature, we extend the focus of attention beyond product markets to analyze the influences of technology market strategies and co-optive strategies on growth in revenues and employment. Our findings lend further support to the view that growth in revenues and growth in employees reflect different underlying constructs in the value creation process. Studies in this literature stream typically use financial indicators such as revenue growth which represents the firm’s success in its ability to market products. Our use of employment growth as a performance indicator in the context of entrepreneurial strategy provides a proxy for the accumulation of resources and knowledge (Kogut and Zander, 1992).

Our argumentation and findings contribute to the literature on new venture growth. There is considerable debate about how to measure growth (see Davidsson et al., 2007 for a review of the literature). It is recognized that high growth is multidimensional in nature and can be achieved in several ways (Delmar et al., 2003), such as total assets, profits, employees, and revenues. Growth on one dimension does not necessarily mean that companies grow on the other. Chandler et al., (2008) have for instance shown that growth in revenues is not highly correlated with growth in employees and is much more volatile. Because of these apparent differences in the dominant type of growth, scholars have argued that research should focus on the differences in dominant type and the determinants of these differences. New venture growth is considered to be multidimensional construct that represent different underlying value creation processes. Previous studies on firm growth have used revenue and employment growth interchangeably but have not conceptualized these differences. By explicating the role of entrepreneurial strategy, we offer theoretical insights into the mechanisms underlying revenue and employment growth.
Our finding that technology strategy has no significant effect on employment growth is puzzling. One possibility may be that the employment effects of a technology strategy are indirect to the focal firm. For example, qualitative insights from our interviews identified cases of research based spin-offs pursuing a technology strategy where the development of the technology was out-sourced to other firms. While this approach helped create employment in supplier firms, the focal firm itself did not grow beyond the core management team. Further analysis is required of the nature of the partner linkages of research based spin-offs and their implications for the nature of growth.

As all studies, this one is not without limitations that open up avenues for further research. Our analysis focused on European research based spin-offs. Given the international diffusion of the research based spin-off phenomenon (Wright et al., 2007), further research might usefully undertake comparative analysis of these kinds of firms in the US and Asia. Identifying growing research based spin-offs was not without difficulty since there is no Europe-wide database of such firms and the newness of the phenomenon limited the overall sample size. While we were able to obtain a reasonable sized sample of firms that had a sufficiently long growth track record, the recent surge in research based spin-off activity holds out the possibility for larger samples in future. Moreover, the recent increase in this kind of venture will also in time enable comparisons to be made of the nature of growth paths by different vintages of firms. A further research agenda concerns the role of founding teams’ social capital since, although we measured the founding teams’ previous experience, we did not incorporate measures of their social capital and trading networks. The strength of such capital and networks may have implications for the growth trajectory of research based spin-offs. Analysis of the development of these networks was beyond the scope of this study but future work could usefully compare the different nature of these networks of partners as between those spin-offs pursuing revenue, employment and co-optive strategies. Our study has also not examined the nature of revenue and employment growth, that is whether the growth occurs organically or through the acquisition of other firms to build revenue streams and/or a broader technology platform. Further research could seek to examine whether research based spin-offs pursuing different growth strategies make relatively more use of organic versus acquisitive approaches to the achievement of growth.

Our study focused on research based spin-offs that had grown but which remained as independent private firms. It was beyond the scope of this study to examine those firms which
has exited through a strategic acquisition or IPO on a stock market. A substantial literature has examined the nature of exits through these two options (Cumming and MacIntosh, 2004). In this context, our analysis has also not distinguished between firms that have received venture capital support and those which have not. Given the objectives of venture capital firms, those spin-offs receiving finance from this support may be more pre-disposed to seek realise capital gains from exiting the business through a strategic acquisition or IPO. Further research might usefully examine whether the growth strategies of spin-offs that have pursued an exit differ from those that have not and whether the growth trajectories of those pursuing an IPO exit route differ from those seeking a trade sale. For example, are those firms pursuing an IPO route more likely to seek to generate revenues as well as building their technology base while those pursuing a trade sale seek primarily to build a technology base that will be attractive to a corporate acquirer? For example, in one of the companies we visited it was put to us that pharma companies are only interested in the quality of the codified knowledge of the firm that is embedded in the patent portfolio and consider large staff and research facilities as liabilities "they have to get rid of". The important highly specialized tacit knowledge that biotech spin-offs typically develop may thus hamper their post-acquisition integration (Schweizer, 2005). This suggests that the introduction of the financial market (i.e., the possibility of exit) introduces the possibility that different organizational forms may be more effective than the traditional ones associated with developing a presence in the product market by building critical mass internally and setting up own research facilities. Further research is needed to examine the scope and applicability of these different organizational forms.

Our findings have implications for practitioners and policy makers as they face the challenges of developing support beyond the creation of research based spin-offs to facilitate their growth. In particular, the heterogeneity of strategies adopted by research based spin-offs indicates a need for support by policymakers and advisers also to be heterogeneous. The policy tools needed to facilitate high growth in revenues may be different from those that will generate growth in employment. Moreover, policymakers with a focus on generating employment growth may also need to introduce support for revenue generation at the same time. Our evidence of a lack of association between a pure technology strategy and growth but of a positive link between co-optive strategies and growth raises question marks about the feasibility of the former strategy. However, it also suggests that practitioners and policymakers need to consider the indirect as well as the direct employment effects. Firms building the value of technology may do so by outsourcing this activity to laboratories. As a
result, the employment size of the focal firm may be very low, but significant employment may be created in the laboratories being contracted to develop the technology. This was the case in one company we visited that had raised over £10 million of venture capital but directly only employed five people, yet its indirect employment creation was probably tens of people. This point also extends to policy concerning the regional impact of research-based spin-offs, since focal firms may appear to be employing few people but indirectly may be creating employment elsewhere in the region. Although it is beyond the scope of this study, this example raises an intriguing area both for policy concerning what are the most effective configuration of organisational forms for the implementation of technology strategies.

CONCLUSION

The influences on and the nature of the growth of new ventures in general, and research based spin-offs in particular remain much debated and vexed questions. In this study we sought to address these questions by shedding new light on the relationship between entrepreneurial strategy and firm growth in revenues and employment. We have thus extended previous studies beyond examination of different measures of growth and of the factors that determine market choice to consider the effects of different commercialization strategies on the nature of firm performance.

We used a unique European dataset of research-based spin-offs to show that firms emphasizing a product strategy are positively associated with growth in revenues. We also showed that firms using a co-optive strategy achieved growth in both revenues and employment. Contrary to expectation, however, we find that firms pursuing a technology strategy do not grow fast in employment. Our study thus represents a contribution towards reconciling differences in findings using different measures of the growth of new ventures. As we have indicated in the discussion, however, this is a first step and further conceptual and empirical developments are anticipated. The approach adopted may help in pointing the way forward.
REFERENCES


