INTERNAL AND EXTERNAL FINANCING OF INNOVATION:
SECTORAL DIFFERENCES IN A LONGITUDINAL STUDY
OF EUROPEAN FIRMS

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Purpose
Successful innovation requires a significant financial commitment. We therefore investigate the relation between internal and external financing and the degree of innovation in European firms.

Methodology
We carry out an empirical investigation using a longitudinal data set including 146 large, quoted, European firms over ten years, resulting in 1460 firm years.

Findings
We find that only firms in the energy sector will be more innovative when they are profitable. For the sectors of basic materials, manufacture, and construction, services, financial and property services, and technology and telecommunications, profitability is negatively related to innovation. External financing in the form of debt reduces the focus on innovation in profitable firms.

Research Implication
We analyze the findings through the lens of evolutionary economics. The model is not valid for firms in the consumer goods sector, which indicates a need for adapting the model to each sector. We conclude that the impact of profitability on innovation varies across sectors, with debt financing as a moderating factor.

Originality
To best of our knowledge, this is the first study analyzing internal and external financing and the degree of innovation in European firms on a longitudinal basis.
Introduction

Analogous to the process in natural ecosystems, firms go through evolutionary processes of selection and competition that determine who thrives and who withers into oblivion (Nelson and Winter, 1977). Innovation is a source of competitive advantage (Banbury and Mitchell, 1995; Bates and Flynn, 1995), but can also lead to the detriment of the firm when the required investments in R&D (Balakrishnan and Fox, 1993; O’Brien, 2003) are not reflected by acceptance in the selection process of the market (Dosi and Nelson, 1994). Innovation may thus difficult to fund due to the uncertain outcome (Miller and Bromiley, 1990).

The capacity to continuously generate innovations is a primary source of sustained competitive advantage (Brem, Maier, and Wimschneider, 2016; Porter, 1990). Innovation is a key driver of firm performance (Lee, Smith, and Grimm, 2003) and contributes to a dominant competitive position (Banbury and Mitchell, 1995; Bates and Flynn, 1995). Firm performance and competitive advantage thus depend on the ability to generate innovation and on the R&D activities through which innovations are generated. R&D investment is therefore a key strategic factor for most firms (Balakrishnan and Fox, 1993; Shaikh, O’Brien and Peters, 2018). Large investments in innovation may however require resources beyond the internal cash flow of a firm. In these cases, access to external resources boosts competitive advantage (Barney, 1991). More innovative firms tend to create more attractive investment opportunities and are therefore more reliant on external sources of funding than less innovative firms (Aghion et al., 2004).

However, R&D activities encounter financial constraints due to their risky nature (Miller and Bromiley, 1990). The relationship between financial factors and investment decisions has been previously researched (Fazzari, Hubbard, and Petersen, 1988; Coldbeck and Ozkan, 2018). There is evidence that financial constraints to R&D depend on specific features of the firm, e.g. size, age, or institutional factors (Hall, 2002). As R&D is often a costly and long-term investment, financing is often considered a prerequisite for innovation (Aghion et al., 2004).

In this paper, we study whether and under which conditions financing constitutes a barrier to firm innovation. We develop theory based on evolutionary economics, and deduce relationships between internal and external financing and innovation. We then formulate hypotheses about these relationships, which we test with a regression analysis on ten-year panel data from 146 large firms noted on six European stock exchanges. We assert the robustness of the results through separate analyses for different sectors and are therefore able to nuance research on the financing of innovation. For most firms, profitability is negatively related to innovation, whereas firms in the energy sector will be more innovative when they are profitable. Only for firms in the consumer-goods industry is there no relation between profitability and innovation. External financing in the form of debt reduces the focus on innovation in profitable firms. We discuss the implications of these findings for the financing of innovation as well as for evolutionary economics.

Theory and Hypotheses

Innovation can be studied as either a process or an outcome (Quintane et al. 2011). Firm processes such as innovation and technological change can be viewed through the lens of evolutionary economics and thus seen as processes of competition and selection analogous to those of natural species (Hannan and Freeman, 1977). Within the firm, some ideas are then selected in favor of others to the receive resources that they need to develop and prosper into commercialized innovations (Dosi and
Nelson, 1994). The innovations that make it through the firm process and become launched products and services then face the selection process of the market (Nelson and Winter, 1977). While some innovations are selected by the market and contribute to the economic performance of the firm, others fail to beat competition (Saviotti and Metcalfe, 2018). Firms that create successful innovations thus create income streams, which in turn constitute another selection mechanism of the market in that more innovative firms prosper and are able to fund continued innovation processes.

Financial resources are then critical to create and sustain the innovative capabilities of firms, but literature is scarce on financial constraints in R&D (Brown, Fazzari and Petersen, 2009). However, funding has been found to influence R&D investments in some developed countries like the U.S. (Savignac, 2008), Germany (Harhoff, 1998), Belgium (Cincera, 2002), Italy (Ughetto, 2008), and Ireland (Bougheas, Gorg, and Strobl, 2003).

Borisova and Brown (2013) have shown a strong and positive relationship between funds from fixed asset sales and R&D investment in firms. This relationship is stronger among firms that are financially challenged, but the effect may vary from one country to the other. For example, Mulkay et al. (2001) asserted that funding appears to be more critical for firms in the U.S. compared to those in France with respect to R&D financing and note that firms in the U.S. and some other countries lack financing for R&D. Such lack of financing has a negative impact on the innovative capabilities of firms (Hall, 1990; Giudici and Paleari, 2000).

Woodman et al. (1993) however see financial constraints as an opportunity for firms to be innovative as financial challenges improve the innovative performance of firms. In spite of this, some firms rely on external source of funding to finance their R&D. Such efforts from the external business environment are considered by most firms as a good motivation for innovation (Amabile et al., 1996). Bhattacharya and Ritter (1983) on the other hand realized that firms are cautious to access external funds to finance their R&D activities due to the odds of leaking their innovative ideas to competitors. They concluded and advised that firms should rely on internally generated funds to finance their R&D projects. Czarnitzki and Hottenrott (2011) found that internal funds are more vital for funding R&D projects than is capital investment.

Innovation in firms has been linked to performance (Pillai and Rao, 1996). On one hand, investments in R&D are an antecedent to financial performance (Ravenscraft and Scherer, 1982; Zahra and Covin, 1995). R&D and the resulting innovation are necessary for firms to create competitive advantage in changing industries. The changing context that causes declining profits may require that the little free capital available is destined to finance innovation. On the other hand, profitability has been associated with greater subsequent R&D intensity. Profitable firms have the means to make investments in R&D. A number of studies have shown a relationship between innovation and firm profitability. Roberts (1999) examined the impact of innovation on superior profits in U.S. pharmaceutical industry and found that high innovative propensity affects sustainable high profits. Cefis and Ciccarelli (2005) corroborated this finding in their study. Using a panel of 267 UK manufacturing firms from 1988–1992, they found a positive and a significant impact of innovation on firm profitability. Similar links between product innovation activity and increase in profitability have been established in later studies (Eggert et al. 2011; Chiesa et al. 2009). This link appears to persist over time (Hunt and Morgan, 1995). However, Geroski, Machin and Van Reenen (1993) contend that the positive impact of innovation on firm profitability might be a short-term effect which declines with time. This situation is very common in the services industry where innovations are easily imitable (Roberts, 1999), which is a salient
feature since the degree to which a firm profits from innovation depends on how imitable the innovation is (Teece, 1986). Kang and Afuah (2010) sustain that in order for firms to gain profit from innovation, they must position themselves and cooperate with each other even if the innovation is hard to imitate. Contrary to the views and empirical findings above, Hundley, Jacobson and Park (1996) found an inverse relationship between increase in innovation and profitability in Japan. This might be due to the size of investments required in many R&D projects (Savignac, 2008).

In view of this mixed evidence regarding the impact of profitability on innovation, we follow organizational ecology and hypothesize that in general, profitability will increase innovation. We formalize this hypothesis:

*Hypothesis 1: The level of profitability will be positively related to the level of innovation.*

The financing of innovation can take different forms. In addition to internal financing through cash flows generated by profitability, innovation can be financed through external inputs of debt or equity (Balakrishnan and Fox, 1993; O’Brien, 2003; Takalo and Tayanama, 2010). Debt and equity are different as to how they impact the governance of the firm (Williamson, 1988). Debt financing gives the lender little or no impact on firm decisions, as the holder of the debt only gains rights to the assets of the firm in case the firm does not pay back the debt. Equity financing gives the investor more control over firm decisions, as representation in the board of directors enable shareholders to be involved in the management of the firm (Balakrishnan and Fox, 1993). The presence of debt financing would therefore make firms favor exploitation of existing products which give yields in the short term, rather than long-term yields from exploration of new ideas (March, 1991).

Pecking order theory further holds that managers choose the financing source that has the highest market value and the lowest capital cost (Myers and Majluf, 1984). Firms will hence finance innovation first with internal resources and only in their absence recur to external financing, prioritizing debt over equity. More profitable firms will use less debt to finance innovation (Fama and French, 2002; Frank and Goyal, 2007). Profitability and debt have been found to exhibit a negative relationship (Donaldson, 1961). The most profitable firms carry little debt. Profitable firms usually prefer to fund new investments with retained benefits, rather than with external financing which is riskier and costlier (Hovakimian, Opler, and Titman, 2001). Very profitable firms are thus likely to finance innovation mainly through internal funds.

However, excessive amounts of debt put a strain on the firm, as the pressure to return the funds may increase default risk (Wruck, 1990). Trade-off theory holds that as debt increases, the possibility of default also rises. Therefore, the positive effect of tax savings must be balanced against the negative effect arising from the insolvency costs (Myers, 1984; Chirinko and Singha, 2000). Thus, trade-off theory yields a high recommended debt for companies with high profits. (Brealey et al 2007). Several empirical studies have shown that more profitable firms tend to use more debt for financing (Pindado, 2001; Frank and Goyal 2003; Gaud et al. 2005). The decision to raise debt therefore reflects the firm attitude towards risk (Covin and Slevin, 1988; Miller and Friesen, 1982). The riskiness of debt financing also reduces overinvestment in activities that do not create adequate value for the shareholders (Amihud and Lev, 1981).

Due to the inherent riskiness of both innovative activity and debt financing R&D-intensive firms may try to limit the use of debt (Wang and Thornhill, 2010). More innovative firms are therefore likely to be less reliant on debt financing to minimize expected bankruptcy costs (Aghion et al., 2004; Ogawa, 2007). The use of debt has
been found to decline with the innovative effort (Bartoloni, 2013). Some contradictory evidence points to that R&D intensive firms tend to be more indebted than firms with low R&D activity (Aghion et al., 2004). We adhere to the evolutionary logic that firms that are debt financed will use funds more for exploitation than exploration. We therefore hypothesize that debt financing is likely to decrease the impact of profitability on innovation. We formalize the hypothesis as follows:

Hypothesis 2: The level of debt financing will negatively moderate the relationship between profitability and innovation.

The hypothesized relationships are depicted in Figure 1.

Data and Method

We test the derived hypotheses regarding financing and innovation and the moderating effect of profitability using a longitudinal data set covering 167 large, publicly traded European firms. The sample includes the firms present in six major European stock indices, namely the Dutch index AEX 25, the French CAC 40, the German DAX 30, the British FTSE 100, The Italian FTSE MIB 40, and the Spanish IBEX 35. The firms included in the CAC 40, DAX 30 and FTSE 100 are the largest ones noted on these stock exchanges in terms of market capitalization. For the AEX 25, FTSE MIB 40, and the IBEX 35 inclusion in the index is based on share trading volume. The panel data was collected for the ten years of 2008-2017 and we were able to collect complete data from the Osiris database for 146 firms which are included in the final sample, resulting in balanced panel which represents 1460 firm years. The longitudinal dataset permits us to control for differences between firms that are constant over time.

Measures

The dependent variable, innovation, is defined as the firms yearly R&D expenditure divided by sales and thus measures the percentage of sales that is used to fund R&D. R&D expenditure has been found to be a good indicator of innovation and correlates highly with alternative measures of innovation such as patent counts, patent citations, and new product announcements (Hagedoorn and Cloodt, 2003; Griliches, 1990, 1998; Hausman et al., 1984; Hitt et al., 1997). We thus use an indicator of innovation input, but one that is highly correlated with innovation output.

The independent variable, profitability, is measured as the return on equity (ROE), i.e. the net income divided by equity, of each firm for each year. The variable hence measures how efficiently the firm is able to generate profit from the shareholder’s equity. Since the equity is one measure of firm size, the inclusion of equity in the definition of profitability is an implicit control for firm size.

The moderating variable, debt financing, is defined as the debt ratio i.e. the total debt divided by the total assets of each firm for each year. This variable thus measures the relative proportion of debt and equity used to finance the investments of the firm.

We control for exports and sector to account for the different innovation processes of firms subject to different international and sectoral dynamics (Czarnitzki and Hottenrott, 2011).

The first control variable, exports, is measured as the ratio of export sales to total sales and thus indicates to which extent the firm relies on international markets.
Innovation and internationalization are two activities that often compete for firm resources and the extent to which the firm engages in one of these activities could therefore have an impact on the other activity (Kyläheiko et al. 2011).

The second control variable, sector, is covered by the use of fixed firm effects in the regressions. However, as our theoretical development suggests differences in the validity of the model between sectors, we decided to break out this variable. The firms in the sample belong to one of the following six sectors; Consumer goods, Basic materials, manufacture, and construction, Energy, Services, Financial and property services, and Technology and telecommunications. Each sector is coded as a separate dummy variable.

With the applied regression methodology, we also control for firm heterogeneity, i.e. those effects that are different between firms but remain constant for a firm throughout the ten years of the panel, such as country and regulatory factors (Hoshi, et al., 1991).

Hundley, Jacobson, and Park (1996) controlled for macroeconomic fluctuations, policy shifts, and other variables affecting the general level of R&D expenditures through including a time variable. We control for time through including the year as the time variable in our panel.

**Estimation Method**

The dependent variable follows an exponential distribution and a generalized least squares regression is therefore likely to be appropriate (Greene, 1993). We first run the basic GLS model for the entire pooled data set (Model 1).

To control for time-variant effects and firm heterogeneity we use an estimation method that takes these factors into account (Baltagi, 2008). We thus opt for cross-sectional time-series feasible generalized squares (FGLS) regressions with panel-specific first-order autoregressive (AR(1)) autocorrelation (Cameron and Trivedi, 2005). In a regression with autoregressive correlations, the dependent variable is also a function of its own previous values for each firm. We run the FGLS model with fixed firm effects, first without including interaction effects (Model 2), and then including the interaction effect of debt financing and profitability (Model 3) to test for the moderating effect of hypothesis 2 (Baron and Kenny, 1986).

We investigate the robustness of results across sectors by introducing the sector variable. Since the sector is already present as a fixed firm effect, we run separate FGLS regressions with fixed firm effects including only the firms in one sector at a time (Models 4 to 9).

**Results**

The descriptive statistics and correlations among the variables used in the analysis are presented in Table 1. There is a significant correlation between debt financing and exports and we therefore calculate the variance inflation factors (VIFs), which are under 1.01, and the tolerance, which is over 0.98 and indicates no concern about multicollinearity in this case (Kutner et al., 2004).

Insert Table 1 about here

The results of the GLS regression analysis are detailed in Table 2.
Model 1, which is a GLS regression on the pooled data set, shows significant effects for profitability and debt financing and for the intercept of the regression curve. Some of these effects could however be due to firm-level heterogeneity, and in model 2 we control for these differences by including fixed firm effects. This model does not yet contain interaction effects, and only debt financing and the intercept are significant. In model 3, we include the interaction of debt financing and profitability. The moderating effect of debt financing on profitability is not significant and the Wald $\chi^2$ is lower when introducing the moderating variable. Our hypothesized model is thus not valid for the sample as a whole.

In model 4, we limit the sample to firms in the consumer goods sector. None of the independent variables are significant for this sector and the model is thus not relevant. Consumer-goods firms make up nearly one third of the entire sample.

In model 5, only firms in the sector of basic materials, manufacture, and construction are included. The impact of profitability is significant as is the moderating effect of debt financing. Therefore, Figure 2 plots the moderating effect of debt financing on the relationship between profitability and innovation for firms in this sector, using the procedures suggested by Aiken and West (1991). In this plot, we see that high profitability reduces innovation for this sector, in contrary to the positive effect of our hypothesis 1. High debt financing further emphasizes this effect.

In model 6, we limit the sample to the energy sector. For this sector, all independent variables have significant effects and the impact of profitability on innovation is positive in line with hypothesis 1. In the margins plot of Figure 3 we see that debt financing mitigates the positive effect, which also supports hypothesis 2 for this sector.

In model 7 the sample is limited to the service sector. The impact of profitability on innovation appears to be negative, rejecting hypothesis 1, and debt financing further reduces innovation as described in the plot of Figure 4, which supports hypothesis 2.

In model 8, only firms in the financial and property services sector are included. Profitability again has a negative impact on innovation and high debt reduces innovation further in support of hypothesis 2 as per Figure 5.

In model 9, we include only the technology and telecommunications sector. Profitability is negatively related to innovation also for this sector, and debt financing reduces innovation in support of hypothesis 2 as plotted in Figure 6.
Discussion and Conclusions

In this article we study whether and under which conditions financing constitutes a barrier to innovation for companies. The results vary for different sectors and only firms in the energy sector will be more innovative when they are profitable and thus have access to internal financing. For the sectors of basic materials, manufacture, and construction, services, financial and property services, and technology and telecommunications, profitability reduces the propensity for innovation. External financing in the form of debt reduces innovation in profitable firms and hence indeed constitutes a barrier to innovation.

The econometric analysis provides support for both our hypotheses only for the energy sector. More profitable energy firms will invest more in innovation, particularly if they have less debt financing. Innovation is important for traditional carbon energy producers as the retrieving and refining of oil and gas require large investments in long-term R&D projects. Furthermore, most of the listed companies in our sample are privately owned and are more profitable than traditional oil companies (Wolf, 2009). Thus, they are inclined to reinvest some of their profit in R&D investment in order to sustain the business. A detailed study of the impact of financing choices in the petroleum industry yielded mixed results for different types of debt (Wang and Thornhill, 2010). Profitability and innovation have been more strongly related for firms that sell renewable energy than for those that sell energy from fossil sources (Apergis and Sorros, 2014). The development of renewable energy is still dependent on developing the adequate technology as this sector is not completely mature. For instance, while in photovoltaic solar energy there is now a dominant standard, this is not yet the case in concentrated solar energy where different technologies are still competing (del Rio, Peñasco, and Mir-Artigues, 2018). This could indicate that internal, profitability-driven financing is a more important antecedent of innovation in firms and industries in intense stages of evolution where selection processes are active. It is particularly important that profits are derived towards innovation during periods of financial distress (Shaikh, O’Brien and Peters, 2018), e.g. the early years of our sample, when harsh selection processes produced by the global financial downturn eliminated many firms. Future research may consider the specific mechanisms through which the global financial climate affects our model. Corporate investments in new energy technology companies has been growing strongly in our reference period especially from ICT companies (International Energy Agency, 2018), which have a strong focus on innovation and good experiences from the external financing of innovation, which is important in that sector. For example, corporate debt is the primary factor supporting wind technology research investments, while other sources of finance play a limited role (Corsatea, Giaccarina, and Arántegui, 2014).

For the sectors of basic materials, manufacture, and construction, services, financial and property services and technology and telecommunications sectors, profitability is negatively related to innovation, thus rejecting hypothesis 1. The reason profitability is often negatively related to innovation could lie in an additional layer of selection process. Firms do not only make selections among alternative innovations, but also regarding the resources allocated to different functions, e.g. R&D, advertising, production, etc. (Levinthal, 2017). Our results could indicate that when firms are profitable, they tend to allocate funding to other functions than to R&D. Exploitation of
existing innovations is then favored in lieu of the exploration of new ideas (March, 1991). This tendency could contribute to organizational inertia that hinders established firms from innovating continuously (Hannan and Freeman, 1984).

Our cross-sectoral approach means each sector is broadly defined. Future sector-specific studies may want to delve further into the differences within sectors. For instance, basic materials, manufacture, and construction are defined as one sector, and whereas there may be innovative firms in manufacture, the construction sector is characterized by low R&D intensity and small numbers of people employed directly in R&D (Kraatz, Hampson and Sanchez, 2014).

The presence of debt financing further emphasizes the identified negative relationships, and hypothesis 2 is supported for all sectors except consumer goods. The absence of a relationship between profitability and innovation in the latter sector could be due to the intense demand for new products and services. Consumer-goods firms may not be able to afford reducing R&D intensity in times of lower profitability.

Our results thus contribute to research on the conditions under which competitive advantage can be generated through innovation (Banbury and Mitchell, 1995; Bates and Flynn, 1995). Specifically, we contribute to the literature on financing innovation (e.g. Titman and Wessels, 1988; Balakrishnan and Fox, 1993; Hundley, Jacobson, and Park, 1996; Wang and Thornhill, 2010; Bartoloni, 2013; Shaikh, O’Brien and Peters, 2018) with an investigation of the combined impact of internal and external financing of innovation. The separate analysis of different sectors further contributes to nuancing our view of innovation finance.

We contribute to the theory of financing innovation through applying the logic of evolutionary economics to these relationships (Nelson and Winter, 1977; Hannan and Freeman, 1977; Dosi and Nelson, 1994; Saviotti and Metcalfe, 2018). Inversely, we also contribute to evolutionary economics by deepening its application to the financing of innovation.

The moderating effect of debt financing on the relationship between profitability and innovation encourages managers to combine different sources of financing for innovation. In addition, the sectorial analysis enables managers to weigh internal and external financing depending on the sector in which the company is active.

The study is limited to the study of large firms. Larger companies have easier access to external financing than small and medium enterprises (Ughetto, 2008). Caution is thus suggested when generalizing the results to small businesses. There may also question about the causal effects of this study, since profitability is an antecedent of innovation, but innovation is also an antecedent to profitability. Those effects are however spread over time (Geroski, Machin and Vanreenen, 1993), and we measure profitability the same year as firms invest in the innovation process.

In conclusion, we have found that the way firms combine internal and external financing is crucial to their ability to invest in innovation, and the adequate financial structure differs across sectors.
References


Kyläheiko, K., Jantunen, A., Puimalainen, K., Saarenketo, S., and Tuppura, A. (2011),


Figure 1: Hypothesized model

- Debt financing
- Innovation
- Profitability

H1: Profitability → Innovation
H2: Debt financing → Innovation
Figure 2: Moderating effect of debt financing on the relationship between profitability and innovation for firms in the sector of basic materials, manufacture, and construction.
Figure 3: Moderating effect of debt financing on the relationship between profitability and innovation for firms in the energy sector
Figure 4: Moderating effect of debt financing on the relationship between profitability and innovation for firms in the service sector
Figure 5: Moderating effect of debt financing on the relationship between profitability and innovation for firms in the financial and property services sector.
Figure 6: Moderating effect of debt financing on the relationship between profitability and innovation for firms in the technology and telecommunications sector.
<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>
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<tbody>
<tr>
<td>1. Innovation</td>
<td>0.028</td>
<td>0.065</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Profitability</td>
<td>0.134</td>
<td>0.487</td>
<td>-0.009</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Debt financing</td>
<td>0.621</td>
<td>0.159</td>
<td>-0.083**</td>
<td>-0.020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Exports</td>
<td>1.69×10^7</td>
<td>2.70×10^7</td>
<td>-0.016</td>
<td>-0.028</td>
<td></td>
<td>0.085**</td>
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<table>
<thead>
<tr>
<th>Variable</th>
<th>Freq.</th>
<th>Percent</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
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<tbody>
<tr>
<td>5. Consumer goods</td>
<td>460</td>
<td>31.51</td>
<td>0.044*</td>
<td>0.031</td>
<td>-0.061**</td>
<td>0.037</td>
</tr>
<tr>
<td>6. Manufacturing</td>
<td>380</td>
<td>26.03</td>
<td>-0.012</td>
<td>0.003</td>
<td>-0.093**</td>
<td>-0.097**</td>
</tr>
<tr>
<td>7. Energy</td>
<td>240</td>
<td>16.44</td>
<td>-0.105**</td>
<td>-0.065**</td>
<td>0.134**</td>
<td>0.182**</td>
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<td>8. Services</td>
<td>220</td>
<td>15.07</td>
<td>-0.017</td>
<td>0.007</td>
<td>0.057**</td>
<td>-0.128**</td>
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<tr>
<td>9. Finance</td>
<td>70</td>
<td>4.79</td>
<td>0.022</td>
<td>0.029</td>
<td>-0.047*</td>
<td>-0.043*</td>
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<tr>
<td>10. Technology</td>
<td>90</td>
<td>6.16</td>
<td>0.103**</td>
<td>-0.001</td>
<td>0.038</td>
<td>0.055**</td>
</tr>
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</table>

** Correlations significant at the 5% level
* Correlations significant at the 10% level

n = 1460
Table 2: GLS regression results

<table>
<thead>
<tr>
<th>Group</th>
<th>Model</th>
<th>1</th>
<th>2</th>
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<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>Profitability</td>
<td></td>
<td>-2.958**</td>
<td>0.002</td>
<td>-0.048</td>
<td>-0.018</td>
<td>-0.076**</td>
<td>0.041**</td>
<td>-0.094*</td>
<td>-0.023**</td>
<td>-0.145**</td>
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<td>Debt financing</td>
<td></td>
<td>-1.539**</td>
<td>-0.040**</td>
<td>-0.042*</td>
<td>-0.003</td>
<td>-0.016*</td>
<td>-0.040**</td>
<td>-0.033**</td>
<td>-0.002</td>
<td>-0.189**</td>
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<tr>
<td>Debt financing × Profitability</td>
<td>3.362*</td>
<td></td>
<td>0.047</td>
<td>0.017</td>
<td>0.092**</td>
<td>-0.056**</td>
<td>0.051**</td>
<td>0.032**</td>
<td>0.157**</td>
<td></td>
</tr>
<tr>
<td>Exports</td>
<td></td>
<td>0.000</td>
<td>-0.000</td>
<td>-0.000</td>
<td>0.000</td>
<td>-0.000**</td>
<td>-0.000**</td>
<td>-0.000**</td>
<td>-0.000**</td>
<td>-0.000**</td>
</tr>
<tr>
<td>Constant</td>
<td></td>
<td>-2.529**</td>
<td>0.060**</td>
<td>0.094**</td>
<td>0.035**</td>
<td>0.037**</td>
<td>0.041**</td>
<td>0.093**</td>
<td>0.038**</td>
<td>0.188**</td>
</tr>
<tr>
<td>Wald $\chi^2$ (df)</td>
<td></td>
<td>18.47**</td>
<td>8.89*</td>
<td>17.10**</td>
<td>45.09**</td>
<td>293.32**</td>
<td>26.77*</td>
<td>15.95**</td>
<td>2122.88**</td>
<td></td>
</tr>
</tbody>
</table>

** Estimates significant at the 5% level
* Estimates significant at the 10% level