Paper to be presented at the

35th DRUID Celebration Conference 2013, Barcelona, Spain, June 17-19

The Performance Effect of Business Model Innovation: An Empirical Analysis of Pension Funds

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Abstract

This paper focuses on the performance effect of business model innovation in incumbent firms in an environment where IP protection is not an option. We utilize a direct measure of business model innovation to test the performance effect. Furthermore, we look at the influence of contingency factors on this relationship. Business model innovation is operationalized by using a NK-model approach. We use a panel dataset consisting of single, incumbent firms to test our hypotheses. The empirical setting is the Australian pension industry, an established and fast growing industry. The panel spans the years 2003-2010 and consists of a total of 64 firms. The empirical analysis shows a positive effect of business model innovation within incumbents on their operational performance. This effect is moderated by the size of the firm and the experience of the firm. Larger sized firms are better able to exploit the opportunities of business model innovation and show a reinforcement of the effect. Firms with experience in a domain close to the target environment also show a stronger ability to exploit the opportunities of business model innovation.

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Abstract

This paper focuses on the performance effect of business model innovation in incumbent firms in an environment where IP protection is not an option. We utilize a direct measure of business model innovation to test the performance effect. Furthermore, we look at the influence of contingency factors on this relationship. Business model innovation is operationalized by using a NK-model approach. We use a panel dataset consisting of single, incumbent firms to test our hypotheses. The empirical setting is the Australian pension industry, an established and fast growing industry. The panel spans the years 2003-2010 and consists of a total of 64 firms. The empirical analysis shows a positive effect of business model innovation within incumbents on their operational performance. This effect is moderated by the size of the firm and the experience of the firm. Larger sized firms are better able to exploit the opportunities of business model innovation and show a reinforcement of the effect. Firms with experience in a domain close to the target environment also show a stronger ability to exploit the opportunities of business model innovation.

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INTRODUCTION

Business model innovation has seen strong interest in practitioner and academic research alike (e.g., Casadesus-Masanell & Zhu, 2012; Chesbrough & Rosenbloom, 2002; Reeves & Deimler, 2011; Zott & Amit, 2007). Past work has especially focused on defining a business model and setting it apart from other constructs (Baden-Fuller & Morgan, 2010; Sabatier, Mangematin, & Rousselle, 2010; Teece, 2010; Zott & Amit, 2008). Furthermore, antecedents and barriers to business model innovation have been researched (Amit & Zott, 2001; Casadesus-Masanell & Zhu, 2012; Chesbrough, 2010; Hartmann, Oriani, & Bateman, 2013; Sosna, Trevinyo-Rodrìguez, & Velamuri, 2010; Tripsas & Gavetti, 2000).

The result of business model innovation for a firm in terms of performance has so far received less attention. A call has been voiced for further research on the impact of business model innovation on performance (Zott & Amit, 2007). Work has tried to shed light on the relationship between business models and organizational performance. This research focused on new business models of entrepreneurial firms. It compared different types of business models and their performance effects (Zott & Amit, 2007). Other studies have focused on the shift from free to fee business models in the digital domain (Pauwels & Weiss, 2008) or the comparison of different business models in the biotechnology industry (Patzelt, Zu Knyphausen-Aufseß, & Nikol, 2008). The recent study of Desyllas and Sako (2012) focuses on a pay-as-you-go insurance business model and looks at business method patenting and possible profits a firm can derive from this type of intellectual property (IP) protection. They see a three step approach to profiting from business model innovation. Firstly, firms protect the new business model with patents, wherever possible. Secondly, firms try to exploit the IP rights and lastly, firms aim to build complementary assets. However, this leaves open the issues of the performance effect of business model innovation in incumbent firms when no patenting can be applied and hence a firm

does not gain time to fully develop its business model and create legal first mover advantages. Overall, we see a gap in understanding if the performance gains of business model innovation are retained, even when IP protection mechanisms cannot be employed.

Past work has also looked at contingency factors of the business model innovation to performance relationship. In particular, broader environmental regimes have been analysed (Zott & Amit, 2007), as well as specific complementary assets that help the new business model to succeed (Desyllas & Sako, 2012). However, firm-level contingency factors that are not directly related to the business model have also so far not been considered in the business model innovation to performance link. We extrapolate from past work in trying to derive general, firm level factors that could act as a contingency on the performance relationship of business model innovation. The size of the firm has been seen to be positively related to the performance of new ventures competing on the market with new business models (Zott & Amit, 2007). However, while a direct effect of size on performance was found, a possible moderating effect was not analysed. Furthermore, we see the possible advantage of relationships and links with other stakeholders in increasing the monetary success of business model innovation (Desyllas & Sako, 2012) and hence expect the experience of the firm in the target environment to play a significant role in moderating the performance effect. The target environment hereby defines the environment in which the new business model will be embedded.

Therefore, in this paper, we strive to answer the following research questions: What is the performance effect of business model innovation within incumbent firms independent of IP protection? What contingency factors play a role when assessing the influence of business model innovation on the performance of a firm?

To test our model and hypotheses, we use a unique database of firm characteristics for pension funds in the Australian pension industry, spanning the years 2003-2010. We analyse this

data base to test our theory and derived hypotheses on the performance effect of business model innovation within incumbent firms. A business model innovation value for each firm is derived by using a NK-model approach (Hartmann et al., 2013). This variable is then employed as independent variable in our regression analysis to better understand the performance effect of business model innovation. Furthermore, we theoretically derive possible contingency factors that influence the relationship and test these hypotheses empirically. Lastly, we consider an adequate way to express different degrees of business model innovation that can be pursued by incumbent firms.

This paper contributes to extant research by, firstly, providing an empirical analysis of the effect of business model innovation in incumbents on their performance irrespective of patenting options. Past work emphasized the need to understand the result of business model innovation (Zott & Amit, 2007) and thus give guidance as to the payoff for firms embarking on this trial-and-error process (Sosna et al., 2010). We extend work that looked at partly patentable business models (Desyllas & Sako, 2012) and also go beyond past research (Hartmann et al., 2013) that looked at antecedents to business model innovation within incumbents.

Secondly, we propose a means to classify business model innovation according to the scope of the innovation effort. This allows us to distinguish performance effects depending on the intensity of business model innovation conducted and to build on the well-known distinction between incremental and radical innovation (Crossan & Apaydin, 2010).

Lastly, we provide an analysis of possible contingency factors on the firm level of analysis of the relationship between business model innovation and the performance of the firm. This allows us to take a look at factors that could influence the relationship between business model innovation and performance and enable a firm to better exploit the possibilities of a new

business model. In this we depart from previous research that looked at different environmental regimes influencing the performance effect of entrepreneurial business models (Zott & Amit, 2007).

We build upon the innovation and strategy literature to guide our theoretical development and to formulate relevant hypotheses on the firm level of analysis.

The remainder of the paper is organized as follows. Firstly, we reflect on the business model construct and choose a definition well suited for empirical analysis. Secondly, we describe our theoretical considerations and develop our hypotheses. Thirdly, we specify our methodology and data. Next, we present the results of our empirical analysis before, lastly, discussing results and avenues for future research.

THEORY AND HYPOTHESIS DEVELOPMENT

The Business Model Innovation Construct

Business model innovation has been widely discussed and defined in the literature but no consensus for a precise definition of the construct has been achieved (George & Bock, 2011; Zott, Amit, & Massa, 2011). Multiple definitions have been presented, each with a different angle on business model innovation (Afuah & Tucci, 2001; Amit & Zott, 2001; Baden-Fuller & Morgan, 2010; Casadesus-Masanell & Ricart, 2010; Chesbrough & Rosenbloom, 2002; Demil & Lecocq, 2010; Johnson, Christensen, & Kagermann, 2008; Morris, Schindehutte, & Allen, 2005; Seelos & Mair, 2007; Stewart & Zhao, 2000; Teece, 2010; Williamson, 2010).

We build on previous work regarding antecedents to business model innovation and utilize a definition of business model innovation that allows for immediate empirical implementation. Accordingly, we define business model innovation as the "modification or introduction of a new set of key components – internally focused or externally engaging – that enable the firm to create and appropriate value." (Hartmann et al., 2013, p. 5).

This definition of business model innovation draws upon research on business models from an activity-based perspective (Zott & Amit, 2010) as well as including a component approach (see also Seelos & Mair, 2007). The definition used here furthermore allows a more general view of the business model construct and allows direct application to an empirical context outside of the e-business and entrepreneurship literature. Innovation is seen as absolute, as well as relative novelty (Crossan & Apaydin, 2010; Van de Ven, 1986). Hence, an innovation can be new to the world, but also just new to the firm under analysis. This is in accordance with past work on innovation studies (Garcia & Calantone, 2002) and research on business model innovation (Amit & Zott, 2010).

The Performance Effect of Business Model Innovation

Incumbents strive to stay on top of their game and find ways to better compete against their rivals. Innovation and renewal can help a firm find a new competitive edge. However, a sole focus on R&D and new product development does not guarantee a sustained competitive advantage. A firm must also look towards its business model to find innovation that can have an impact on the performance of the firm (Chesbrough, 2007). For incumbent firms, business model innovation can be a means of renewal and adaptation to a changing market. Business model innovation allows the firm to enhance value creation and appropriation (Teece, 2010). Incumbents can struggle to develop a new business model to accommodate a changing market

environment (Chesbrough & Rosenbloom, 2002). High risk and uncertainty are clearly associated with business model innovation. Firms that decide to continue on this path must be prepared to overcome these barriers (McGrath, 2010). Business model innovation is also an opportunity for a firm that can result in a competitive advantage (Reeves & Deimler, 2011; Teece, 2010). A firm may be able to exploit a market niche not addressed by its competitors and thus serve a latent demand in the market or open up a completely new market. Past research on different business model designs has seen positive performance effects for novel business models (Zott & Amit, 2007). Other work has noted that the potential of technologies can often only be tapped by utilizing a new business model (Chesbrough & Rosenbloom, 2002). Overall, an incumbent might struggle to embark on the process of business model innovation. However, if the firm succeeds in implementing the innovation we expect a positive effect on the performance of the firm.

In formal terms:

Hypothesis 1: Business model innovation has a positive influence on the performance of a firm

Business model innovation is a complex task for a firm to achieve. It reworks the most basic routines ingrained within the firm. However, the degree of renewal conducted by a firm can differ in intensity of the innovation effort. We draw upon the distinction between incremental and radical innovation (Crossan & Apaydin, 2010) to classify business model innovation. Incremental innovation per se focuses on small innovative steps. Radical innovation in contrast is a much heavier effort for a firm that results in a much wider scope. It is important to note that both radical and incremental innovation are classified as explorative behaviour (Crossan & Apaydin, 2010) that leads the firm away from known territory. The difference between the two lies in the magnitude of the innovation (Gopalakrishnan & Damanpour, 1997).

Incremental business model innovation is seen as a change of small magnitude. In our definition of a business model this would for example relate to a change in just one business model component. Hence, while constituting a departure from the status quo, the business model remains relatively close to its original form. Radical business model innovation is seen as a change of large magnitude. In our definition of business model innovation such a change would relate to a simultaneous change of the majority of all business model components. Thus, radical business model innovation establishes a stronger distance to the status quo. However, it is difficult to denote when incremental business model innovation finishes and radical business model innovation starts. Hence, we see a fluid change between incremental and radical business model innovation making the concept continuous.

In light of this distinction, we consider a difference in the performance effect of business model innovation depending on the radicalness of the innovation. Incremental business model innovation is a change of smaller magnitude and hence less complexity in innovating the business model can be assumed. An easier absorption into existing structures can be expected and hence possibly a stronger utilization of the value creating possibilities of the new business model. Radical business model innovation in contrast, is a change of large magnitude involving higher complexity. Significant resources are needed to achieve the implementation and a higher degree of uncertainty of success can be assumed. Hence, while a positive effect on performance is still expected, the larger drain on resources will lower the effect.

Thus, we assume an inverse u-shaped effect of business model innovation on performance. A strong increase in performance is expected for business model innovation up to an inflection point from which the positive effect decreases in size, as we move towards radical business model innovation. In formal terms:

Hypothesis 2: An inverted u-shaped relationship exists between the radicalness of business model innovation and the performance of the firm

We propose a positive effect of business model innovation on the operational performance of the firm. However, the linear effect of business model innovation on performance could depend on contingent factors. Past research on appropriability measures for business model innovation in pay-as-you-go insurance found the importance of specialized complementary assets in order to fully exploit the potential of this type of business model innovation (Desyllas & Sako, 2012). Research on organizational innovation and performance has seen an important role of moderators influencing the innovation to performance relationship (Damanpour, 1991). The size of the firm has been associated with firm innovation in a variety of research (e.g., Cohen & Klepper, 1996; Damanpour, 1991). Furthermore, business model research has seen a significant effect of size on the performance of new ventures promoting new business models (Zott & Amit, 2007). Here we extend this work by looking at firm size as moderator of the business model innovation to performance relationship. Hereby, we utilize a definition of firm size as the "scale of an organization's operations" (Aldrich, 1972, p. 33; Kimberly, 1976)

Research and development productivity has been shown to have a mixed relationship with firm size (Cohen & Klepper, 1996). We are interested in understanding, if firm size influences a firm's ability to exploit the opportunities presented by the business model innovation and hence moderates the business model innovation to performance link Firm size has been seen to be positively related to performance (Gooding & Wagner, 1985). A positive effect can derive from economies of scale (e.g., Thompson, 1967), the better relationships and control of external stakeholders and resources (Aldrich & Pfeffer, 1976) or bargaining power (Zott & Amit, 2007). These advantages of firm size are also positive when considering the effect of business model

innovation on performance. Economies of scale should allow a firm to gain a better cost position on all elements related to business model components that are scaleable, such as IT systems. Secondly, the stronger control of stakeholders and better relationships should increase acceptance of the new business model, influencing its profitability. Firms of smaller size do not have these advantages at their disposal that can strongly influence the value creation potential of a business model. Hence, we see a positive moderating effect of the size of the firm on the effect of business model innovation on performance. In formal terms:

Hypothesis 3: The effect of business model innovation on performance is positively moderated by the size of the firm

Moderating effects can also derive from a firms' experience. Past research has shown that prior experience of a firm can influence its entry into a new market, innovative capability and performance (Klepper & Simons, 2000). Other research noted that change is beneficial if organizations can build on their original domain and the competences developed therein (Haveman, 1992). A firm whose original domain is closely related to the target environment of the innovated business model will be able to draw on competences to help make business model innovation a success. This enables firms to avoid pitfalls in business model innovation and better exploit the new opportunities presented through the innovated business model. Past research in business model innovation showed the importance of relationships and links to other stakeholders (Desyllas & Sako, 2012). For example, a good relationship with third parties can allow a firm to negotiate a better deal for necessary collaborations that could result from a new business model. In contrast, a firm that does not have such a deep understanding of the industry will be more likely to embark on a costly trial-and-error process. Inexperience can provoke the firm to spend

more resources on elements of a business that might not pay off or fail to see the full potential of business model innovation. Ultimately, the firm cannot fully exploit the economic value that the business model innovation can provide. In formal terms:

Hypothesis 4: The effect of business model innovation on performance is negatively moderated by firm inexperience of the target environment

RESEARCH DESIGN

Empirical Setting and Data Collection

The business model literature has analysed firm performance in the context of entrepreneurial ventures and new business model design (Pauwels & Weiss, 2008; Zott & Amit, 2007). The high-tech industry and online businesses dominate the research space (for an exception, please see Desyllas & Sako, 2012). Traditional industry settings and mature firms have so far received little attention in an empirical and quantitative way. Here, we address this gap and depart from the emphasis on new ventures within the high-tech industry and focus on incumbent firms in a more traditional business space. Specifically, the empirical analysis looks at firms in the Australian pension fund industry[1].

Performance analysis of business model innovation must overcome several possible pitfalls. In order to gain the most comprehensive view of the impact of an innovation of the business model, it is important to not only look at the development over time for an individual firm, but to be able to compare across firms. This necessitates a dataset of single firms faced with

[1] Australia's pension fund industry is locally referred to as superannuation industry. The superannuation industry is the pension system of Australia with mandatory membership for working individuals and compulsory contributions through employers.

the same environmental conditions and limited diversification into other industries. In particular, it is important to be able to directly measure the performance of the single firm. Problems arise when conglomerates or firms with multiple business units are considered that are also active in multiple industries (Dess & Robinson, 1984).

An analysis of the Australian pension fund industry over time allows this comparison. The Australian pension fund industry is an established industry that has grown into a AUD 1.4 trillion business (as of June 2012) and biggest retirement income system of this kind on a per capita basis in the world (APRA, 2012a). It is an established industry that has been growing continuously since its inception in the 1980s (APRA, 2007). A multitude of funds exist that compete on the market with different business models. Hence, the allows the analysis of incumbent firms in contrast to entrepreneurial new ventures. Furthermore, this enables us to focus on business model innovation in contrast to new business model design without having to reduce our analysis to a specific business model.

The Australian pension fund industry is regulated by the Australian Prudential Regulatory Authority (APRA). The regulatory framework envelopes all funds within the industry. It is an advantage for the proposed research as it creates a uniform environment in which funds must compete on the market. This ensures that firm strategies that could distort the proposed analysis, such as diversification efforts or internationalization of the business (Desyllas & Sako, 2012) are not existent or kept to a minimum. Hence, businesses remain highly comparable over time, allowing a more precise estimate of the effect of business model innovation on the performance of the firm. However, it is important to note that regulation also poses a challenge to the proposed research. Regulation changes and new laws alter the environment for funds and can influence the performance of the funds. But, the changes affect all funds in the same way. For example, a new tax will be felt by all pension funds, not just a select few.

Data collection is good for the presented research setting, with government collected data, industrial group publications and fund specific communication publicly available. We use a dataset of pension funds within Australia developed by the authors and track their performance and other firm characteristics over time. The dataset combines information from various sources, specifically a regulator developed database (APRA, 2012b), surveys published by the industry organization ASFA (ASFA, 2003-2011) and single fund annual reports analysed by the authors. Funds contained in the dataset are a randomly selected subset of the total industry. The multiple data sources allow us to avoid common method bias. In total, the database is an unbalanced panel over the years 2003-2010 with a total of 64 funds.

Explanation of Model Variables

We wish to empirically test our theoretical hypotheses regarding the performance effect of business model innovation and moderating variables. In order to set up the empirical analysis, we define relevant variables for the regression.

Dependent variable. The dependent variable was chosen in order to reflect the *operational performance* of the funds under analysis. An important aspect of variable selection was the reflection of not only investment performance, but also operational improvements. The inclusion of the operational side is important for this research, as business model innovation can manifest itself in all areas of the firm, including its operations. This is sustained by past work that explicitly included efficiency considerations into the typology of new business models (Zott & Amit, 2007). Hence, we utilize the net operational performance of the fund after tax as dependent variable in the regression. For all funds and years in the analysis the same data source is used, namely government provided data (APRA, 2012b).

Independent variables. *Business model innovation* is operationalized by using a NK-model approach (Hartmann et al., 2013). The NK-model has been utilized in the strategic management literature for the theoretical representation of complex problems (Kauffman, Lobo, & Macready, 2000; Levinthal, 1997; Westhoff, Yarbrough, & Yarbrough, 1996). Strategic problems, such as hierarchical decision processes (Rivkin & Siggelkow, 2002) or corporate strategy (Caldart & Ricart, 2004) have also been analysed under a NK-model framework.

The NK-model consists of N components and K levels of interaction between the components to generate a fitness landscape that reflects the solution space of an optimization problem. Firms move around this space as they consider different solutions for a problem at hand. Each solution equates to a position on the landscape and is given a fitness value. The fitness value changes, as the firm moves along the landscape. We apply the NK-model to business model innovation by defining the N components as innovation options of the firm (Hartmann et al., 2013). In line with past research in the social sciences (Levinthal, 1997) no interaction is assumed between the components, hence resulting in K=0.

Seven innovation options are considered within the empirical setting. The different components were derived from interviews with academics, the regulator and fund representatives. Interviews were structured in open form with broad and general questions asked to avoid a bias of the interview partner towards pre-specified components. Results were then summarized, mapped against previous research before again being discussed. The resulting components constitute the major innovation activities that impacted the business models of pension funds in the time frame under study. None of the derived components are patentable business methods under current law (Australian Government, 2003). The following seven components are considered: transition to retirement product, in-house administration, unit pricing, online account access, online transactions, alternative investments, financial planning affiliate.

A transition to retirement product relates to a pension stream that can be granted to members close to retirement age. The introduction of such a product strongly changes the value proposition of a fund. Secondly, in-house administration relates to administration services performed by a fund's own staff, hence implying a stronger sophistication of the fund. Next, unit pricing relates to the valuation of member fund balances and stands in contrast to a crediting approach typically used. Unit pricing evaluates each balance individually on the basis of bought units representing the balance of the account. Crediting looks at the whole fund and distributes profits/losses proportionally to the funds held by a member. Fourthly, online account access enhances the value proposition for members and leads to more sophisticated operations. Fifth, online transactions allow members to use their accounts electronically and are a significant step up from the often employed "only checks accepted" approach. Next, alternative investments refer to the usage of alternative investment vehicles in the investment of fund assets and show a stronger expertise of the fund. Lastly, a financial planning affiliate provides financial planning advice to members through own staff and shows a stronger evolution of a fund to a financial services firm.[2]

Each firm makes a decision about the implementation of the individual components. This results in a decision vector for each firm $[d_1\ d_2\ \dots\ d_N] = \mathbf{d}$. Each decision d_i is associated with a contribution value specific to the component the decision relates to. A function is then used to combine all contribution values derived from the decision stream. Here, we utilize a simple additive fitness function. This function gives the fitness value for each firm described earlier. The position of a firm on the landscape can then be described through this fitness value.

In the specific case of business model innovation, a firm makes a decision regarding the implementation of each innovation component. For simplicity, the contribution value of each

[2] Please also see Hartmann et al. (2013) for an application of the NK-model to the Australian pension fund industry.

decision is set as equal to one if the decision was taken to implement the innovation to the business model and zero if otherwise. Utilizing the additive fitness function gives the fitness value of the business model of a firm at each point in time in relation to the innovation components. To answer the question of innovation of the business model, the difference of two fitness values at two points in time is taken. This approach allows us to generate a business model innovation value for each fund at each point in time in the database. This variable then allows us to enter a specific business model innovation value for each fund into the regression analysis.

The business model innovation value enters the regression analysis with a time lag. Previous research on business model innovation and expected time effects is lacking until now. Hence, we draw upon research on mergers and acquisition transactions to decide on an adequate time frame. Research has shown that the time delay is affected by the type of acquisition, as well as firm and industry specific factors (Zollo & Meier, 2008). A short-term time frame is hereby defined as up to one year from the completion of the transaction. This time tends to include the initial impact of the merger and acquisition integration process. Here we are not only interested in the initial impact, but also a longer-term effect. In deciding on a time frame, we also consider industry characteristics. Namely, the fact that the pension fund industry is a service industry. This can simplify implementation times making performance effects visible sooner. Hence, we double the short-term time-lag and propose a two-year time lag in order to understand the impact of business model innovation on performance. However this merits empirical testing. The data underlying this variable was taken from industry body surveys (ASFA, 2003-2011) combined with fund annual reports.

We define the *size of the firm* as the logarithm of the amount of members of the fund. This measure reflects the scope of a fund's operations and hence fits our needs very well. Member size is a good reflection of a fund's operations, as each member needs to be administrated by the fund,

independent of the balance in the member account. Assets under management do not necessitate this work by the fund. To invest 1 dollar or 1000 dollars does not make a big difference, but to adequately service 1 member or 1000 members is a game-changer. Hence, we utilize firm size by members to reflect the scope of the pension funds' operations. The values for the size of the fund are taken from government provided data (APRA, 2012b).

Firm inexperience is operationalized by looking at the inexperience of the fund in the target environment, i.e. the financial service industry. Funds that show a longer and tighter relationship to this industry are taken to have stronger experience of its operations, possibilities and players than funds that do not have this background. The empirical setting allows us to approximate the experience/inexperience of a fund within the financial service industry by looking at the origin of the fund. Historically, funds in this industry come from diverse industrial backgrounds (APRA, 2007). For example, some funds were founded as a spin-off to a corporation that aimed to provide pension services to its employees. These corporations could be part of an array of industries ranging from mining, to automobiles or financial services. The close connection to the corporation meant that many to all board members came from this corporation and many operations of the fund were conducted by the founding corporation that thus imprinted its knowledge and culture onto the spin-off fund. Hence, we use this fund background to distinguish between funds that originated strongly embedded in the financial service industry versus funds that were not so. We assume that a negative moderation will be visible for funds not originating from the financial service industry reflecting their relative inexperience. Hence, we generate a dummy variable that discriminates between experience and inexperience. Data is taken from an analysis of fund annual reports.

Control variables. We include further variables in the regression analysis that could influence the operational performance of pension funds. In this, we also aim to reduce omitted variable bias in the regression. The regression includes asset growth of a fund between respectively the present and past year. We also include the public offer status of a fund in the regression. The public offer status relates to the membership of a fund. Public offer funds are open to all individuals, whereas non-public offer funds are restricted to a select group, for example the employees of a specific company. The above variables are taken from government supplied data and industry body surveys. A variable that reflects the fitness value of the business model of a fund at the beginning of the period under analysis is also included in the regression. This should address any issues that might result from funds that innovated prior to the time period being analysed. This variable value is a product of the NK-model used to analyse business model innovation within the funds. Individual year dummy variables are also included in the analysis.

Econometric modelling and estimation approach

Data analysis and model testing preceded the selection of an appropriate regression model for the described analysis. We analyse the data using a generalized linear model with lagged independent variables. This model is preferred, as it takes the within-subject correlation into account without necessitating a direct specification of the correlation (Liang & Zeger, 1986; Zeger & Liang, 1986). Furthermore, it recognizes the panel structure of the data by accommodating grouping on the fund ID. This corrects the regression for possible unobserved firm effects. Furthermore, year dummy variables are included to cater for time effects in the regression. Both together ensure validity of variable coefficients. Standard errors and p-values are corrected for the panel data by taking clustering of data points on the fund ID into account (Cameron & Trivedi, 2010). We calculated variance inflation factors (VIF) to test for multicollinearity among the independent

variables (Kleinbaum, Kupper, Nizam, & Muller, 2008). VIF is acceptable at all levels with mean VIF at 1.39 for the general measure of business model innovation and without the interaction terms for moderation or time-lags of the business model innovation measure.

Moderation is tested in the regression analysis by including the moderator variable, as well as an interaction term between the moderator and the business model innovation value. A value of mean VIF at 3.77 is reached when we add the interaction terms for moderation in the analysis without time-lags and a value of VIF at 10.52 with two year time-lags. The increase in collinearity is driven by the relationship between the business model innovation value and the interaction terms. We do not mean-centre the interaction terms to reduce multicollinearity, as recent research advised against this process (Echambadi, Campbell, & Agarwal, 2006). Overall, we conclude VIF to be within acceptable levels. Furthermore, we tested for serial correlation of first order using a Wooldridge test and found no indication of serial correlation (p-value 0.06) for the full model including interaction effects and time-lags. Overall, we find our model to be valid and robust for the conducted analysis.

RESULTS

Descriptive Statistics

Table 1 provides descriptive statistics for the variables used in the regression analysis at no lag length. The dependent variable is the log of the operational performance of a fund. It ranges from a minimum of 5.21 to a maximum of 16.48 with the mean value at 12.17. Hence, ample variation exists between funds to allow an analysis of different performance effects.

The values of business model innovation (BMI) are generated by using a NK-model framework. The variable at two year lag shows that between zero and four components are

changed simultaneously in any given year describing the different categories of business model innovation. A mean of 0.60 shows that most firms do not innovate the business model in most time periods. This is in line with expected results, as business model innovation is a costly experience for firms and will hence not be conducted in every time period. It remains an unusual event for a firm. Secondly, the design of the NK-model limits the possible innovation options to pre-specified components; hence innovation outside of these components is not picked up by the model[3].

INSERT TABLE 1 ABOUT HERE

Furthermore, we see that the average firm starts into the analysis with at least one innovation component already present (fitness value (2003) with mean 1.55). The range of values spreads from zero to five. The variable for firm size ranges from 917 to ca. 1.9 million, with a mean of ca. 181 thousand members. Hence, a good size range is present in the analysis. Firm inexperience as dummy variable shows a mean of 0.94. This also indicates a high amount of firms not originating from the financial service industry in the dataset.

INSERT TABLE 2 ABOUT HERE
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[3] Please notice that once a firm has implemented all seven possible components in the time period, the model currently does not allow for further modifications of the business model. Outside of the time frame under study a firm can revisit individual components and modify or introduce new components. In the time frame of our analysis this was not the case. The seven considered elements constitute the most important business model innovation efforts in the time span under study. However, considering that only 4 of seven possible components were changed simultaneously, the second argument seems to stand back in comparison to the first. Most firms would still have had enough degrees of freedom in the model to continue to innovate the business model.

Table 2 shows the Pearson correlation coefficients between the variables (without time-lags) in the regression. A test for multicollinearity showed no cause for concern with VIF factors within acceptable levels.

Hypotheses Tested

Table 3 shows the results of the regression analysis regarding business model innovation and the effect on firm performance. Five models are tested, starting with a base model as model 1 and followed by models testing the direct effect of business model innovation on performance including different lag lengths (model 2 and model 3). Model 4 relates to the radicalness of business model innovation and tests the hypothesized inverse u-shaped relationship of radicalness of business model innovation on performance. Lastly, a fifth model is run that includes all independent and control variables to test our hypotheses regarding business model innovation and firm performance under consideration of contingency factors of this linear relationship.

Model 1 is a baseline model that consists of only the dependent variable and control variables. Asset growth and the size of the fund expressed as number of members are both significant at 1% level and 0.1% level respectively, and positively influence the operational performance of a fund. Firm industry inexperience shows a negative effect on the performance of the firm, as expected. This effect is significant at 1% level. The fitness value at the beginning of the time period considered shows a positive effect. Lastly, the public offer status shows a positive effect on the operational performance. These effect are however not significant.

INSERT TABLE 3 ABOUT HERE

Model 2 and model 3 tests our hypothesis relating business model innovation to the operational performance of the firm. Both models are used to determine the appropriate lag length of business model innovation. Theoretically we derived a two year lag length, however this merits further attention. We use an iterative approach of lag elimination to understand the validity of a two-year lag length. Hence, we start by looking at a three lag length model (model2). This model does not show significance in any lags, but most importantly, not in lag 3. Hence, we eliminate this lag and test the model again with only two lag lengths (model 3). Here we find significance for the second lag and hence refrain from reducing lags further. Model 3 hence allow us to test hypothesis 1 (regarding the performance effect of business model innovation). The regression results indicates support for the hypothesis. Business model innovation, measured as simultaneous changes in components shows a positive coefficient in the regression at a two year lag. The coefficient is significant at 5%.

All control variables show the same direction of effect and significance levels on operational performance as in model 1 with the exception of the fitness value at the beginning of the time period increasing significance to 10%.

In model 4 we enter a quadratic term of business model innovation into the regression to test hypothesis 2 (regarding the inverse u-shaped effect of radicalness on performance). We retain the derived two-year lag length. The coefficient of the quadratic term is negative and the linear effect is positive indicating an inverted u-shaped effect between the radicalness of business model innovation and performance. However, the effect is not significant. Hence, we can assume that the effect of business model innovation on performance does not differ strongly enough for different degrees of radicalness. Nonetheless, we see this as a first indication of an inverse u-shaped relationship that merits further attention.

Model 5 looks at contingency factors that moderate the linear relationship between business model innovation and firm performance. We exclude the quadratic term, but retain the two-year lag length. Firstly, we see an increase in the positive coefficient for the business model innovation variable and significance level. This increase indicates that the direct effect model (model 3) suffered from omitted variable bias. Model 5 removes this deficit and hence shows a more appropriate effect with a much larger coefficient. The change in coefficient should not be interpreted as resulting from the increase in collinearity through the interaction terms, but rather a better specification of the model (Echambadi et al., 2006).

Hypothesis 3 (regarding the size of the firm) is supported by the regression. The model, firstly, shows a positive effect for the contingency factor of firm size on the performance of the firm, which is significant at 0.1%. This indicates that larger firm size has a positive effect on the performance of the firm. We can see this as an indication of economies of scale that could be present within the industry for larger firms and that would boost their performance. Secondly, the interaction term included in model 5 that reflects the moderating effect of firm size, shows a significant (1% level), positive effect on the performance of the firm at lag length 2. This positive effect indicates that larger firms gain more in terms of performance from business model innovation. It is important to note that this influence exists, notwithstanding the inclusion of a direct effect of firm size by members in the regression. Furthermore, a direct effect of business model innovation on performance remains positive and with significance at 1%. Hence, an increase of this positive effect is seen for larger firms confirming a positive moderation.

Model 5 also shows support for hypothesis 4 (regarding firm inexperience). The direct effect of firm inexperience on the performance of the firm is negative and significant at 1%. This indicates that firms with more experience have an advantage in the market. The interaction effect tests, if this advantage in the market is carried over to the monetization of business model

innovation. The coefficient of the interaction is negative indicating that less experienced firms are not able to fully capture the value business model innovation can generate for a firm. The coefficient is significant at 5% level for a two-year lag.

All control variables retain the same direction of effect as in the previous models.

DISCUSSION AND CONCLUSION

Business model innovation has found strong support as option for firms to generate a competitive advantage (Reeves & Deimler, 2011; Teece, 2010) and as an instrument to adapt to a dynamic environment. The performance effect of business model innovation for incumbent firms has however so far not seen extensive empirical study. In particular, we focus on the general case of business models that do not fall under intellectual property protection. Business model innovation is seen as a set of components that allow a firm to create and appropriate value (Hartmann et al., 2013). The empirical analysis shows that business model innovation has a positive effect on the performance of the firm. This effect is positively influenced by the contingency factors of firm size and firm experience. We find a stronger performance effect of business model innovation as firm size increases. Furthermore, we find that firms that can build on experience gained in their original domain achieve better performance effects through business model innovation. Lastly, we find that the effect of business model innovation on performance indicates an inverse u-shaped relationship when considering the radicalness of the business model. This effect is however not statistically significant.

This paper contributes to the extant literature in multiple ways. Firstly, this analysis allows a view on the effect of business model innovation on the operational performance of a firm independent of IP protection mechanisms. Hence, it enables us to answer the question if

business model innovation actually pays off. In this, this paper departs from previous work, as it does not limit the analysis to proxy vehicles, such as patent profits, but directly enters a business model innovation variable into the regression analysis.

Secondly, we recognize contingency factors that influence the relationship between business model innovation within incumbents and the performance of these firms. We acknowledge that firm characteristics can influence the ability to fully exploit all options business model innovation presents to the firm.

Lastly, we propose a method to differentiate between different degrees of business model innovation and show that the radicalness of the business model innovation effort changes the influence of the innovation on the performance of the firm.

Our analysis aims to give managers an introduction to expected performance effects of business model innovation and possible contingency factors. It underlines that the performance effect depends on a multitude of factors. Namely, the size of the firm, prior experience gained and the intensity of the renewal. Hence, it is necessary for a firm to strongly evaluate their specific situation in order to take appropriate measures to increase the effect of business model innovation on performance. For example, experience can be brought into the firm from the outside in order to ensure that adequate capabilities are present within the firm so that business model innovation also becomes a monetary success.

The conducted analysis also shows specific limitations. The variable that measures business model innovation depends on the specification of the underlying NK-model. The NK-model allows a good approximation of the business model innovation effort of a firm; however, it remains a simplification of real life. The usage of interaction effects between innovation components could introduce further complexity into the model and a more sophisticated contribution or fitness function could help to replicate reality in a more precise way.

Furthermore, the empirical analysis focuses only on a limited number of contingency factors. In particular, it does not consider the influence of a new, breakthrough technology on the performance effect of business model innovation. This extension of the research could be an interesting future step.

References

Afuah, A., & Tucci, C. 2001. ***Internet business models and strategies: Text and cases***. New York: McGraw-Hill.

Aldrich, H. E. 1972. Technology and Organizational Structure: A Reexamination of the Findings of the Aston Group. ***Administrative Science Quarterly***, 17(1): 26-43.

Aldrich, H. E., & Pfeffer, J. 1976. Environments of Organizations. ***Annual Review of Sociology***, 2(ArticleType: research-article / Full publication date: 1976 / Copyright © 1976 Annual Reviews): 79-105.

Amit, R., & Zott, C. 2001. Value Creation in e-business. ***Strategic Management Journal***, 22: 493-520.

Amit, R., & Zott, C. 2010. Business Model Innovation: Creating value in times of change: 1-15: Working paper no. 870, IESE Business School, University of Navarra.

APRA. 2007. Celebrating 10 Years of Superannuation Data Collection, ***APRA Insight***, Vol. Issue 2: Australian Prudential Regulation Authority.

APRA. 2012a. Annual Superannuation Bulletin, June 2011, ***APRA Statistics***. Sydney: Australian Prudential Regulation Authority.

APRA. 2012b. Superannuation Fund-level Profiles and Financial Performance, June 2011, ***APRA Statistics***. Sydney: Australian Prudential Regulation Authority.

ASFA. 2003-2011. Annual fund surveys, ***Superfunds***: ASFA - the Association of Superannuation Funds of Australia Limited.

Australian Government, I. P. 2003. Patents for Business Methods, Vol. 2013.

Baden-Fuller, C., & Morgan, M. 2010. Business Models as Models. ***Long Range Planning***, 43: 156-171.

Caldart, A. A., & Ricart, J. E. 2004. Corporate strategy revisited: a view from complexity theory. ***European Management Review***, 1(1): 96-104.

Cameron, C., & Trivedi, P. 2010. ***Microeconometrics Using STATA***. USA: Stata Press.

Casadesus-Masanell, R., & Ricart, J. E. 2010. From Strategy to Business Models and onto Tactics. ***Long Range Planning***, 43: 195-215.

Casadesus-Masanell, R., & Zhu, F. 2012. Business Model Innovation and Competitive Imitation: the case of sponsor-based business models. ***Strategic Management Journal***: doi: 10.1002/smj.2022.

Chesbrough, H. 2007. Business model innovation: it's not just about technology anymore. ***Strategy & Leadership***, 35(6): 12-17.

Chesbrough, H. 2010. Business Model Innovation: Opportunities and Barriers. ***Long Range Planning***, 43: 354-363.

Chesbrough, H., & Rosenbloom, R. 2002. The role of the business model in capturing value from innovation: evidence from the Xerox Corporation's technology spin-off companies. ***Industrial and Corporate Change***, 11(3): 529-555.

Cohen, W. M., & Klepper, S. 1996. Firm Size and the Nature of Innovation within Industries: The Case of Process and Product R&D. ***The Review of Economics and Statistics***, 78(2): 232-243.

Crossan, M., & Apaydin, M. 2010. A Multi-Dimensional Framework of Organizational Innovation: A Systematic Review of the Literature. ***Journal of Management Studies***, 47: 1154-1191.

Damanpour, F. 1991. Organizational Innovation: A Meta-Analysis of Effects of Determinants and Moderators. ***The Academy of Management Journal***, 34(3): 555-590.

Demil, B., & Lecocq, X. 2010. Business Model Evolution: In Search of Dynamic Consistency. ***Long Range Planning***, 43: 227-246.

Dess, G. G., & Robinson, R. B. 1984. Measuring organizational performance in the absence of objective measures: The case of the privately-held firm and conglomerate business unit. ***Strategic Management Journal***, 5(3): 265-273.

Desyllas, P., & Sako, M. 2012. Profiting from business model innovation: Evidence from Pay-As-You-Drive auto insurance. ***Research Policy***, 42(1): 101-116.

Echambadi, R., Campbell, B., & Agarwal, R. 2006. Encouraging Best Practice in Quantitative Management Research: An Incomplete List of Opportunities*. ***Journal of Management Studies***, 43(8): 1801-1820.

Garcia, R., & Calantone, R. 2002. A Critical Look at Technological Innovation Typology and Innovativeness Terminology: A Literature Review. ***The Journal of Product Innovation Management***, 19: 110-132.

George, G., & Bock, A. 2011. The Business Model in Practice and its Implications for Entrepreneurship Research. ***Entrepreneurship Theory and Practice***, 35: 83-111.

Gooding, R. Z., & Wagner, J. A. 1985. A Meta-Analytic Review of the Relationship between Size and Performance: The Productivity and Efficiency of Organizations and Their Subunits. ***Administrative Science Quarterly***, 30(4): 462-481.

Gopalakrishnan, S., & Damanpour, F. 1997. A review of innovation research in economics, sociology and technology management. ***Omega***, 25(1): 15-28.

Hartmann, M., Oriani, R., & Bateman, H. 2013. Exploring the Antecedents to Business Model Innovation: An Empirical Analysis of Pension Funds, ***Working Paper***: 1-37. Rome: LUISS University.

Haveman, H. A. 1992. Between a Rock and a Hard Place: Organizational Change and Performance under Conditions of Fundamental Environmental Transformation. ***Administrative Science Quarterly***, 37(1): 48-75.

Johnson, M., Christensen, C., & Kagermann, H. 2008. Reinventing your business model. ***Harvard Business Review***, 86(12): 50-59.

Kauffman, S., Lobo, J., & Macready, W. G. 2000. Optimal search on a technology landscape. ***Journal of Economic Behavior & Organization***, 43: 141-166.

Kimberly, J. R. 1976. Organizational Size and the Structuralist Perspective: A Review, Critique, and Proposal. ***Administrative Science Quarterly***, 21(4): 571-597.

Kleinbaum, D. G., Kupper, Nizam, & Muller. 2008. ***Applied regression analysis and other multivariable methods*** (4th ed.). Belmont, CA: Thomson Brooks/Cole.

Klepper, S., & Simons, K. L. 2000. Dominance by Birthright: Entry of Prior Radio Producers and Competitive Ramifications in the U.S. Television Receiver Industry. ***Strategic Management Journal***, 21(10/11): 997-1016.

Levinthal, D. 1997. Adaptation on Rugged Landscapes. ***Management Science***, 43: 934-950.

Liang, K.-Y., & Zeger, S. L. 1986. Longitudinal data analysis using generalized linear models. ***Biometrika***, 73(1): 13-22.

McGrath, R. 2010. Busines Model: A Discovery Driven Approach. ***Long Range Planning***, 43: 247-261.

Morris, M., Schindehutte, M., & Allen, J. 2005. The entrepreneur's business model: Toward a unified perspective. ***Journal of Business Research***, 24: 15-21.

Patzelt, H., Zu Knyphausen-Aufseß, D., & Nikol, P. 2008. Top Management Teams, Business Models, and Performance of Biotechnology Ventures: An Upper Echelon Perspective*. ***British Journal of Management***, 19(3): 205-221.

Pauwels, K., & Weiss, A. 2008. Moving from Free to Fee: How Online Firms Market to Change Their Business Model Successfully. ***Journal of Marketing***, 72(3): 14-31.

Reeves, M., & Deimler, M. 2011. Adaptability: The New Competitive Advantage. ***Harvard Business Review***, 89: 134-141.

Rivkin, J. W., & Siggelkow, N. 2002. Organizational sticking points on NK Landscapes. ***Complexity***, 7(5): 31-43.

Sabatier, V., Mangematin, V., & Rousselle, T. 2010. From Recipe to Dinner: Business Model Portfolios in the European Biopharmaceutical Industry. ***Long Range Planning***, 43: 431-447.

Seelos, C., & Mair, J. 2007. Profitable business models and market creation in the context of deep poverty: A strategic view. ***Academy of Management Perspectives***, 21: 49-63.

Sosna, M., Trevinyo-Rodrìguez, N., & Velamuri, R. 2010. Business Model Innovation through Trial-and-Error Learning. ***Long Range Planning***, 43: 383-407.

Stewart, D., & Zhao, Q. 2000. Internet marketing, business models and public policy. ***Journal of Public Policy and Marketing***, 19: 287-296.

Teece, D. 2010. Business Models, Business Strategy and Innovation. ***Long Range Planning***, 43: 172-194.

Thompson, J. D. 1967. ***Organizations in action: Social science bases of administrative theory***: Transaction Pub.

Tripsas, M., & Gavetti, G. 2000. Capabilities, Cognition and Inertia: Evidence from Digital Imaging. ***Strategic Management Journal***, 21: 1147-1161.

Van de Ven, A. H. 1986. Central Problems in the Management of Innovation. ***Management Science***, 32: 590-607.

Westhoff, F. H., Yarbrough, B. V., & Yarbrough, R. M. 1996. Complexity, organization, and Stuart Kauffman's The Origins of Order. ***Journal of Economic Behavior & Organization***, 29: 1-25.

Williamson, P. 2010. Cost innovation: Preparing for a 'Value-for-Money' Revolution. ***Long Range Planning***, 43: 343-353.

Zeger, S. L., & Liang, K.-Y. 1986. Longitudinal Data Analysis for Discrete and Continuous Outcomes. ***Biometrics***, 42(1): 121-130.

Zollo, M., & Meier, D. 2008. What Is M&A Performance? ***The Academy of Management Perspectives***, 22(3): 55-77.

Zott, C., & Amit, R. 2007. Business Model Design and the Performance of Entrepreneurial Firms. ***Organization Science***, 18: 181-199.

Zott, C., & Amit, R. 2008. The Fit Between Product Market Strategy and Business Model: Implications for Firm Performance. ***Strategic Management Journal***, 29: 1-26.

Zott, C., & Amit, R. 2010. Business Model Design: Activity System Perspective. ***Long Range Planning***, 43: 216-226.

Zott, C., Amit, R., & Massa, L. 2011. The Business Model: Recent Developments and Future Research. ***Journal of Management***, 37: 1019-1042.

Tables

Table 1 Descriptive Statistics

Variable name	Mean	Median	Standard deviation	Min	Max	Nr. obser-vations
Operat. performance (log)	12.17	12.40	1.58	5.21	16.48	220
BMI	0.60	0.00	0.83	0.00	4.00	220
Firm size	181,481	38,835	369,693	917	1,965,511	220
Firm size*BMI	96,672	0	298,176	0	2,334,640	220
Firm inexperience	0.94	1.00	0.24	0.00	1.00	220
Firm inexperience*BMI	0.57	0.00	0.80	0.00	4.00	220
Fitness value (2003)	1.55	1.00	1.05	0.00	5.00	220
Asset growth (%)	0.20	0.18	0.20	-0.05	2.10	220
Public offer status	0.42	0.00	0.50	0.00	1.00	220

Table 2 Pearson correlation coefficients of model variables (without lags)

Variable name	Operational performance	BMI	BMI^2	Firm size	Firm size*BMI	Firm inexperience	Firm inexperience*BMI	Fitness value (2003)	Asset growth (%)	Public offer status
Oper. performance	1.00									
BMI	0.12	1.00								
BMI^2	0.09	0.90	1.00							
Firm size	0.46	0.02	0.02	1.00						
Firm size*BMI	0.28	0.39	0.36	0.52	1.00					
Firm inexperience	-0.10	0.05	-0.01	0.10	0.06	1.00				
Firm inexperience*BMI	0.10	0.95	0.80	0.04	0.40	0.18	1.00			
Fitness value (2003)	0.20	-0.10	-0.07	0.05	0.00	-0.30	-0.13	1.00		
Asset growth (%)	0.40	0.09	0.03	0.13	0.13	0.09	0.11	0.04	1.00	
Public offer status	0.28	0.08	0.00	0.42	0.23	0.20	0.11	0.23	0.23	1.00

Table 3

	Dependent variable: operational performance				
Variable name	Model 1 Value (st. err.)	Model 2 Value (st. err.)	Model 3 Value (st. err.)	Model 4 Value (st. err.)	Model 5 Value (st. err.)
Constant	10.58*** (0.54)	11.38*** (0.50)	10.30*** (0.55)	10.30*** (0.55)	10.32*** (0.55)
BMI		0.23† (0.13)	0.12* (0.05)	0.19 (0.14)	0.02 (0.05)
BMI lag1		-0.10 (0.08)	-0.04 (0.07)	-0.19 (0.16)	0.08† (0.04)
BMI lag2		0.14 (0.09)	0.15* (0.07)	0.31* (0.14)	0.36** (0.13)
BMI lag3		0.02 (0.09)			
BMI^2				-0.02 (0.04)	
BMI^2 lag1				0.07 (0.05)	
BMI^2 lag2				-0.07 (0.04)	
Firm size	2.0E-06*** (5.6E-07)	2.0E-06*** (5.3E-07)	2.0E-06*** (5.4E-07)	2.0E-06*** (5.3E-07)	1.7E-06*** (4.9E-07)
Firm size* BMI					9.5E-08 (1.7E-07)
Firm size* (BMI lag1)					3.6E-07* (1.5E-07)
Firm size* (BMI lag2)					2.0E-07** (7.0E-08)
Firm inexperience	-0.95**(0.30)	-1.12**(0.37)	-0.94** (0.29)	-0.90** (0.26)	-0.77** (0.28)
Firm inexperience* BMI					0.09 (0.07)
Firm inexperience* (BMI lag1)					-0.22* (0.09)
Firm inexperience* (BMI lag2)					-0.28* (0.13)
Fitness value (2003)	0.17 (0.11)	0.19 (0.12)	0.19† (0.11)	0.19† (0.11)	0.19† (0.11)
Asset growth (%)	2.21** (0.74)	4.13*** (0.99)	2.19** (0.71)	2.17** (0.69)	2.21** (0.66)
Public offer status	0.23 (0.18)	0.14 (0.24)	0.20 (0.18)	0.21 (0.18)	0.19 (0.18)
N	220	157	220	220	220
Groups	64	63	64	64	64

†0.05≤p<0.1, *0.01 ≤p<0.05, **p<0.01, ***p<0.001.

Year dummy variables included in the regression, but coefficients not shown. Standard errors in parentheses.