Going, Going, Gone.
Innovation and Exit in Manufacturing Firms

Elena Cefis and Orietta Marsili

ERIM REPORT SERIES *RESEARCH IN MANAGEMENT*	
ERIM Report Series reference number	ERS-2007-015-ORG
Publication	February 2007
Number of pages	21
Persistent paper URL	http://hdl.handle.net/1765/9732
Email address corresponding author	omarsili@rsm.nl
Address	Erasmus Research Institute of Management (ERIM) RSM Erasmus University / Erasmus School of Economics Erasmus Universiteit Rotterdam P.O.Box 1738 3000 DR Rotterdam, The Netherlands Phone: + 31 10 408 1182 Fax: + 31 10 408 9640 Email: info@erim.eur.nl Internet: www.erim.eur.nl

Bibliographic data and classifications of all the ERIM reports are also available on the ERIM website:
www.erim.eur.nl

ERASMUS RESEARCH INSTITUTE OF MANAGEMENT

REPORT SERIES
RESEARCH IN MANAGEMENT

ABSTRACT AND KEYWORDS	
Abstract	This paper examines the effect of innovation on the risk of exit of a firm, distinguishing between different modes of exits. Innovation represents a resource and a capability that helps a firm to build competitive advantage and remain in the market. At the same time, the resources and capabilities of innovative firms make them an attractive target for the acquisition process of other firms, thereby increasing the likelihood of the exiting the market. We explore these effects empirically by linking data on innovation and exits for a large sample of manufacturing firms in the Netherlands. The results show that the effect of innovation on a firm's risk of exit differs according to the mode of exit and, in addition, it is shaped by the nature of the innovation. While a firm can lower its risk of failure by innovating in either products or processes, the introduction of a new product in the absence of innovation in the production process increases the risk of exit as a result of merger and acquisition.
Free Keywords	Mergers and Acquisitions, Firm Exit, Innovation, Competing Risks Model
Availability	The ERIM Report Series is distributed through the following platforms: Academic Repository at Erasmus University (DEAR), DEAR ERIM Series Portal Social Science Research Network (SSRN), SSRN ERIM Series Webpage Research Papers in Economics (REPEC), REPEC ERIM Series Webpage
Classifications	The electronic versions of the papers in the ERIM report Series contain bibliographic metadata by the following classification systems: Library of Congress Classification, (LCC) LCC Webpage Journal of Economic Literature, (JEL), JEL Webpage ACM Computing Classification System CCS Webpage Inspec Classification scheme (ICS), ICS Webpage

Going, Going, Gone.
Innovation and Exit in Manufacturing Firms*

Elena Cefis♦

University of Bergamo and Utrecht School of Economics,
Utrecht University, Janskerkhof 12, 3512 BL Utrecht, The Netherlands.
E-mail: e.cefis@econ.uu.nl

Orietta Marsili

Rotterdam School of Management, Erasmus University
Burg. Oudlaan 50 , 3062 PA Rotterdam, The Netherlands.
E-mail: omarsili@rsm.nl

February 2007

Abstract

This paper examines the effects of innovation on the risk of exit of a firm, distinguishing between different modes of exits. Innovation represents a resource and a capability that helps a firm to build competitive advantage and remain in the market. At the same time, the resources and capabilities of innovative firms make them an attractive target for the acquisition process of other firms, thereby increasing the likelihood of their exiting the market. We explore these effects empirically by linking data on innovation and exits for a large sample of manufacturing firms in the Netherlands. The results show that the effect of innovation on a firm's risk of exit differs according to the mode of exit and, in addition, it is shaped by the nature of the innovation. While a firm can lower its risk of failure by innovating in either products or processes, the introduction of a new product in the absence of innovation in the production process increases the risk of exit as a result of merger and acquisition.

Keywords: Mergers and Acquisitions; Firm Exit; Innovation; Competing Risks Model

JEL codes: L11; L25; D21; O32

---

* The authors would like to thank Paola Criscuolo, Bernd Ebersberger, Keld Laursen, Mariana Mazzucato, Pierre Mohnen, Stéphane Robin, Ammon Salter, Toke Reichstein and participants at the 2006 International Schumpeter Society Conference and the 2006 DIME (Dynamics of Institutions and Markets in Europe – Network of Excellence) workshop, *Firm-Level Longitudinal Data on Economic Performances and their Determinants*, for helpful comments and suggestions. The empirical part of this research was carried out at the Centre for Research of Economic Microdata at Statistics Netherlands (CBS). The views expressed in this paper are those of the authors and do not necessarily reflect the policies of Statistics Netherlands. Elena Cefis acknowledges the financial support of the University of Bergamo (grant ex 60%, n. 60CEFI06, Dept. of Economics).

♦ Corresponding author

1. Introduction

Staying in the market is a basic requisite for firm success. Traditionally, studies in economics have used the likelihood of survival (as opposed to exit), or its duration, as an indicator of firm performance (Audretsch, 1995; Klepper, 2002). Management studies, in contrast, highlight exit as being part of the overall strategy of a firm (Graebner & Eisenhardt, 2004; Villalonga & McGahan, 2005). In addition to closing down activity or bankruptcy, both of which are signs of failure, a firm may choose to exit the market by merging with or selling out to another. In these cases, exit does not equate with failure. The decision to exit can be made by the entrepreneur or the firm's management for the purpose of increasing efficiency or harvesting the rents from its business activity. Indeed, new firms are often created by entrepreneurs and venture capitalists with the specific objective of selling on to larger firms. Most studies examining firm exit and survival apply a definition of exit that includes both the actual death of a firm and exit as a result of merger and acquisition (M&A). This is often a reflection of lack of data to allow a distinction to be made among modes of firm exit. The aim of this paper is to illustrate the different influences of firm attributes on exit mode - either failure or change of ownership.

A well-known interpretation of firm exit relies on Jovanovic's (1982) model of 'passive' learning (Pakes & Ericson, 1998). By assuming that a firm, through experience in production, learns its unknown level of efficiency, the model predicts that the risk of exit is negatively related to firm age and size. This relationship has been widely documented in the empirical literature, but little attention has been paid to the effects of 'active' learning that result of the firm's engagement in innovative activities (Nelson & Winter, 1982; Ericson & Pakes, 1995).

This paper explores the contribution of innovation to firms' exit, by identifying its distinct influences on various modes of exit – failure, M&A and radical restructuring. The paper makes a number of contributions. First, unlike the definition of firm exit employed in most empirical studies, it separates the event of firm failure from the event of exit through change of ownership, which in fact may represent a success for the firm. Second, it provides new evidence on the determinants of firm failure, often explained on the basis of firm age and size, by focusing on the innovative activities carried out by the firm. Third, it adds to the understanding of the role of technology in the M&A decision process, by exploring how innovation in the target firm affects the likelihood of takeover. It does so by linking two harmonised and comprehensive micro-economic datasets collected by the Central Bureau of

Statistics Netherlands (CBS): the annual General Business Register (ABR) in 1996 – 2002 and the second Community Innovation Survey (CIS-2).

The remainder of the paper is organised as follows. Section 2 reviews the theoretical and empirical studies on the factors that influence firm exit by failure or ownership change, focusing on the role of innovation. Section 3 describes the data used to construct the variables and estimate the econometric model presented in Section 4. Section 5 discusses the empirical results and Section 6 concludes.

2. Firm innovation and exit

According to Schumpeter (1934), innovation driven competition is what ultimately leads to the emergence in the market of winners and losers. Innovation explains "especially in a competitive economy … the process by which individuals and families rise and fall economically and socially and which is peculiar to this form of organisation" (Schumpeter, 1934, p. 67). Economic models that embody a Schumpeterian process of competition as the driver of firm and industry dynamics, are based on the assumption of 'active' learning (Nelson & Winter, 1982; Ericson & Pakes, 1995). In other words, firms invest resources in research and development (R&D) and improve their efficiency through a stochastic process of innovative search.[1] Therefore, higher investment in innovative search increases the chances of the firm discovering new opportunities and improving efficiency. However, higher investment in R&D also means more 'Knightian' type uncertainty, as the outcomes of innovative search are unknowable *a priori.* In a Schumpeterian approach, innovation creates new opportunities to gain economic rents for the firm that introduces it in the market, thereby reducing that firm's probability of failure. However, because of the uncertainty associated with the search process, innovation can also have the opposite effect of increasing the probability of firm failure.

Management studies point to the contribution of a firm's knowledge and capabilities, seen as strategic assets, to firm performance (Winter, 1987). In particular, the resource-based view (RBV) of the firm argues that, in order to achieve a competitive advantage, a firm needs to build and mobilise resources that are specific to its own activities and difficult to imitate (Penrose, 1959; Barney, 1986). These resources include not only physical and human capital, but also skills, heuristics, and know-how that are partly tacit, and are stored by the firm in the form of routines (Nelson & Winter, 1982; Winter, 1987). In this perspective, innovation can

[1] In contrast, Jovanovic's (1982) model of adaptive or 'passive' learning assumes that firm-specific levels of efficiency are invariant over time (Pakes & Ericson, 1998).

be regarded as a resource and a capability, which helps the firm to build competitive advantage and reduce the risk of failure. However, the risk of the firm being acquired may increase. Large firms often use M&A as a strategy to obtain resources and capabilities that are otherwise difficult to transfer or to build in-house (James, Georghiou & Metcalfe, 1998; Ranft & Lord, 2002). Innovation enhances the 'value' of the resources of a potential seller, and especially of a technology based firm, which becomes more attractive as an acquisition. In sum, the RBV of the firm predicts that innovation contributes negatively to the risk of exit by failure, and positively to the risk of exit by M&A.

The issue of firm failure is also central to organisational ecology. This approach maintains that a firm survives if it is 'reliable', which, in turn, requires a certain degree of 'structural inertia' in the organisation (Hannan & Freeman, 1984). Structural inertia guarantees the stability of organizational practices, routines and structures. It allows the firm to maintain a stable network of relationships within the organisation and with external parties. By innovating, a firm may undermine its operating routines (Barnett & Freeman, 2001). For example, new product developments may put strain on the balance of power between product divisions, the supply chain may require changes, new customers may be needed. These disruptions can become critical when several new products are introduced at the same time. The risk of organisational failure is thus likely to increase with the number of innovations (Barnett & Freeman, 2001).

Although the empirical evidence is limited, there is some support for the claim that innovation reduces the risk of exit. Hall (1987) finds that the stock of knowledge of a firm, as measured by the share of accumulated R&D expenditure on total capital, has a positive effect on its likelihood of survival. This effect however is less evident for firms that hold patents than for those that do not. In a recent study of Spanish manufacturing firms, the exit risk for firms investing in R&D was found to be 57 per cent lower than for firms that did not, and this effect was enhanced by the firm's international orientation (Perez, Llopis & Llopis, 2004). Using data on Dutch manufacturing firms for the period 1996–2003, Cefis and Marsili (2005; 2006) show that innovative firms that introduced a new or an improved product or process, experience higher survival probabilities than non-innovators. In contrast, Bruderl, Preisendorfen and Ziegle (1992) found no significant differences in the mortality rates of innovative and traditional firms, for a sample of firms in Upper Bavaria, founded in 1985–1986 and observed in 1990.

Other empirical studies focus on what determines the probability that a firm will be acquired, based on various interpretations of motivations for takeover bids. Traditionally, these motives are financial or managerial. Firms negotiate acquisitions in order to replace inefficient management, to exploit undervalued growth potential in the target firm, to obtain free cash flow, and to access tangible fixed assets (Powell, 1997). Related to these motives are the characteristics of the acquired firm, including firm size, and stock market value before the takeover bid, which have been found to shape the likelihood of being acquired (Powell, 1997). There is contrasting evidence however on whether units of higher or lower performance (e.g. productivity, market value) are more likely to be acquired (Caves, 1998). The evidence appears to be conditional on the size of the plant targeted for acquisition (McGuckin & Nguyen, 1995). On the one hand, unproductive (large) plants are acquired because they own resources that can be reallocated to better management or more productive use. On the other hand, highly productive (small) plants offer opportunities that could be better exploited if matched with the resources of the acquirer (Caves, 1998). Departing from this approach, recent research has emphasised the transfer of knowledge and intangible assets from the acquired to the acquiring firm as a motive for takeover (James, Georghiou & Metcalfe, 1998). For example, in an empirical study of the M&A process in Finland, Lehto and Lehtoranta (2004) observe that a greater stock of R&D capital enhances the probability of a firm's being acquired. This effect is mediated by the type of industry in which the firm is active, as it emerges only in non-processing industries; it is not significant in processing industries. Consistent with this interpretation, we concentrate on innovation as a characteristic that may cause a firm to become a target for takeover. We consider that innovation, as a firm resource and capability, may have divergent effects on the probabilities of failure and takeover, and that these effects are shaped by the nature of the innovation in products or in processes, that the original firm is able to realise.

3. Competing risks models

The main aim of our empirical analysis is to model the effects of firm innovative activities on different modes of exit. Specifically, we consider three types of events that induce the exit of a firm: actual death or failure; M&A; and radical restructuring. Because these three types of exits may have different causes and consequences, we choose a model that has the potential to differentiate between the outcomes. We estimated a competing risks model that enables pursuit of two aims: (i) to analyse the factors that influence the probability of an event occurring (in our case the event is firm exit); and (ii) to distinguish the effects of these factors on the event resulting from different modalities (failure, M&A, and radical restructuring). The exit of a firm is an event that occurs in continuous time, but it is reported in discrete time, in our case monthly. We therefore applied the discrete-time method proposed by Allison (1982) and extended by Jenkins (1995; 2004) to estimate the model's parameters taking into account the discrete nature of our data. The model is based on the definition of a latent variable representing the uncensored failure time T_j for each specific modality j of the exit event, for $j = 1,...,k$. The observed failure time $T = \min\{T_j\}_j$ is censored for the firms that survive throughout the period. The discrete-time hazard rate specific to the exit mode j for firm i is defined as

$$h_{ji}(t) = \Pr\{T_{ji} = t \mid T_{ji} \geq t;\ \mathbf{X}_{it}\} \tag{1}$$

where $\mathbf{X}_{it}$ is a vector of covariates. Consequently, the probability of observing a spell of length t for a specific type of exit j is:

$$p_{ji}(t) = \Pr\{T_j = t\} = h_{ji}(t) S_i(t-1) \tag{2}$$

where *S(t)* is the discrete time survivor function, which can be written as

$$S_i(t) = \Pr\{T_i > t\} = \prod_{s=1}^{t} \left[1 - h_i(s)\right] = [1 - h_i(t)] S_i(t-1)\,. \tag{3}$$

where $h_i(t) = \sum_{j=1}^{k} h_{ji}(t)$ is the hazard function for *any* type of exit equal to the sum of the single hazard functions, specific to the various types of exit, assuming independent competing risks.

Combining (3) and (2) leads to:

$$p_{ji}(t) = \Pr\{T_{ji} = t\} = \frac{h_{ji}(t)}{1 - h_i(t)} S_i(t) \tag{4}$$

The contribution of the *i*th firm with observed spell t (uncensored or censored) to the likelihood is

$$L_i = \prod_{j=1}^{k} \Pr\{T_{ji} = t\}^{\delta_j} \Pr\{T_i > t\}^{1-\sum \delta_j} \tag{5}$$

where δ_{ji} is a dummy variable set equal to 1 if the *ith* observation of T_j is uncensored and equal to 0 if it is censored; the observation is considered as censored when either the firm does not exit during the considered time period or the firm exits by means of a type of exit different from *j*.

Given the previous properties, the firm's contribution to the log-likelihood is:

$$\ln L_i = \sum_{j=1}^{k} \delta_{ji} \ln \frac{h_{ji}(t)}{1 - \sum_{j=1}^{k} h_{ji}(s)} + \sum_{s=1}^{t} \ln \left[1 - \sum_{j=1}^{k} h_{ji}(s) \right] \quad (6)$$

This likelihood depends only on the hazards that are specific to the various types of exit, and therefore only requires the specification of single hazard functions in relation to the covariates $\mathbf{X}_{it}$. However, the overall log-likelihood does not have the property (which holds for continuous independent competing risks models) that it can be partitioned into the sum of separate parts, each corresponding to a single type of event. Therefore, the model cannot be estimated by means of separate duration models, each formulated for a certain type of exit and corresponding censoring indicator δ_j. It can be estimated creating a new variable $y_{ji,t}$, which is set equal to 1 if firm i experiences an exit of type j at time t, and equal to 0 otherwise, with $\delta_{ji} = \sum_{s=1}^{t} y_{ji,s}$

Allison (1982) proposed selection of a generalised form of the logistic function for the hazard rate, which is a common choice for a non-proportional hazard specification.

$$h_{ji}(t) = \frac{\exp\{\beta_j' X_{it}\}}{1 + \sum_{j=1}^{k} \exp\{\beta_j' X_{it}\}} \quad (7)$$

In this case the log-likelihood is equivalent to that of a multinomial logit model, in which the unit of analysis is the time spell. An alternative specification for the hazard function is the complementary log-log form (Jenkins, 1995).

$$h_{ji}(t) = 1 = \exp\{-\exp[\beta_j' X_{it}]\} \quad (8)$$

Discrete-time competing risks models can be related to underlying continuous-time duration models, under specific assumptions on the shape of the continuous-time hazards within discrete intervals (Jenkins, 1995; 2004). In particular, the 'complementary log-log model' is the discrete-time counterpart of a continuous-time proportional hazards model, in which failure times are grouped in unit intervals and registered only at the end of each time period (Prentice & Gloeckler, 1978). That is, events take place only at the boundaries of intervals. In this case, the overall likelihood does have the property of being separable into destination specific components, and therefore the model can be estimated through independent single-event models, assuming appropriate censoring conditions on each type of exit (Narendranathan & Stewart, 1993). Likewise, Jenkins (2004) proves that the 'multinomial logit model' represents an approximation in discrete time of a duration model, in which each type of event takes place in continuous time (between discrete observations) with specific hazard rates that remain constant within intervals.

In our empirical analysis we have estimated an independent competing risks model, in order to assess separately the effects of firm innovation and the control variables on the hazard rates of firms, distinguishing among different modes of exit. Because the month of exit is available in our dataset, we apply a discrete-time model using a multinomial logit formulation. In addition, we carry out a sensitivity analysis with respect to the assumptions on the continuous hazards that yield the observed duration times, using the complementary log-log model.

4. Data and measurements

This study is based on two micro-economic databases collected and managed by the CBS: the annual ABR and the CIS-2 for the Netherlands.

Firm data on innovation are drawn from the second national survey of innovation in the Netherlands, based on the core Eurostat CIS (CBS, 1998). Within Europe, CIS surveys have been conducted since the early 1990s, with periodicity of four years in most countries. The CIS data are increasingly being used as a key data source in the study of innovation and its effects on performance at firm level, in Europe, Canada and Australia (Cassiman & Veugelers, 2002; Mairesse & Mohnen, 2002). The second CIS for the Netherlands was administered in 1997. It provides information on innovative activities and performance in the period 1994–1996, for a large sample of firms with at least 10 employees. These firms were extracted from those present in the ABR in 1996 in order to constitute a stratified random sample, based on size class, region and industrial sector at the 2-digit standard industry classification (SIC) code level. For the manufacturing sector, the number of respondents to CIS-2 was 3,299 firms, with a response rate of 71 per cent.

We matched the data on respondents to CIS-2 with data from the ABR for 1996, from which the CIS-2 sample was extracted. This allowed us to combine, at firm level, data on innovation for a large set of firms, with data on exit and other covariates (such as age, size and sector), derived from the ABR for the same set of firms.

The ABR comprises annual records for all firms that are registered for fiscal purposes in the Netherlands. The annual dataset is constructed longitudinally: for each firm present in the population at a certain year, it reports the month that the firm was first included in the register and the month that the firm was eventually dropped from the register. Because of its comprehensive nature and its fiscal purpose, the dates of inclusion and exclusion in the register are very close approximations of the actual dates of entry and exit in the market. It is worth noting that the definition of entry and exit is based on the entire population of firms: it excludes changes in a firm's sector of activity, which is regarded as a continuing firm. The population includes self-employment, that is, firms with 0 employees. For the manufacturing sector in 1996 the ABR includes 61,177 firms.

The annual ABR allows the mode of firm exit to be identified. We distinguish three categories. 'Exit by failure', which includes firms dropped from the register because of termination of activities (either voluntary or by bankruptcy).[2] The category 'exit by M&A' includes: where a firm is merged with other(s) into a firm with a new identity, and where the firm is acquired by another firm, which maintains its identity. The third category of 'exit by radical restructuring' accounts for where a firm is decomposed into several units (some of which may reappear in the register as new firms, some of which may be sold to other firms), or where the firm undergoes a major transformation, which results in a change to its legal or economic identity. By combining this information from the annual ABR datasets for 1996 to 2003, we can follow the sequence of exits up to December 2003, for each type of exit.

< *Insert Table 1 about here* >

Table 1 provides composition and average employment for the set of firms from the CIS-2 and the population from the ABR, according to mode of exit, for the period 1996–2002. Because only firms with 10 or more employees are included in the CIS-2, we also report the ABR data that relates only to the population of firms above the same threshold. This excludes more than three-quarters of firms included in the ABR data. Bearing in mind that the ABR also includes firms with 0 employees, the large majority of firms in the Netherlands are small or even very small, and are not included in the innovation surveys of the European Union.[3] The percentage of continuing firms is higher in CIS-2 than for the whole population in the ABR and for the set with more than 10 employees. This is due to the effect of size on firm survival. Indeed, as previous work using the same data (Cefis & Marsili, 2005; 2006) shows, survival probabilities increase with firm size. When we look at exit modes we can see that the

---

[2] The data do not allow us to distinguish between exit resulting from bankruptcy and exit due to voluntary closure. However, for the purposes of our analysis, these two types of exits can be considered equivalent. In general, the ownership of a firm does not close a profitable firm without selling the whole or part of the firm, which would be recorded in our data set, respectively, as an acquisition or a radical restructuring.

[3] For the CIS-2, few countries like the Netherlands, Finland and the UK set threshold of 10 employees; the threshold for all the other countries is 20 employees.

number of firms that exited the market due to failure is much higher for the whole ABR than for the other two samples. This is because micro firms (less than 10 employees) are more likely to exit the market and, in particular, to exit due to failure, than larger firms. Furthermore micro firms are obviously much less likely to undertake a restructuring process and are much less involved in M&As. The average number of employees for firms exiting as a result of failure is six, for those exiting through M&As around 34, and for exits due to restructuring 227.

Dependent variable

The duration variable is the length of time from January 1996 to the time of exit from the ABR. The exit event is differentiated into: failure, M&A and radical restructuring. The survival time is measured in months and is censored to the right for firms that had survived to December 2003, the last month for which the date and exit mode for firms listed in the ABR are available.

Independent variables

The ability of a firm to innovate is our main variable of interest. On the basis of the CIS-2 dataset, we define a dummy variable that is equal to 1 if a firm is an 'innovator' and to 0, if the firm is a 'non-innovator' (we label the variable *innov*). An innovator is a firm that has introduced a product or a process innovation in the period 1994-1996. A non-innovator is a firm that either has not engaged in innovative activities in that period, or carried out innovative projects that were unsuccessful or incomplete at the end of 1996. Beyond the general ability of a firm to innovate, we consider that the nature of the innovation, product or a process, may shape its effects on hazard rates, leading to divergent effects for different types of exit. For this purpose, we introduce two other dummy variables. A dummy that is equal to 1 if a firm is a 'product innovator', that is, if it has introduced a new or an improved product in the period 1994-1996, and equal to 0 otherwise (*pdt*), and a dummy that is equal to 1 if the firm is a 'process innovator', that is, if it has introduced a new or an improved process in the period 1994-1996, and equal to 0 otherwise (*pcs*).

From the sample of 3,275 firms in CIS-2, 42.7% of firms introduced both a product and a process innovation; 14.8% of firms introduced only a product innovation and 5.8% of firms introduced only a process innovation. Non-innovators constituted 36.6% of the total. Because of the considerable share of firms that introduced both product and process innovations, we created another set of dummy variables to separate the specific roles of the two types of innovation. The first identifies 'only product innovator', and is set at 1 if a firm introduced only a product innovation in 1994-1996 and 0 otherwise (*onlypdt*). The second dummy for 'only process innovator', is equal to 1 if the firm introduced only a process innovation (*onlypcs*), and the third for 'product and process innovator' if the firm introduced both a product and a process innovation (*pdtpcs*).

Control variables

Firm age is an important control variable, which has been found to shape the survival probability (Evans, 1987; Dunne, Roberts & Samuelson, 1988) and the likelihood of being acquired (Powell, 1997). Firm age is calculated as date of entry in the ABR. Based on evidence that the link between age, survival, and exit may follow an inverted-U shape (Evans, 1987; Bruderl & Schussler, 1990), we entered the squared term of age into all our models. The variable is expressed in logarithm values (*lnage*) and its squared value calculated (*sq_age*).

Firm size is one of the conditions that we want to control for. In particular we use the current size of a firm (Evans, 1987; Hall, 1987) at the beginning of the period of observation. The variable of firm size is derived from the ABR and is measured by the number of employees in 1996. In addition, to account for a non-linear relationship between survival, exit, and firm size we included the squared term of firm size in all models (Evans, 1987; Hall, 1987). And, firm size being a highly skewed variable, is transformed in logarithms (*lnsize*) and the squared term calculated (*sq_size*).

Finally, as firm age and size may interact in shaping firm survival, we included an interaction term between the two variables (Evans, 1987), defined as the product of the logarithm of size and the logarithm of age (*agesize*).

In order to control for differences in the nature of technology, and their influence on the survival or the exit of firms (Agarwal & Audretsch, 2001) we classified our firms according to Pavitt's (1984) taxonomy. We constructed four dummies for each of Pavitt's firm categories: science-based firms (*dpav1*), scale intensive firms (*dpav2*), specialised suppliers (*dpav3*), and supplier dominated firms (*dpav4*). The last category is the reference group in our estimates.

5. Results

In this section we present the results of the competing risks model using the multinomial logit form, which is equivalent to assuming a logistic-type hazard function for each exit event, as in equation (7). In addition, we use three different versions of the model, each corresponding to an alternative set of dummies used to express innovation in a firm, while the control variables remain the same for all three models. The estimated coefficients for these models are reported in Table 2.

<Insert Table 2 about here>

Innovation and type of innovation

In model 1 we chose as a proxy for the innovative ability of the firm the general dummy for the firm's being an innovator (*innov*). In this case, innovation has a negative and statistically significant effect on the probabilities of exit due to failure and to restructuring, while the effect is statistically significant but positive for the probability of being acquired.[4] In model 2, we replace the general innovator variable with product (*pdt*) and process (*pcs*) innovator dummies, to distinguish between the roles of different types of innovation. We observe that the results are differentiated across the different modes of exit, according to the type of innovation. Introduction of either product or process innovations significantly decreases the probabilities of exit due to failure. This is the only mode of exit where the type of innovation introduced does not matter; it is the fact of having innovated that is important. However, the probability of exiting as the result of an M&A is significantly and positively affected by the firms being involved in product innovations. It seems that firms that can demonstrate ability to introduce new products in the market have higher chances of being the targets of M&A processes. In the case of exits due to restructuring, on the other hand, firms that have introduced process innovations are more likely to survive, or their chances of exiting the market are reduced.

Finally, in order to disentangle the individual roles of product and process innovation, from their combined effect, model 3 introduces three dummies that identify firms with product innovations only (*onlypdt*), with process innovations only (*onlypcs*), and those with

[4] From hereon we use the term acquired as being synonymous with "merged and acquired". It is an abbreviation that we use for convenience, but it also reflects the fact that the majority of "mergers and acquisitions" are actually acquisitions and are rarely real mergers, in which two previously independent firms lose their identities to become (with equal shares, 50%) a completely new firm.

both product and process innovations (*pdtpcs*). The coefficients of these dummies confirm and reinforce the previous results. Being an innovator, regardless of which type of innovation is involved, is what really matters in reducing the probability of exiting the market because of firm failure. Having produced innovative products (and especially where this is not supported by process innovation) is relevant in increasing the chances of being acquired, and therefore exiting the market. The introduction of both process and product innovation lowers the chances of exit due to restructuring.

These results suggest that innovative firms are less subject to exit by failure and by restructuring, independent of the type of innovation they introduce. However, those firms that have shown a capacity to create new products, but have not developed new processes in combination with them, attract the attention of other (probably larger) firms and became the object of M&A. Thus, innovation seems to play two distinct roles according to its characteristics: one enhancing exit from the market and the other enhancing survival.

Control variables

It is worth noting that the statistical significance and the sign of the coefficients of the control variables do not change if we use different proxies for innovation to measure the effects of the innovative abilities of firms on the probability of different modes of exiting the market. In other words, the coefficients are relatively invariant across model 1, 2, and 3. However, different effects of these same covariates can be observed across the various modes of exits.

Firm age (*lnage*) and firm size (*lnsize*) both have a negative and statistically significant effect on the probability of exit due to failure and to M&A. In contrast, firm size has a positive and statistically significant influence on the probability that a firm exits because of restructuring. The square of age (*sq_age*) is significant and positive only for exit as a result of failure, while the coefficient of the square of firm size (*sq_size*) is statistically significant for all three types of exit, but with varying sign: it is positive in the case of exit due to failure and M&A, and negative in the case of exit due to restructuring. The larger the firm, lower is the probability of exit due to failure or M&A and the higher is the probability of exit due to radical restructuring; but the magnitude of these effects decreases with firm size. The interaction between age and size (*agesize*) is significant only for exit due to failure. The sign is positive, indicating that although firm size and age reduce the probability of exit due to failure, this probability declines less rapidly for firms that are, respectively, older and larger. Firms may become too large or too old to survive.

In order to control for sectoral specificities, we estimated the models using Pavitt's taxonomy and SIC at the 2-digit level. In controlling for sectoral specificities, the coefficients of the dummies for Pavitt sectors are significant only in the case of exit due to M&A. Belonging to the science-based (*dpav1*) and specialised supplier (*dpav3*) sectors decreases the probabilities of exit from the market due to being acquired by other firms. These two categories of firms include knowledge based firms, which are major 'producers' of innovations, both product and process. The percentage of innovators in the specialised suppliers category is 76.5, in the science-based firms it is 75.7, in the scale intensive firms it is 60.4, and in the supplier-dominated firms it is 54.4%. Although the percentage of innovators can be considered as a measure of the level of technological opportunity this dimension represents only one of the technological conditions captured by Pavitt's taxonomy.[5]

When we apply the dummies for the 2-digit sector in which the firm is active rather than the Pavitt dummies, the results generally do not change.[6] The innovation proxies do not lose their significance and their effects on the probabilities of different types of exit change neither in direction nor magnitude. This is also the case for the coefficients of the control variables for age and size, and their interaction. The effects of belonging to a specific sector are mixed; there are no regularities or empirical patterns that emerge from the analysis in contrast to what happens when we consider Pavitt's taxonomy. That is, the dummies for 2-digit sectors do not identify any particular sectors in which the probabilities of exiting the market for a particular reason significantly decrease or increase.

Sensitivity analysis

Table 3 presents the estimates of the coefficients of the competing risks model under the assumption of a complementary log-log specification for the hazard function, according to equation (8). The purpose is to assess the sensitivity of the estimates with respect to different hypotheses about the hazards in continuous time, that generate the failure times that were registered at discrete intervals.

<Insert Table 3 about here>

The table shows that the estimated coefficients of the complementary log-log model maintain

---

[5] Indeed, Pavitt's taxonomy simultaneously captures the toughness of competition, market opportunities and market growth potential.
[6] Available on request.

statistical significance for the same set of variables as in the case of the logistic specification of the hazard functions. It should be noted that the estimated values of the coefficients are remarkably similar for the two cases presented in Tables 2 and 3. This suggests that monthly intervals in the observation of firms' exits are quite fine-grained, and different assumptions about the behaviour of the continuous hazards within intervals do not lead to substantial differences in results.

6. Conclusions

Our empirical analyses show that the ability of a firm to introduce an innovation affects the likelihood of the firm exiting the market, but that this effect varies according to the nature of innovation and type of firm exit. We used data on a sample of 3,275 manufacturing firms in the Netherlands, with 10 or more employees. For these firms, we matched data on overall innovative performance in the period 1994-1996 (obtained from CIS-2), with monthly data on exit events in the period 1996-2003 (derived from the ABR of the entire population of firms in the Netherlands). We found that innovation reduces the probability of a firm dying or undergoing a process of radical restructuring. However, it also exposes the firm to a higher risk of exiting due to M&A. When the effects of different types of innovation, namely product and process, are separated the effects remain invariant for the risk of exit by failure, and to a certain extent, for the risk of exit due to radical restructuring. In contrast, the nature of the innovation plays a role in the probability of a firm exiting due to M&A. It is product innovation, without complementary development of new or improved production processes, which increases the risk of the firm being acquired (or involved in a merger). With regard to the effects of firm age and size, our findings confirm previous evidence that larger and older firms are subject to lower risks of failure and being acquired, although at a decreasing rate in most cases. In contrast, the risk of radical restructuring increases with firm size.

In sum, the risk of firm exit from the market is influenced by its own innovative capabilities and structural characteristics such as age and size. Innovation represents a resource and a capability that helps the firm to acquire competitive advantage and to stay in the market, in particular avoiding the risk of failure and radical restructuring. Yet, when these capabilities lead to the development of new products, but not new processes, firms become more attractive for acquisition by other firms. These capabilities are more likely to be "purchased" by and integrated into other organisations. In this case, the exit of the firm does not indicate failure, but rather a form of transfer of new knowledge from one organisation to another.

References

Agarwal, R., and D. B. Audretsch, "Does Entry Size Matter? The Impact of the Life Cycle and Technology on Firm Survival," *The Journal of Industrial Economics* 49: 1 (2001), 21-43.

Audretsch, D. B., "Innovation, Growth and Survival," *International Journal of Industrial Organization* 13: 4 (1995), 441-457.

Barnett, W. B., and J. Freeman, "Too Much of a Good Thing? Product Proliferation and Organizational Failure," *Organization Science* 12: 5 (2001), 539-558.

Barney, J. B., "Types of Competition and the Theory of Strategy: Towards an Integrative Framework," *The Academy of Management Review* 11: 4 (1986), 791-800.

Bruderl, J., P. Preisendorfen, and R. Ziegler, "Survival Chances of Newly Founded Business Organizations," *American Sociological Review* 57: 2 (1992), 227-242.

Bruderl, J., and R. Schussler, "Organizational Mortality: The Liabilities of Newness and Adolescence," *Administrative Science Quarterly* 35: 3 (1990), 530-547.

Cassiman, B., and R. Veugelers, "Spillovers and R&D Cooperation: Some Empirical Evidence," *American Economic Review* 92: 4 (2002), 1169-1184.

Caves, R. E., "Industrial Organization and New Findings on the Turnover and Mobility of Firms," *Journal of Economic Literature* 36: 4 (1998), 1947-1982.

CBS, *The Knowledge Based Economy (in Dutch: Kennis En Economie)* (Voorburg/Heerlen, The Netherlands: Statistics Netherlands, 1998).

Cefis, E., and O. Marsili, "A Matter of Life and Death: Innovation and Firm Survival," *Industrial and Corporate Change* 14: 6 (2005), 1-26.

Cefis, E., and O. Marsili, "Survivor: The Role of Innovation in Firm's Survival," *Research Policy* (2006).

Dunne, T., M. J. Roberts, and L. Samuelson, "Patterns of Firm Entry and Exit in the U.S. Manufacturing Industries," *RAND Journal of Economics* 19: 4 (1988), 495-515.

Ericson, R., and A. Pakes, "Markov-Perfect Industry Dynamics: A Framework for Empirical Work," *Review of Economic Studies* 62: 1 (1995), 53-82.

Evans, D. S., "The Relationship between Firm Growth, Size, and Age: Estimates for 100 Manufacturing Industries," *The Journal of Industrial Economics* 35: 4 (1987), 567-581.

Graebner, M. E., and K. M. Eisenhardt, "The Seller's Side of the Story: Acquisition as Courtship and Governance as Syndicate in Entrepreneurial Firms," *Administrative Science Quarterly* 49: 3 (2004), 366-403.

Hall, B. H., "The Relationship between Firm Size and Firm Growth in the Us Manufacturing

Sector," *The Journal of Industrial Economics* 35: 4 (1987), 583-606.

Hannan, M. T., and J. Freeman, "Structural Inertia and Organizational Change," *American Sociological Review* 49: 149-164 (1984).

James, A. D., L. Georghiou, and S. J. Metcalfe, "Integrating Technology into Merger and Acquisition Decision Making," *Technovation* 18: 8-9 (1998), 563-573.

Jenkins, S. P., "Easy Estimation Methods for Discrete-Time Duration Models," *Oxford Bulletin of Economics and Statistics* 57: 1 (1995), 129-138.

Jenkins, S. P., *Survival Analysis. Unpublished Manuscript* (Institute for Social and Economic Research, University of Essex, Colchester, UK. Downloadable from http://www.iser.essex.ac.uk/teaching/degree/stephenj/ec968/pdfs/ec968lnotesv6.pdf, 2004).

Jovanovic, B., "Selection and the Evolution of Industry," *Econometrica* 50: 3 (1982), 649-670.

Klepper, S., "Firm Survival and the Evolution of Oligopoly," *RAND Journal of Economics* 33: 1 (2002), 37-61.

Lehto, E. L. O., and M. O. Lehtoranta, "Becoming an Acquirer and Becoming Acquired," *Technological Forecasting and Social Change* 71: 6 (2004), 635-650.

Mairesse, J., and P. Mohnen, "Accounting for Innovation and Measuring Innovativeness: An Illustrative Framework and an Application," *American Economic Review Papers and Proceedings* 92: 2 (2002), 226-230.

McGuckin, R. H., and S. V. Nguyen, "On Productivity and Plant Ownership Change: New Evidence from the Longitudinal Research Database," *RAND Journal of Economics* 26: 2 (1995), 257-276.

Narendranathan, W., and M. B. Stewart, "Modelling the Probability of Leaving Unemployment: Competing Risks Models with Flexible Base-Line Hazards," *Applied Statistics* 42: 1 (1993), 63-83.

Nelson, R. R., and S. G. Winter, *An Evolutionary Theory of Economic Change* (Cambridge, MA: Belknap Press of Harvard University Press, 1982).

Pakes, A., and R. Ericson, "Empirical Implications of Alternative Models of Firm Dynamics," *Journal of Economic Theory* 79: 1 (1998), 1-45.

Penrose, E., *The Theory of the Growth of the Firm* (Oxford: Oxford University Press, 1959).

Perez, S. E., A. S. Llopis, and J. A. S. Llopis, "The Determinants of Survival of Spanish Manufacturing Firms," *Review of Industrial Organization* 25: 3 (2004), 251-273.

Powell, R. G., "Modelling Takeover Likelihood," *Journal of Business Finance & Accounting* 24: 7&8 (1997), 1009-1030.

Prentice, R. L., and L. A. Gloeckler, "Regression Analysis of Grouped Survival Data with Application to Breast Cancer Data," *Biometrics* 34: 1 (1978), 57-67.

Ranft, A. L., and M. D. Lord, "Acquiring New Technologies and Capabilities: A Grounded Model of Acquisition Implementation.," *Organization Science* 13: 4 (2002), 420-441.

Schumpeter, J. A., *The Theory of Economic Development* (Cambridge, Mass: Harvard Economic Studies, 1934).

Villalonga, B., and A. M. McGahan, "The Choice among Acquisitions, Alliances, and Divestitures," *Strategic Management Journal* 26 (2005), 1183-1208.

Winter, S. G., "Knowledge and Competence as Strategic Assets," in D. J. Teece (Ed.) *The Competitive Challenge. Strategies for Industrial Innovation and Renewal* (Cambridge, Mass.: Ballinger Publishing Company, 1987).

Table 1. Composition of sample and population

	Observations	%	Average Employment
ABR			
Exits			
Failure	24,222	39.6	5.6
M&A	3,077	5.0	33.9
Restructuring	263	0.4	227.1
Continuing firms	33,614	55.0	19.2
Observations	61,176		
ABR (10 or more employees)			
Exits			
Failure	2,247	18.3	42.6
M&A	1,197	9.8	81
Restructuring	225	1.8	264.8
Continuing firms	8,591	70.1	74.4
Observations	12,260		
CIS-2			
Exits			
Failure	391	11.9	66.5
M&A	275	8.4	114.1
Restructuring	72	2.2	193
Continuing firms	2,537	77.5	120.9
Observations	3,275		

Table 2. Competing risks model - Estimates of multinomial logistic regression

		Model (1)		Model (2)		Model (3)	
Exit mode	Variables	Coeff.	p-value	Coeff.	p-value	Coeff.	p-value
Failure							
	innov	**-.479**	(.000)				
	pdt			**-.288**	(.031)		
	pcs			**-.253**	(.059)		
	onlypdt					**-.369**	(.023)
	onlypcs					**-.424**	(.073)
	pdtpcs					**-.531**	(.000)
	lnage	**-.976**	(.003)	**-.957**	(.003)	**-.971**	(.003)
	lnsize	**-1.238**	(.000)	**-1.257**	(.000)	**-1.252**	(.000)
	agesize	**.089**	(.030)	**.088**	(.031)	**.089**	(.030)
	sq_age	0.040	(.168)	.039	(.186)	.040	(.173)
	sq_size	**.064**	(.006)	**.068**	(.004)	**.067**	(.004)
	dpav1	.211	(.125)	.211	(.129)	.210	(.132)
	dpav2	-.040	(.748)	-.039	(.757)	-.041	(.744)
	dpav3	-.086	(.644)	-.115	(.544)	-.107	(.572)
M&A							
	innov	**.243**	(.069)				
	pdt			**.393**	(.014)		
	pcs			-.202	(.188)		
	onlypdt					**.482**	(.009)
	onlypcs					.010	(.971)
	pdtpcs					.199	(.171)
	lnage	**-.928**	(.014)	**-.959**	(.011)	**-.950**	(.012)
	lnsize	**-.604**	(.095)	**-.618**	(.091)	**-.628**	(.084)
	agesize	.018	(.685)	.019	(.671)	.019	(.678)
	sq_age	**.073**	(.012)	**.076**	(.009)	**.075**	(.009)
	sq_size	.048	(.103)	**.049**	(.093)	**.051**	(.083)
	dpav1	-.298	(.104)	**-.341**	(.065)	**-.342**	(.065)
	dpav2	.213	(.125)	.194	(.164)	.195	(.160)
	dpav3	**-.730**	(.006)	**-.812**	(.003)	**-.823**	(.002)
Restructuring							
	innov	**-.777**	(.002)				
	pdt			-.154	(.613)		
	pcs			**-.506**	(.091)		
	onlypdt					**-.710**	(.082)
	onlypcs					-42.773	(1.000)$^{+}$
	pdtpcs					**-.652**	(.014)
	lnage	-.264	(.734)	-.276	(.720)	-.318	(.683)
	lnsize	**1.763**	(.056)	**1.650**	(.073)	**1.792**	(.052)
	agesize	.023	(.809)	.023	(.805)	.023	(.803)
	sq_age	-.028	(.621)	-.026	(.637)	-.023	(.687)
	sq_size	**-.139**	(.052)	**-.128**	(.073)	**-.144**	(.047)
	dpav1	-.391	(.266)	-.459	(.196)	-.469	(.185)
	dpav2	-.233	(.411)	-.251	(.376)	-.265	(.351)
	dpav3	-.109	(.778)	-.248	(.533)	-.200	(.613)
Log-likelihood		-5551.17		-5551.43		-5545.21	
LR Chi Square		340.19		339.66		352.10	
p-value		(.000)		(.000)		(.000)	
Observations		249287		249287		249287	

Notes: Significant coefficients ($p<0.10$) in **bold**. The dependent variable is the ratio between the probability of an exit event and the probability of the continuing state (or survival), the latter selected as base outcome.

$^{+}$ The result is due to the lack of variability and the small number of observations in this particular category: firms that have developed only process innovations and experience a radical restructuring (see also Table 3).

Table 3. Competing risks model - Estimates of complementary log-log regression

	Failure			*M&A*			*Restructuring*		
	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)	Model (1)	Model (2)	Model (3)
	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.	Coeff.
Variables	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)	(p-value)
innov	**-.478**			**.244**			**-.776**		
	(.000)			(.068)			(.002)		
pdt		**-.288**			**.394**			-.154	
		(.031)			(.014)			(.612)	
pcs		**-.252**			-.201			**-.505**	
		(.059)			(.189)			(.092)	
onlypdt			**-.369**			**.482**			**-.710**
			(.023)			(.009)			(.082)
onlypcs			**-.423**			.011			*
			(.074)			(.967)			
pdtpcs			**-.531**			.200			**-.651**
			(.000)			(.168)			(.014)
lnage	**-.971**	**-.952**	**-.967**	**-.923**	**-.954**	**-.945**	-.258	-.271	-.313
	(.003)	(.003)	(.003)	(.014)	(.012)	(.012)	(.739)	(.725)	(.688)
lnsize	**-1.235**	**-1.255**	**-1.249**	**-.599**	**-.613**	**-.623**	**1.768**	**1.654**	**1.796**
	(.000)	(.000)	(.000)	(.097)	(.093)	(.086)	(.055)	(.072)	(.051)
agesize	**.088**	**.088**	**.088**	.018	.019	.018	.023	.023	.023
	(.030)	(.031)	(.030)	(.690)	(.676)	(.683)	(.811)	(.808)	(.806)
sq_age	.040	.038	.040	**.073**	**.075**	**.075**	-.028	-.027	-.023
	(.170)	(.188)	(.175)	(.012)	(.009)	(.010)	(.617)	(.633)	(.682)
sq_size	**.064**	**.068**	**.066**	.047	**.049**	**.051**	**-.140**	**-.129**	**-.144**
	(.006)	(.004)	(.004)	(.104)	(.095)	(.084)	(.052)	(.072)	(.046)
dpav1	.211	.212	.210	-.298	**-.341**	**-.342**	-.391	-.459	-.468
	(.124)	(.128)	(.131)	(.104)	(.065)	(.065)	(.266)	(.196)	(.185)
dpav2	-.040	-.039	-.041	.213	.194	.195	-.233	-.252	-.265
	(.747)	(.756)	(.743)	(.124)	(.163)	(.160)	(.410)	(.376)	(.350)
dpav3	-.085	-.114	-.106	**-.730**	**-.811**	**-.822**	-.108	-.247	-.198
	(.646)	(.547)	(.575)	(.006)	(.003)	(.002)	(.780)	(.535)	(.615)
Log-likelihood	-2831.4	-2831.3	-2830.9	-2104.8	-2103.5	-2103.1	-615.8	-617.4	-612.0
LR Chi Square	168.6	168.7	169.5	85.3	88.0	88.8	86.0	82.7	84.9
p-value	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)	(.000)

Notes: Significant coefficients ($p<0.10$) in **bold**. The dependent variable is the ratio between the probability of an exit event and the probability of the continuing state (or survival), the latter selected as base outcome. Number of observations = 249287.

* Observations were dropped because the value of onlypcs equal to 1 predicts failure perfectly.

Publications in the ERIM Report Series Research* in Management

ERIM Research Program: “Organizing for Performance”

2007

Leadership Behaviour and Upward Feedback: Findings From a Longitudinal Intervention
Dirk van Dierendonck, Clare Haynes, Carol Borrill and Chris Stride
ERS-2007-003-ORG
http://hdl.handle.net/1765/8579

The Clean Development Mechanism: Institutionalizing New Power Relations
Bettina B.F. Wittneben
ERS-2007-004-ORG
http://hdl.handle.net/1765/8582

How Today’s Consumers Perceive Tomorrow’s Smart Products
Serge A. Rijsdijk and Erik Jan Hultink
ERS-2007-005-ORG
http://hdl.handle.net/1765/8984

Product Intelligence: Its Conceptualization, Measurement and Impact on Consumer Satisfaction
Serge A. Rijsdijk, Erik Jan Hultink and Adamantios Diamantopoulos
ERS-2007-006-ORG
http://hdl.handle.net/1765/8580

Testing the Strength of the Iron Cage: A Meta-Analysis of Neo-Institutional Theory
Pursey P.M.A.R. Heugens and Michel Lander
ERS-2007-007-ORG
http://hdl.handle.net/1765/8581

Export Orientation among New Ventures and Economic Growth
S. Jolanda A. Hessels and André van Stel
ERS-2007-008-ORG
http://hdl.handle.net/1765/8583

Allocation and Productivity of Time in New Ventures of Female and Male Entrepreneurs
Ingrid Verheul, Martin Carree and Roy Thurik
ERS-2007-009-ORG
http://hdl.handle.net/1765/8989

Cooperating if one’s Goals are Collective-Based: Social Identification Effects in Social Dilemmas as a Function of Goal-Transformation
David De Cremer, Daan van Knippenberg, Eric van Dijk and Esther van Leeuwen
ERS-2007-010-ORG
http://hdl.handle.net/1765/9041

Unfit to Learn? How Long View Organizations Adapt to Environmental Jolts
Pursey P. M. A. R. Heugens and Stelios C. Zyglidopoulos
ERS-2007-014-ORG
http://hdl.handle.net/1765/9404

Going, Going, Gone. Innovation and Exit in Manufacturing Firms
Elena Cefis and Orietta Marsili
ERS-2007-015-ORG
http://hdl.handle.net/1765/9732

High in the Hierarchy: How Vertical Location and Judgments of Leaders' Power are Interrelated
Steffen R. Giessner and Thomas W. Schubert
ERS-2007-021-ORG
http://hdl.handle.net/1765/9727

Contracts to Communities: a Processual Model of Organizational Virtue
Pursey P.M.A.R. Heugens, Muel Kaptein and J. van Oosterhout
ERS-2007-023-ORG
http://hdl.handle.net/1765/9728

Why Are Some Entrepreneurs More Innovative Than Others?
Philipp Koellinger
ERS-2007-024-ORG
http://hdl.handle.net/1765/9730

∗ A complete overview of the ERIM Report Series Research in Management:
https://ep.eur.nl/handle/1765/1

ERIM Research Programs:
LIS Business Processes, Logistics and Information Systems
ORG Organizing for Performance
MKT Marketing
F&A Finance and Accounting
STR Strategy and Entrepreneurship