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Interdependencies in the Dynamics of Firm Entry and Exit [1]

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Interdependencies in the Dynamics of Firm Entry and Exit

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Abstract

This paper investigates the dynamics of firm entry and exit with a focus on differences between industrial sectors. The paper discusses how entry and exit rates in industrial sectors are affected by previous exit and entry rates. Economic theory presents two different approaches to how entry and exit of firms are interrelated to each other, the multiplier effect and the competition effect. This paper intends to investigate which force that is the predominant one. The empirical analysis is based on data for 25 Swedish manufacturing industries at the 2-digit SIC-level, for firms with more than five employees during the period 1991-2000. A dynamic panel data approach as suggested by Anderson and Hsio (1981) and Arellano and Bond (1991) are used in estimating the relationships. The empirical results find some evidence of the multiplier effect being the predominant effect explaining entry while competition effects are more important for explaining exit patterns.

JEL classification code: L1, C33

Keywords: Entry, exit, dynamic panel data

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Introduction

Exit and entry of firms are fundamental elements behind the structural changes in different industries. To investigate forces underlying the establishment of new firms and closing down firms is very important, both for understanding industrial change, and from an economic policy point of view. The importance of industrial dynamics and firm entry and exit has been recognised since the early 20th century. Perhaps the most influential contributions in this area are made by Schumpeter (1942) who discussed the concept of “creative destruction”. According to Schumpeter the most important form of competition comes from “…the new commodity, new technology, the new source of supply, the new form of organisation.” (Schumpeter, 1942 p. 84-85).

The creative destruction approach clearly emphasizes the competition aspects of industrial dynamics. In contrast to the competition approach, theories of agglomeration suggest there are important interrelationships between firms that influence new firm formation and exit of firms. One also has to consider the demand side effects of new firm formation and firms that close down. These two types of theories instead suggest that there might be cumulative effects of firm entry and exit. Both of these forces can be expected to be working at the same time. The question is which force is the most important? Do previous entry cause exits or do entry stimulate new firm formation? What are the interrelationship between entry and exit? These are questions that we intend to answer in this paper.

The result of earlier empirical work on entry and exit differs substantially between different studies depending on industries, countries and time periods studied and methodology used. It is therefore important to take time specific and industry specific effects into account in the empirical analysis. The time specific effect makes it possible to control for differences in the level of entry and exit rates over the business cycle.

An investigation with Swedish data of the relationship on the relationship between entry and exit of firms is not yet available and would be of interest for both researches who want to know more about industrial change and for politicians who try to stimulate entry and keep exit rates at a low level. Methodologically the paper contributes to the existing literature on firm entry and exit by using the tools offered by recent developments in panel data econometrics (especially methods of dynamic panel data).

The paper is organised as follows: The theoretical framework is presented in section two. In particular the two major competing forces determining the relationship between entry and exit are expanded upon; multiplier effect versus competitive effect. Section three presents an overview of previous studies on the relationship between entry and exit of firms. In section four the data and variables included in the study are presented. Section five presents the econometric tools used, focusing on methods for dynamic panel data estimation. The empirical results are presented in section six. Finally conclusions and suggestions for future research are presented.

Theoretical framework: Entry and exit dynamics

The interrelationship between entry and exit

The literature and empirical work on entry and exit has put an increasing focus on the interrelationships between entry and exit. For an overview of the empirical findings on entry and exit, see for example, Siegfried and Evans (1994). One important reason for this relationship is the connection between entry and exit barriers. The literature usually discusses barriers to entry and they are defined as structural or behavioral barriers to entry, were structural barriers to entry are defined as persistent structural characteristics of an industry such as the existence of scale economies or industry density. Behavioral barriers to entry refer to reactions from incumbent firms to the threat of new entrants such as aggressive advertising or limit pricing. If entry barriers are high one could expect that also exit barriers are high since incumbent firms that once has succeeded in entering the market would be unwilling to exit, and therefore the turnover of firms could be expected to be lower in such industries (Shapiro and Kehmani, 1987). This relationship between entry and exit barriers has also been confirmed empirically (Dunne and Roberts, 1991).

Since entry and exit barriers differ between industries, entry and exit rates can also be expected to vary substantially between different industrial sectors. This has been empirically confirmed by, for example, Nyström, (2001) who finds both entry and exit rates to be higher in the service sector than in the manufacturing industry. Even though cross-section differences are important, empirical studies have concluded that variations over time seem to be even more important (Geroski, 1991). Therefore it is important to take both time and industry variations into account when analysing the interrelationship between entry and exit.

The competitive and multiplier effect in entry and exit dynamics

Johnson and Parker (1994) recognise two opposing forces influencing the interdependency between entry and exit of firms; the multiplier effect and the competition effect. These forces can be assumed to be at work simultaneously but the interesting question is to try to determine which of the forces that is the predominant one.

The multiplier effect means that entry causes other firms to enter. Two forces can explain this phenomenon. The “demonstration effect” occurs for example when a new firm enters, it stimulates others to do the same since it makes people aware of the markets or the possible shortcomings of those markets that could be satisfied by starting a new firm. The demonstration effect can easily be linked to theories on clusters and spill-over effects following Marshall’s (1920) theories on agglomeration. These theories state that firms can benefit from each other in several ways. Firms can, according to these theories, benefit from a shared skilled-labour market, accessibility to local inputs and information spillovers. An entering firm also generate an “income effect” since entry may increase incomes and therefore may lead to higher demand. According to the same line of reasoning the multiplier effect means that one should expect exits to cause future exits, since demand decreases when firms close down. Since a large amount of previous exit means less incomes and decreased demand it could be expected, according to the theory about the multiplier effect, to decrease entry. If we have many entering firms the previous period we would also expect exits to be low due to the income effect suggested by the multiplier theory.

The competition effect, on the contrary, suggests that entry causes future exit. An obvious example of how entry leads to exit is when a new firm, which for example is more effective, results in excessive production capacity and therefore forces other firms to exit. If the entering firm produces a superior good in terms of quality or other product characteristics this might also force already existing firms to exit. One reason for why the entrance of a new more innovative firm causes incumbent firms to exit is that both firms compete for the same resources. The entering more innovative firm that produce a superior good can charge a higher price to the consumers, and is therefore able to pay higher wages or higher prices for other inputs in the production. As input prices rises the incumbent and less efficient firm are forced to exit since they can not run a profitable business any longer. The competition effect can easily be connected to theories of product life cycles. The product life cycle theory, were Vernon (1966) and Hirsch (1967) have made important contributions during the 1960s, discuss how new product innovations are introduced in the market and how they later expand and mature, and how the later on a replaced by new products. During this product life cycle the nature of competition change from product competition to price competition. This implies that initially firms compete with product designs, quality and product characteristics, whereas in later stages they concentrate on lowering the production cost and mainly competes with a low price. This causes opportunities for potential entrants in markets in different stages of the product life cycle. Either they are able to supply an attractive product design or a lower price for the product.

The mechanism by which exits cause entry has two major arguments. One explanation is that the possibility of being unemployed as a firm exits might encourage the former employees to start a new business. The second argument suggests that exits lower the price of different resources that potential entrants may take advantage of. This argument has been put forward by for example Storey and Jones (1987) with special reference to the case of the manufacturing industry.

The competition effect also suggest a negative relationship between previous entry and present entry, since increased entry also increases competition, entry in the next period can be expected to decrease. The same type of relationship between previous exit and present exit is expected. Increased levels of exit lower competition and exit in the next period can be expected to decrease.

Generalising the theoretical discussion we can conclude that:

$$E_t = f(E_{t-1}, X_{t-1}) \tag{1}$$

and

$$X_t = f(E_{t-1}, X_{t-1}) \tag{2}$$

where E denotes entry rate, X denotes exit rate and *t* is the time period.

Table 1 summarises what we expect regarding the derivatives of these functions if the multiplier or competitive effect respectively is the most dominant force.

Table 1:Expected sign for multiplier and competition effects

	Multiplier	Competition
$\partial E / \partial E_{t-1}$	+	-

$\partial X / \partial X_{t-1}$	+	-
$\partial E / \partial X_{t-1}$	-	+
$\partial X / \partial E_{t-1}$	-	+

Previous studies

There is, according to my knowledge, no empirical study on the interrelationship between entry and exit, focusing on the question about multiplier effect and competition effect, taking *industry* differences into consideration that also uses a *dynamic* panel data approach. However, there is reasonable amount of studies that examine the interdependence between entry and exit rates, for example, Geroski (1991).

There are also some studies focusing on *regional* differences with regard to entry and exit which employ dynamic panel data methods. Johnson and Parker (1994) analyse the interrelationships between births and deaths in the retail industry in a regional perspective. They use Holtz-Eakin's (1988) method for estimating vector autoregressions with panel data. Their results are very different from those of Kangasharju and Moisio (1998) who estimate a very similar model using the Holtz-Eakin Newey and Rosen, (1988) and Holtz-Eakin, Newey and Rosen, (1989) method but applying instrumental variables instead of an OLS estimator. One explanation to the different results can be the fact that they study different regions and time periods, but also that they use different methods. Kangasharju and Moisio (1998) find that exit causes entry, whereas entry does not cause exit. Johnson and Parker (1994) get the opposite results.

Data and variables

The data used in this paper comes from two different sources, but both are collected by Statistics Sweden. The two different data sources are statistics covering plant level data in the manufacturing industry 1990-1996, and firm level data covering all industrial sectors for 1996-2000. The two different sources of data are described more in detail below.

Plant level data 1990-1996

The plant level data are covering the Swedish manufacturing industry with SIC[3]-code 10-37. The data are collected for plants on a 5-digit SIC-code level. The data material consists of about 280 different sectors and the total number of observations counts to about 8 000 to 9000 plants each year. The data contains information about for example industry codes, sales value, wages and employment. All plants with more than 10 employees are included in the dataset while for firms with less than 10 employees a sample of plants is included in the dataset. The data covers the period 1990-96. Each plant has an individual code that makes it possible to determine entry and exit. The data covers plants with 5 or more employees.

Firm level data 1996-2000

The firm level data are also classified according to the (SIC) system on the 5-digit level. The data consists of information regarding the financial situation of non-financial enterprises in the corporate sector. This means that all industries except Financial intermediation (SIC-code 65-67) Real estate activities (SIC-code 70) and Activities of membership organizations (SIC-code 91)

[3] Standard industrial classification code

are included in the original dataset. For firms with more than 50 employees the data are based on a survey conducted by Statistics Sweden and for firms with less than 50 employees the data are based on other administrative sources. Also in this case the firms are coded in a way that makes it possible to identify when each individual firm enters or exit. The total number of observations in the dataset for the year 1996 is almost 266,000 firms. The data includes information from joint-stock companies, cooperatives, partnerships, limited partnerships, associations and some foundations. The dataset includes financial information from the profit and loss account and balance sheet as well as some basic data such as the number of employees and value added. Statistics Sweden reports a non–response rate of about fifteen percent for the surveys. Most of these non-response firms are small firms with 0-19 employees. Statistics Sweden deals with this non-response rate by instead using last year’s value or averages from similar companies.

Combining the datasets

The only possible way of getting a sufficiently long time period for doing a dynamic panel data analysis is to combine the two data sets. This will result in a ten year long time series of entry and exit rates from 1991 to 2000. This means that 25 2-digit SIC-industries in only the manufacturing industries will be included in the merged dataset. In order to improve the quality of that dataset and make the two datasets more consistent the following types of observation were removed in the two datasets:

1) Plants/firms with less than five employees
2) Plants/firms with a turnover of less or equal to zero. (in order to only include firms and plants with real economic activity)

3) Plants/firms with a gross profit share[4] larger than one (this is indicating inconsistency in the data)

A description about how many plants and firms that were removed in each stage and the remaining number of observations is provided in Appendix 1.

Since the plant level data covers firms with more than 5 employees, and because firms with less than five employees were removed from the firm level dataset, it should be emphasized that entry and exit in this case must be interpreted as firms moving in or out of economic activity exceeding five employees. It should also be noted that the definition of entry and exit in some cases could be influenced by mergers and acquisitions, where the legal structure of the firm changes[5]. If a two firms merger one of the firms will keep their registration number but the other firm will be reported as an exit. This problem is mainly associated with the firm level database since a plant is associated with a geographic location that remains the same irrespectively if the firms ownership changes or not.

Variables and descriptive statistics

The variables that will be included in the empirical analysis are entry and exit rates. Two approaches of computing these entry and exit rates are usually used; the ecological approach or the labor market approach. The ecological approach relates the number of entering or exiting firms to the number of already existing firms in an specific industry, whereas the labor market approach relate the number of entering or exiting firms to the number of employees in the

[4] The gross profit share is defined as: (value added-wage cost)/sales value.
[5] Note that pure ownership changes (where the firm remains a legal entity) will not affect entry and exit rates.

industry (Armington and Acs 2002). In this paper the ecological approach is used, and the definition of entry rate in industry i at time t can according to the ecological approach be expressed as: $E_{i,t}$ = number of entering firms in industry i at time t divided by number of firms in industry i at time $t-1$. The exit rate in industry i at time t ($X_{i,t}$) is computed by dividing the number of exiting firms at time t in industry i with the number of firms in industry i at time $t-1$. Table 2 below presents some descriptive data regarding the computed entry and exit rates for 1991-2000. In the table we can clearly see the consequences, in terms of entry and exit rates, of the recession in the beginning of the 1990s and the recovery during the last years of the 1990s. For example, in 1991 on average 16 percent of the firms exited, whereas only 11 percent entered. In 1997 the exit rate was 11 percent but the entry rate was 14 percent.

Table 2: Descriptive data for entry and exit rates 1997-2000.

Entry rate	Mean	Std.Dev.	Min.	Max.	Skewness	Kurtosis
1991	0.11	0.66	0.00	0.32	1.02	4.95
1992	0.08	0.41	0.05	0.25	3.03	12.68
1993	0.09	0.067	0.00	0.31	1.71	6.39
1994	0.11	0.05	0.00	0.23	0.87	3.39
1995	0.10	0.04	0.00	0.18	0.06	2.78
1996	0.09	0.05	0.00	0.23	0.48	3.73
1997	0.14	0.06	0.09	0.42	3.42	15.07
1998	0.12	0.06	0.06	0.31	2.19	7.44
1999	0.13	0.05	0.06	0.28	1.43	4.22
2000	0.13	0.08	0.06	0.42	2.58	9.03
Exit rate						
1991	0.16	0.08	0.00	0.34	0.18	2.69
1992	0.14	0.05	0.06	0.29	1.08	5.02
1993	0.17	0.06	0.06	0.33	0.68	4.24
1994	0.10	0.06	0.00	0.26	1.05	4.15
1995	0.06	0.03	0.00	0.12	-0.26	3.12
1996	0.09	0.05	0.00	0.19	0.56	3.36
1997	0.11	0.04	0.04	0.24	1.14	4.67
1998	0.13	0.07	0.04	0.38	2.10	7.80

1999	0.12	0.04	0.06	0.21	0.75	3.59
2000	0.13	0.07	0.06	0.33	1.94	6.29

In Appendix 2 and 3 the distribution of entry and exit rates are displayed. Our analysis of the distribution figures and descriptive statistics show that we have some problems with skewness and kurtosis, especially regarding the entry rates. One commonly used measure for dealing with such problems is to use the logarithmic values of the entry and exit rates. In this case such a transformation of the variable did not at all solve these problems.

Econometric Modelling

A two-way dynamic panel data model

To empirically test the relationship between entry and exit rates we have earlier concluded that a model should take care of industry specific effects and time effects. A two-way fixed effect model would be appropriate in this case, and two different equations to be estimated can be formulated. Equation (3) is a model where previous entry and exit explain entry, while in equation (4) exit is explained by previous entry and exit.

$$E_{i,t} = \alpha + \sum_{l=1}^{m} \delta_l E_{i,t-l} . + \sum_{l=1}^{m} \beta_l X_{i,t-l} + u_i + \lambda_t + v_{it} \qquad (3)$$

and

$$X_{i,t} = \gamma + \sum_{l=1}^{m} \phi_l E_{i,t-l} . + \sum_{l=1}^{m} \pi_l X_{i,t-l} + \omega_i + \gamma_t + \varepsilon_{it}$$

(4)

where β, δ, ϕ and $\pi,$ are parameters to be estimated, *m* is the lag length. u_i, ω_i, γ and λ_i are fixed individual and time effects and $v_{it} \sim IID(0, \sigma_v{}^2)$ and $\varepsilon_{it} \sim IID(0, \sigma_v{}^2)$. The explanatory variables are assumed to be independent of v_{it} for all *i* and *t*. (Baltagi 2001)

Modifying Table 1 presented earlier to the model specifications in this section Table 3 presents the expected signs of the parameters according to the predictions of the multiplier and competition effect

Table 3: Expected sign for multiplier and competition effects

	Multiplier	Competition
$\delta,$	+	-
$\pi,$	+	-
$\beta,$	-	+
ϕ	-	+

Estimation of dynamic panel data methods

The model presented in the pervious section includes lagged dependent variables and therefore certain properties of the panel data model have to be carefully considered. The difficulty arises because the lagged dependent variable is correlated with the disturbance term, even if the disturbance term is not autocorrelated. This implies that the OLS estimator is biased and inconsistent (Baltagi, 2001). These properties of the equations that will be estimated suggest that dynamic panel data methods that take care of these problems must be used. Regarding the estimation of such dynamic models with relatively short time periods (T=10 years in our case) the econometric literature proposes several different approaches. At the moment there does not seem to be any coherent estimation method, and therefore we will in our paper present and estimate our dynamic model using alternative estimation methods presented in the econometric literature on dynamic panel data methods. In the following section two methods specifically developed for dynamic panel data methods, Anderson and Hsiao and Arrellano and Bonds methods, are described. The methods are described for the general dynamic panel data case as expressed in Equation 5 below.

$$y_{i,t} = \varphi y_{i,t-1} + \rho x_{i,t-1} + \mu_i + v_{i,t} \tag{5}$$

where $\mu_i \sim IID(0, \sigma_\mu{}^2)$ and $v_{it} \sim IID(0, \sigma_v{}^2)$ are independent of each other and among themselves. φ and ρ, are parameters to be estimated.

Anderson and Hsiao (1981) propose a method were the individual effects are wiped out by differencing Equation 5. We then get the following equation:

$$(y_{i,t} - y_{i,t-1}) = \varphi(y_{i,t-1} - y_{i,t-2}) + \rho(x_{i,t-1} - x_{i,t-2}) + (v_{i,t} - v_{i,t-1}) \tag{6}$$

The above equation is then estimated by an instrumental variable method. The question is which instrumental variables that should be used. We must find instrumental variables that are uncorrelated with $(v_{i,t} - v_{i,t})$. Anderson and Hsiao (1981) claim that $\Delta y_{i,t-2} = (y_{i,t-2} - y_{i,t-3})$ or just $y_{i,t-2}$ can be used as instrumental variables for $(y_{i,t-1} - y_{i,t-2})$. Since $y_{i,t-2}$ have better properties than $\Delta y_{i,t-2}$ it is recommended to use $y_{i,t-2}$ as an instrumental variable. Since we also have predetermined exogenous variables in our model, $x_{i,t-2}$ should also be included as an instrumental variable. The estimates obtained by this method are consistent but not necessarily efficient, since they do not take care of the differenced disturbance $(v_{i,t} - v_{i,t})$ and do not use all available moment conditions.

Arellano and Bond (1991) show that additional instrumental variables can be used in the estimation. To illustrate things let us look at the difference Equation (6) when t=4:

$$(y_{i,4} - y_{i,3}) = \varphi(y_{i,3} - y_{i,2}) + \rho(x_{i,3} - x_{i,2}) + (v_{i,4} - v_{i,3}) \qquad (7)$$

In this case both $y_{i,1}$ and $y_{i,2}$ are uncorrelated with the differenced error term and therefore both can be used as instrumental variables. These additional moment conditions increases the efficiency of the estimator. Arellano and Bond (1991) also show how to take care of the structure of the differenced error terms. Their solution is to premultiply the differenced equation with the matrix of instruments. W_i, which in a model with both endogenous and predetermined exogenous variables is defined as:

$$W_i = \begin{bmatrix} [y_{i,1}, x'_{i,1}, x'_{i,2}] & & & & \\ & [y_{i,1}, y_{i,2}, x'_{i,1}, x'_{i,2} x'_{i,3}] & & & \\ & & \ddots & & \\ & & & \ddots & \\ & & & & [y_{i,1} \ldots\ldots y_{i,T-2}, x'_{i,1} \ldots\ldots x'_{i,T-1}] \end{bmatrix}$$

The premultiplied model then becomes:

$$W'\Delta y = W'(\Delta y_{-1})\delta + W'(\Delta x)\beta + W'(\Delta v) \quad (7)$$

This can be estimated by GLS resulting in a one-step consistent estimator, or a two step GMM estimator which uses the differenced residuals from the one step consistent estimator.

The one-step and two-step estimators of δ and β' are then:

$$\begin{pmatrix} \hat{\delta} \\ \hat{\beta} \end{pmatrix} = ([\Delta y_{-1}, \Delta X]' W \hat{V}_N^{-1} W' [\Delta y_{-1}, \Delta X])^{-1} ([\Delta y_{-1}, \Delta X]' W \hat{V}_N^{-1} W' \Delta y_{-1} \quad (8)$$

An important assumption in Arellano and Bonds method of estimating dynamic panel data models is that there is no second order serial correlation. If there is second order serial correlation the GMM estimator will not be consistent.

The consequences of using different dynamic panel data methods as described above, can be further illustrated by comparing the results using different methods. Baltagi (2001) compare different estimates and find that the estimates can vary quite substantially when using different methods. In this paper we estimate the dynamic panel data model using the Anderson and Hsiao the method and Arellano and Bond method and compare them with the result of using OLS and an ordinary within estimator, which is an ordinary panel data estimation applying sector and time dummies.

To determine the lag length and test for fixed effects

In order to estimate a models such as Equation (3) and Equation (4), it is important to choose the correct lag length. Holtz-Eakin (1988) starts estimating the model using a procedure similar to the Anderson and Hsiao method, applying a relatively long lag length. The sum of squared residuals for this estimation (Q_U) is compared with an estimation using m-1 lags (Q_R). The difference $L=Q_R-Q_U$ of the residual sums of squares follows a chi-square distribution. This procedure is repeated with successively shorter lags until the lag length could no longer be reduced (Holtz-Eakin, 1988). Another similar approach, that will be used in our case is, to successively test if the parameters for the last lagged variables are zero. This is practice done by an F-test to establish if the coefficients in the unrestricted model is equal to zero.

Empirical findings

The results from estimating the lag length are reported in Table 4 below. The tests are based on estimations using the Arrelano and Bond method. In both the entry and the exit equations the null hypothesis about the last included lag being zero cannot be rejected until we have a lag length of three. This result can be compared with the result of Johnson and Parker (1994) who found a lag length of six years for the entry and a two-year lag for the exit equation. On the other hand Kangasharju and Moisio (1998) found a two-year lag structure for entry and a lag structure of one year regarding exits.

Table 4: Lag length for entry and exit equations.

F-value	Entry	Exit
Lag length m=7	0.28	0.20
Lag length m=6	0.41	0.46
Lag length m=5	1.47	1.87
Lag length m=4	0.54	0.27
Lag length m=3	3.11*	3.37*
Lag length m=2	0.63	2.28*

* indicate significance at the 5%-level.

After we have determined the lag length, the entry and exit model were estimated using the different estimation methods described above. In addition to the lagged entry and exit variables, time dummies were also included in all estimations. In the Arellano and Bond estimation a test for second order serial correlation was also performed. In both estimations the null hypothesis of no second order autocorrelation could not be rejected at the 5% significance level[6], and therefore the GMM estimator can be assumed to be consistent. The result of the estimations is presented in Tables 5 and 6. The numbers in parenthesis denotes t-statistics, and the F-value reported corresponds to is the F-value computed when testing the hypothesis that all coefficients are zero.

Comparing the results of the estimations of the entry equation confirms the observation by Baltagi (2001) that the size of the coefficients estimated differs depending on which estimation method that is used. The difference between OLS and the Arellano and Bond method seems to be

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[6] The Durbin-Watson autocorrelation test is performed where z=-0,19 Pr>z=0,85 in the entry regression and z=1,74 Pr>z=0,08 in the exit regression

particularly high. Looking at the results from all the different estimation methods we can see that entry during the previous year has a positive coefficient in all estimations and is significant in all estimations except the Anderson-Hsiao estimation. This result supports the hypothesis about the multiplier effect. The evidence regarding exits causing entry is weaker since the X_{t-1} and X_{t-3} variables are the only significant (and positive) in the Arrellano and Bond estimation. An interpretation of the results of the Arrelano and Bond estimation would be that there exists a competitive effect that is present during a longer time period, compared to previous entry rates affecting present entry. It is also interesting to note that the explanatory power is lower when using the Anderson-Hsiao and the Arellano and Bond method. (Lower F-values especially in the Andersson-Hsiao estimation)

Table 5: Estimation of the entry equation.

	Const.	E_{t-1}	E_{t-2}	E_{t-3}	X_{t-1}	X_{t-2}	X_{t-3}	F-value
OLS	0.51* (2.65)	0.40* (5.04)	0.26 (0.30)	0.21* (2.67)	0.41 (0.47)	-0.42 (-0.46)	-0.73 (-0.09)	5.92
Within	0.86* (3.60)	0.22* (2.58)	-0.80 (-0.89)	0.14 (1.57)	0.54 (0.49)	-0.43 (-0.43)	-0.46 (-0.05)	9.53
Andersson-Hsiao	0.00 (0.22)	0.16 (0.62)	-0.61 (0.37)	0.02 (0.16)	0.11 (0.40)	0.02 (0.12)	0.08 (0.56)	0.51
Arellano and Bond	-0.01 (-0.56)	0.22* (2.42)	-0.14 (-1.53)	0.09 (0.99)	0.28** (1.85)	0.14 (1.09)	0.35* (1.97)	2.59

* denotes significance at the 5%-level

**denotes significance at the 10%-level

Table 6 reports the different estimations of the exit equation. The estimations show a positive and significant effect of previous entry on exit rates in all estimations except the Anderson-Hsiao estimation where the parameter for the E_{t-1} variable is not significant. This implies that the competition effect is the predominant force. The negative coefficients of the previous exits' coefficients in the Arellano and Bond estimation also support the competition effect implying that previous exits decrease future exit. Also in this case the F-values are significantly lower in the Andersson-Hsiao and Arellano and Bond estimates. In particular we can conclude that the Anderson-Hsio method do not perform very well in either the estimation of the entry or the exit equation.

Table 6: Estimation of the exit equation.

	Const.	E_{t-1}	E_{t-2}	E_{t-3}	X_{t-1}	X_{t-2}	X_{t-3}	F-value
OLS	0.37* (2.19)	0.23* (3.38)	-0.11 (-1.46)	0.37 (0.54)	0.40* (3.65)	0.28 (0.72)	0.57* (3.70)	7.86
Within	0.95* (5.16)	0.30* (4.50)	0.22 (0.31)	0.15* (2.25)	-0.12 (-1.49)	-0.20 (-2.59)	-0.56 (-0.71)	5.34
Andersson- Hsiao	0.00 (0.11)	0.22 (0.86)	0.00 (0.02)	0.12 (1.19)	-0.01 (-0.05)	-0.12 (-0.79)	0.05 (0.41)	3.00
Arellano and Bond	0.00 (0.02)	0.34* (4.11)	0.10 (1.27)	0.21* (2.60)	-0.16** (-1.70)	-0.23* (-2.74)	-0.05 (-0.59)	3.92

Numbers in parenthesis are t-statistics

* denotes significance at the 5%-level

**denotes significance at the 10%-level

Our results of a multiplier effect being most important explaining entry rates and the competition effect explaining exits can be compared with those of Johnson and Parker (1994) and Kangasharju and Moisio (1998). In doing such a comparison it is though important to remember that their results are based on a regional analysis in a different country and during a different time period using different estimation methods. Kangasharju and Moisio (1998) find results similar to ours i.e. support for the multiplier effect in the entry equation but support for the competition effect in the exit equation. These conclusions are based on the relationship between previous exit and future entry and exit respectively since the pervious entry variable is not significant in the estimation of the entry or exit equation. Johnson and Parker (1994) get the opposite results, compared to Kangasharju and Moisio (1998), i.e. a competitive effect as a dominating explanation to entry rates and the multiplier effect explaining the exit rates.

Conclusions and suggestions for future research

Economic theory suggests two opposing forces influencing the dynamic relationship between entry and exit, the competition effect and the multiplier effect. The purpose of this paper is to determine which force that is the strongest in determining present entry and exit rate respectively.

Using different methods to estimate dynamic panel data models, in our empirical investigation we find support of both the multiplier effect and the competition effect as regards determinants of entry, whereas the competition effect could explain patterns of exit. This conclusion has important policy implications since it tells us something about how policymakers should act if they desire higher levels of new firm formation. The multiplier effect as a determinant of entry tells us that it is a good idea to stimulate new firm formation instead of using resources to try to prevent already existing firms from exiting. The reason for why we can make such a conclusion is that our empirical analysis shows that previous entry creates even more entry and increased levels of exit increases entry via the competition effect.

Our empirical analysis also shows that different methods of estimating a dynamic panel data relationship give us different results especially regarding the size of the coefficients estimated. One should be especially careful in interpreting OLS results since they can be expected to produce biased results.

The empirical analysis in this paper could probably be further improved by using a more homogenous data source for a longer time period, i.e using plant level or firm level data for the entire period. It would also be interesting to also include service industries in the analysis and see if there are any differences between manufacturing and service industries.

When comparing the empirical results with earlier research we conclude that the importance of the competition and multiplier effect differs between different countries and time periods. It is also interesting to note that the dynamics seem to differ in terms of lag-length. Such differences could be due to country specific institutional arrangements and one topic for future research would be to investigate further why such differences exist.

The empirical analysis in our paper covers both the serious recession in the beginning of the 1990s and the recover during the late 1990s. It is possible that the strength of the multiplier and competition effects differ between different stages of the business cycle, i.e. that size or the sign of the coefficients differs between different periods. It would therefore be interesting to add such an approach to the empirical analysis, but this kind of analysis requires a longer time series than the 10 years that were available in this empirical study.

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Appendix 1: Deleted observations and remaining number of observations in the datasets.

	Employees <5	Sales value ≤ 0	Gross profit share>1	Total number of observations removed	Remaining number of observations
1990[7]	157	33	20	210	9126
1991	296	48	5	349	8763
1992	280	40	6	326	8245
1993	279	34	3	316	7652
1994	173	29	4	206	7831
1995	118	27	6	151	8168
1996	173	29	12	214	8308
1996[8]	21657	10	6	21673	11584
1997	21960	52	10	22022	11870
1998	21618	44	22	21684	12041
1999	21433	50	14	21497	12042
2000	21888	56	16	21960	12166

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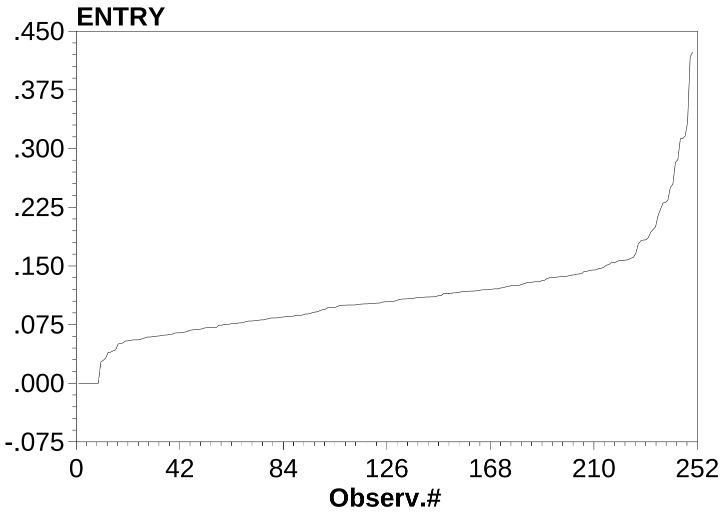
[7] Plant level data 1990-1996
[8] Firm level data 1996-2000

Appendix 2: The distribution of the entry rate variable.



Appendix 3: The distribution of the exit rate variable.