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Firm Size and Short-Term Dynamics in Aggregate Entry and Exit

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ABSTRACT:

Much of the research on industry dynamics focuses on the interdependence between the sectorial rates of entry and exit. This paper argues that the size of firms and the reaction-adjustment period are important conditions missed in this literature. I illustrate the effects of this omission using data from the Spanish manufacturing industries between 1994 and 2001. Estimates from systems of equations models provide evidence of a conical revolving door phenomenon and of partial adjustments in the replacement-displacement of large firms.

KEYWORDS: aggregation, industry dynamics, panel data, symmetry, simultaneity

JEL CLASSIFICATION: C33, C52, L60, L11

1. Introduction

Critical issues in Industrial Organization, such as competition, efficiency and innovation, hinge to a large extent on the markets' selection process. It is not surprising, therefore, to find so many papers investigating the reasons behind the inflows and outflows of firms. However, the only studies that are of interest here are those that analyse the determinants of the rates of entry and exit in manufacturing industries (broadly defined by SIC codes) and address questions related to the fringe of market structure.[1] This largely empirical literature has contributed to a better understanding of market turnover by presenting a number of stylised facts about entry and exit. At the same time, it has raised interesting research questions and economic policy concerns about its mechanics (Geroski, 1995; Caves, 1998). This paper focuses on the implications that the interdependence between aggregate entry and exit has for the analysis of industry dynamics.

To illustrate the importance of this concern we need only consider a few qualified views about the way entry and exit are related. Whereas some leading researchers in the area claim that "industries may be more consistently characterised by turnover rates than by net entry rates" (Dunne et al., 1988: 514), others wonder "[w]hich metaphor, that of displacement, where the new saplings in a forest overtake the old trees, or of the revolving door, where there is considerable exit but very little permanent penetration is correct?" (Audretsch, 1995: 156). There are also those who believe that "mass-exit naturally follows mass-entry and does not require a deep explanation" (Horvath et al. 2001: 1024), while others stress that "firm-turnover (...) is not a phenomenon confined to a group of small firms that constantly churn at the margin" (Baldwin and Gorecki, 1991: 321). Our results somehow reconcile these conflicting viewpoints. They indicate that at the industry level entry and exit are related in a dynamic way that reminds one of a conical revolving door at the bottom of which demand and technological conditions are partly responsible for the turbulent behaviour of small concerns and at the top of which a displacement-replacement of large firms occurs.

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[1] In other words, we restrict attention to the dynamics of industries in the short term and do not consider questions related to their life cycle or long-term evolution.

There are indeed studies that analyse entry and exit independently —see Geroski and Schwalbach (1991) and Siegfried and Evans (1994). However, the high correlation between the rates of entry and exit found in different countries and periods suggests that these are not isolated phenomena (Cable and Schwalbach, 1991). Modelling the empirical behaviour of these variables therefore requires some form of interrelation in the econometric specifications. Following an influential paper by Shapiro and Khemani (1987) this is usually done in two ways. One way is via the error terms, maintaining a certain symmetry in the vector of explanatory variables (i.e. estimating a system of seemingly unrelated regressions, SUR). The other way is via the explanatory variables, including entry and exit (i.e. estimating a simultaneous equations model, SEM). These two approaches have become a benchmark and are the starting point for this study. New evidence on the symmetry and simultaneity hypotheses is provided using entry and exit data from the Spanish Central Register of Firms (DIRCE, a data base from the National Statistical Institute) between 1994 and 2001. I also examine model selection procedures to discriminate between these two hypotheses in the Spanish manufacturing industries —see Segarra (2002) for a thorough analysis of this data set. These include results from goodness-of-fit measures for seemingly unrelated and IV regressions (Buse 1979; Pesaran and Smith, 1994), as wells as *t*-tests on the nested structure of the proposed econometric specifications. Ultimately, this paper discusses why it is important to consider the size of the firms and the dynamic nature of agents' decisions in this setting.

Firm size has been shown to be important for the analysis of industry dynamics.[2] However, to my knowledge its role in the symmetry and simultaneity frameworks has not been addressed. In this paper I distinguish between intervals of size (defined by the DIRCE) when estimating the system of entry and exit equations and discuss moment conditions for consistently doing this when aggregate panel data are used (see the appendix for details). One reason for this apparent gap in the literature may be

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[2] See e.g. Lieberman (1990), Baldwin and Gorecki (1991), Fariñas et al. (1992), Mata and Machado (1996) and Fariñas and Moreno (2000).

that researchers have mostly focused on testing Gibrat's Law. However, it does not seem plausible to assume that patterns of entry and exit across big firms and small and medium-sized concerns are homogenous. Small newcomers, for example, are likely to face liquidity constraints that may precipitate exit and/or delay entry, while large incumbents have generally easier access to external and internal funds and are therefore probably less affected by these constraints (Evans and Jovanovic 1989, Audretsch and Elston, 2002). Other studies that have explored this idea along the lines discussed in this paper are Acs and Audrestch (1989a, 1989b), Mata (1991) and Wagner (1994). However, in their analyses they focus on entry using cross-section and pooled data.

This paper's second contribution stems from the introduction of a simple timing structure in the decisions of entry and exit (Geroski et al., 1987; Geroski, 1991). I will argue that the relation between them is broadly guided by the following game (Jovanovic, 1982; Frank, 1988): in stage 1 Nature plays and causes the entries or exits, and in stage 2 agents observe the outcome and decide. A number of theoretical models discuss similar tenets (Dixit and Shapiro, 1986; Ericson and Pakes, 1995; Pakes et al., 2003), and related empirical evidence based on descriptive statistics (e.g. Dunne et al., 1988), hazard functions (e.g. Audrestch and Mahmood, 1995) and time series models (e.g. Geroski and Mazzucato, 2001) also exists. Because of the panel structure of the data, in this paper I consider the dynamics of entry and exit using an error-components system of equations and including the lag of entry as a covariate in the exit equation, and vice versa.[3] As Geroski and Mata (2001: 999) pointed out, "[n]ot only can important unobservables be controlled for using (...) a panel, but the time series dimension of such data enables one to say something about market dynamics". Other studies that resort to an analogous econometric specification are those of Johnson and Parker (1994), Carree and Thurik (1996) and Lay (2003), although none exploits the error-components structure of the model as

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[3] Firstly, the use of panel data allows me to control for unobservable sectorial effects (see e.g. Dunne and Roberts 1991 and Segarra et al. 2002). This aspect is surprisingly absent in many previous studies, such as those of Sleuwagen and Dehadschutter (1991) and Fotopoulos and Spence (1998). Secondly, although some studies include endogenous variables (e.g., Sleuwagen and Dehadschutter, 1991 and Kleijweg and Lever, 1996) or lags of the dependent variable (e.g., Shapiro and Khemani, 1987; Austin and Rosembaum, 1990; Evans and Sigfried,

I do (see the appendix for details). Moreover, Johnson and Parker (1994) and Carree and Thurik (1996) focus on retailing and Lay (2003) examines a developing country.

The paper is organised as follows. Section 2 reviews the literature on the symmetry and simultaneity hypotheses. Section 3 discusses the introduction of dynamics in this analytical framework. Sections 2 and 3 provide the economic foundations for the econometric specifications presented in section 4. Section 5 maintains that it is necessary to discriminate between size intervals in order to obtain appropriate inferences. Section 6 discusses the main results of model estimation and evaluation. Section 7 is the conclusion.

2. The relation between aggregate entry and exit

Many studies on industry dynamics focus on one of the flows of market turnover: either entry or exit. Following a simple maximisation rule, new firms enter the markets when the expected benefits of this decision are positive, whereas incumbents abandon their activity if the expected benefits are negative. Illustrative examples of this approach can be found in the collection of papers edited by Geroski and Schwalbach (1991). What is interesting to note here is that these studies use an econometric model which implicitly assumes that the data generation processes of the entry and exit variables are independent.

[Insert Table 1 about here]

This assumption implies, for example, that in a typical economy one would expect to observe a negative relationship between entry and exit. This is because entries are likely to be more intense in the upswings of the business cycle (i.e. they are procyclical), and exits are likely to be more intense in the downswings (i.e. they are anticyclical). The empirical evidence, however, does not support this

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1992; and Fotopoulos and Spence, 1998) on the right hand side of the model, their goal is not to analyse short-term dynamics but to solve identification, endogeneity and/or data availability problems.

tenet. On the contrary, the rates of entry and exit in different countries and periods tend to behave closely (Cable and Schwalbach, 1991). In our sample, for example, the correlation between the annual rates of entry and exit in the Spanish manufacturing industry is 0.63. Also, as the detail of Table 1 shows, in most of the Spanish manufacturing sectors the correlations over the period of analysis defining our data set are effectively positive —see also Segarra et al. (2002).

Another implication derived from the independence assumption is that demand and technological factors affecting entry should be different from those affecting exit. Accordingly, the correlation between the sectorial rates of entry and exit is expected to be weak. Once again, this tenet is at odds with the empirical evidence. One of the stylised facts on which there is general agreement between researchers is the high correlation between entry and exit rates by industry (Geroski, 1995; Caves, 1998). As an illustration, the average correlation between these rates in the Spanish manufacturing sectors in the period between 1994 and 2001 is 0.51 — also see Segarra (2002).

These contradictions suggest that the independence hypothesis is too restrictive and may involve serious errors of specification. Therefore, we must abandon it and move a step forward in the analytical foundations sustaining the empirical tests. The above-mentioned evidence fits nicely into two frameworks: one based on symmetry and one based on simultaneity (Shapiro and Khemani, 1987). Next I shall briefly analyse each of these frameworks and later I shall review the empirical evidence.

2.1 Symmetry

One possible explanation for these statistical regularities around the rates of entry and exit is that their determinants are actually the same. This would imply perfect symmetry in the vector of explanatory variables. In practice, however, this “strong” version of the symmetry hypothesis is hardly ever considered (one exception is Anagnostaki and Louri, 1995). Rather, it is common to employ a “weak” version in which only some of the regressors are the same and allow for correlation between the error terms of the entry and exit equations. These regressors are “common” (structural or behavioural) barriers in the sense that they affect both entry and exit. Well-known examples of these barriers are assets that, because of their specificity and durability, become sunk costs (Caves and Porter, 1976, 1977). On the one hand, investing in such assets is a requirement for entry and, if the potential entrant effectively becomes an incumbent, the investment eventually becomes a disincentive to exit. On the other hand, these barriers to exit can also raise barriers to entry because they can alter the expectations of the potential entrants (Dixit, 1980): directly, e.g. increasing the discount factor of the expected benefits; and/or indirectly, e.g. as a form of signalling that incumbents will behave aggressively against the entrants.

2.2 Simultaneity

An alternative (or perhaps complementary) explanation is that entry and exit are interrelated in a Schumpeterian setting of “creative destruction”. The entry of new (efficient) firms in a market causes the exit of the (less efficient) producers and there is consequently a displacement effect. However, existing firms leave behind a “vacuum” of resources and sets of unsatisfied customers that are an appealing carrot for potential entrants. This may change the subjective probability of success for the potential entrants to the extent that they may indeed decide to enter and replace those who have left. The outcome of these opposite effects is known in the literature as the “revolving door” phenomenon (Audrestch, 1995) or the “negative feedback model” (Geroski and Mazzucato, 2001).

But is what we observe really creative destruction or is it simply trial and error? Some industries may have higher or lower rates than others just because of their idiosyncratic characteristics: regulation, technology, etc. If that is the case, the relation between entry and exit is mostly due to fluctuations in demand, as in the “market size model” of Geroski and Mazzucato (2001). Changes in the size of the markets are ultimately responsible for the success or failure of many (small) firms and for movements on the fringes of industries (Lucas 1978). Therefore, industry turbulence is not necessarily due to displacement-vacuum effects: perhaps it is only due to “natural churning”. What seems beyond question in any case is that uncontrolled sectorial heterogeneity may lead to spurious conclusions (Dunne et al., 1988; Dunne and Roberts, 1991).

2.3 Empirical evidence

The hypothesis of symmetry is usually tested by using SUR specifications. Statistically significant coefficients for the barriers to exit (entry) included in the entry (exit) equation would support accepting this hypothesis. Shapiro and Khemani (1987), for example, present supportive evidence based on Canadian data. “Symmetry [also] appears to be demonstrated and extended beyond traditional barriers” in Greece (Anagnostaki and Louri, 1995; Fotopoulos and Spence 1998: 261). In Spain and Taiwan, Segarra et al. (2002) and Lay (2003) respectively present mixed evidence that, nevertheless, seems to be at least partially supportive. Rosenbaum and Lamort (1992), on the other hand, reject the symmetry hypothesis in the American manufacturing industries —see, however, Dunne and Roberts (1991). Similarly, Carree and Thurik (1996) find little evidence of symmetry in their vector of explanatory variables.

As for the simultaneous hypothesis, it is common to use SEM specifications. The displacement-replacement effects would be supported by statistically significant coefficients of the entry and exit variables on the right hand side of the exit and entry equations, respectively. Otherwise, the natural-churning view would be accepted. Shapiro and Khemani (1987), for example, find evidence of displacement in Canada and, albeit in an indirect way, so do Horvath et al. (2001) in the US brewing, automobile and tyre industries. Segarra (2002) and Segarra et al. (2002) in Spain, Sleuwaegen and Dehandschutter (1991) in Belgium, and Lay (2003) in Taiwan appear to support the existence of displacement-vacuum effects. This also seems to be the case in American and Dutch new business starts (Evans and Siegfried 1992, Kleijweg and Lever 1996) and Dutch retailing (Carree and Thurik, 1996). However, Austin and Rosenbaum (1990) and Rosenbaum and Lamort (1992) in the USA and Fotopoulos and Spence (1998) in Greece reject simultaneity because they argue that most of the changes in the identity of the incumbent firms occur in the short term and among a fringe of small firms. Consequently, these authors raise doubts about the causality and interrelation between entry and exit —see, however, Carree and Thurik (1996). From their point of view, entry and exit are parts of the market's selection mechanism and are therefore subject to similar determinants, the most important of which are those related to the structural characteristics of the industries.

To sum up we can conclude that the empirical evidence on the symmetry and simultaneity hypotheses is not totally conclusive. There are doubts about the displacement-vacuum versus natural-churning viewpoints but there is a broad agreement amongst researchers that omitting interdependence entails an error of specification. The critical question then is how to model the relation between entry and exit properly. In the following sections an attempt to provide such a model is made by analysing two missed aspects of the relation: the adjustment period required by the potential entrants (exits) to react to the exits (entries) and the assumption that the patterns of behaviour are homogenous for all sizes of firms.[4]

3. Dynamics

Cross-section studies may have obtained biased estimates because they neither control for the idiosyncratic unobservable effects nor take into account the evolution of the variables over time. As for those using panel data, their static specifications are appropriate as long as the reactions to the entry and exit of other firms (i.e. the exit and entry, respectively) occur in the same period. Following e.g. Geroski (1991), I will argue that this may not be the case, but I will present my arguments in a simple, intuitive way. A complete game-theoretical framework is beyond the scope of this paper and

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[4] There are, needless to say, other issues worth considering: e.g. those related to the territory (Segarra et al., 2002), to the types of entrants (Dunne et al., 1988; Evans and Siegfried, 1992), to the definition of the explanatory variables (Acs and Audretsch, 1989a, 1989b), and to the level of aggregation (Cable and Schwalbach, 1991).

is left for future research. It is also important to bear in mind that I will restrict my attention to short-term dynamics.

These caveats aside, let us contemplate the possibility that entries induce exits and vice-versa. The point, however, is that this cannot happen instantaneously. Agents do need some time to detect changes in the environment and implement their decisions. Therefore, we are clearly dealing with a dynamic game (Horvath et al., 2001; Pakes et al., 2003). As an illustration, let us consider a sector hit by an unexpected demand shock that causes a high number of exits in the market (notice that this may occur during a certain period, as in the "contagion model" of Geroski and Mazzucato, 2001). This sector then becomes attractive to potential entrants. However, they may need to build up facilities, hire workers, etc., and all these actions take some time (Geroski et al., 1987). In terms of the extensive form of the game, the decision of whether to enter will materialise once the agents have incorporated the information about the shock into their functions of benefits. That is, in stage 1 Nature plays and causes the exits and in stage 2 agents observe the outcome and decide (Frank, 1988; Ericson and Pakes, 1995). Similarly, consider a sector in which a change in the available technology (for example, the Internet) facilitates the entry of new competitors. Some incumbents may be displaced, but this will only happen after, for example, the competitive pressure affects their balance sheets and they take all the actions at hand to avoid the exit. Naturally, the extensive-form game is analogous.

Firms involved in the entry and exit games do not react instantaneously (Jovanovic, 1982; Dixit and Shapiro 1986), as is implicitly assumed in the symmetry and simultaneity literature. However, any test on this claim faces the problem of choosing the period of reaction and the appropriate econometric specification. For simplicity, and given the discrete time nature of my yearly data, I will assume that the reactions to the entry and exit of firms can be observed either in the same year or in the following year. Specifically, I will allow for a temporal adjustment in the displacement-vacuum effects by including among the covariates the lag of entry (exit) in the exit (entry) equation.[5] As for the econometric specification, it is well known that duration and time-series models are good candidates when one is concerned with the survival of firms and the long-term evolution of a particular industry (Geroski and Mata, 2001). The symmetry-simultaneity framework instead requires the use of systems of equations for panel data. I believe that this approach has not previously been exploited as it is in this paper.

4. Econometric specifications

The econometric specifications presented below stem directly from the symmetry and simultaneity hypotheses discussed in Section 2. Models 1 (symmetry) and 2 (simultaneity) are intended to represent typical specifications used in this literature. The difference between these models is that Model 2 contains endogenous explanatory variables. With this design I can analyse whether symmetry and simultaneity are rival or complementary explanations for the relationship between entry and exit. I also introduce dynamic structures in line with the discussion of Section 3. First, in Model 3 I substitute the endogenous explanatory variables for their corresponding lags. Later I include both the endogenous explanatory variables and their lags, i.e. Model 4 is a combination of Models 2 and 3. In this way I expect to differentiate between the fraction of the displacement-replacement that occurs simultaneously and the fraction that occurs after the temporal adjustment. In all models the dependent variables are the natural logs of the gross rates of entry ($LGRE_{it}$) and exit ($LGRX_{it}$), calculated after adding 1 to the number of entries and exits in each sector and period to avoid the indeterminacy caused by zero entry and exit (Khemani and Shapiro 1986).

Following Geroski et al. (1990), the explanatory variables include structural barriers ($BARENT_{it}$, $BAREXI_{it}$ and $BARCOM_{it}$ stand for entry, exit and common barriers, respectively) and strategic actions

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[5] This is also the approach used by Carree and Thurik (1996) and Lay (2003), whereas Johnson and Parker (1994) determine empirically the optimal lag length using a vector autoregression model. Another possibility is to introduce dynamics through the barriers of entry and exit (see e.g. Wagner, 1994; Kleijweg and Lever, 1996;

taken by the incumbents, SA_{it}. Entry barriers include market structure and capital requirements. These are approximated, respectively, by an index of concentration and the average gross investment accounted in the sector. Exit barriers are reduced to sunk costs, which I proxy with the average investment per worker. Common structural barriers include the minimum efficient scale, price cost margin (a proxy based on sales) and added-value growth of the industry. The vector of strategic actions is made up of indirect measurements of product differentiation and technological intensity. Finally, I have also included the evolution of the GDP to control for the business cycle and as a rough measure of the expected benefits. The vector $CYCLE_t$ is formed by ex-post and ex-ante GDP growth. These variables somehow play the role of a time-effect in the error component.

[Insert Table 2 about here]

Table 2 gives definitions of the variables, the statistical sources (all databases from the National Institute of Statistics except one) and the expected signs of the parameters based on conclusions from previous studies. For comparative purposes I have also included the results of this study (discussed in Section 6). In general, higher demand and higher expected benefits favour entries and discourage exits. Market concentration, capital requirements and, to a lesser extent, the actions of rivals are among the most important barriers to entry. Sunk costs seem to be the main barrier to exit. Notice, however, that the empirical evidence in Table 2 provides inconsistent results and is often at odds with the Economic Theory —see also Siegfried and Evans (1994) and Carree and Thurik (1996).

Demand and technology conditions, as well as the reactions of the incumbent firms partly explain the sectorial differences in business rotation. Still, there is an important residual variability that suggests non-observable effects must be taken into account (Dunne et al., 1988; Dunne and Roberts, 1991). Table 1 shows, for example, that some sectors have high correlations between the rates of entry and

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Fotopoulos and Spence, 1998). However, these are usually seen as long-term effects (Shapiro and Khemani, 1987; Austin and Rosembaum, 1990; Evans and Sigfried, 1992).

exit. This suggests that substantial intra-sectorial flows may occur. The low correlations in other sectors, however, indicate that inter-sectorial flows may be more important. By the same token, in some industries entry and exit appear to be practically unrelated. The structure of the non-systematic part of Models 1 to 4 aims to control for these miscellaneous patterns in Spanish manufacturing industries. The error component includes an individual effect, λ_j, which controls for unobserved heterogeneity and a classical disturbance, ε_{jt}, which controls for idiosyncratic shocks.

Bearing in mind these definitions, the following relations between entry and exit were estimated:

Model 1: Symmetry.

$$LGRE_{jt} = \alpha + \beta_1 BARCOM_{jt} + \beta_2 BARENT_{jt} + \beta_3 SA_{jt} + \beta_4 CYCLE_t + \lambda_j + \varepsilon_{jt} = \alpha + \beta_{11} MES_{jt}$$
$$+ \beta_{12} PCM_{jt} + \beta_{13} GIAV_i + \beta_{21} MS_i + \beta_{22} GI_{jt} + \beta_{31} PD_{jt} + \beta_{32} TI_{jt} + \beta_4 GDPP_t + \lambda_j + \varepsilon_{jt}$$

$$LGRX_{jt} = \alpha' + \beta'_1 BARCOM_{jt} + \beta'_2 BAREXI_{jt} + \beta'_3 SA_{jt} + \beta'_4 CYCLE_t + \lambda'_j + \varepsilon'_{jt} = \alpha' + \beta'_{11} MES_{jt}$$
$$+ \beta'_{12} PCM_{jt} + \beta'_{13} GIAV_i + \beta'_{21} GI_{jt} + \beta'_{31} SC_{jt} + \beta'_{32} TI_{jt} + \beta'_4 GDPA_t + \lambda'_j + \varepsilon'_{jt}$$

Model 2: Simultaneity.

$$LGRE_{jt} = \alpha + \beta_1 BARCOM_{jt} + \beta_2 BARENT_{jt} + \beta_3 SA_{jt} + \beta_4 CYCLE_t + \beta_5 LGRX_{jt} + \lambda_j + \varepsilon_{jt}$$

$$LGRX_{jt} = \alpha' + \beta'_1 BARCOM_{jt} + \beta'_2 BAREXI_{jt} + \beta'_3 SA_{jt} + \beta'_4 CYCLE_t + \beta'_5 LGRE_{jt} + \lambda'_j + \varepsilon'_{jt}$$

Model 3: Dynamics.

$$LGRE_{jt} = \alpha + \beta_1 BARCOM_{jt} + \beta_2 BARENT_{jt} + \beta_3 SA_{jt} + \beta_4 CYCLE_t + \beta_5 LGRX_{jt-1} + \lambda_j + \varepsilon_{jt}$$

$$LGRX_{jt} = \alpha' + \beta'_1 BARCOM_{jt} + \beta'_2 BAREXI_{jt} + \beta'_3 SA_{jt} + \beta'_4 CYCLE_t + \beta'_5 LGRE_{jt-1} + \lambda'_j + \varepsilon'_{jt}$$

Model 4: Simultaneity and Dynamics.

$$LGRE_{jt} = \alpha + \beta_1 BARCOM_{jt} + \beta_2 BARENT_{jt} + \beta_3 SA_{jt} + \beta_4 CYCLE_t + \beta_{51} LGRX_{jt-1} + \beta_{52} LGRX_{jt} + \lambda_j + \varepsilon_{jt}$$

$$LGRX_{jt} = \alpha' + \beta'_1 BARCOM_{jt} + \beta'_2 BAREXI_{jt} + \beta'_3 SA_{jt} + \beta'_4 CYCLE_t + \beta'_{51} LGRE_{jt-1} + \beta'_{52} LGRE_{jt} + \lambda'_j + \varepsilon'_{jt}$$

SUR Models 1 and 3 were estimated using a GLS procedure proposed by Avery (1977). SEMs 2 and 4 were estimated using an Error Components Three-Stage estimator proposed by Baltagi (1981) —see the appendix for details. An interesting assumption in both SUR and SEM estimations is that the error components of the equations of entry and exit are not independent, i.e. $E(\lambda_j \lambda'_j) \neq 0$ and $E(\varepsilon_{jt} \varepsilon'_{jt}) \neq 0$. This is very convenient for model selection because it implies that Models 1, 2, 3 and 4 are nested. Choosing which model is better for making inference from the data therefore becomes straightforward: it is just a matter of testing simple parametric restrictions on the β_5 coefficients. Conditional on the non-independence assumption, model selection may therefore be based on testing the null hypothesis that $\beta_5 = 0$.

[Insert Table 3 about here]

To evaluate to what extent such an assumption holds in our data, Table 3 shows estimates of the variances and covariances of the error terms. In Models 1 and 3 these estimates are based on Least Squares (LS) residuals and in Models 2 and 4 they are based on Two-Stage LS residuals. Values are generally small, but apparently non-negligible, for all the models.[6] The largest part of the variance tends to correspond to the individual component, which indicates the need for an error-component model. Interestingly, although no overriding pattern emerges from Table 3 it seems that increasing the complexity of the model (i.e. moving from Model 1 to 4) reduces its variance components. This indicates that there are certain efficiency gains that are associated with the more complex specifications.

5. The size of firms

A final element in the econometric specifications is the discrimination of firms by size. It is widely accepted that the size of the entrants is usually smaller than the average incumbent firm, that the hazard rate is inversely related to the size of the firm, and that the smaller the size the higher the business rotation —see e.g. Fariñas et al. (1992) and Segarra (2002) for Spanish evidence. However, the size of firms has received little attention in empirical tests of the symmetry and simultaneity hypotheses.

Given that differences in size reflect differences in other important variables such as investment, technology and age (Fariñas and Moreno, 2000, Audretsch and Elston, 2002), it is difficult to accept that *a priori* the determinants of entry and exit act in the same way in all the intervals of size. Rather, one would expect that the reactions of large firms to demand and technological factors differ from those of small and medium-sized concerns. The results of a simple statistical exercise proposed by Mata (1991: 54) suggest that this may well be the case. I calculated the correlation between the number of entrants for large (50 or more employees) and small (1 to 9 employees) firms, and did the same for the exits. The average coefficients over the 1994 to 2001 period were 0.44 for the entrants and 0.50 for the exits. I then calculated analogous average correlations for the rates of entry and exit

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[6] Negative estimates of the variance components are not uncommon when dealing with SEM for panel data. Replacing them with zero would not affect the performance of the estimates (see Baltagi 1984), but in Model 4 this was judged unnecessary because of the small (albeit negative) values obtained. Moreover, as shown in the

with respect to the total number of entries and exits and obtained values of -0.09 and -0.15. “This indicates that market size is probably a common determinant of both small- and large-scale entry, but also suggests that after market size is taken into account, these two types of entry [and exit] have different patterns and may be determined by different factors”.

A number of previous related studies support this claim. Focusing on small-firm entry, Acs and Audrestch (1989b) review several factors (capital barriers, R&D, niches within the industry, product innovation strategies and flexible production techniques) that may explain why small entrants behave differently than large ones —see also Acs and Audrestch (1989a). Mata (1991) discusses why the effects of entry barriers (capital requirements, scale economies, industrial concentration, sunk costs and product differentiation) ought to be different for large and small firms. Lieberman (1990) shows that the size of the incumbents is an important strategic liability that explains differences in the exit of declining industries. Small concerns are more likely to just close down (shakeout), whereas large firms tend to opt for incremental capacity reductions through the closure of plants (stakeout).

All these findings should necessarily condition the estimation of the equations of entry and exit defined by Models 1 to 4. Consequently, results are presented separately for the whole sector (*SIZE0*, firms with more than 1 employee) and for different intervals of size defined by the DIRCE: firms with 1 to 9 employees (*SIZE1*), firms with 10 to 19 employees (*SIZE2*), firms with 20 to 49 employees (*SIZE3*) and firms with 50 or more employees (*SIZE4*).[7] Acs and Audrestch (1989a) and Audretsch and Elston (2002), for example, use this kind of empirical strategy and analogous intervals to analyse, respectively, the entry process in the USA and liquidity constraints on German firms. Acs and Audrestch (1989b), Mata (1991) and Wagner (1994) did likewise, although they simply distinguished

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appendix, estimation is actually based on the matrix $T\Sigma_{\lambda} + \Sigma_{\varepsilon}$ and its variance components are indeed positive in all the specifications.

[7] Self-employment appears to be guided by very different factors from those discussed in this paper —see e.g. Evans and Leighton (1989). It therefore seemed more appropriate to drop these observations from all our samples. Previous versions of this paper that used them essentially reported the same results, except for

between large- and small-scale entry (measured in terms of employees in Acs and Audrestch 1989a and Wagner 1994). To a certain extent, the breakdown of the dependent variable resembles the quantile regression approach of Mata and Machado (1996) for evaluating the determinants of firm start-up size. However, our ultimate goal is to show the impact of structural barriers and strategic actions across the size of the Spanish manufacturing firms.[8]

6. Results

6.1 Estimation

Table 4 shows the results under the symmetry hypothesis. If we focus on the statistically significant estimates for the whole sector (see columns *SIZE0*) we find that the signs are right, in the sense that they agree with the predictions in Table 2. According to these estimates of Model 1, industry growth and capital requirements are barriers to entry. Among the incentives is the minimum efficiency size. As for exits, price-cost margin and sunk costs act as barriers. As expected, ex-post benefits positively affect entry and ex-ante benefits negatively affect exits. However, we find no evidence of symmetry in the vector of explanatory variables.

[Insert Table 4 about here]

Table 5 shows the results under the simultaneity hypothesis. Model 2 is “looking for an explanation of *residual entry*, over and above that which is determined by exit, and *residual exit*, exceeding that which is determined by entry” (Evans and Siegfried, 1992: 260). Here too the estimates for the whole

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exceptionally large estimates of the replacement-displacement effects. This suggested a misspecification error that has been corrected in the current sample design.

[8] This analysis is valid as long as size is an exogenous covariate. This is unlikely to be the case at firm level but is more arguable at the sectorial level. In the appendix I show this using an illustrative example. The basic condition is the independence of the sectorial average size of the entries (or exits) with respect to the average unobserved heterogeneity of firms and sectors, where both averages are calculated over the number of incumbent firms. In general, similar concerns may arise regarding the exogeneity of other explanatory variables. However, the use of aggregate data implies that most of these variables are rough averages calculated over the incumbent firms (Garrett 2003), so it is reasonable to assume that they are uncorrelated with the sectorial error component of the

sector (columns *SIZE0*) tend to be as expected. These support the existence of displacement-replacement effects and reveal a hint of symmetry in the minimum efficiency size and R&D expenditure unobserved in Model 1. This would imply that symmetry and simultaneity are complementary explanations of the relationship between entry and exit.

[Insert Table 5 about here]

As for the dynamic specifications of Model 3 (the first two columns in Table 6), the conclusions from Models 1 and 2 on the role of certain barriers (growth of industry, gross investment, price-cost margin and sunk costs) and the non-significance of the strategic actions of rivals are not substantially different. However, including lags of the dependent variables as regressors breaks the symmetry of barriers found in Model 2. This is also apparent in Model 4, in which we also find evidence to support the hypothesis of simultaneity and the existence of lagged (displacement) effects —see column *SIZE0* in Table 7.

[Insert Table 6 about here]

The statistical significance of the lagged endogenous variables in Models 3 and 4 suggests that their omission in Models 1 and 2 may have biased our initial estimates. In particular, the lagged displacement effect is consistent with the evidence provided by Dunne et al. (1988) in the USA, Sleuwaegen and Dehandschutter (1991) in Belgium, Kleijweg and Lever (1996) in the Netherlands, and Lay (2003) in Taiwan. On the other hand, Carree and Thurik (1996) in the Netherlands did not find statistically significant estimates. Our finding of a lagged vacuum effect in Model 3 also agrees with Sleuwaegen and Dehandschutter (1991), Johnson and Parker (1994) in the UK, and Kleijweg and Lever (1996), whereas its non-significance in Model 4 was similarly reported by Carree and Thurik

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entrant (exit). The downside, of course, is the potential bias that this may create with respect to any assessment of firm behaviour (Pakes 1983). However, this is not a major concern given the aim of the paper.

(1996) and Lay (2003). All in all, our results are largely consistent with previous related studies in other countries.

[Insert Table 7 about here]

If we now analyse the estimates from Model 1 by intervals of size, we notice that symmetry is not accepted in any of the four intervals considered. As Table 4 shows, this hypothesis is therefore unambiguously rejected using this SUR specification. However, there are striking differences in the behaviour of small and large firms. On the one hand, the entry and exit of small firms is largely determined by some specific barriers (investment for the entry and sunk costs for the exit) and the expected benefits. On the other hand, large firms are affected by very few of the factors predicted by Economic Theory. In fact, as discussed below, the model fits very poorly for these firms.

Acs and Audretsch (1989a, 1989b) and Mata (1991) report analogous differences in the US and Portuguese entry, respectively. As Table 5 shows, however, no such signs of misspecification for large firms arise when we include the endogenous variables among the covariates. In general, results from Model 2 are much more consistent across the intervals of size. This is mostly evident in the symmetry of certain barriers (although the variables that support this vary across intervals), the existence of displacement-replacement effects, and the statistical significance of both ex-ante and ex-post benefits. Nevertheless, firms with more than 50 employees present the largest estimates of the displacement-replacement and expected-benefits effects. Moreover, the evolution of ex-ante benefits does not appear to affect their exit from markets. What we need to determine now is whether this is evidence of dissimilar behaviour (as this paper argues) or the result of a specification error (as in Model 1).

Judging from the estimates obtained for Model 3, it is in fact evidence of dissimilar behaviour. As Table 6 shows, lagged displacement and replacement, as well as expected benefits, are statistically significant variables in all intervals of size considered except that of large firms (for which only displacement and ex-post benefits are significant). Moreover, the symmetry hypothesis is not supported and the regularity in the determinants of entry and exit observed in Model 2 disappears. This suggests that symmetry and simultaneity are rival rather than complementary hypotheses. However, Model 3 raises the same kind of reservations as Model 1 because the non-significance of traditional barriers in large firms is at odds with the predictions of the Economic Theory.

To a large extent, Model 4 sorts out these caveats. First, Table 7 shows that there are differences in the determinants of entry and exit between large and small firms. These differences arise from the importance for large firms of the strategic actions of rivals, the expected benefits, and the displacement-replacement effects (both lagged and simultaneous). Second, there is evidence of a conical revolving door phenomenon in the Spanish manufacturing industries —see also Fariñas et al. (1992). This means that the interdependence between entries and exits is essentially a matter for large firms, whereas turbulence, or natural churning, seems to be the guiding principle for small and medium-sized concerns after controlling for certain barriers. Audrestch (1995: 165) claims that "[w]hether the revolving door or forest metaphor better applies to any given industry is apparently determined by the conditions of market demand and market technology". Our results suggest that one should also take into account short-term dynamics and the size of firms. Third, as Shapiro and Khemani (1987) pointed out in the seminal paper of this literature, both symmetry and simultaneity are needed to explain the relationship between the rates of entry and exit in manufacturing industries. However, they cannot be applied uniformly across sizes for although they may be complementary explanations of the behaviour of large firms they appear more like rival hypotheses for small firms.

6.2 Model evaluation

To conclude our empirical analysis it is interesting to discuss the results from the goodness-of-fit measures (in the bottom row of Tables 4 to 7). One caveat to bear in mind, however, is that those from the seemingly unrelated regressions (Buse, 1979) are not directly comparable with those from the systems of equations (Pesaran and Smith, 1994). Therefore, if we compare the values for Models 1 and 3, we notice that the simple dynamic model of Table 6 performs better than the symmetry specification of Table 4. Moreover, as pointed out above, under the symmetry hypothesis the explanatory power of the model is relatively high for the smaller firms (columns *SIZE1* and *SIZE2* in Table 4) but fairly poor for the large ones (columns *SIZE3* and *SIZE4* in Table 4). Model 3 shows more consistency across intervals of size but still performs worse for large firms —see Table 6. Similarly, Model 2 (Table 5) performs worse and is less consistent across intervals of size than Model 4 (Table 7). From this point of view, Models 3 and 4 should be taken as the standard specifications for making inference.

However, such an assessment requires further statistical support because these goodness-of-fit measure should be interpreted with care. Given that Models 1, 2 and 3 are nested in Model 4, this simply boils down to analysing the *t*-tests of the current and lagged values of the dependent variables. The statistical significance of these variables suggests that, at least for these data, Model 4 is indeed the best specification. Accordingly, the estimates from this model are the basis for the comparisons with previous studies presented in Table 2.

[Insert Table 8 about here]

One may still argue that the results for Model 4 (as well as those for Model 2) may be driven by the choice of instruments. There may be analogous concerns about the specification of the model, particularly with regard to the choice of explanatory variables. To address these points Table 8 presents estimates of the lagged and simultaneous replacement-displacement effects from: i) an alternative Three-Stage LS estimator that uses a different matrix of instruments and the original specifications; and ii) Error Components Two- and Three-Stage LS estimators on a simplified version of Models 2 and 4 —see the appendix for details. As Baltagi and Li (1992) show, these Three-Stage estimators have the same asymptotic variance-covariance matrix. It is apparent from the figures in Table 8, however, that their small samples properties may differ. Also, Monte Carlo experiments indicate that the Error Components Two-Stage LS estimator is less affected by specification errors than its Three-Stage counterpart (Baltagi, 1984). However, the main conclusion of a dynamic conical interdependence between entry and exit remains largely unaltered across these alternative methods and specifications. Small differences do arise in the size of the effects, but given that some of the values look rather implausible (i.e. are outside the 0-1 interval) this actually reinforces our original choice.

7. Conclusions

The literature on the determinants of aggregate entry and exit has provided researchers and policy makers with a better understanding of the market's selection process at the sectorial level. Symmetry and simultaneity have become reliable analytical frameworks for testing a number of research questions. In this context, our results for the Spanish manufacturing industries are consistent with those from previous studies for other countries. If we use suitable estimation techniques for panel data systems of equations and control for technological and demand factors, we can draw two main conclusions. Firstly, there is certain symmetry in the regressors of the entry and exit equations and a close relationship between entry and exit. Secondly, capital requirements (as a barrier) and ex-post benefits (as incentives) are the main determinants of entry, whereas sunk costs and ex-ante benefits are the main barriers to exit. At this stage of the economic knowledge on industry dynamics, however, it is interesting to pursue new avenues of research. In this paper I have argued that among the most obvious gaps in this literature are the omission of the size of firms and the absence of a dynamic setting.

Goodness-of-fit measures and nested model selection tests suggest that we need a complex econometric specification to analyse entry and exit properly. Symmetry, simultaneity and dynamics, as well as size discrimination and error terms correlations, are probably needed. A more restricted framework may provide misleading results. In particular, the break up by intervals of size shows that symmetry and simultaneity may be rival (complementary) explanations for small and medium-sized (large) firms. There is also evidence of a conical revolving door driving the entry and exit processes, i.e. a high turbulence among the small firms and a partially adjusted displacement-replacement among the large ones. These results support our tenets and cast doubts on the robustness of the conclusions of static, size-homogeneous tests.

These conclusions, however, are subject to two important constraints: the characteristics of the data set and the econometric techniques. As I have used aggregated data, inference actually refers to (conditional) average sectorial effects and does not necessarily hold at firm level. In fact, in models using individual data the correlations between some regressors and the unobservable firm effects may alter the estimates considerably. Also, the dynamic relationships may be affected by the short period of time considered. If a longer time series had been available, I could also have explored Granger-causality and the existence of unitary roots. Future research should take care of these aspects.

8. Appendix

8.1 Estimation methods

Let us consider the following system of M (=2, entry and exit) equations:

$$y_m = X_m\beta_m + u_m \qquad (m = 1,\ldots,M) \qquad (1)\,,$$

in which y_m is a NT vector, X_m is a $(NT)x(k_m + 1)$ matrix containing the explanatory variables and β_m is a $(k_m + 1)$ vector of coefficients. The error component term is:

$$u_m = Z_\lambda\mu_m + \varepsilon_m \qquad (2),$$

where $Z_\lambda = I_N \otimes \iota_T$, I_N is an identity matrix of dimension N (= 20) and ι_T is a vector of ones of dimension T (= 8). Moreover, $\lambda_m' = (\lambda_{1m},\lambda_{2m},\ldots,\lambda_{nm})$ is a vector of random latent variables and $\varepsilon' = (\varepsilon_{11m},\ldots,\ \varepsilon_{1Tm},\ldots,\ \varepsilon_{N1m},\ldots,\ \varepsilon_{NTm})$ is an idiosyncratic shock with the classical features. We assume that these are independent vectors with zero expectation and matrix of variances and covariances given by $\Sigma_\lambda = [\sigma^2_{\lambda_{ms}}]$ and $\Sigma_\varepsilon = [\sigma^2_{\varepsilon_{ms}}]$, $s = 1,\dots,M$. This error-components structure enables us to control for the unobservable heterogeneity of the sectors.

Under the symmetry hypothesis, the starting point for the estimation is an SUR analogous to the cross-section case. The main difference is the presence of new components in the variance across equations. So, the matrix of variances and covariances of the system, $\Omega = [\Omega_{ml}]$, is:

$$E(uu') = \Sigma_\lambda \otimes (I_N \otimes J_T) + \Sigma_\varepsilon \otimes I_{NT} \qquad (3),$$

where J_T is a matrix of ones of dimension T and I_{NT} is an identity matrix of dimension NT. Given that for any scalar r it can be demonstrated that $\Omega^r = (T\Sigma_\lambda + \Sigma_\varepsilon) \otimes P + \Sigma^r_\varepsilon \otimes Q$ $P = I_N \otimes (J_T / T)$ and $Q = I_{NT} - P$, the vector of coefficients is obtained as a Generalised Least Squares estimator:

$$\beta = (X'\Omega^{-1}X)^{-1}X'\Omega^{-1}y \qquad (4).$$

In particular, in Model 1 the feasible forms are based on the errors of a Least Squares estimation (Avery, 1977). Results are shown in Table 4. This method is also used to estimate Model 3, in which a predetermined variable (the lagged dependent of the other equation) is included among the explanatory variables. Results are shown in Table 6.

Under the hypothesis of simultaneity (Models 2 and 4), the specification is similar to that of (1), (2), and (3). The main difference is the endogenous variables on the right hand side of the model. Let us consider the system in (1), but rewrite it in compact form:

$$y = Z\delta + u \qquad (5).$$

with $y' = (y'_1, y'_2, \dots, y'_M)$, $Z = diag\,[Z_m] = diag\,[y_m, X_m]$, $\delta'_m = (\gamma'_m, \beta'_m)$ and $u' = (u'_1, u'_2, \dots, u'_M)$. If we premultiply (5) by $\Omega^{-1/2}$ ($y^* = \Omega^{-1/2}y$, $Z^* = \Omega^{-1/2}Z$ and $u^* = \Omega^{-1/2}u$) and define the matrix of instruments W, the vector of estimated coefficients can be obtained from the following expression:

$$\delta = (Z^{*\prime}P_w Z^*)^{-1}Z^{*\prime}P_w y^* \qquad (6),$$

where $P_W = W(W'W)^{-1}W'$ is the projection matrix onto W. I use errors from a Two-Stage Least Squares estimation to obtain feasible forms (Baltagi, 1984). As for the matrix of instruments, let X^E be a $NTxk$ matrix containing all the exogenous variables in the system. Then $\Omega^{-1/2}(I_M \otimes X^E)$ provides the (efficient) Three-Stage Least Squares estimator (Baltagi and Li, 1992), whereas $[QX^E, PX^E]$ and $[I_M \otimes QX^E, I_M \otimes PX^E]$ provide, respectively, the Error Components Two- and Three-Stage Least Squares Estimator (Baltagi, 1981).[9] Results in Tables 5 and 7 correspond to the Error Components Three-Stage Least Squares Estimator of Models 2 and 4, respectively. Table 8 presents selected comparative results from the other estimates. In Model 4 the lagged endogenous variables are considered predetermined and are not instrumentalised.

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[9] Error Components Two- and Three-Stage estimators require that X^E contains neither individual- nor time-invariant variables, otherwise P_W does not have full rank. This is because of the individual averages and deviations from individual means (i.e. constants and zeros) created by the transformation matrices P and Q. To avoid this trap the matrix of instruments in the Error Components Three-Stage Least Squares Estimator is actually $W = [I_M \otimes Q\,X^E_{it}, I_M \otimes P\,X^E_{it}, \Omega^{-1/2}(I_M \otimes X^E_i), \Omega^{-1/2}(I_M \otimes X^E_t)]$, where $X^E = [X^E_{it}, X^E_i, X^E_t]$. This problem does not arise in the Two-Stage estimators because this was obtained for a simplified version of Models 2 and 4 without such individual- and time-invariant variables, i.e. we drop the variables MS_i, PD_i, $GDPP_t$ and $GDPA_t$. As explained in section 6.2, this was done to address the robustness of the results to alternative specifications.

8.2 Exogeneity of firm size in a model of aggregate entry and exit

The following example illustrates under which conditions size is not endogenously determined at the sectorial level. Our approach is analogous to that of Pakes (1983) and Garrett (2003) in the context of aggregation problems. However, here we are not concerned with how to recover micro-responses from aggregated regressions or what the repercussions of aggregation on statistical inference are. Rather, our interest is precisely the aggregated model.

Let us first consider a disaggregated version of our models —see section 4 for a complete description. At the firm level, the unobservable dependent variable (y^*, e.g. expected benefits) takes value $y = 1$ if firm i enters (exits) sector j in period t (i.e. $y^* > 0$), and $y = 0$ otherwise. The vector of explanatory variables includes size (denoted by x) as the main covariate and a set of control variables (denoted by z):

$$y^*_{ijt} = \beta_0 + \beta_1 x_{ijt} + \beta_2 z_{ijt} + \mu_i + \lambda_j + \eta_t + \varepsilon_{ijt} \qquad (7),$$

where β_0, β_1 and β_2 are conformable parameters. This latent variable model also includes an error component with firm (μ_i), sector (λ_j) and time (η_t) effects and a classical disturbance (ε_{ijt}). As for the moment conditions, consistent with the work of Lucas (1978), Evans and Jovanovic (1989) and Ericson and Pakes (1995) we assume that $Cov(x_{ijt},\lambda_j) = 0$ and $Cov(x_{ijt},\mu_i) \neq 0$. This means that entry (exit) and size are outcomes of an optimal decision process in which the firm chooses both simultaneously on the basis of the observed attributes of the industry (and not of unobservable characteristics such as the quality of the labour force or the incumbents' technology). Conditional on entry, size essentially depends on e.g. financial and technological constraints and, conditional on exit, on e.g. size in the previous period and business prospects.[10] Moreover, firm size is correlated with unobserved firm characteristics such as entrepreneurial talent, goodwill and managerial ability.

Our present concern, however, is not the firm-level model of (7) but the following aggregated regression equation:

$$y_{.jt} = \beta_{0.} + \beta_{1.} x_{.jt} + \beta_{2.} z_{.jt} + \mu_{i.} + \lambda_{j.} + \eta_{t.} + \varepsilon_{.jt} \qquad (8),$$

where the dots denote averages over the number of incumbent firms in sector j, N_j. In compact form, $Y_{jt} = X_{jt}\beta + \lambda_j + \varepsilon_{jt}$. The critical assumption for the analysis developed in sections 5 and 6 is that $Cov(x_{.jt},\mu_{i.}) = 0 = Cov(x_{.jt},\lambda_{j.})$. If we assume that the error components are random variables with zero means and constant variances (see the previous appendix on estimation methods), then both covariances tend to zero because the number of incumbent firms in each sector is fairly large. More specifically, $Cov(x_{.jt},\mu_{i.}) = E(x_{.jt}\mu_{i.}) = (N_j)^{-2}E(\sum_i x_{ijt} \sum_i \lambda_j) = 0$, and similarly for $Cov(x_{.jt},\lambda_{j.})$.

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[10] See e.g. Caves and Porter (1977), Dunne et al. (1988), Lieberman (1990), Fariñas and Moreno (2000), and Audrestch and Elston (2002).

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Table 1: Correlation between GRE and GRX in Spanish manufacturing (1994-2001)

Code	Description (SIC, CNAE)	
15	Food products and beverages	0.46
16	Tobacco products	– – –
17	Textiles	0.26
18	Wearing apparel; dressing and dyeing of fur	- 0.11
19	Tanning and dressing of leather; manufacture of luggage, handbags, saddlery, harness and footwear	0.17
20	Wood and products of wood and cork, except furniture; articles of straw and plaiting materials	0.82
21	Paper and paper products	0.31
22	Publishing, printing and reproduction of recorded media	0.42
23	Coke, refined petroleum and nuclear fuel	– – –
24	Chemicals and chemical products	0.57
25	Rubber and plastic products	0.51
26	Other non-metallic mineral products	0.63
27	Basic metals	0.24
28	Fabricated metal products, except machinery and equipment	0.88
29	Machinery and equipment	0.44
30	Office, accounting and computing machinery	0.06
31	Electrical machinery and apparatus	0.57
32	Radio, television and communication equipment and apparatus	0.36
33	Medical, precision, and optical instruments, watches and clocks	0.12
34	Motor vehicles, trailers and semitrailers	0.52
35	Transport equipment	0.17
36	Furniture	0.67
15-36	Manufacturing (excluding codes 16 and 23)	0.63

Note: The gross rate of entry is $GRE_{it} = N^o\ of\ Entry\ Firms_{it} / N^o\ of\ Active\ Firms_{it}$ and the gross rate of exit is $GRX_{it} = N^o\ of\ Exiting\ Firms_{it}\ /\ N^o\ of\ Active\ Firms_{it}$. Calculations are based on data from the DIRCE and only include firms with more than one employee (see footnote 7 in the text). The sub-index $i = 1, ..., 20$ and $t= 1994, ..., 2001$ denote, respectively, the SIC (CNAE) codes and the time period. I did not include tobacco and petroleum in the sample because of the shortage of firms.

Table 2: Determinants of entry (ENT) and exit (EXI)

Variables	Name	Expected Sign		Definition[a]	Source[b]	Previous studies[c, d]		
		ENT	*EXI*			+ *sig.*	- *sig.*	*ns*
Endogenous								
Ln of GRE	$LGRE_{it}$		+	Ln GRE_{it}	DIRCE	EXI: AR90, CP76, CT96, ES92, FS98, KL96, LA03, RL92, SD91, SE02, SK87 , MA03		
Ln of GRX	$LGRX_{it}$	+		Ln GRX_{it}	DIRCE	ENT: AR90, CT96, ES92, FS98, KL96, LA03, RL92, SD91, SE02, SK87, MA03		
Barriers								
Min. Efficiency Size	MES_{it}	+	–	Minimum Efficiency Size	IS	ENT: AR90, KS87, MA03	EXI: SK87	ENT: SD91, MA03 EXI: SD91
Price Cost Margin	PCM_{it}	+ –	–	(Sales-S.E.–I.I.)/Sales	NA	ENT: AR90, DR91, FS98, SD91, SE02, SK87 EXI: DR91, FS98	EXI: SD91, MA03	ENT: MA03 EXI: AR90, ES92, SK87
Growth of industry	$GIAV_{it}$	+	–	Added Value (A.R.G.)	IS	ENT: AR90, DR91, KL96, SD91, SE02	EXI: AR90, DR91, KL96, RL92, SD91	ENT: MA03 EXI: SE02, SK87, MA03
Market Structure	MS_i	–		CR10 index	SABI, NA		ENT: AL95, SD91, SK87 EXI: CP76	ENT: RL92, MA03 EXI: AL95
Gross Investment	GI_{it}	-		Average gross investment (×10^{-6})	IS		ENT: MA03 EXI: CP76, DR91, ES92	EXI: SD91
Sunk Costs	SC_{it}		–	Average investment per worker	IS	ENT: AR90	ENT: FS98, LA03 EXI: FS98, MA03	EXI: LA03
Strategic Actions								
Product Differentiation	PD_i	–	–	Advertising Expenditures/ Sales	IOT	ENT: FS98	ENT: AR90, RL92, SD91, SK87 EXI: CP76, FS98, SD91	ENT: AL95, ES92, KL96, SE02, MA03 EXI: AL95, AR90, ES92, KL96, RL92, SE02, SK87, MA03
Technological Intensity	TI_{it}	+	–	R&D Expenditures / Nº of Firms	TIS, IS	ENT: ES92, FS98, KL96	EXI: CP76, KL96, FS98, MA03	ENT: SD91, MA03 EXI: ES92, SD91
Business Cycle								
GDP ex-post	$GDPP_t$	+ –		Growth rate of GDP_{t+1}	NA	ENT: SD91, RL92, MA03	ENT: KL96, SE02	ENT: ES92
GDP ex-ante	$GDPA_t$		+ –	Growth rate of GDP_{t-1}	NA	ENT: AL95 EXI: AL95, SE02	EXI: CP76, SE02, MA03	EXI: KL96, RL92

Note [a]: S.E.: Staff expenditures. I.I.: Intermediate Inputs. A.R.G.: Annual Rate of Growth. Note [b]: IS: Industrial Survey, INE (National Institute of Statistics). NA: National Accounts, INE. SABI, a private dataset managed by Informa and Bureau van Dijk. IOT: Input-Output Tables 1995, INE. TIS: Technological Innovation Survey, INE. Note [c]: + *sig.*: Positive coefficient statistically significant. - *sig.*: Negative coefficient statistically significant. *ns*: Statistically non-significant coefficient. Note [d]: AL95: Anagnostaki and Louri (1995). AR90: Austin and Rosenbaum (1990). CP76: Caves and Porter (1976). CT96: Carree and Thurik (1996). DR91: Dunne and Roberts (1991). ES92: Evans and Siegfried (1992). FS98: Fotopoulos and Spence (1998). KL96: Kleijweg and Lever (1996). LA03: Lay (2003). RL92: Rosenbaum and Lamort (1992). SD91: Sleuwaegen and Dehandschutter (1991). SE02: Segarra et al. (2002). SK87: Shapiro and Khemani (1987). MA03 is the present study, which is included for comparative purposes –see Table 7 and columns labelled *SIZE0* for details.

Table 3: Estimated Variances and Covariances of the Error Term

	SIZE0		SIZE1		SIZE2		SIZE3		SIZE4	
	Σ_λ	Σ_ε	Σ_λ	Σ_ε	Σ_λ	Σ_ε	Σ_λ	Σ_ε	Σ_λ	Σ_ε
Model 1										
σ^2_{entry}	0.0318	0.0323	0.0221	0.0316	0.0683	0.0671	0.1554	0.1166	0.1025	0.2085
σ^2_{exit}	0.0216	0.0417	0.0169	0.0407	0.0709	0.1781	0.0970	0.2143	0.0515	0.2294
$\sigma_{entry\ exit}$	0.0204	0.0093	0.0110	0.0093	0.0683	0.0347	0.1330	0.0143	0.063	0.0438
Model 2										
σ^2_{entry}	0.0317	0.0325	0.0213	0.0324	0.0681	0.0672	0.1550	0.1149	0.0657	0.2174
σ^2_{exit}	0.0175	0.0428	0.0148	0.0416	0.0675	0.1761	0.0978	0.2127	0.0369	0.2341
$\sigma_{entry\ exit}$	0.0188	0.0102	0.0102	0.0090	0.0690	0.0346	0.1341	0.0173	0.0485	0.0488
Model 3										
σ^2_{entry}	0.0188	0.0307	0.0169	0.0287	0.0251	0.0853	0.0294	0.1608	0.0682	0.2239
σ^2_{exit}	0.0080	0.0312	0.0118	0.0311	0.0046	0.1578	0.0078	0.1701	0.0091	0.2275
$\sigma_{entry\ exit}$	-0.0018	0.0029	-0.0012	0.0029	0.0052	0.0328	0.0169	-0.0089	0.0065	0.0670
Model 4										
σ^2_{entry}	0.0103	0.0285	0.0095	0.0313	-0.0040	0.0823	-0.0014	0.1610	0.0180	0.2422
σ^2_{exit}	0.0054	0.0295	0.0081	0.0327	0.0125	0.1586	0.0063	0.1680	-0.0005	0.2332
$\sigma_{entry\ exit}$	-0.0034	-0.0003	0.0009	0.0047	0.0048	0.0302	0.0132	-0.0073	0.0068	0.0639

Note: *SIZE0* = Firms with more than 1 employee. *SIZE1*= Firms with 1 to 9 employees. *SIZE2* = Firms with 10 to 19 employees. *SIZE3*= Firms with 20 to 49 employees. *SIZE4* = Firms with more than 50 employees. Σ_λ and Σ_ε denote, respectively, the matrices of variances ($\sigma^2_{entry}, \sigma^2_{exit}$) and covariances ($\sigma_{entry\ exit}$) of the sectorial and idiosyncratic components of the error term.

Table 4: Symmetry

Variables	SIZE0		SIZE1		SIZE2		SIZE3		SIZE4	
	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT
Barriers										
MES	0.0027*	0.0018	0.0047*	0.0049*	0.0007	0.0003	0.0009	0.0005	-0.0003	0.0002
	(0.0011)	(0.0011)	(0.0021)	(0.0024)	(0.0020)	(0.0031)	(0.0017)	(0.0022)	(0.0004)	(0.0004)
PCM	0.1237	-0.3389*	0.0682	-0.2772	0.2486	-0.6861	-0.1123	-0.5457	-0.2964	-0.9583
	(0.1417)	(0.1551)	(0.2285)	(0.2446)	(0.3061)	(0.4396)	(0.4590)	(0.5264)	(0.7324)	(0.6857)
GIAV	-0.2952*	0.0246	-0.1236*	0.0359	-0.1283*	0.0873	-0.0966	0.0779	0.6309**	-0.3822
	(0.1240)	(0.1693)	(0.0436)	(0.0585)	(0.0431)	(0.0851)	(0.0688)	(0.1185)	(0.3739)	(0.4434)
MS	0.0209		0.2626		0.6108*		0.6523*		0.4055	
	(0.2467)		(0.1875)		(0.2010		(0.2227)		(0.3744)	
GI	-1.6664*		-1.4732*		-1.7199*		-1.3007*		-0.1749	
	(0.2690)		(0.2712)		(0.3651)		(0.4628)		(0.6628)	
SC		-0.1800*		-0.1519*		-0.1202**		-0.0739		0.1225**
		(0.0357)		(0.0350)		(0.0648)		(0.0661)		(0.0700)
Actions										
PD	0.0009	0.0007	0.0004	-0.0026	-0.0018	0.0038	0.0203	0.01810	0.0146	0.0044
	(0.0071)	(0.0062)	(0.0061)	(0.0055)	(0.0100)	(0.0110)	(0.0146)	(0.0124)	(0.0134)	(0.0107)
TI	0.0002	-0.0029	0.0009	0.0005	7.09×10^{-5}	0.0001	-0.0002	0.0003	0.0005	0.0005
	(0.0033)	(0.0024)	(0.0013)	(0.0012)	(0.0003)	(0.0004)	(0.0002)	(0.0002)	(0.0003)	(0.0003)
Cycle										
GDPP	3.8453*		4.1401*		2.1960		1.4224		12.2577*	
	(1.7136)		(1.7904)		(2.4692)		(3.2838)		(4.3110)	
GDPA		-10.4346*		-9.5555*		-14.6239*		-6.4925		-0.7213
		(2.0431)		(2.0324)		(4.1167)		(4.6644)		(5.2058)
R^2-*SUR*	0.34		0.31		0.23		0.08		0.08	

Note: * and ** mean that coefficients are statistically significant at 5% and 10%, respectively. Standard errors are given in brackets. *SIZE0* = Firms with more than 1 employee. *SIZE1*= Firms with 1 to 9 employees. *SIZE2* = Firms with 10 to 19 employees. *SIZE3*= Firms with 20 to 49 employees. *SIZE4* = Firms with more than 50 employees. R^2-*SUR* is a goodness of fit measure proposed by Buse (1979).

Table 5: Simultaneity

Variables	SIZE0		SIZE1		SIZE2		SIZE3		SIZE4	
	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT
Barriers										
MES	0.0012*	0.0018*	0.0041*	0.0049*	0.0002	0.0008	0.0007	0.0005	-0.0002*	0.0005*
	(0.0004)	(0.0004)	(0.0008)	(0.0009)	(0.0004)	(0.0007)	(0.0006)	(0.0008)	(0.0001)	(0.0001)
PCM	-0.0015	-0.3489*	0.0305	-0.2046*	0.4438*	-0.4663*	-0.0344	-0.2048	-0.2578	-0.9677*
	(0.0495)	(0.0553)	(0.0879)	(0.0930)	(0.0699)	(0.1087)	(0.1680)	(0.2200)	(0.2342)	(0.2293)
GIAV	-0.0645	0.1406*	-0.0987*	0.0332	-0.1333*	0.0799*	-0.0611*	0.0560	0.8041*	-0.5960*
	(0.0470)	(0.0599)	(0.0184)	(0.0220)	(0.0096)	(0.0198)	(0.0250)	(0.0440)	(0.1215)	(0.1520)
MS	0.1547**		0.3079*		1.0809*		0.8987*		-0.2792*	
	(0.0844)		(0.0720)		(0.0511)		(0.0875)		(0.1279)	
GI	0.1526		-1.0517*		0.2103		-0.3396**		0.4416*	
	(0.1941)		(0.1707)		(0.1329)		(0.2256)		(0.2174)	
SC		-0.1968*		-0.1416*		-0.0234		-0.0141		0.1314*
		(0.0135)		(0.0142)		(0.0157)		(0.0256)		(0.0232)
Actions										
PD	-0.0030	0.0031	0.0019	0.0013	-0.0126*	0.0097*	0.0075	0.0126*	0.0088*	0.0025
	(0.0025)	(0.0020)	(0.0023)	(0.0020)	(0.0024)	(0.0026)	(0.0056)	(0.0046)	(0.0038)	(0.0034)
TI	0.0035*	-0.0034*	0.0005	-7.35×10^{-5}	-0.0001*	-0.0004*	-0.0004*	0.0001	0.0001	0.0001
	(0.0011)	(0.0008)	(0.0005)	(0.0005)	(8.27×10^{-5})	(0.0001)	(9.91×10^{-5})	(0.0001)	(0.0001)	(0.0001)
Cycle										
GDPP	14.8728*		7.2272*		15.7108*		11.8374*		24.2873*	
	(1.1660)		(1.1180)		(0.9392)		(2.0740)		(1.7935)	
GDPA		-8.5856*		-8.0071*		-10.4927*		-3.9259*		0.4726
		(0.7600)		(0.8088)		(1.1354)		(2.0846)		(2.5144)
Endogenous										
LGRE		0.0671**		0.0906**		0.5679*		0.4414*		0.3020*
		(0.0377)		(0.0514)		(0.0412)		(0.0663)		(0.0524)
LGRX	0.8031*		0.2204*		0.8310*		0.5633*		0.9471*	
	(0.0783)		(0.0745)		(0.0445)		(0.0868)		(0.0799)	
GR^2	0.45	0.33	0.41	0.27	0.38	0.41	0.46	0.38	0.21	0.34

Note: * and ** mean that coefficients are statistically significant at 5% and 10%, respectively. Standard errors are given in brackets. *SIZE0* = Firms with more than 1 employee. *SIZE1*= Firms with 1 to 9 employees. *SIZE2* = Firms with 10 to 19 employees. *SIZE3*= Firms with 20 to 49 employees. *SIZE4* = Firms with more than 50 employees. GR^2 is the generalised R^2 measure proposed by Pesaran and Smith (1994).

Table 6: Dynamics

Variables	**SIZE0**		**SIZE1**		**SIZE2**		**SIZE3**		**SIZE4**	
	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT
Barriers										
MES	0.0015	0.0019*	0.0046*	0.0063*	0.0003	0.0011	0.0003	0.0017	-7.23×10^{-5}	0.0002
	(0.0011)	(0.0010)	(0.0021)	(0.0021)	(0.0022)	(0.0029)	(0.0020)	(0.0020)	(0.0004)	(0.0004)
PCM	0.0310	-0.4151*	-0.0956	-0.3776**	0.0688	-0.6590**	-0.5451	-0.8351**	-0.6036	-0.8621
	(0.1436)	(0.1363)	(0.2272)	(0.2185)	(0.3447)	(0.4034)	(0.5363)	(0.4937)	(0.7912)	(0.6668)
GIAV	-0.2384*	-0.0592	-0.1139*	-0.0279	-0.0980*	0.0402	-0.0168	-0.0050	0.5031	-0.2013
	(0.1252)	(0.1544)	(0.0424)	(0.0553)	(0.0478)	(0.0803)	(0.0818)	(0.1122)	(0.4033)	(0.4548)
MS	0.0455		0.3823*		0.6979*		0.9656*		0.8113**	
	(0.2792)		(0.1926)		(0.2428)		(0.2838)		(0.4289)	
GI	-1.1956*		-1.0298*		-1.6565*		-0.6038		-0.2653	
	(0.3394)		(0.3240)		(0.4631)		(0.6178)		(0.7350)	
SC		-0.0975*		-0.0753*		-0.0420		0.0405		0.1047
		(0.0349)		(0.0351)		(0.0603)		(0.0664)		(0.0700)
Actions										
PD	0.0004	-0.0018	0.0005	-0.0018	-0.0040	0.0075	0.0062	0.0088	0.0142	-0.0019
	(0.0060)	(0.0048)	(0.0055)	(0.0048)	(0.0074)	(0.0063)	(0.0089)	(0.0067)	(0.0124)	(0.0081)
TI	0.0019	-0.0056*	0.0001	-0.0005	-3.58×10^{-5}	-0.0004	-0.0001	0.0001	0.0001	0.0003
	(0.0036)	(0.0019)	(0.0013)	(0.0011)	(0.0003)	(0.0003)	(0.0002)	(0.0002)	(0.0004)	(0.0003)
Cycle										
GDPP	7.6170*		7.7098*		6.1763*		11.8504*		14.0474*	
	(2.0727)		(2.0874)		(3.1338)		(4.8263)		(4.8879)	
GDPA		-4.3572*		-3.9968*		-3.9501		7.6954		0.7506
		(2.0480)		(2.0422)		(4.4467)		(4.7758)**		(5.6646)
Predetermined										
$LGRE_{t-1}$		0.3819*		0.2153*		0.6287		0.4476		0.3631*
		(0.0723)		(0.0868)		(0.0910)*		(0.0680)*		(0.0773)
$LGRX_{t-1}$	0.2936*		0.2160*		0.1398*		0.3487*		0.0517	
	(0.0735)		(0.0723)		(0.0545)		(0.0764)		(0.0831)	
R^2-*SUR*	0.40		0.34		0.31		0.30		0.22	

Note: see note to Table 3.

Table 7: Simultaneity and Dynamics

Variables	SIZE0		SIZE1		SIZE2		SIZE3		SIZE4	
	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT	ENTRY	EXIT
Barriers										
MES	8.38×10^{-5}	0.0010**	0.0041*	0.0053*	0.0013	0.0012	0.0009	0.0010	0.0001	-0.0002*
	(0.0006)	(0.0006)	(0.0012)	(0.0012)	(0.0011)	(0.0017)	(0.0010)	(0.0011)	(0.0001)	(0.0001)
PCM	0.0304	-0.3438*	-0.1205	-0.3975*	-0.0810	-0.5854*	0.0450	-0.4174	-0.5937*	-0.6851*
	(0.0793)	(0.0865)	(0.1267)	(0.1196)	(0.1643)	(0.2492)	(0.2578)	(0.2864)	(0.2061)	(0.2145)
GIAV	-0.0832	-0.0131	-0.0925*	-0.0033	-0.1213*	0.0323	-0.0267	0.0435	0.5342*	-0.3990*
	(0.0744)	(0.0946)	(0.0252)	(0.0303)	(0.0230)	(0.0466)	(0.0421)	(0.0629)	(0.1030)	(0.1279)
MS	0.1997		0.3493*		0.7429*		0.9303*		0.1312	
	(0.1418)		(0.0922)		(0.0728)		(0.1038)		(0.0963)	
GI	-0.6746*		-1.0539*		-0.5593*		0.3980		-0.4841*	
	(0.2108)		(0.1890)		(0.1794)		(0.2594)		(0.2060)	
SC		-0.0673*		-0.0850*		-0.0116		0.0385		0.0661*
		(0.0206)		(0.0184)		(0.0376)		(0.0366)		(0.0190)
Actions										
PD	-0.0006	0.0003	-5.21×10^{-5}	-0.0025	-0.0112*	0.0075**	-0.0049**	0.0064**	0.0096*	-0.0076*
	(0.0028)	(0.0024)	(0.0024)	(0.0023)	(0.0019)	(0.0043)	(0.0030)	(0.0036)	(0.0025)	(0.0021)
TI	0.0028	-0.0055*	0.0003	-0.0004	-5.63×10^{-5}	-0.0005*	-0.0004	-2.7×10^{-5}	0.0001	0.0001
	(0.0018)	(0.0010)	(0.0007)	(0.0006)	(0.0001)	(0.0002)	(0.0001)	(0.0001)	(0.0001)	(-9.11×10^{-5})
Cycle										
GDPP	9.6156*		7.4759*		11.2819*		20.7287*		16.9582*	
	(1.3080)		(1.2783)		(1.9413)		(2.7110)		(2.3593)	
GDPA		-5.5759*		-4.7783*		-2.8050*		4.9741**		-11.7659*
		(1.2654)		(1.1452)		(2.9390)		(3.0079)		(3.1656)
Predetermined										
$LGRE_{t-1}$		0.1409**		0.0663		-0.5078*		0.1331*		0.1909*
		(0.0855)		(0.0679)		(0.0889)		(0.0680)		(0.0294)
$LGRX_{t-1}$	0.0460		0.1253*		0.0455		0.2015*		0.0099	
	(0.0543)		(0.0532)		(0.0319)		(0.0454)		(0.0244)	
Endogenous										
LGRE		0.3754*		0.1543**		0.1786		0.5443*		0.6127*
		(0.1052)		(0.0895)		(0.1120)		(0.0822)		(0.0718)
LGRX	0.7323*		0.1511		0.6394*		0.8419*		0.5969*	
	(0.1029)		(0.1120)		(0.0455)		(0.0584)		(0.0626)	
GR^2	0.49	0.44	0.44	0.28	0.52	0.43	0.42	0.42	0.37	0.41

Note: see note to Table 4.

Table 8: Alternative Estimates of the Simultaneous and Lagged Replacement-Displacement Effects

	SIZE0			SIZE1			SIZE2			SIZE3			SIZE4		
	EC2SLS	EC3SLS	E3SLS	EC2SLS	EC3SLS	E3SLS	EC2SLS	EC3SLS	E3SLS	EC2SLS	EC3SLS	E3SLS	EC2SLS	EC3SLS	E3SLS
Model 2															
LGRE	0.4223*	0.2012*	0.1818*	0.4088*	0.2245*	0.2450*	0.6701*	0.3969*	1.0146*	0.5945*	0.4811*	1.6738*	0.5517*	0.4810*	0.4747*
	(0.0272)	(0.0277)	(0.0433)	(0.0357)	(0.0368)	(0.0435)	(0.0280)	(0.0404)	(0.0028)	(0.0212)	(0.0474)	(0.2118)	(0.0353)	(0.0424)	(0.0702)
LGRX	0.6114*	0.5990*	0.3994*	0.5463*	0.3922*	0.1504*	0.9927*	0.6700*	0.7851*	1.4546*	0.8612*	-0.8633*	1.0317*	0.8574*	0.8036*
	(0.0487)	(0.0564)	(0.0830)	(0.0619)	(0.0649)	(0.0721)	(0.0336)	(0.0483)	(0.0039)	(0.0345)	(0.0659)	(0.4617)	(0.0517)	(0.0585)	(0.1231)
Model 4															
$LGRE_{t-1}$	0.0849	0.0969	-0.1795**	-0.0412	-0.0442	-0.2459*	0.4662*	0.5457*	0.8345*	0.1658*	0.1146	-0.5855*	0.2942*	0.3485*	0.1909*
	(0.0845)	(0.0839)	(0.0953)	(0.0732)	(0.0739)	(0.0495)	(0.0801)	(0.0813)	(0.0683)	(0.0733)	(0.0830)	(0.0983)	(0.0398)	(0.0427)	(0.0294)
$LGRX_{t-1}$	-0.1030	-0.0852	-0.0067	0.0226	0.0696	0.0833*	-0.0228	-0.0185	-0.0491*	-0.0497	-0.0431	0.3573*	-0.1201*	-0.1285*	0.0099
	(0.0659)	(0.0651)	(0.0426)	(0.0793)	(0.0806)	(0.0365)	(0.0316)	(0.0327)	(0.0144)	(0.0494)	(0.0523)	(0.0269)	(0.0475)	(0.0487)	(0.0244)
LGRE	0.3368*	0.3384*	0.6474*	0.3524*	0.3291*	0.2605*	0.3612*	0.1341	0.1243	0.5976*	0.6051*	1.8739*	0.3901*	0.2508*	0.6127*
	(0.1088)	(0.1081)	(0.1289)	(0.0901)	(0.0909)	(0.0678)	(0.1009)	(0.1028)	(0.0972)	(0.0864)	(0.0975)	(0.1559)	(0.0495)	(0.0531)	(0.0718)
LGRX	0.6047*	0.6195*	0.6554*	0.1746	0.0096	-0.4676*	0.5480*	0.4560*	0.9556*	1.0046*	0.9494*	1.1356*	0.9106*	0.8083*	0.5969*
	(0.1240)	(0.1225)	(0.1467)	(0.1853)	(0.1880)	(0.1415)	(0.0520)	(0.0549)	(0.0272)	(0.0654)	(0.0686)	(0.0425)	(0.0813)	(0.0849)	(0.0626)

Note: *SIZE0* = Firms with more than 1 employee. *SIZE1*= Firms with 1 to 9 employees. *SIZE2* = Firms with 10 to 19 employees. *SIZE3*= Firms with 20 to 49 employees. *SIZE4* = Firms with more than 50 employees. EC2SLS and EC3SLS stand, respectively, for Error Components Two- and Three-Stage Least Squares. E3SLS stands for Efficient Three-Stage Least Squares.