ENTRY AND EXIT IN SPAIN:

TESTS OF THE INDEPENDENCE, SYMMETRY AND SIMULTANEITY HYPOTHESES*

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**ABSTRACT**

In this study we empirically tested three hypotheses on the relationship between the entry and exit of firms in an industry. In essence, the independence hypothesis states that the sectorial and geographical determinants of entry and exit are different; the symmetry hypothesis states that barriers to entry are also barriers to exit; and, finally, the simultaneity hypothesis states that there is a close relationship between entry and exit. The econometric specification is based on a system of equations that uses panel data from Spanish regions and sectors. Our results seem to confirm the simultaneity hypothesis for Spain during the period 1980 to 1994.

**Key words:** entry and exit, panel data, systems of equations

**JEL:** C33, R19, R30

## 1. Introduction

Market turnover involves two related processes: entry and exit of firms. These are the results of decisions taken by different economic units, but they are not necessarily isolated phenomena. If the variables that affect the decision to enter are different from the variables that affect the decision to leave, we may conclude that the relationship between entries and exits is weak. However, the correlation between the rates of entry and the rates of exit in industries is usually strong – i.e. industries with high rates of entry also have high rates of exit and vice versa (see, e.g., Dunne and Roberts 1991). This suggests that the entries and exits of businesses are not independent processes but ones that are somehow related. Entries may create a displacement effect that causes exits to increase and exits, on the other hand, can free both niches in the market and the business resources that speed up the ability of potential producers to respond by entering (Acs and Audrestch 1990, Audrestch 1995).

Moreover, there is empirical evidence suggesting that entry and exit are closely related within sectors and regions. The entry of new producers in a region is linked, among others, to the profits they expect to make, to the barriers to entry and to territorial factors that shape the environment in that region. The exit of industrial establishments, on the other hand, depends on the economic cycle, on sunk costs and on geographical variables that affect the ability of local companies to survive (Caves 1998, Gerosky 1995, Sutton 1997).

In this paper we will use a system of equations for three different scenarios in order to determine the nature of the relationship between the entry and exit of industrial establishments in a particular Spanish region. The *independence hypothesis* states that the sectorial and geographical determinants of entry and exit are different. The *symmetry hypothesis* states that there is a link between entry and exit such that barriers to entry are also barriers to exit. The *simultaneity hypothesis* states that the interdependence between entry and exit is derived not only from a symmetrical relationship, but also from the effects that entries have on exits, and vice versa (Shapiro and Khemani 1987).

Other studies that have explored this type of approach are, for example, Evans and Siegfried (1992). They reported a close relationship between entry and exit in the manufacturing industries of the United States between 1977 and 1882. Kleijweg and Lever (1996) and Love (1996) reached similar conclusions about the manufacturing industries of Holland and England, respectively. The study by Fotopoulos and Spence (1998) on the manufacturing industries of Greece between 1982 and 1998 supported the symmetry hypothesis. These authors also found that the barriers to entry also affected the barriers to exit, and vice versa.

On the whole, empirical evidence is rather scarce. This paper aims to fill this void to some extent by presenting results for Spain. Our approach is basically similar to that used by the above authors. In brief, estimates from equations for entry and exit determine how sectorial and regional variables affect industrial rotation and explain the relationship between the entry and exit of industrial concerns. We will also discuss whether the effects of displacement or *natural churning* are valid in the Spanish case.

The main differences with other studies lie in our sources of data and the econometric techniques we have used. The gross rates of entry and exit of Spanish industries were taken from the *Registro de Establecimientos Industriales* (the Register of Industrial Establishments, REI) and the *Encuesta Industrial* (the Industrial Survey, EI). Information about how the data base was constructed can be found in Segarra *et al.* (2002). As for the econometric specification, we employ several estimation methods for panel data depending on the stochastic assumptions sustained by the three hypotheses of interest. Moreover, this seems to be the first study that uses two latent variables for industries and regions to collect unobservable effects (Baltagi 2001).

The paper is structured as follows: section 2 describes the independence, symmetry and simultaneity hypotheses in detail; section 3 outlines the estimation methods; section 4 describes the econometric specification and the main results; and finally, section 5 summarizes our main conclusions.

## 2. Alternative hypotheses on the relationship between entry and exit

### 2.1 Independence

Many studies on business demography have focused on one of the extremes of industrial dynamics. Either they have analyzed the factors determining the entry of new companies (Orr 1974, Geroski 1991, Baldwin 1995) or they have concentrated on the reasons why a productive activity is abandoned (Marcus 1967, Mata and Audretsch 1995, Doi 1999). The arguments in these papers vary, but the basic premise common to all of them is that new companies enter markets when the expected profit, after discounting the costs due to the barriers to entry, is positive. Also, a company will abandon its activity when the expected profits, taking into account the percentage of sunk costs that are not made up before leaving the market, are negative[1].

This implies that the stochastic processes generating the data are *independent*. This means, for example, that the probability of events defined in terms of the gross rate of exit in a given sector and/or geographical area in a given time period is never affected by the behavior of the net rates of entry. Generally, given that the moments of the distribution of the gross rates of entry and exit (and, in particular, the mathematical expectation) are not affected by, respectively, the probability distribution of the net rates of exit or entry, there is no need to deal with the interdependence of these random variables. Also, we can expect that the determinants of the two processes are different. This asymmetry means that the cost structure is assumed to be homogeneous. This is actually an extremely restrictive assumption but it is nevertheless very useful as a benchmark.

[1] This approach is based on the concept of limit price developed in the studies of Bain (1949, 1956).

In practice, the specification of the reduced form is given by the following expressions, which should be estimated separately using the most suitable method[2]:

$$LNGRE = f(BARENT)$$

$$LNGRX = f(BAREXI) \tag{1}$$

where $f$ is a mathematical function – for example, linear – *LNGRE* and *LNGRX* are the natural logarithms of the gross rate of entry and exit, and *BARENT* and *BAREXI* are vectors of variables that take into account the presence of barriers to entry and barriers to exit.

The overall result we expect to see empirically is a negative relationship between the rate of entry and the rate of exit, since we are assuming that the first is greater when extraordinary profits are expected (it is procyclical) and the second is greater in recession periods (it is anticyclical). For example, the partial correlation between the annual aggregate values for the Spanish manufacturing industry in the sample we analyzed is $r = -0.47$. However, Segarra *et al.* (2002) showed that in both sectorial and territorial disaggregation, the patterns of entry and exit are not always conflicting. During this period the average correlations between the gross rates of entry and exit sectorially and territorially were $\bar{r} = 0.62$ and $\bar{r} = 0.25$, respectively. This apparent contradiction is not exclusive to Spain. Actually, it happens regularly for other countries and periods. Moreover, studies on the American economy show that extraordinary profits in an industry affect both decisions to enter and decisions to leave[3].

[2] For example, Ordinary Least Squares (OLS) or Generalized Least Squares (GLS) - directly if cross-section data are used or after suitable transformations (e.g., within and orthogonal deviations) if a panel data is used. The semilogarithmic specification presented is the most common one in the literature. See Orr (1974: 62-63), Shapiro and Khemani (1987: 17, note 6) and Fotopoulos and Spence (1988: 255-256) for a discussion on why it is used.

[3] For Spain see, for example, Callejón and Segarra (1999). A comparison of international evidence is found in Reynolds *et al.* (1994), Geroski (1995), Malerba and Orsenigo (1996) and Caves (1998). On how entries and exits behave when there are supranormal profits, see Austin and Rosenbaum (1990), Dunne and Roberts (1991) and Rosenbaum and Lamort (1992).

These stylized facts of the industrial dynamics can be explained in either of the following two scenarios. First, the determinants of the rate of entry and the rate of exit are identical, i.e. the barriers to entry become barriers to exit. Second, the entry of new companies encourages the closure of active companies, and vice versa. Entrances influence exits since they increase the pressure of competition in the market and displace the least efficient companies, and the companies that decide to abandon the market leave behind niches of unsatisfied consumers that encourage new companies to enter. The first scenario leads to a *symmetry* in the incidence of the variables for explaining the entry and exit, whereas in the second entries and exits have a certain *simultaneity*. We will now analyze each of these scenarios in more detail.

### 2.2 Symmetry

From the available empirical evidence we can deduce that, unlike what is said to happen when we assume independence, some factors acting as barriers to the entry of new firms also affect the exit of existing ones. Even assuming that the cost structures are heterogeneous, this may be due to the specificity and durability of some assets that eventually become sunk costs – see Caves and Porter (1976) and Eaton and Lipsey (1980, 1981). These specific investments signal to the potential entrants the barriers they must face if they are to compete in this market. Paradoxically, once the new company has entered the market, the investment becomes a disincentive to leave it. Following on from this argument, the ratios of exit should, on average, be lower in industries whose technological characteristics require capital investment with a long redemption period (Dunne, Roberts and Samuelson 1988, Dunne and Roberts 1991). However, this is difficult to prove, precisely because it is difficult to know the proportion of sunk costs.

From the statistical point of view, the *symmetry hypothesis* states that the specification of the equations for entry and exit should be similar. This means modifying (1) by using a new vector of exogenous variables that is common to both equations and that includes both barriers to entry and barriers to exit. Notice also that if the main determinants of entering or leaving the market were analogous we would expect to see a strong sample correlation between the errors in equations (1). This is due to the omission of relevant variables, as suggested by Shapiro and Khemani (1987: 20). Formally, we have:

$$\begin{aligned} LNGRE &= f(BARENT; BAREXI) \\ LNGRX &= f(BAREXI; BARENT) \end{aligned} \tag{2}$$

However, the literature advocates incorporating certain differential features to control the peculiarities of each phenomenon. This also helps to identify the coefficients of the model. Shapiro and Khemai's seminal study (1987), for example, includes the structure of the market as a specific determinant of entry and the growth of the industry as a specific determinant of exit. In the equations of Austin and Rosenbaum (1990), the difference lies in the efficient minimum scale and the ratio of investment to sales. In Evans and Siegfried (1992) the difference is between profits and margins. Rosenbaum and Lamort (1992) categorize incentives, barriers and other structural characteristics. Love (1996) includes among the determinants of entry variables related to the structure of the population - density and percentage of people employed in administrative posts – and among the determinants of exit the percentage of homes owned in the area. Kleijweg and Lever (1996) distinguish between types of entry and exit and use lags. Finally, Fotopoulos and Spence (1998) apply lags to price-margin and the presence of small firms.

**2.3 Simultaneity**

Many of these studies have also investigated whether the rates of entry and exit in a given sector or region can be considered simultaneously determined in the model. The argument used in favor of the interdependence of the two decisions goes as follows (Acs and Audrestch 1990, Audrestch 1995). On the one hand, the entry of new firms in a market may cause established firms to leave. This is the so-called displacement, revolving door or conical revolving door effect. On the other hand, the "vacuum" left by those who leave liberalizes useful resources and improves the chances of success of those who enter. However, there is some controversy about whether this approach is consistent. While the first relationship between entry and exit seems to be generally accepted, the second (i.e. that exits affect entries) is more debatable. What is true is that the decision to enter always involves an exit at some time in the future, but the disappearance of a company does not necessarily involve the appearance of another.

Empirical evidence confirms these doubts, as only in a few of the above-discussed studies the exit variables included in the entry equation are statistically significant. We must therefore ask whether a displacement-vacuum effect is actually involved or whether it is simply a continuous process of trial and error – natural churning. The answers are still not conclusive. The results of Fotopoulos and Spence (1998) for the Greek manufacturing industry, for example, raise doubts about the nature and extent of the relationship between the entries and exits. They conclude that most changes in the identity of active firms take place in the short term and on the periphery of the largest industries. A similar study of the British manufacturing industry made by Love (1996) concluded that the interaction between entry and exit is mainly a product of the revolving door effect.

From the econometric point of view, the general formulation of the equations is similar to that in (2), except that the endogenous variables now appear as covariates:

$$\begin{aligned} LNGRE &= f(BARENT; BAREXI; TBS) \\ LNGRX &= f(BAREXI; BARENT; TBE) \end{aligned} \qquad (3)$$

### 3. Estimation methods

The econometric framework is given by a system of $M$ equations:

$$y_m = X_m \boldsymbol{b}_m + u_m \qquad (m = 1,\dots,M) \qquad (4)$$

and an error component structure:

$$u_m = Z_\mu \mu_m + Z_\lambda \lambda_m + Z_\eta \eta_m + \varepsilon_m \qquad (5)$$

in which $Z_\mu = I_N \otimes e_T \otimes e_Q$, $Z_\lambda = e_N \otimes I_T \otimes e_Q$, $Z_\eta = e_T \otimes e_N \otimes I_Q$; $e_N$, $e_T$ and $e_Q$ are vectors of ones and $I_N$, $I_T$ and $I_Q$ are identity matrices of dimension $N$, $T$ and $Q$, respectively. $\mu' = (\mu_1, \mu_2, \ldots, \mu_n)$, $\lambda' = (\lambda_1, \lambda_2, \ldots, \lambda_t)$ and $\eta' = (\eta_1, \eta_2, \ldots, \eta_q)$ and $\varepsilon_m$ is an idiosyncratic shock with classical properties. Also, $y_m$ is a vector $(NTQ) \times 1$. $X_m$ is a matrix of explanatory variables whose dimension is $(NTQ) \times (k_m + 1)$ and $\beta_m$ is the vector $(k_m + 1)$ of model coefficients.

This econometric specification arise from the tenet that empirical studies on the determinants of entry and exit should at least consider two types of explanatory variables: one controlling the nature and extent of the barriers to entry and exit in each industry and one for the specific features of each region in which the firm is located. Without doubt regions are not homogenous in terms of their ability to create and support business projects. In fact, many industries tend to concentrate in certain geographical areas (Fujita, Krugman and Venables 1999). But one can also argue that the inconsistent results obtained in many regional studies probably arise because most of them do not differentiate between sectors (Audretsch and Fristch 1999). Moreover, the descriptive results obtained by Segarra *et al.* (2002) for Spain highlight the need for variables that control the unobservable heterogeneity from both the sectorial and the territorial points of view. A classic solution for panel data models is to introduce these unobservable components in the error term, as in (5). We have also included a time dimension to allow for some dynamic effects. This is therefore an extension to three dimensions of the model with error components for panel data[4].

[4] In the application we have carried out in this paper, $M = 2$, $N = 17$ (regions or "Comunidades Autónomas"), $T = 15$ (1980 to 1994) and $Q = 11$ (sectors defined by the Spanish SIC, NACE-R25), so that $NTQ = 2805$.

To decide which is the most suitable method for estimating the parameters of equations (1) and systems (2) and (3), we must take into account the underlying assumptions in the various hypotheses regarding the stochastic behavior of the variables and the error terms. Under the *independence hypothesis* we used OLS and "fixed effects" (FE). The latter were based on the "within" transformation of model (1). Details of the algebra of these estimators are omitted because they are so widely used[5] (see, e.g., Baltagi 2001). Under the *simultaneity hypothesis* we are dealing with a system of simultaneous equations model (SEM), while under the symmetry hypothesis the analytical reference corresponds to the particular case that defines a system of seemingly unrelated regressions (SUR). These are less familiar estimation techniques, so they probably need the following brief descriptions.

### 3.1 Symmetry hypothesis: SUR

The biggest difference between the SUR estimation and the OLS/FE for (1) is the greater efficiency achieved by considering the correlations between the perturbations of each equation. From (4) and (5), we also assume without loss of generality that the latent variables are random and independent vectors of the form $\mu \sim (0, \Sigma_\mu \otimes I_N)$, $\lambda \sim (0, \Sigma_\lambda \otimes I_T)$, $\eta \sim (0, \Sigma_\eta \otimes I_Q)$ and $\varepsilon \sim (0, \Sigma_\varepsilon \otimes I_{NTQ})$, where $\Sigma_\mu = \left[\sigma^2_{\mu_{ml}}\right]$, $\Sigma_\eta = \left[\sigma^2_{\eta_{ml}}\right]$, $\Sigma_\eta = \left[\sigma^2_{\eta_{ml}}\right]$ and $\Sigma_\varepsilon = \left[\sigma^2_{\varepsilon_{ml}}\right]$ are matrices of dimension $M \times M$. Also, the matrix of variances and covariances of the system $\Omega = [\Omega_{ml}]$ will be (Wansbeek and Kapteyn 1982):

$$\Omega = \sum_{s=1}^{5} \xi_s \otimes V_s \qquad (6)$$

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[5] In particular, the transformation matrix of the FE was

$$P = I_N \otimes I_T \otimes I_Q - I_N \otimes \bar{J}_T \otimes \bar{J}_Q - \bar{J}_N \otimes I_T \otimes \bar{J}_Q - \bar{J}_N \otimes \bar{J}_T \otimes I_Q + 2\bar{J}_N \otimes \bar{J}_T \otimes \bar{J}_Q$$

with $\bar{J}_N = J_N/N$, $\bar{J}_Q = J_Q/Q$ and $\bar{J}_T = J_T/T$ where $J_N$, $J_T$ and $J_Q$ are matrices of ones of dimension $N$, $T$ and $Q$, respectively. The estimates of the variance of $\beta_m$ obtained after estimating by *OLS* the model transformed in this way should be adjusted for the loss of degrees of freedom by $\frac{NTQ - k_m}{(NTQ - N - T - Q + 2) - k_m}$ (≅1 in this study, so the correction was judged unnecessary).

in which $\boldsymbol{x}_1 = \boldsymbol{S}_e$, $\boldsymbol{x}_2 = TQ\boldsymbol{S}_m + \boldsymbol{S}_e$, $\boldsymbol{x}_3 = NQ\boldsymbol{S}_l + \boldsymbol{S}_e$, $\boldsymbol{x}_4 = NT\boldsymbol{S}_h + \boldsymbol{S}_e$ and $\boldsymbol{x}_5 = TQ\boldsymbol{S}_m + NQ\boldsymbol{S}_l + NT\boldsymbol{S}_h + \boldsymbol{S}_e$ are the characteristic roots of $\boldsymbol{W}$. Moreover, $V_1 = P$, $V_2 = E_N \otimes \bar{J}_T \otimes \bar{J}_Q$, $V_3 = \bar{J}_N \otimes E_T \otimes \bar{J}_Q$, $V_4 = \bar{J}_N \otimes \bar{J}_T \otimes E_Q$, $V_5 = \bar{J}_N \otimes \bar{J}_T \otimes \bar{J}_Q$ are the corresponding matrices of eigenprojectors, in which $E_N = I_N - \bar{J}_N$, $E_T = I_T - \bar{J}_T$ and $E_Q = I_Q - \bar{J}_Q$. Given that for every scalar $r$ it can be demonstrated that $\Omega^r = \sum_{s=1}^{5} \boldsymbol{x}_s^r \otimes V_s$, from (6) the vector of parameters in (4) can be estimated by GLS. Further, to obtain feasible GLS we must first estimate the characteristic roots of $\boldsymbol{W}$. One way is to use ANOVA estimates like $\hat{\boldsymbol{x}} = u'V_s/tr(V_s)$, $s = 1,2,3,4$ and substitute the vector $u$ with the residuals from the OLS (Avery 1977) or FE (Baltagi 1980) estimates. Both techniques provide asymptotically efficient estimates of the model coefficients.

### 3.2 Simultaneity hypothesis: SEM

In this case the model is analogous to that from expressions (4), (5) and (6), except that there are endogenous variables on the right-hand side of the equation. Of the various methods in the literature for estimating SEM with panel data, the properties and simplicity of Baltagi (1981) make it best suited to our application (see Baltagi and Li 1992). The estimation methods are based on two-stage least squares (2SLS) with limited information and three-stage least squares (3SLS) with complete information. The identification condition is simply that the number of exogenous variables not included in the corresponding equation is greater than or equal to the number of endogenous variables.

Let the model given by (4) be rewritten in this case in compact form. A transformation matrix $A$ is applied such that $y^* = Ay$, $Z^* = AZ$ and $u^* = Au$. If the matrix of instruments used is $W$, the vector of coefficients will be given by the following general expression:

$$\boldsymbol{b}_W = (Z^{*\prime} P_W Z^*)^{-1} Z^{*\prime} P_W Y^* \qquad (7)$$

in which $P_w = W(W'W)^{-1}W'$ is the projection matrix of the instruments $W = [V_1X, V_2X, V_3X, V_4X, V_5X]$. In particular, if we define the transformation matrix in terms of the elements of the main diagonal of the matrix of variances and covariances of each equation ($A = w_{mm}^{-1/2}$), and apply *2SLS* to the transformed model (Cornwell *et al.* 1992), we obtain the error component two-stage least squares (EC2SLS) estimator. Similarly, if we use the complete matrix ($A = \boldsymbol{W}^{-1/2}$) and 3SLS we obtain the error component three-stage least squares (EC3SLS) estimator. Both GLS estimates are consistent, and in their feasible version they are based on the residuals from an initial 2SLS estimation. However, as the EC3SLS estimator is based on complete information, it is generally more efficient than EC2SLS (for example, whenever the matrix of variances and covariances is not diagonal in blocks[6]).

## 4. Models specification and results

The econometric specifications to tackle the independence, symmetry and simultaneity hypotheses between the gross rates of entry and exit by industry (NACE R-25) and region (NUTS-2) are:

Independence hypothesis:

$$LNGRE_{iqt} = a_0 + a_1\,BARENT + a_2\,REGIO + a_3\,CYCLE + \left(m_i + l_t + h_q + e_{iqt}\right)$$

$$LNGRX_{iqt} = a'_0 + a'_1\,BAREXI + a'_2\,REGIO + a'_3\,CYCLE + \left(m'_i + l'_t + h'_q + e'_{iqt}\right)$$

Symmetry hypothesis:

$$LNGRE_{iqt} = a_0 + a_1\,BARENT + a_2\,REGIO + a_3\,CYCLE + a_4\,BAREXI + \left(m_i + l_t + h_q + e_{iqt}\right)$$

$$LNGRX_{iqt} = a'_0 + a'_1\,BAREXI + a'_2\,REGIO + a'_3\,CYCLE + a'_4\,BARENT + \left(m'_i + l'_t + h'_q + e'_{iqt}\right)$$

Simultaneity hypothesis:

$$LNGRE_{iqt} = a_0 + a_1\,BARENT + a_2\,REGIO + a_3\,CYCLE + a_4\,BAREXI + a_5\,LNGRX + \\ + \left(m_i + l_t + h_q + e_{iqt}\right)$$

[6] However, Baltagi (1984: 616) showed in Monte Carlo experiments with a similar model to ours that "going from *EC2SLS* to *EC3SLS* may not be worth the effort".

$$LNGRX_{iqt} = \boldsymbol{a}'_0 + \boldsymbol{a}'_1 \, BAREXI + \boldsymbol{a}'_2 \, REGIO + \boldsymbol{a}'_3 \, CYCLE + \boldsymbol{a}'_4 \, BARENT + \boldsymbol{a}'_5 \, LNGRE +$$
$$+ \left( \boldsymbol{m}'_i + \boldsymbol{l}'_t + \boldsymbol{h}'_q + \boldsymbol{e}'_{iqt} \right)$$

Table 1 summarizes the definitions of the variables we used in our study. The dependent variables are the natural logs of the gross rates of entry (LNGRE) and exit (LNGRX) for each pairing of industry and region that, for each year between 1980 and 1994, were obtained from the link between the REI and the EI. The maximum and minimum values are obtained by adapting the "modified Aitchison procedure" proposed by Fry *et al.* (2000). The details of this approach can be found in the appendix.

As for the explanatory variables, *BARENT* and *BAREX* are vectors of structural characteristics that determine the nature and extent of the barriers to entry and exit of each industry. This includes benefits ex-ante (BEXA) and ex-post (BEXP), market structure (ME), profit margins (PCM), technological intensity (RDS), product differentiation (DIF), average size of the concerns (SIZE), average capital requirements (KR) and percentage of micro-firms in the sector (MICROS). The second set of variables contains the specific factors for each region that affect business rotation. *REGIO* is formed by measures of industrial diversity (DIV) and relative specialization (ES) of the region, human capital (HC) and public capital (PC), market accessibility (ACCESS), population structure (PE), income per capita (INC), percentage of micro-firms (MICROR), unemployment rate (U) and technological investments (RDR). The third group is made up of control variables to correct the effects of economic activity on entries and exits (*CYCLE*). This distinguishes between growth evolution for the whole manufacturing industry (MG), the sector (IG), the manufacturing industry of the region (RMG) and the pairing region-sector (RSG).

As discussed above, the model is completed with an error component with sectorial (*i*), territorial (*q*) and time effects (*t*). The sectorial classification we used was NACE R-25 and we distinguished between *11* manufacturing branches, *i = 1,......, 11*. Territorial disaggregation is given by the *Comunidades Autónomas*

(Spanish regions) except Ceuta and Melilla, $q = 1,......, 17$. Finally, the analysis was made between 1980 and 1994, $t = 1980,......, 1994$.

**4.1 Independence hypothesis**

Results under the independence hypothesis are presented in Table 2. However, OLS estimates should just be taken as a starting point because they are asymptotically inefficient. Efficient estimates in single equation models depend on the assumptions on the stochastic relationship between the covariates and the latent effects (e.g., alternative assumptions lead to the fixed and random effects). A strong correlation between the effects and the explanatory variables is plausible, so we chose to carry out conditional inference. This decision was also supported by the fact that our main interest lies in the statistical units under study – i.e. the regions and sectors.

The most important results of our first econometric approach are as follows. The only sectorial variable that appears to be a barrier to the entry of new companies is the average requirement of capital. On the other hand, the size of existing firms and R&D expenditure tend to behave in the opposite way. Moreover, sectors whose established firms invest in R&D are very dynamic and provide ample opportunity for new operators, usually fairly small ones, to enter. Highly concentrated sectors with large profit margins do not present substantial barriers to entry either.

At the same time, entries are not very sensitive to ex-post profits, but they are clearly related to the economic cycle. New firms grow especially with the upswing of the aggregate activity of both the industrial sector and the manufacturing industry. Moreover, intraindustrial externalities predominate over intraregional ones. As expected, the behavior of entries is procyclical.

If we consider the regional factors affecting the creation of new firms, we can see that the sense and the value of the estimates from the two methods are closer. This should be interpreted as (indirect) proof that regionally the latent factors are less important. Entrances increase in regions with good human capital and, although this is less clear, in regions with more R&D, with a greater presence of micro companies among those entering the market and a greater diversity in the structure of production. A second set of regional indicators, such as the degree of specialization in the sector, the ratio of public capital to private capital and the rate of unemployment seem to have a negative effect on entry.

On the other hand, the number of companies that close seems to increase as the average size of the incumbents increases, and to a lesser extent, as R&D investments increase. Exits depend little on ex-ante profits and behave anti-cyclically. While entries were more sensitive to the intraindustrial effects, exits are more sensitive to the economic cycle in the region. Therefore, intraregional external effects are more important.

The effects of the regional variables are ambiguous and the parameters obtained are often of little statistical significance. There seem to be more exits in regions where the productive structure is more diverse, income per inhabitant is higher, and the percentage of micro companies is greater. On the other hand, there seem to be fewer exits in the more sectorially specialized regions, regions with better infrastructure and regions whose established firms have high RD costs.

**4.2 Symmetry hypothesis**

Next we estimated the coefficients using a SUR. We assume no direct relationship between entry and exit, but the correlation between the error terms mean that these variables are dependently distributed at the population level. Moreover, as we have already said, if the decisions about entry and exit show a certain symmetry with respect to their determinants, we will expect to see a strong sampling correlation between the errors of equations (1).

However, the empirical results do not completely support the assumptions of the symmetry hypothesis. Partial correlations between the OLS residuals were 0.2260 (max) and 0.0946 (min), while those from the EF residuals were 0.2162 (max) and

0.0953 (min). Therefore, the analysis of the interrelationship between the decision to enter and the decision to exit seems to require more advanced hypotheses. For this reason we also made our study using the simultaneity hypothesis. Nevertheless, as the sample correlations are not negligible, we think it is worth commenting briefly on the results of the estimations. In fact, as Table 3 shows, the figures for the specification based on OLS residuals and the figures for FE residuals are quite similar. We will therefore analyze the statistical significance of the coefficients and how they should be interpreted in the same way – irrespective of whether they are from OLS or FE.

The average stock of capital per establishment and, to a lesser extent, advertising expenditure, are the two sectorial variables that create barriers to entry. On the other hand, the average size of the incumbents works in the opposite direction. A similar thing happens with the proxy of the industry's technological system, although this effect is less clear. We need to add to these two variables those that, in the case of entry, relate to the structure of the market (ME, PCM). As we saw under the symmetry hypothesis, we can conclude that it is easier for new firms (in general, relatively small ones) to enter sectors with high price-to-cost margins.

Entrances react negatively to ex-post profits and behave pro-cyclically. Exits, on the other hand, are not strongly linked to ex-ante profits and increase during recessions, especially when there is less industrial activity in the region. It is interesting to note here that the cyclical effects under this hypothesis and under the independence hypothesis are similar. In fact, the results under the simultaneity hypothesis follow the same pattern. We may therefore say that they are robust to all the proposed econometric specifications.

The regional variables have a stronger and more varied effect on the rotation of industrial firms. For example, a high degree of specialization in a sector and a high ratio of public infrastructure to private capital negatively affect the flow of entry and exit in a region. In regions with a high percentage of citizens aged between 30 and 44, the flow rates of entry, and possibly of exit, are higher. On the other hand, the contribution of human capital and the technological intensity in a region increase industrial rotation, especially in terms of entry. In terms of exits, industrial rotation is higher in regions with a wide diversity of production and a high income per capita. Finally, the conditions of transport infrastructure and the rate of regional unemployment do not provide significant results.

### 4.3 Simultaneity hypothesis

Under the symmetry hypothesis, the relationship between entry and exit arise from the correlations between the error terms. However, the empirical evidence in Spain suggests that the interdependence between the two rates could be much stronger. Entrances may affect exits in the short term via a displacement effect, and exits may affect entries via the liberalization of business resources (resource release) or the appearance of segments of demand that are not covered (room market). The simultaneity hypothesis therefore considers the entries as a factor that determines exits, and vice versa. In this way it takes the complexity of the structure of the equations a step further by introducing the endogenous variables as explanatory factors. The estimation methods used (EC2SLS and EC3SLS) differ only in terms of efficiency (incomplete information as opposed to complete information, respectively). However, the results of the two methods are generally very similar (see Table 4). Nevertheless, as the correlations between the terms of perturbation in the equations of the model appear not to be nil, we will take the EC3SLS estimates as our main guide.

Our results show a clear interrelationship between the creation and the closure of industrial firms in Spanish manufacturing industry. The gross rate of exits shows positive and highly significant values in the entry equation, while the gross rates of entries shows positive and significant values, although less so in the exit equation. Although decisions about entering or leaving are taken by different subjects, industrial sectors with a strong flow of entries record a displacement effect that causes more firms to leave the market, while industrial sectors with a strong flow of exits record a reassignment of business resources that manifests itself in the creation of more new firms.

Under the simultaneity hypothesis, barriers to entry are created only by the average required stock of capital. In fact, no sectorial variable seems to negatively affect the exit of firms. R&D expenditure and the difference between price and marginal cost did not create barriers to entry for new firms. Rather, they helped increase industrial rotation. On the other hand, these coefficients are not so significant under the independence or simultaneity hypotheses.

The relationship between entry/exit and ex-ante and ex-post profits is more tenuous than in the other specifications. However, entries (exits) are still positively (negatively) related to the economic cycle. The sectorial variables are not important for determining the pattern of exits. The exception is the technological intensity of the industry, which does contribute to business rotation.

If we look at the regional variables, we can see that a large supply of human capital in a region favors the creation of industrial establishments, but the index of industrial diversity, the income per inhabitant and the number of micro companies show ambiguous parameters. The ratio of public capital to private capital, the age distribution of the population and the specialization of production have a negative effect on the creation of firms. The structure of the population, the diversity of the industrial mix in the region and the percentage of micro companies provide conflicting results about exits, as do the INC, U and RDR variables. This reinforces the impression that the factors determining the rates of exit are far from clear, both from the theoretical and the empirical points of view.

**5. Conclusions**

We have analyzed the sectorial and regional factors determining the entry and exit of the Spanish industrial concerns from three perspectives. The independence hypothesis assumes that entries and exits are independent processes and that the link between them, if any, is very weak. The symmetry hypothesis assumes that there is indeed a link between entries and exits such that the barriers to entry are also barriers to exit. Finally, the simultaneity hypothesis assumes that the interdependence between entry and exit is not only derived from a symmetrical relationship but also from the incidence of entries on exits, and vice versa. Our general conclusions from the empirical study are the following.

First, all three groups of variables (sectorial, regional and business cycle) provided significant estimates in all the specifications we analyzed. This supports the idea that they are all important for analyzing industrial rotation. In particular, advertising expenditure and the average stock of capital per establishment raised barriers to entry but had less effect on exits. Moreover, neither entries nor exits are strongly linked to ex-ante or ex-post profits but they are very sensitive to cycles. Entries increase during the boom phases of the economic cycle and they are very sensitive to both the evolution of the sector and the manufacturing industry. Exits increase during recessionary cycles and are more sensitive to the economic situation in a region. As far as the geographical factors behind industrial rotation are concerned, the human capital, R&D expenditure and the presence of small firms in the region clearly have a positive effect on the gross rates of entry and moderates the rates of exit. The values representing regional income, the rate of unemployment, the distribution by age of the regional population and the degree of diversity of the productive structure are ambiguous and rarely significant.

Second, the estimates from the independence, symmetry and simultaneity hypotheses are relatively stable. Also, the statistics that test the overall significance of the model and the goodness of fit are acceptable in all cases. The results under all three of our initial hypotheses look therefore robust. However, they could be improved by exploring aspects such as the linearity of the specification or the incidence of the data sources we used. We will leave these aspects for future studies.

Finally, we aimed to conclude which initial hypothesis future studies should take as the reference for analyzing the determinants of industrial rotation in Spain. Although our study does not provide a definite answer, the simultaneity hypothesis and the displacement effects appear to be the most plausible tenets guiding the Spanish business demography. The statistical significance of the endogenous variables and the relatively low sample correlation of the errors between equations clearly point in this direction. Results show that in Spain the entrances and exits of industrial establishments are strongly related. Although decisions to enter or leave an industry are made by different subjects, entrances create a displacement effect that causes exits to increase. Exits, on the other hand, free both niches in the market and the business resources that speed up the ability of potential producers to respond by entering.

## 6. Appendix: minimum and maximum values for GRE and GRX

In order to calculate GRE and GRX we used two statistical sources: the REI and the EI. The former provides the number of establishments created every year in the region-sector pairing (*Entries*$_t$), and the latter provides the number of existing establishments (*Establishments*$_t$). Thus[7],

$$GRE_t = \frac{Entries_t}{Establishments_{t-1}} \qquad GRX_t = \frac{Establ._{t-1} + Entries_t - Estab._t}{Establishments_{t-1}}$$

Naturally, some observations turned out to be zero. Notice that this may be due to the quality and/or the disagreggation of the data, although we do not have a way of finding out what the cause is. Taking logs causes a mathematical indeterminacy that we solve in the following way: i) when both numerator and denominator were nil[8], we employed $LNGRE_t$ ($LNGRX_t$) = 0; ii) when either the entries or the exits in *t* were nil, we employed a modified Aitchison procedure[9].

[7] Negative values of the $Exits_t = Establishments_{t+1} + Entries_t - Establishments_t$ were replaced with zero.

[8] Most of these were "cells" in which both the REI and the EI provided zero values throughout the period.

[9] The design of Fry *et al*. (2000) uses cross-section data, but here we have opted for replacing the zeros along the time dimension. Moreover, our minimum value of replacement is 1 (i.e. one establishment). Therefore, given that $Establishments_{\min} = 5$ and $Establishments_{\max} = 8490$, the minimum and maximum values of replacement are $t_{max} = \frac{1}{5}$ y $t_{min} = \frac{1}{8490}$. With these limits we can test the sensitivity of the results to the replacements and define the dependent variables of Tables 2, 3 and 4 (lngremin, lngremax, lngrxmin and lngrxmax).

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**Table 1**
**Regional and sectorial variables**

| Variables | Definition |
|---|---|
| **Dependent** | |
| Gross Rate of Entry (GRE) | $Entrances_t / Establishments_{t-1}$ |
| Gross Rate of Exit (GRX) | $Exits_t / Establishments_{t-1}$ |
| **Sectorial** | |
| Benefits ex-ante (BEXA) | Yearly variation of the Gross Operational $Surplus_{t-1}$ (EBE) |
| Benefits ex-post (BEXP) | Yearly variation of the Gross Operational $Surplus_{t+1}$ (EBE) |
| Market structure (ME) | Concentration index CR4 |
| Profit margins (PCM) | (Turnover - Staff costs – Intermediate inputs)/Turnover |
| Technological intensity (RDS) | R&D expenditure/Turnover |
| Product differentiation (DIF) | Advertising expenditure/Turnover |
| Average size (SIZE) | $Workers_t / Establishment_t$ |
| Capital requirements (KR) | Capital $stock_t / Establishments_t$ |
| Micro firms (MICROS) | Establishments with less than 10 workers/Total establishments |
| **Regional** | |
| Industrial diversity (DIV) | Herfindhal index (inverse) |
| Relative specialization (ES) | Specialization index |
| Human capital (HC) | % of population with a university degree |
| Public Capital (PC) | Public capital stock /Private capital Stock |
| Market accessibility (ACCESS) | Road and port infrastructure |
| Population structure (PE) | % of population between 30 and 44 years old |
| Income per capita (INC) | Regional income per inhabitant |
| Micro-firms (MICROR) | Entries with less than 10 workers/Total entries |
| Unemployment (U) | Regional rate of unemployment |
| Technological intensity (RDR) | R&D expenditure/Turnover |
| **Control variables** | |
| Manufacturing growth (MG) | Yearly variation of the Gross Added Value in manufacturing |
| Industrial growth (IG) | Yearly variation of the Gross Added Value in the sector |
| Regional manufacturing growth (RMG) | Yearly variation of the Gross Added Value in manufacturing of the region |
| Region-sector growth (RSG) | Yearly variation of the Gross Added Value in the pairing region-sector |

*Source: REI and EI. See also Segarra et al. (2002) for more details.*

**Table 2**
**Independence**

| | Entry | | | | Exit | | | |
|---|---|---|---|---|---|---|---|---|
| | lngremin | | lngremax | | lngrxmin | | lngrxmax | |
| | LS | FE | LS | FE | LS | FE | LS | FE |
| **SECTORIAL** | | | | | | | | |
| **PCM** | 0,0049 | 0,0012 | 0,0079 | 0,0091 | | | | |
| | (0,0074) | (0,0114) | (0,0053) | (0,0079) | | | | |
| **RDS** | 0,2571 | 0,0312 | 0,2806 | 0,0482 | 0,2817 | 0,2652 | 0,1163 | -0,1490 |
| | (0,0311)* | (0,0752) | (0,0224)* | (0,0522) | (0,0813)* | (0,2116) | (0,0237)* | (0,0625)* |
| **DIF** | -0,1849 | - | -0,0659 | - | -0,1096 | - | -0,0090 | - |
| | (0,0470)* | | (0,0339)** | | (0,1111)* | | (0,0324) | |
| **KR** | -0,0013 | -0,0006 | -0,0008 | -0,0014 | -0,0007 | 0,0015 | -0,0011 | 0,0002 |
| | (0,0002)* | (0,0008) | (0,0002)* | (0,0005)* | (0,0007)* | (0,0023) | (0,0002) | (0,0007) |
| **SIZE** | 0,0095 | 0,0114 | 0,0071 | 0,0023 | 0,0061 | 0,0255 | 0,0112 | 0,0043 |
| | (0,0021)* | (0,0033) | (0,0015)* | (0,0023)* | (0,0045)* | (0,0094)* | (0,0013) | (0,0028) |
| **MICROS** | -0,0009 | 0,0012 | -0,0003 | -0,0013 | | | | |
| | (0,0007) | (0,0021)* | (0,0005) | (0,0014) | | | | |
| **ME** | 0,0048 | - | 0,0098 | - | | | | |
| | (0,0039) | | (0,0028)* | | | | | |
| **BEXA** | | | | | -0,0002 | 0,0144 | 0,0021 | 0,0015 |
| | | | | | (0,0028)* | (0,0040)* | (0,0008) | (0,0012) |
| **BEXP** | -0,0018 | -0,0001 | -0,0019 | -0,0025 | | | | |
| | (0,0009)* | (0,0011) | (0,0006)* | (0,0007)* | | | | |
| **REGIONAL** | | | | | | | | |
| **DIV** | -0,0162 | 0,0318 | -0,0396 | 0,0668 | 0,1147 | 0,1629 | -0,0528 | 0,0234 |
| | (0,0130) | (0,0293) | (0,0093)* | (0,0204)* | (0,0360)* | (0,0836)** | (0,0105)* | (0,0247) |
| **ESP** | -0,0004 | -0,0001 | -0,0006 | -0,0004 | -0,0007 | -0,0001 | -0,0004 | -0,0003 |
| | (0,0001)* | (0,0001) | (0,0001)* | (0,0001)* | (0,0004)* | (0,00041) | (0,0001)** | (0,0001)* |
| **HC** | 0,0109 | 0,0300 | 0,0071 | 0,0244 | 0,0095 | 0,0049 | -0,0023 | 0,0004 |
| | (0,0043)* | (0,0133)* | (0,0031)* | (0,0092)* | (0,0118) | (0,0379) | (0,003) | (0,0112) |
| **PC** | -0,0426 | -0,0299 | -0,0193 | 0,0353 | -0,0187 | 0,0976 | -0,0013 | 0,0139 |
| | (0,0071)* | (0,0164)** | (0,0051)* | (0,0114)* | (0,0198) | (0,0469)* | (0,0034) | (0,0138) |
| **ACCES** | $2,50*10^{-07}$ | $2,25*10^{-07}$ | $-7,31*10^{-08}$ | $-5,59*10^{-07}$ | $-1,98*10^{-08}$ | $-1,92*10^{-06}$ | $-4,59*10^{-07}$ | $1,71*10^{-08}$ |
| | $(1,47*10^{-07})$** | $(3,27*10^{-07})$ | $(1,06*10^{-07})$ | $(2,27*10^{-07})$* | $(4,05*10^{-07})$* | $(9,33*10^{-07})$* | $(1,18*10^{-07})$ | $(2,76*10^{-07})$ |
| **PE** | -0,1887 | - | -0,1001 | - | -0,3579 | - | 0,0254 | - |
| | (0,0298)* | | (0,0215)* | | (0,0822) | | (0,0240)* | |
| **INC** | 0,0001 | 0,0007 | 0,0002 | 0,0001 | 0,0021 | 0,0009 | -5,37e-06 | 0,0016 |
| | (0,0002) | (0,0010) | (0,0002) | (0,0007) | (0,0007) | (0,0029) | (0,0002)* | (0,0008)** |
| **MICROR** | 0,0148 | 0,0156 | 0,0002 | -0,0003 | 0,0034) | 0,0031 | 0,0009 | 0,0008 |
| | (0,0007)* | (0,0007)* | (0,0005) | (0,0005) | (0,0019)** | (0,0019) | (0,0006)** | (0,0006) |
| **U** | 0,0049 | -0,0012 | 0,0018 | -0,0206 | 0,0644 | -0,0299 | 0,0028 | 0,0135 |
| | (0,0049) | (0,0109) | (0,0035) | (0,0076)* | (0,0134) | (0,0311) | (0,0039)* | (0,0092) |
| **RDR** | 0,1729 | 0,1639 | 0,1390 | -0,0455 | 0,1163 | 0,2599 | 0,0996 | -0,2655 |
| | (0,0417)* | (0,1353) | (0,0301)* | (0,0940) | (0,1150)* | (0,3859) | (0,0336) | (0,1140)* |
| **CONTROL** | | | | | | | | |
| **MG** | 0,0178 | - | 0,0187 | - | 0,0203 | - | 0,0042 | - |
| | (0,0057)* | | (0,0041)* | | (0,0159) | | (0,0046) | |
| **IG** | 0,0055 | 0,0039 | 0,0052 | 0,0025 | 0,0073 | -0,0106 | 0,0036 | -0,0004 |
| | (0,0023)* | (0,0022)** | (0,0016)* | (0,0015) | (0,0069)** | (0,0076) | (0,0020) | (0,0022) |
| **RMG** | 0,0053 | 0,0019 | 0,0028 | 0,0021 | -0,0238 | -0,0128 | -0,0029 | 0,0004 |
| | (0,0027)* | (0,0027) | (0,0019) | (0,0018) | (0,0076) | (0,0077)** | (0,0022)* | (0,0023) |
| **RSG** | 0,0011 | 0,0011 | 0,00092 | 0,0009 | -0,0022 | -0,0021 | 0,0005 | 0,0004 |
| | (0,0004)* | (0,0003)* | (0,0003)* | (0,0002)* | (0,0010) | (0,0009)* | (0,0003)* | (0,0003) |
| **CONS** | -0,3257 | 24,7530 | -1,1121 | 16,8809 | -0,4099 | 30,9175 | -2,4380 | 15,9785 |
| | (0,6472) | (4,3004)* | (0,4668)* | (2,9874)* | (1,7018)* | (11,6431)* | (0,4971) | (3,4396)* |
| **F** | 44,49* | 32,16* | 41,02* | 6,75* | 8,84* | 4,86* | 21,18* | 3,00* |

**Table 3**
**Symmetry**

| | Entry | | | | Exit | | | |
|---|---|---|---|---|---|---|---|---|
| | lngremin | | lngremax | | lngrxmin | | lngrxmax | |
| | LS | FE | LS | FE | LS | FE | LS | FE |
| **SECTORIAL** | | | | | | | | |
| **PCM** | 0,0047 | 0,0037 | 0,0136 | 0,0112 | | | | |
| | (0,0108) | (0,0111) | (0,0077)** | (0,0079) | | | | |
| **RDS** | 0,0960 | 0,0663 | 0,0809 | 0,0598 | 0,2245 | 0,2907 | -0,0239 | -0,0957 |
| | (0,0655) | (0,0699) | (0,0483)** | (0,0508) | (0,1325)** | (0,1459)* | (0,0477) | (0,0565)** |
| **DIF** | -0,1809 | -0,2010 | -0,0063 | 0,0010 | -0,0225 | 0,0871 | -0,0582 | -0,0925 |
| | (0,1601) | (0,2279) | (0,1404) | (0,2294) | (0,2057) | (0,2420) | (0,0879) | (0,1533) |
| **KR** | -0,0013 | -0,0011 | -0,0012 | -0,0013 | -0,0011 | -0,0020 | -0,0005 | -0,0001 |
| | (0,0006)* | (0,0007) | (0,0005)* | (0,0005)* | (0,0011) | (0,0012) | (0,0004) | (0,0005) |
| **SIZE** | 0,0126 | 0,0123 | 0,0074 | 0,0072 | 0,0121 | 0,0162 | 0,0084 | 0,0061 |
| | (0,0031)* | (0,0032)* | (0,0022)* | (0,0023)* | (0,0067)** | (0,0072)* | (0,0023)* | (0,0026)* |
| **MICROS** | -0,0001 | 0,0004 | -0,0012 | -0,0013 | | | | |
| | (0,0018) | (0,0019) | (0,0013) | (0,0014) | | | | |
| **ME** | -0,0025 | -0,0045 | 0,0223 | 0,0248 | | | | |
| | (0,0130) | (0,0171) | (0,0108)* | (0,0162) | | | | |
| **BEXA** | | | | | 0,0027 | 0,0153 | -0,0008 | 0,0006 |
| | | | | | (0,0030) | (0,0038)* | (0,0009) | (0,0011) |
| **BEXP** | -0,0005 | -0,0003 | -0,0023 | -0,0024 | | | | |
| | (0,0011) | (0,0011) | (0,0007)* | (0,0008)* | | | | |
| **REGIONAL** | | | | | | | | |
| **DIV** | 0,0025 | 0,0104 | -0,0187 | 0,0251 | 0,1315 | 0,1064 | -0,0515 | -0,0187 |
| | (0,0170) | (0,0253) | (0,0115) | (0,0171) | (0,0464)* | (0,0546)** | (0,0106)* | (0,0187) |
| **ESP** | -0,0002 | -0,0001 | -0,0005 | -0,0005 | -0,0005 | -0,0005 | -0,0003 | -0,0003 |
| | (0,0001) | (0,0001) | (0,0001)* | (0,0001)* | (0,0004) | (0,0004) | (0,0001)* | (0,0001)* |
| **HC** | 0,0099 | 0,0151 | 0,0056 | 0,0090 | 0,0083 | 0,0034 | -0,0016 | -0,0054 |
| | (0,0061)* | (0,0089)** | (0,0040) | (0,0063) | (0,0152) | (0,0205) | (0,0036) | (0,0064) |
| **PC** | -0,0372 | -0,0372 | -0,0096 | 0,0092 | -0,0064 | 0,0156 | -00009 | 0,0021 |
| | (0,0093)* | (0,0137)* | (0,0063) | (0,0093) | (0,0255) | (0,0299) | (0,0058) | (0,0102) |
| **ACCES** | $1{,}88*10^{-07}$ | $8{,}68*10^{-08}$ | $-1{,}33*10^{-07}$ | $-4{,}22*10^{-07}$ | $-3{,}26*10^{-07}$ | $-6{,}21*10^{-08}$ | $-4{,}58*10^{-07}$ | $-3{,}64*10^{-07}$ |
| | $(1{,}86*10^{-07})$ | $(2{,}66*10^{-07})$ | $(1{,}26*10^{-07})$ | $(1{,}81*10^{-07})$* | $(5{,}16*10^{-07})$ | $(5{,}88*10^{-07})$ | $(1{,}19*10^{-07})$* | $(1{,}99*10^{-07})$** |
| **PE** | -0,1954 | -0,2321 | -0,1018 | -0,1117 | -0,3698 | -0,3260 | 0,0223 | 0,0199 |
| | (0,0409)* | (0,0825)* | (0,0273)* | (0,0526)* | (0,1115)* | (0,1385)* | (0,0241) | (0,0508) |
| **INC** | 0,0002 | 0,0001 | 0,0004 | 0,0001 | 0,0024 | 0,0023 | $1{,}86*10^{-5}$ | 0,0002 |
| | (0,0003) | (0,0006) | (0,0002)* | (0,0004) | (0,0009)* | (0,0012)* | (0,0002) | (0,0004) |
| **MICROR** | 0,0157 | 0,0156 | 0,0002 | 0,0000 | 0,0046 | 0,0036 | 0,0014 | 0,0011 |
| | (0,0007)* | (0,0007)* | (0,0005) | (0,0005) | (0,0020)* | (0,0020)** | (0,0006)* | (0,0006)** |
| **U** | 0,0091 | -0,0017 | 0,0032 | -0,0083 | 0,0671 | 0,0247 | 0,0031 | 0,0072 |
| | (0,0067) | (0,0092) | (0,0045) | (0,0064) | (0,0166)* | (0,0214) | (0,0042) | (0,0069) |
| **RDR** | 0,1779 | 0,1884 | 0,1419 | 0,0850 | 0,1372 | 0,2674 | 0,0985 | 0,0015 |
| | (0,0569)* | (0,1003)** | (0,0381)* | (0,0662) | (0,1564) | (0,1885) | (0,0337)* | (0,0687) |
| **CONTROL** | | | | | | | | |
| **MG** | 0,0225 | 0,0210 | 0,0238 | 0,0209 | 0,0186 | 0,0298 | 0,0039 | 0,0019 |
| | (0,0112)* | (0,0146) | (0,0069)* | (0,0131) | (0,0177) | (0,0496) | (0,0058) | (0,0101) |
| **IG** | 0,0035 | 0,0036 | 0,0021 | 0,0023 | 0,0037 | -0,0101 | 0,0016 | 0,0003 |
| | (0,0023) | (0,0023) | (0,0016) | (0,0016) | (0,0071) | (0,0075) | (0,0021) | (0,0022) |
| **RMG** | 0,0021 | 0,0018 | 0,0015 | 0,0016 | -0,0229 | -0,0147 | -0,0022 | -0,0006 |
| | (0,0027) | (0,0027) | (0,0019) | (0,0019) | (0,0076)* | (0,0077)** | (0,0022) | (0,0023) |
| **RSG** | 0,0011 | 0,0011 | 0,0009 | 0,0009 | -0,0022 | -0,0023 | 0,0004 | 0,0004 |
| | (0,0004)* | (0,0003)* | (0,0002)* | (0,0002)* | (0,0010)* | (0,0010)* | (0,0003) | (0,0003) |
| **CONS** | -0,1179 | 0,0153 | -0,3368 | -0,1786 | -0,1357 | -0,0816 | -0,8772 | -0,4528 |
| | (0,1676) | (0,1973) | (0,1380)* | (0,1369) | (0,3420) | (0,1898) | (0,1850)* | (0,1837)* |
| **F** | 29,95* | 26,82* | 7,86* | 4,95* | 6,11* | 3.39* | 9,01* | 2,76* |

**Table 4**
**Simultaneity**

| | Entry | | | | Exit | | | |
|---|---|---|---|---|---|---|---|---|
| | lngremin | | lngremax | | lngrxmin | | lngrxmax | |
| | EC2SLS | EC3SLS | EC2SLS | EC3SLS | EC2SLS | EC3SLS | EC2SLS | EC3SLS |
| **SECTORIAL** | | | | | | | | |
| **PCM** | -2,42*10-5 | 0,0004 | 0,0212 | 0,0128 | | | | |
| | (0,0112) | (0,0107) | (0,0079)* | (0,0066)** | | | | |
| **RDS** | 0,0647 | 0,0404 | 0,1125 | 0,1003 | 0,2555 | 0,2276 | -0,0541 | -0,0714 |
| | (0,0673) | (0,0664) | (0,0488)* | (0,0477)* | (0,1353)** | (0,1338)** | (0,0478) | (0,0467) |
| **DIF** | -0,1382 | -0,1338 | 0,0849 | 0,0870 | 0,0559 | 0,0686 | -0,0557 | -0,0485 |
| | (0,1622) | (0,1608) | (0,1427) | (0,1402) | (0,2050) | (0,2039) | (0,0866) | (0,0861) |
| **KR** | -0,0014 | -0,0012 | -0,0012 | -0,0009 | -0,0013 | -0,0006 | -0,0001 | 0,0002 |
| | (0,0006)* | (0,0006)* | (0,0005)* | (0,0005)** | (0,0012) | (0,0012) | (0,0004) | (0,0004) |
| **SIZE** | 0,0101 | 0,0091 | 0,0052 | 0,0024 | 0,0098 | 0,0040 | 0,0056 | 0,0031 |
| | (0,0034)* | (0,0033)* | (0,0023)* | (0,0022) | (0,0076) | (0,0075) | (0,0024)* | (0,0023) |
| **MICROS** | 0,0001 | 0,0001 | -0,0014 | -0,0009 | | | | |
| | (0,0018) | (0,0017) | (0,0013) | (0,0011) | | | | |
| **ME** | 0,0083 | 0,0047 | 0,0170 | 0,0075 | | | | |
| | (0,0140) | (0,0134) | (0,0110) | (0,0092) | | | | |
| **EXA** | | | | | 0,0125 | 0,0116 | -0,0013 | -0,0007 |
| | | | | | (0,0040)* | (0,0038)* | (0,0010) | (0,0009) |
| **BEXP** | -0,0001 | 9,9*$10^{-5}$ | -0,0020 | -0,0013 | | | | |
| | (0,0011) | (0,0010) | (0,0007)* | (0,0006)* | | | | |
| **REGIONAL** | | | | | | | | |
| **DIV** | -0,0167 | -0,0232 | 0,0286 | 0,0513 | 0,0677 | 0,0583 | -0,0465 | -0,0431 |
| | (0,0226) | (0,0223) | (0,0159)** | (0,0149)* | (0,0394)** | (0,0390) | (0,0108)* | (0,0105)* |
| **ESP** | -0,0001 | -0,0001 | -0,0003 | -0,0002 | -0,0005 | -0,0004 | -0,0002 | 2,15*$10^{5}$ |
| | (0,0001) | (0,0001) | (0,0001)* | (0,0001)* | (0,0004) | (0,0004) | (0,0001) | (0,0001) |
| **HC** | 0,0137 | 0,0136 | 0,0099 | 0,0095 | 0,0022 | -0,0014 | -0,0027 | -0,0047 |
| | (0,0072)** | (0,0072)** | (0,0050)** | (0,0048)** | (0,0148) | (0,0146) | (0,0038) | (0,0036) |
| **PC** | -0,0376 | -0,0333 | -0,0043 | -0,0052 | 0,0014 | 0,0104 | 0,0015 | 0,0016 |
| | (0,0117)* | (0,0116)* | (0,0079) | (0,0077) | (0,0216) | (0,0213) | (0,0059) | (0,0057) |
| **ACCES** | 1,15*$10^{-07}$ | 1,98*$10^{-08}$ | -7,48*$10^{-09}$ | 2,20*$10^{-07}$ | 5,11*$10^{-07}$ | 5,21*$10^{-07}$ | -4,34*$10^{-07}$ | -3,34*$10^{-07}$ |
| | (2,32*$10^{-07}$) | (2,29*$10^{-07}$) | (1,68*$10^{-07}$) | (1,58*$10^{-07}$) | (4,27*$10^{-07}$) | (4,23*$10^{-07}$) | (1,20*$10^{-07}$)* | (1,16*$10^{-07}$)* |
| **PE** | -0,1657 | -0,1242 | -0,1317 | -0,1372 | -0,2591 | -0,1987 | 0,0420 | 0,0628 |
| | (0,0632)* | (0,0623)* | (0,0378)* | (0,0371)* | (0,0980)* | (0,0964)* | (0,0252)** | (0,0245)* |
| **INC** | -0,0001 | -0,0003 | 0,0002 | 0,0002 | 0,0020 | 0,0019 | -0,0001 | -0,0001 |
| | (0,0005) | (0,0005) | (0,0003) | (0,0003) | (0,0007)* | (0,0007)* | (0,0002) | (0,0002) |
| **MICROR** | 0,0153 | 0,0150 | -0,0004 | -0,0008 | -0,0025 | -0,0112 | 0,0013 | 0,0012 |
| | (0,0007)* | (0,0007)* | (0,0005) | (0,0005) | (0,0063) | (0,0061)** | (0,0006)* | (0,0006)* |
| **U** | -0,0033 | -0,0056 | -0,0053 | -0,0066 | 0,0264 | 0,0255 | 0,0035 | 0,0044 |
| | (0,0081) | (0,0080) | (0,0054) | (0,0053) | (0,0160)** | (0,0159) | (0,0043) | (0,0041) |
| **RDR** | 0,1350 | 0,0952 | 0,0657 | 0,0168 | 0,2010 | 0,1584 | 0,0685 | 0,0430 |
| | (0,0821)** | (0,0810) | (0,0530) | (0,0512) | (0,1266) | (0,1251) | (0,0349)** | (0,0339) |
| **CONTROL** | | | | | | | | |
| **MG** | 0,0214 | 0,0198 | 0,0206 | 0,0198 | 0,0132 | -0,0129 | -0,0043 | -0,0103 |
| | (0,0098)* | (0,0098))* | (0,0073)* | (0,0072)* | (0,0425) | (0,0420) | (0,0068) | (0,0067) |
| **IG** | 0,0035 | 0,0028 | 0,0011 | 0,0018 | -0,0083 | -0,0097 | 0,0008 | -0,0015 |
| | (0,0023) | (0,0022) | (0,0016) | (0,0015) | (0,0074) | (0,0072) | (0,0021) | (0,0020) |
| **RMG** | 0,0034 | 0,0043 | 0,0022 | 0,0029 | -0,0163 | -0,0175 | -0,0022 | -0,0027 |
| | (0,0028) | (0,0027) | (0,0019) | (0,0019) | (0,0076)* | (0,0076)* | (0,0022) | (0,0022) |
| **EFEREGS** | 0,0013 | 0,0015 | 0,0007 | 0,0006 | -0,0028 | -0,0034 | 0,0000 | -0,0003 |
| | (0,0004)* | (0,0004)* | (0,0002)* | (0,0002)* | (0,0011)* | (0,0011)* | (0,0003) | (0,0003) |
| | | | | | | | | |
| **LNTBE** | | | | | 0,1459 | 0,3471 | 0,3493 | 0,6672 |
| | | | | | (0,1379) | (0,1322)* | (0,0962)* | (0,0844)* |
| **LNTBS** | 0,2405 | 0,4454 | 0,4586 | 0,7721 | | | | |
| | (0,1241)* | (0,1194)* | (0,0956)* | (0,0822)* | | | | |
| **CONS** | -0,0398 | -0,0743 | 0,0731 | 0,3735 | -0,0389 | 0,0414 | -0,7425 | -0,6753 |
| | (0,2201) | (0,2178) | (0,1895) | (0,1804)* | (0,1793) | (0,1772) | (0,1798)* | (0,1753)* |
| **F, $c^2$** | 26,76* | 633,88* | 7,21* | 212,56* | 4,61* | 103,11* | 8,86* | 225,18* |