Universidad de la República
Facultad de Ciencias Sociales
DEPARTAMENTO DE ECONOMIA

Documentos de trabajo

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Documento No. 05/95
Agosto, 1995

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Domestic and foreign firms

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Abstract

Trade liberalization has had an important impact on the Uruguayan manufacturing industry. Foreign (multinationals) and domestic firms had to compete in a more open economic environment. This paper studies the effects of a more open economic environment on entry conditions for foreign and domestic firms in manufacturing industries. We find significant differences in the behavior of foreign and domestic firms, both when they are incumbents or when they act as potential entrants. In general, foreign firms seem to be more succesful in applying entry deterring strategies, due to advantages in foreign markets, deeper financial resources or better technological capabilities. They also appear to be more responsive to entry conditions when they face the prospects of entering a given industry.

1 Introduction

Industry evolution can be described by the flow of firms, that is entry and exit processes into different economic activities. These processes are likely to be influenced by changes in the economic environment. In the case of economies with a high degree of protection, entry barriers may be an important factor in shaping domestic industrial structure. For open economies instead, import competition may hamper the importance of entry barriers on the domestic level.

Uruguayan industries have been exposed to increasing international competition and regional integration. The process of opening of the Uruguayan economy had some distinguishing characteristics as compared with other trade liberalization cases: 1) it represented a unilateral reform and 2) the process was gradual and stable since 1973 [1].

Liberalization policies were accompanied by market deregulation for a significant number of economic activities. This implied that domestic industries were increasingly involved in competition both internally and in regional markets. Regional competition in turn implied a process of learning in regional protected markets. Incumbent and potential entrant firms can be either domestic or multinational. They can adopt different strategies both as domestic competitors or foreign competitors. It is not clear which kind of firms will be at an advantage in terms of the entry barriers that they face. If multinationals can operate at a larger scale, it is clear that they may be more likely to enjoy cost advantages over domestic firms, but domestic firms may enjoy other kinds of advantages such as a better strategic position in the industry. Financial and technological aspects seem to be also in favor of foreign firms.

This paper attempts to estimate the different speed and easiness to entry of different types of firms: foreign and domestic. We define a foreign firm in a discrete way: if more than 50 % of assets are held by non–resident owners, then we consider a firm as foreign. We propose a model of entry and we try to test within this model if the behavior of foreign and domestic firms is different. The data used correspond to Uruguayan manufacturing industries [2].

There are similar studies for industrialized countries, such as Geroski (1991) or Sleuwagen and Dehandschutter (1991), but this issue has received less attention for

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[1] The opening of the Uruguayan economy to free trade and the effects of this process on the specialization pattern of manufacturing industries has been analyzed extensively in national studies, such as Macadar (1987), Lorenzo and Laens (1988), Vaillant and Cassoni (1991), Vaillant and Montado (1991) and Laens and Osimani (1992).

[2] We use the Census of Manufacturers for Uruguay, that contains detailed microeconomic information. This information is complemented with the Annual Industrial Survey to construct a time series of average profits for each industry.

developing economies. This paper also presents a new technique to approximate entry from a cohort of surviving firms.

The paper has the following structure: section 2 presents the model of entry used in this study. In section 3 we present a description of the Uruguayan manufacturing industry and the role of multinationals. In section 4 we formulate the theoretical model of entry in terms of observables and we present and interpret the estimated coefficients. Concluding remarks can be found in section 5.

2   The Model of Entry

We base our analysis on Orr (1974) simple model of entry. Entry in industry j at time t depends on the difference between expected profits π^e_{jt} and b_j, the profits that would be obtained in the limit when the industry is in equilibrium and there is no more scope for further entry or exit [3]. It is assumed that b_j, which can also be defined as the height of entry barriers, depends on different factors such as market size, growth, product differentiation or concentration. Entry can be thought as a response to profit opportunities at a rate γ :

$$E_{jt} = \gamma^i (\pi^e_{jt} - b^i_j) + \mu_{jt}, \qquad (1)$$

where μ_{jt} is a stochastic perturbation that collects the unexplained factors of the entry process [4], and it is assumed that γ and the entry barriers may vary over $i = f, d$, f being foreign and d being domestic. In other words, the estimated coefficients of the model will be allowed to vary according to the type of firm.

For a small economy with a developing industry and increasing international exposure, domestic firms will behave as price–followers in international markets. Entry and exit could then be governed by the behavior of firms in a fringe of domestic firms with profit and growth patterns determined by their degree of international exposure. This implies that potential entrants behavior is determined both by structural characteristics of domestic industries and by profit opportunities in international markets. These considerations lead us to formulate an empirical model

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[3]This model neglects the fact that some industries may be composed by producers of differentiated products and may therefore show a substantial departure of the relation of excess profits to entry. This a well–known short-come of this kind of models, that is not very important if industries are classified in fairly homogeneous production groups, as discussed in Geroski (1991b), chapter 3.

[4]In Geroski (1991a) it is shown that equation (1) can be deduced as the reduced form of a dynamic program for profit maximization.

of entry that includes international and domestic factors. Based on equation (1) we propose the following model:

$$\text{ENTRY}_{jt} = \gamma^i \, \text{PROFIT}_{jt}^e + \alpha^i \, \text{GROWTH}_{j,t-1} + \sum_{k=1}^{K} \beta_k^i X_k + \mu_{jt} \qquad (2)$$

$$i = f, d$$

where ENTRY_{jt} is a measure of entry, PROFIT_{jt}^e is a measure of expected profits, $\text{GROWTH}_{j,t-1}$ is a measure of industry growth, X_k are industry characteristics, associated with barriers to entry and to other structural parameters that determine long-run limit profits, d stands for domestic and f stands for foreign.

There are three separate issues to address in order to specify an estimable equation. First it is necessary to establish which kind of entry measure we will use. Second, since expected profits are unobservable, it is necessary to use a proxy variable or estimate expected profits from past information on profits. And third, some variables have to be proposed in order to estimate the height of barriers to entry. We will analyze these three issues separately.

2.1 Measures of Entry

Two factors determine the choice of a measure of entry. First, the goal of the study is to analyze the determinants of market expansion on different types of entrants, so that our measure of entry should be either entry rates or market penetration rates. Secondly, data availability will also drive our choice.

In our case, it is not possible to construct a measure of gross entry and exit, since we only have information about the stock of firms in each industry for the year 1988, and some information on past profits and date of birth for surviving firms. If the analysis is restricted to the net increase in aggregate supply for each industry, a measure of net entry (gross entry minus gross exit) will give a good approximation of the increase in competition caused by new firms.

We propose a measure of net entry based on the survivors for a given year. We exploit a well known empirical fact: most of the firms that enter an industry exit in a very short period of time [5]. Therefore recent survivors are a good approximation of net entrants in recent periods, since most of the firms that exit in recent years will be firms that had entered in those same recent years.

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[5] See for instance Dunne, Roberts and Samuelson (1988) for empirical evidence about this stylized fact

3

The available information allows us to express the total number of firms as a stock of firms with their dates of birth. Denote by S_t the stock of survivors at date t. Recent and past survivors are related as follows:

$$S_t = S_{t-k} + NE^t_{t-k} + GE^t_{t-k} \tag{3}$$

where NE^t_{t-k} are net entrants during the period $(t-k, t)$ and GE^t_{t-k} are gross exits during the same period of firms that existed before $t - k$. This equation simply states that the stock of survivors is updated through recent firm turnover and exit of old firms. If the latter is small, as we assume, recent and past survivors allow us to approximate net entry.

The farther apart we go, the less likely that the number of recent survivors is equal to the number of net entrants at any period in time. Instead if we take the number of a recent generation of survivors, we can be fairly confident that it will be a good approximation of net entry in the last period. We choose a three-year period to compute net entry and obtain annual net entry as the average observed over this three-year period. Consequently, the following is our measure of the rate of net entry (E_t) for the year 1988:

$$E_{1988} = \frac{(F_{1986} + F_{1987} + F_{1988})/3}{S_{1985}} \tag{4}$$

where F_t are firms surviving from year t and S_{1985} is the stock of survivors from 1985 or previous years.

If net entry is negative, or in other words if more firms exit than enter for some year, our measure of entry will be zero. This could happen if gross exit from previous periods, G^k_{t-k}, is not negligible for some industry. Therefore we will have to correct our estimation for left–censoring of our entry measure, since negative net entry (positive net exit) will be censored to zero.

2.2 Expected profits

The estimation of expected profits is crucial in our model. The simplest specification that we can adopt in order to approximate post-entry expected profits is to use profits lagged one period, assuming that firms have adaptive expectations about future profits: in this case firms adjust their future expectations on profits taking into account their recent experience. This kind of expectations does not incorporate the effects that entrants have on future profits. Incumbents would be able to manipulate pre–entry profits strategically in order to discourage entry.

4

Rational firms will form their expectations about expected post–entry profits taking into account all the available information. Post–entry profits are unobservable at the moment of the entry decision, but a rational firm will take into account:

- Information reflecting performance of the market in the past.

- A priori knowledge of the characteristics of the market

We propose a rational expectations estimator for expected profits, based on a measure of success:

$$\rho_{jt} = \pi_{jt} - \bar{\pi}_t \tag{5}$$

where ρ_{jt} is the deviation of profits in industry j (π_{jt}) from average profits in period t $(\bar{\pi}_t)$.

In Appendix A we show that expected profits can be approximated by the fitted values of the following regression model:

$$\rho_{jt} = \lambda(L)\rho_{j,t-1} + \phi Z_{jt} + v_{jt}, \tag{6}$$

where $\lambda(l)$ is a lag operator, Z_{jt} is a vector of exogenous variables, ϕ is a vector of unknown coefficients that are estimated and v_{jt} is a stochastic perturbation. In other words, current success is supposed to depend on lagged success and a set of exogenous variables. The fitted values of the dependent variable of this regression are a proxy for the values of the latent variable, that is expected profits at time t. We recover expected profits from our success measure by means of equation (5).

2.3   Barriers to entry

We need to construct variables that approximate the non–observable variable limit profits, b_j, or entry barriers. This is usually done by using information related to market structure, sunk costs, advertising or R & D.

Evidence from previous empirical studies show that limit profits are relatively high (in average 15 to 20 % over costs). Regarding the choice of variables, previous studies show that only capital requirements and sunk costs show the expected signs.

Our information allowed us to construct a series of variables related to possible entry barriers, but as we will see in later sections, only sunk costs, cost advantages by incumbents, firm age and participation of multinationals seemed to have any explanatory power.

5

Table 1: Types of firms

	Incumbent	Potential entrants
Domestically based	Owned by residents Owned by non–residents	Owned by residents Owned by non–residents
Foreign based	Owned by residents Owned by non–residents	Owned by residents Owned by non–residents

2.4 Firm type

Firms can be classified according to three criteria: ownership, operation (entrant or incumbent) and location (domestic or foreign). Therefore we have 8 different situations, presented in Table 1.

Foreign based firms can challenge domestic based firms only by imports. In the table we assume that firms owned by residents can be located outside of the country and compete through imports with domestic and foreign domestically located firms. We will concentrate only on domestically based firms and their ownership, distinguishing between incumbent and entrant firms.

3 A description of the Uruguayan industry

In Table 2 we present summary statistics for our sample of Uruguayan industrial firms. A more detailed description of the characteristics of this sample is shown in Appendix B. The average industry analyzed in this sample in 1988 had a clear export orientation and an intermediate degree of concentration (half of the sales is concentrated in the four biggest firms) [6].

Firms in the Uruguayan manufacturing sector have an average age of 15 years, and it can be said that most of them are quite young, despite the fact that there are some firms dating back to the nineteenth century. Their size is quite heterogeneous but the average size is small (the average value of gross production is around one million US dollars). Average capital/worker ratio is 13,000 US dollars.

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[6]The sample includes firms with more than five workers. These are the firms included in the 1988 Census of Manufacturers.

Table 2: Descriptive statistics for Uruguayan manufacturing industries (1988)

Variable	Mean	Coefficient of Variation	Minimum	Maximum
Average Size (thousand US $)	943	7.4	66	491,570
Productivity (thousand US $ of gross production per worker)	30	0.9	6	203
Capital/labor ratio	13	2.1	0.5	198.7
Commercial Specialization	-1	1.4	-6.6	0.7
C4 Index of Concentration (%)	55.5	0.5	12.4	100.0
Number of firms per industry	69	2.0	1	1084
Average age of firms (years)	15	0.4	5	61
Entry rate	0.052	1.0	0	0.25
Profit rate of Incumbents	0.16	0.4	0.02	0.36
Profit rate of Entrants	0.11	1.5	-0.12	0.98

Entry rates computed by the method suggested above show a striking similarity with studies for other countries. Entrants are usually smaller than existing firms, showing that penetration rates are smaller than net entry rates. On the other hand, profit rates for entrants are smaller than for incumbents, but they are also more variable.

In Table 3 we present the main characteristics of the Uruguayan manufacturing industries. This table enables as to trace a picture of the evolution of the Uruguayan industry while the economy was being gradually opened to international trade.

The first six industries with respect to its share in total Gross Value Added are 3111 (meat-processing industries), 3211 (textile), 3530 (oil refinery), 3116 (mill, rice), 3220 (clothing) and 3112 (milk industries). With the exception of petroleum refinery (a public monopoly) the rest are industries with a clear export orientation.

With respect to the age of firms in this set of industries where Uruguay has comparative advantages, it can be noticed that, at the milk and mill industries, firms are older than average and entry is lower.

There is another set of industries with export orientation and an intermediate importance in total Gross Value Added. These are 3121 (food), 3233 (leather), 3114 (sea products), 3521 (paint), 3240 (shoes) and 3213 (knittings). These are in general industries with younger firms than the previous group. Total number of firms and average size are also smaller in this group.

Industries were imports are important are 3843 (cars), 3522 (medicines), 3560 (plastics), 3512 (fertilizers and plaguicides), and 3511 (basic chemicals). These are older industries than industries in the previous group and with a greater variability of average sizes.

A third set of industries is formed by industries mainly oriented towards domestic markets and with small import competition. Industries in this group are 3117 (bread), 3240 (publishers), 3134 (non alcohol beverages), 3411 (paper), 3819 (machinery), 3140 (tobacco), 3523 (cleaning products), 3552 (rubber), 3133 (beer) and 3118 (sugar).

In this group of non-specialized industries there are two types of industries. On the one hand one set of industries (beverages, paper, rubber, beer and sugar) with larger average size and older firms, with the highest concentration indices within the manufacturing sector. In these industries there is almost no entry. The second type shows a more competitive structure with more firms of smaller average size, less concentration and higher entry.

The rest of industries not considered in this description, with weights on total Gross Value Added smaller than 1 %, is characterized by fewer and younger firms and smaller average size. Firms in this group are also generally non specialized

Table 3: Description of the Uruguayan Industry

	Relative size		Entry		Age of firms	
Greater or equal to the average	>	<	>	<	>	<
Group 1: Main Exporters						
Competitive:						
Meat Processors	X		X			X
Textile	X		X		X	
Clothing		X		X		X
Concentrated:						
Rice Mill	X			X	X	
Leather	X		X		X	
Milk Products	X			X	X	
Group 2: Mid Exporters						
Competitive:						
Shoe, Knit		X	X			X
Concentrated:						
Food, Paint	X			X		X
Sea products		X	X			X
Group 3: Importers						
Competitive:						
Plastics		X		X		X
Medicine	X			X	X	
Concentrated:						
Plaguicides	X			X	X	
Car Industry	X			X		X
Group 4: Non-specialized						
Competitive:						
Printing, Electrical Machinery		X	X			X
Concentrated:						
Beverages, Paper Sugar, Beer	X			X	X	

9

and face imports in their markets.

This general description allows us to trace a brief history of the Uruguayan industry. The largest firms belong to industries oriented to the domestic market and not facing high competition from imports. The most extreme examples are tobacco, the beer industry and non–alcoholic beverages. Even with the trade liberalization process going on, there are still strong protection mechanisms in place. Industries where imports are important have a smaller average size than the previous group. Several industries in this group can be traced to the period of import substitutions (decades of the 1940s and 1950s), with very limited entry in the last decades. These are also industries where the participation of foreign capital is important. Some of these industries have adopted an export orientation in certain production lines, for instance the car industry, basic chemicals, plastics and fertilizers.

Exporting industries can be divided in two groups. On the one hand there are industries that traditionally have had comparative advantages, such as textile, meat processing, milk, leather or rice. These are industries with a higher average size and younger firms if we compare them with the previous set of industries. The other group, sea products, ceramics, knit textiles, is composed by even younger firms of a smaller average size and clear export orientation.

4 The empirical model of entry

In this section we present the estimation of the model of entry. We start by estimating expected profits by means of the predicted values of a dynamic model of profitability for each industry. In a second step we estimate the model of entry using the expected profits estimated in the first step. In this second step we take into account that the value of the dependent variable, net entry rates, is left censored.

4.1 Expected Profits

Using a panel data set with information about profits for the period 1981-1988 for all industries we estimate the reduced–form equation (6). We also include as an explanatory variable the participation of the industry in the total gross value of production of the period, as well as a full set of fixed effects. Given our time series span, we decided to truncate the lag structure for the success measure (ρ) at three periods. The estimated coefficients for the lagged value of profits are assumed to be the same across all industries, and therefore these coefficients have to be interpreted as an average elasticity of current success with respect to past success. This

10

Table 4: Estimation of the profit equation. Dependent variable: ρ_t

Variable[a]	Estimate[b]
ρ_{t-1}	-0.209
	(0.047)
ρ_{t-2}	-0.249
	(0.043)
ρ_{t-3}	-0.224
	(0.040)
Participation of the industry in total gross value of production	2.91 (1.38)
R^2 / Adjusted R^2	0.69 / 0.60
$F[79, 296]$	8.166

[a]A full set of 75 fixed effects were included in the regression. Most of them were significantly different from 0 at a 5 % level.

[b]Standard deviations are presented below in brackets. All variables are significantly different from 0 at a 5 % level.

assumption would probably be too strong if we were trying to explain the persistence of profits, which is likely to be quite heterogeneous across industries, but recall that we are just trying to proxy expected profits for our entry equation. The results are shown in Table 4. The dynamics suggested by this equation is stationary. A simulation of this dynamic behavior can be obtained by assuming any level of the deviation from average profits. Suppose that this deviation is 0.50, and ignore the effect of the participation of the industry in total gross value of production of the period. In Figure 1 it is shown that profits will converge quite fast to their long-run level. In approximately eight years the deviation from the long-term level of profits is negligible.

4.2 Entry response in the presence of multinationals

In this section we analize how entry conditions change when there are multinationals present in the industry. As it is usual in entry models, there is an important proportion of the variability of entry that is not accounted by our proposed explanatory variables. There are a series of external factors influencing the entry

11

Figure 1:

Dynamics of the Profit Equation
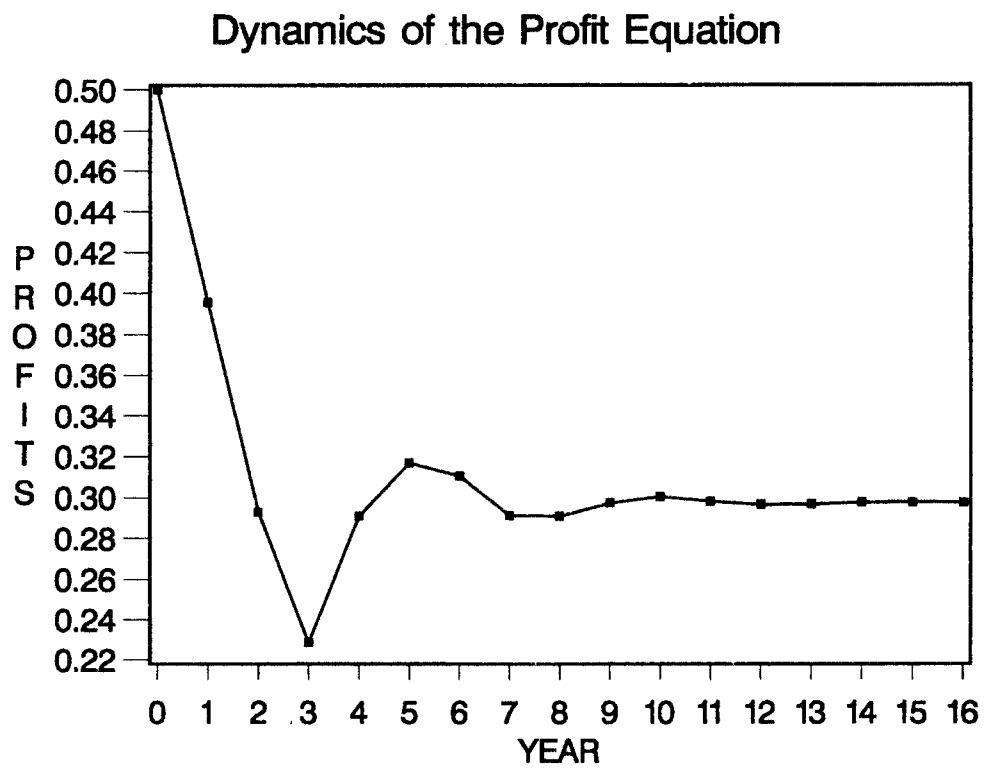
decision that we are not taking into account, such as alternative profitable activities or government regulation. Nevertheless, our model shows a goodness of fit of 60 % as showed by the adjusted-R^2 statistic, which represents a fairly high explanatory power when compared to similar studies.

As explanatory variables we use the fitted values for the dependent variable estimated in the profit equation, and a series of proxies for barriers to entry. These are [7] the average age of the firms in the industry, export orientation of the industry, the ratio between non–machinery capital stock and total sales for incumbents and the ratio between machinery capital stock and total sales also for incumbents. We also tried to include variables gathering information about structural differences between incumbents and entrants. A variable that turned out significantly different from zero in our model was a dummy variable constructed as follows: if the ratio of energy consumption over sales is smaller for incumbents than for entrants then it takes a value of one, otherwise it takes a value of zero. We interpret this variable as giving us information on cost advantages by incumbents with respect to entrants. We also included as an explanatory variable the standard deviation of profits for the period 1981–1988, trying to gather the effect of risk on the entry decision.

We also included three variables gathering the importance of multinationals in each industry. The trade liberalization process started in Uruguay around 1973, and in our estimations this fact turned out to be important. If we include these same variables without discriminating foreign firms from the pre–1973 and post–1973 periods, all the variables related with multinationals loose their explanatory power on entry. The variables included were the percentage of sales by surviving foreign firms that enterered after 1973 on total domestic sales, on total gross value of production and on total patent royalties in each industry.

We found also two industries that were behaving as outliers in the proposed model. These (3419 paper and cardboard products and 3691 clay products for construction) are industries with a large dispersion in the number of firms, with a small average size of firms, with an important proportion of family or hand-craft businesses and a high degree of product differentiation.

We present the estimation by the ordinary least squares method and the Tobit procedure, as proposed in Tobin (1958). The latter is appropriate for the case of left truncation of the dependent variable, as in the case of our entry measure. The results are shown in Table 5. The estimated coefficients are the same for the OLS and TOBIT specification, with the latter being estimated with more precision (smaller standard errors). Expected profits have a significant and positive impact on entry, as we were expecting from economic theory. The coefficient for this variable can

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[7]We tried to include other variables but they did not show any significant impact on entry, such as economies of scale or advertising.

Table 5: Estimation of the entry equation. Dependent variable is entry rate

Variable[a]	Ordinary Least Squares	Maximum Likelihood (TOBIT)
Intercept	0.028	0.028
	(0.012)	(0.011)
Expected[b]	0.074	0.037
Profits	(0.029)	(0.023)
Average	-0.002	-0.002
Age	(0.0004)	(0.0004)
Export	0.059	0.059
Orientation	(0.020)	(0.018
Machinery/Sales	0.092	0.092
Ratio	(0.017)	(0.016)
Non–Machinery/Sales	-0.004	-0.004
Ratio	(0.001)	(0.001)
Risk	-0.126	-0.126
	(0.045)	(0.040)
Cost Advantage	0.028	0.028
Incumbents/Entrants	(0.009)	(0.008)
Dummies for Outliers:		
3419	0.121	0.121
	(0.032)	(0.028)
3691	0.089	0.089
	(0.031)	(0.028)
Foreign Firms Share	0.004	0.004
on Total Domestic Sales	(0.001)	(0.001)
Foreign Firms Share on	-0.003	-0.003
Gross Value of Production	(0.001)	(0.001)
Foreign Firms Share	-0.001	-0.001
on Total Patent Royalties	(0.0003)	(0.0003)
R^2/ Adjusted R^2	0.65/0.59	
$F[12, 61]$	9.332	
Log Likelihood		161.5

[a]Standard deviations are presented in brackets below the estimated coefficients. All estimated coefficients are significantly different from zero at a 5 % level, except when noted

[b]Fitted values of the profit model.

14

be interpreted as the speed of entry according to our specification. The value of the estimated coefficient is similar to the speed of entry estimated for industrialized countries, which range from 8 to 15 %.

Average age of firms has a negative effect on entry. Older firms would be more apt to raise significant barriers to entry, may be taking advantage of their knowledge about existing regulatory mechanisms. This is also the group with the highest levels of foreign investment surviving from the period of import–substitution. It is also a group where patent protection, product differentiation, brand loyalties and scale economies are important.

Export orientation has a positive and significant effect on entry. We did not have an a priori expectation about the sign of this coefficient. Those industries which sell a significant proportion of their output in international markets raise smaller barriers to entry domestically. On the other hand, it has to be taken into account that there are strong expectations about a deepening of the trade liberalization process and increased economic integration [8]. This implies that industries which are more apt to compete regionally are more able to attract resources and therefore, show higher entry rates.

Sunk costs are, according to economic theory, important sources of entry barriers. We tried to capture their importance by means of two measures of the weight of capital (machinery and non–machinery) on total sales. The ratio of machinery capital stock to total sales shows a positive effect on entry, while the ratio of non–machinery on total sales shows a negative and smaller effect. Investment in machinery has probably not the nature of a sunk investment, but of a recoverable fixed cost. Instead non–machinery investment may be gathering both recoverable and non–recoverable investment committed to entry.

Cost advantages by incumbents has the expected sign, showing that entry is more likely in those industries where these cost advantages are not present. This variable may be also giving information about new and improved technologies that entrants may be able to use, reducing therefore the advantage that incumbents may have, as they are committed to older or inferior technologies.

We included also a variable giving information about the uncertainty that potential entrants are facing in terms of the variability of profits. According to our estimation, the more variable is profits in previous periods the less likely is entry in the current period.

It is interesting to compare the entry behavior of industries with old firms and high foreign capital participation, and young export oriented industries. The latter

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[8] On January 1st 1994 a custom union called MERCOSUR starts between Argentina, Brazil, Paraguay and Uruguay.

seem to present high profit opportunities and lower entry barriers. Our last three variables gather partially this type of effects. The higher the participation of recent (post–1973) foreign entrants in domestic sales, the higher the entry rate. Foreign firms seem to have a smaller deterring effect on entry than domestic firms, the higher their market share, the more dynamic in terms of firm flows is the industry considered.

This operates in the opposite direction if we also consider exports. The share of foreign firms on gross value of production has a negative effect on entry. Foreign firms seem to have advantages in terms of exports, which serves as an entry deterring strategy.

Also in technological terms it seems that foreign firms present some advantages, since the participation of foreign firms on patent royalties has also a negative effect on entry.

In short, our estimation shows that there exist a series of systematic forces that facilitate or impede entry, speeding up or delaying the response of potential entrants to the scope of excess profits in different industries. Old industries, in terms of the average age of the firms operating in them, show higher entry barriers, maybe indicating that old firms are able to reposition themselves in front of increased entry threats and raise significant obstacles to entrants. Export oriented industries seem also more akin to new profit opportunities, attracting significantly more entry than domestic oriented industries. Foreign firms act significantly different than domestic firms, and this shows when we consider their market shares in domestic and foreign markets, as well as their technological capabilities.

4.3 Foreign and domestic firms as potential entrants

How differently operate foreign and domestic firms as potential entrants? This question is very hard to answer, since we cannot observe potential entrant behavior directly. But potential entry behavior can be inferred from actual entry behavior [9]. In this section we decompose the sample into foreign and domestic entry rates in different industries, and estimate a version of equation 2. We did not find significant differences in the intercept of the regression equation for foreign and domestic firms, but we found some interesting results with respect to the slopes. Some of the independent variables that were used in the general entry model were dropped because they turned out to be insignificant. Left–censoring was assumed to be present when there was a total entry rate of zero, or when the entry rate for foreign firms was zero, but not when only the entry rate of domestic rates was zero.

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[9]See Geroski (1991b) for a discussion on the search of observables related to unobserved potential entry.

16

The reasoning behind this assumption is that foreign entry rate is much lower than domestic entry rates, and therefore the probability of observing in a given industry positive foreign net entry simultaneously with net exit of domestic firms is very low, but it is more plausible that for a given industry positive domestic net entry occurs at the same time that net exit of foreign firms occurs.

In table 6 we present the results of estimation. The results in this case are also consistent with our expectations, and confirm what we have observed in the general model. We dropped some independent variables used there that turned out statistically non–significant in this case.

Expected profits were not different for domestic and foreign firms, and so we included a common slope. The same can be said for the impact of export orientation on entry. In both cases the results are the same than for the general entry model.

Instead the effect of the average age of incumbent firms on foreign and domestic entrants is signficantly different. In both cases the older incumbent firms, the less entry, but this has a stronger effect on foreign firms, as shown by the estimated coefficients. If average age of firms is correlated with the ability of firms of deterring entry, this has a stronger impact on foreign firms than on domestic firms. Capital mobility may be easier or faster for foreign firms, permitting them to reassign resources in those industries where there are better profit opportunities. Instead domestic firms may be subject to local rigidities and may be more flexible to move between economic activities.

The response to risk is also different for domestic and foreign potential entrants. In the case of the OLS estimation the coefficient is significantly different from 0 only for domestic firms, but in the case of the TOBIT estimation, both coefficients are significant at the 5 % level , and have opposite signs. Profit risk reduces entry in the case of domestic firms, but this does not seem to be the case for foreign firms. Usually financial resources are wider for foreign firms, and industries with high profit variability may be more attractive to increase market shares faster.

Summing up, domestic and foreign firms seem to have substancial differences also when they face the prospects of entring different industries. In general we find that foreign firms are more flexible in their response to profit opportunities, or may have better financial resources to respond to profit opportunities.

Table 6: Foreign and Domestic firms as potential entrants. Dependent variable is entry rate

Variable[a]	Ordinary Least Squares	Maximum Likelihood (TOBIT)
Intercept	0.028	0.072
	(0.008)	(0.016)
Rational[b]	0.037 [c].	0.068 [c]
Expectations	(0.023)	(0.042)
Export	0.014	0.042
Orientation	(0.014)	(0.020)
Dummies for Outliers:		
3419	0.084	0.097
	(0.023)	(0.031)
3691	0.046	0.092
	(0.022)	(0.031)
Domestic Firms		
Average	-0.001	-0.004
Age	(0.0003)	(0.001)
Risk	-0.031[d]	-0.177
	(0.039)	(0.074)
Foreign Firms		
Average	-0.001 [d]	-0.005
Age	(0.0003)	(0.001)
Risk	-0.100	-0.309
	(0.039)	(0.115)
R^2/ Adjusted R^2	0.24/0.20	
$F[12, 61]$	5.57	
Log Likelihood		98.56

[a]Standard deviations are presented in brackets below the estimated coefficients. The coefficients are significant at the 5 % except otherwise noted.

[b]Fitted values of the profit model.

[c]Significant at the 10 % level

[d]Non significant at the 10% level.

5 Conclusion

In this paper we have estimated a model of entry to investigate the determinants of entry for domestic and foreign firms. We study the manufacturing industry of a small developing economy with increased international exposure. There are some studies for industrialized countries that show that both the behavior as incumbents, as well as the response to profit opportunities of domestic and foreign firms diverges. This is, instead, a less well studied issue for developing countries.

The results obtained are of two types. First, our estimated coefficients for the speed of entry and the height of barriers to entry are very similar to equivalent estimations for developed countries. The age of incumbent firms, incumbent cost advantages and sunk costs are negatively associated with entry, as expected. Second, we established that the degree of international exposure of industries is a relevant factor in determining the speed and value of entry. Export orientation of industries is positively associated with entry. Those industries still protected and not exposed to international competition, show a lower rate of entry and firm turnover. Industries with larger cohorts of older firms, surviving from the import substitution period, and mainly oriented towards internal markets, seem to be industries with the highest barriers to entry. In these industries it seems that traditional firms have been repositioning themselves to be able to adopt credible entry deterring strategies and keep their market shares. Furthermore, domestic and foreign firms acting as incumbents show a different impact on entry. Industries were foreign firms have larger domestic shares are usually industries with better profit opportunities, as shown by higher entry rates, but if we include exports into the picture, industries whith a higher share of gross production by foreign firms are industries better protected against entry.

We complete the picture by studying the differences of domestic and foreign firms as potential entrants. Foreign firms, may be due to better financial prospects or more flexibility to move resources from one economic activity to another, are more responsive to entry deterring strategies by well established incumbents, but prefer industries with higher profit variability.

We conclude by presenting an index of barriers to entry and its relation to the different types of industries with respect to the participation of foreign firms. The index of barriers to entry is constructed by multiplying the estimated coefficients of the entry model by the value of the explanatory variables explaining long–run profit levels and normalizing this measure to lie between zero and one, using the estimated coefficients of the general entry model (TOBIT estimation) of section 4.2. We divide the sample in industries with foreign participation and industries with no foreign participation. This plot summarizes nicely some of our results.

19

Figure 2:

Height Index for Entry Barriers
F: Industries with foreign post–1973 participation
D: Industries with no foreign post–1973 participation
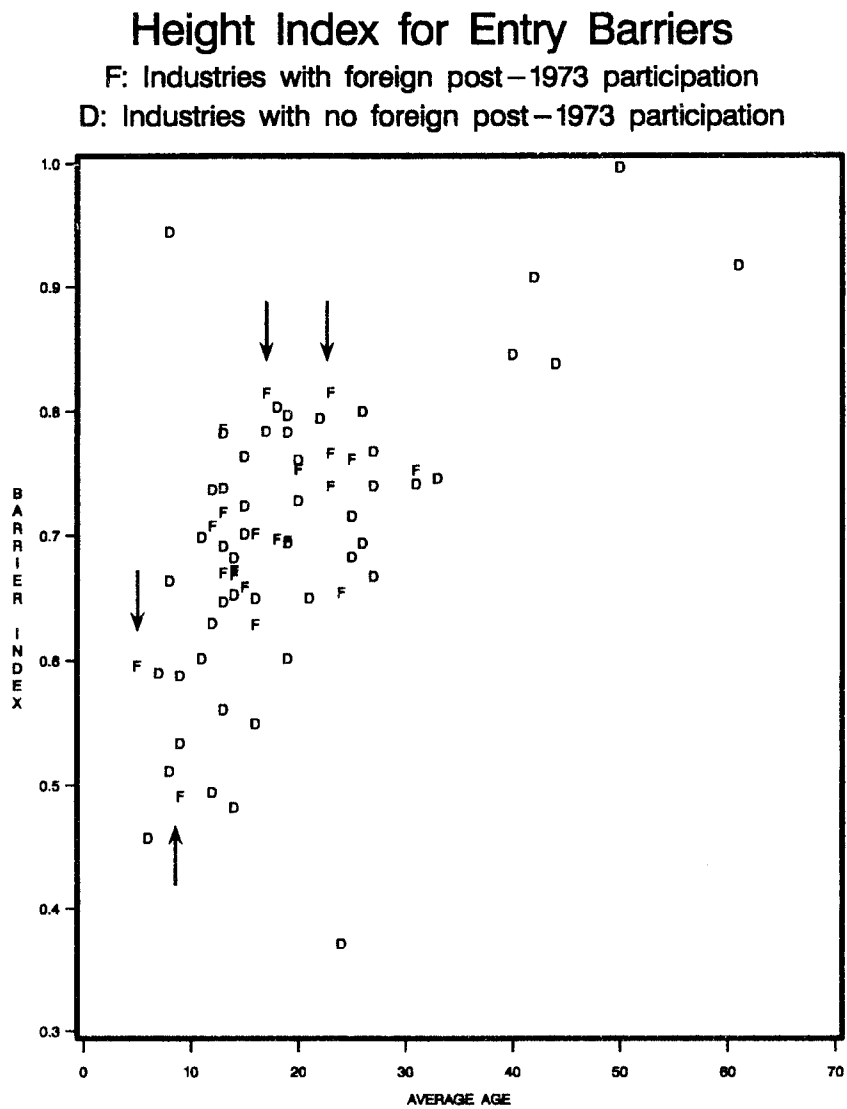
We plot the entry barriers index against average age. The results are shown in Figure 2. We can observe two salient features from this figure. First, there is a high positive correlation between average age and barriers to entry. Older industries seem to be able to raise higher barriers to entry.

On the other hand, the industries with the highest barriers to entry are industries where there is no participation of post-1973 foreign entrants. It is worth remarking that the oldest industries are nevertheless industries with high participation of foreign capital, but from the import-substitution period, before 1973. The industries where those firms participate show higher patent protection, product differentiation, brand loyalty or scale economies, explaining why these industries may be able to raise significant and credible entry barriers.

It is worth remarking the case of four industries that we have highlighted with arrows at figure 2. Two of these industries present fairly high entry barriers, but young firms. These are the textile and the non–specialized machinery industry. These two industries are fairly important in gross value added and clearly export oriented. This may explain why the presence of foreign post-1973 firms is important. In general foreign post–1973 entrants seem to prefer young industries with intermediate height of entry barriers. In the figure we can see that the youngest industries with the lowest entry barriers are usually preferred by domestic firms. There are only two exceptions, which are marked again by arrows. These two industires marked with arrows are also industries with young firms but also with low entry barriers. These are the fisheries and leather products industry. The presence of foreign firms may be explained in this case by means of the dynamic and export oriented character of these industries.

Summing up, the process of industrial restructuring caused by trade liberalization has implied a repositioning of domestic and foreign firms, especially in export oriented industries. Foreign firms seem to have targetted industries with younger firms and high profit variability.

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Appendix

A The profit model

In this section we follow the model proposed by Geroski and Jacquemin (1988) for the persistence of profits. We model changes in success (ρ) as driven by systematic forces E (actual and potential entry) and unsystematic forces μ ("luck"). The equation proposed to explain changes in success, $\Delta \rho_t$ is the following:

$$\Delta \rho_t = \theta + \sum_{j=0}^{\infty} \beta_j E_{t-j} + \gamma \rho_{t-1} + \mu_t \tag{7}$$

For stationarity it is assumed that $-1 < \gamma < 0$. It is also expected that $\beta_j \leq 0$ for all j. E is also endogenous and can be modeled as:

$$E_t = \phi + \sum_{j=1}^{\infty} \alpha_j \rho_{t-j} + \epsilon_t \tag{8}$$

which corresponds to an error–correction model of entry. Past success attracts entry reducing the scope for excess profits. Furthermore, μ_t and ϵ_t are i.i.d. random variables with zero mean and constant and finite variance. Substituting (8) into (7) and restricting the lag structure to three periods, we obtain:

$$\rho_t = \lambda_0 + \lambda_1 \rho_{t-1} + \lambda_2 \rho_{t-2} + \lambda_3 \rho_{t-3} + v_t \tag{9}$$

where,

$$
\begin{aligned}
\lambda_0 &= \theta + \sum_{j=0}^{3} \beta_j \phi \\
\lambda_1 &= 1 + \gamma + \beta_0 \alpha_1 \\
\lambda_2 &= \alpha_1 \beta_1 + \alpha_2 \beta_0 \\
\lambda_3 &= \alpha_2 \beta_2 + \alpha_3 \beta_1
\end{aligned}
$$

which is the reduced–form profit model that we estimate as equation (6).

B Description of the information

We use the Census of Manufacturers for the year 1988, surveyed by the DGEC (Dirección General de Estadísticas y Censos). The universe is all establishments with more than 5 workers. It corresponds to 1616 establishments belonging to 1382

23

firms, existing in 1988. To construct the time series of profits we used the Annual Survey of Industries from the DGEC.

Table 7 summarizes the main information about the sample. There are three

Table 7: Summary information of the sample		
	Expanded Sample	Sample Data
Value Added	1864.9	1614.5
Employment	171.4	124.3
Establishments		
(Activity Class Unit)	5440.0	1616.0
Firms	6256	1382

definitions of production units from where the data is generated:

Production plant: This is the physical place where production takes place. This variable is uniquely associated with geographical location. It can be formed by a set of establishments with different industrial activities.

Establishments: It is a firm or a part of a firm that independently engages only or mainly in an economic activity located or generated in a geographical site, and where value added can be computed.

Activity Class Unit: It is the aggregation of establishments of a single firm that share the same line of production (5-digit industry). This is the unit of observation of the Industrial Census.

Firm: It is the unit of observation and it is formed by a set of Activity Class Units.