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Dynamic Innovative strategies at the firm level: the case of Argentinean manufacturing sector

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Abstract

This paper is aimed at discussing the concept of innovative strategies and proposing a cluster analysis to identify and characterize them, where the possibility of changes in the firm´s innovative behavior is accepted. The model will be applied to a balanced panel manufacturing Argentinean firms during the period 1998-2006. The hypothesis states that there are different innovative strategies, which can be acknowledged by studying the firm´s innovative behavior in terms of investments, capabilities and resources. Preliminary findings show three types of innovative firms: firms with a continuous innovative strategy, firms which after the change in the environment chose to get into an innovative strategy and firms with sporadic investments on innovation. However, there is also a fourth group compound by firms that managed to survive the crisis and grow during the following periods without investing on innovation at all. These findings would confirm that innovation is one of the possible competitive strategies while they also shed light on how to dynamically approach the innovative behavior of firms allowing the possibility of a change in the competitive strategy.

Jelcodes:D21,O12

Dynamic Innovative strategies at the firm level: the case of Argentinean manufacturing sector

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Introduction

This paper is aimed at analyzing the firm´s innovative strategies for a group of Argentinean manufacturing firms. The period under analysis covers three distinct macroeconomic environments: the 1998-2002 crisis, the 2002-2004 recovery and the 2005-2006 growth. Between 1998 and 2002, Argentina´s GDP dropped 20%, the rate of unemployment reached 25% and half of the families were under the poverty line. Since the second semester of 2002, Argentina started to growth again, pulled by the increase in the domestic demand and the competitive shock of a 300% devaluation at the beginning of 2002. In 2005, GDP levels were over the 1998 peak, unemployment rate was under the two digits and the increase and redistribution of incomes had allowed the reduction of total poverty to less than 30%.

Under this context, the hypothesis states that the new period of economic growth has triggered different competitive strategies, some of them based on innovation and technological change, some of them not based on innovation at all. In both groups, there exist firms that grew and survived the macroeconomic fluctuations.

From a theoretical perspective, the relevance of this topic lies on the analysis of micro-heterogeneity and the discussion of how the learning and accumulation processes that arise from innovation could alter the performance of the firm. In this sense, the analysis of the innovative strategies could provide a useful theoretical approximation capable of accounting for both, the path-dependence and the path-creation.

From a practical point of view, this analysis could contribute with the identification of key policy criteria to foster those more successful innovative strategies. If the hypotheses are confirmed, then looking at what specific innovative behavior public policies induce would be more important than counting the number of innovations firms have achieved.

The remainder of this paper is as follows. After this introduction, a brief literature review will be provided. In section two, the model, the methodology and the data are presented. Then the model is applied to a set of Argentinean manufacturing firms and the results are discussed. Finally, some conclusions are provided.

1. Theoretical Background and empirical evidence

1.1. The theoretical approximation to the firm´s strategy

From an Evolutionary perspective, firms have specificities that make them unique and because of that the productive structure will be compound by a heterogeneous set of agents (Penrose, 1959; Nelson and Winter, 1982; Lundvall, 1992; Freeman and Soete, 1997). Under this approximation, there are three complementary explanations regarding the micro-heterogeneity: the capability-based approach, the resource-based approach and the knowledge-based approach.

Under **the capability-based approach** firms are defined as a repertoire of routines and capabilities whose main objective is to exploit valuable knowledge. Given the selection environment (the market competition), the firm has to adapt its routines to survive. This adaptation is the result of learning processes that arise from the selection environment but also from the interaction of individuals inside the firm (Nelson and Winter, 1982; Nelson, 1991; Teece and Augier, 2007). Within the firm, the search for improvements in the routines –intended or problem-solving oriented- is called innovative process, where dynamic capabilities determine how the firm copes with the uncertainty that exists before and during it.

The dynamic capabilities are the aggregation of the strategy, the structure and the core capabilities (Nelson and Winter, 1982; Nelson, 1991; Teece and Augier, 2007). The strategy of the firm is the set of choices regarding which and how objectives will pursue. The structure is the set of assets and resources it has, whose allocation is the result of past and present strategic decisions. Finally, the core capabilities determine the range of possible (profitable) choices the firm can make but also the performance of the resources. In dynamic terms, if the strategy changes the structure should change too, and capabilities must be adapted. At the same time, since the competition and the productive dynamic of the firm will trigger feedback processes that will enhance capabilities, the range of strategic options will also increase, leading to adjustments or changings in the strategy.

This evolving and complex nature of the interaction between strategy, structure and capabilities explains why there is a multiplicity of heterogeneous situations at the firm level, which also change over time. The observable outcome of this process is the innovative behavior of the firm and its performance on the market.

The resource-based approach –also referred as the behavioral approach- is based on Penrose´s (1959) definition of the firm as a collection of resources, which are allocated to different uses and will perform differently according to how human resources make use of them. Under this approach, the innovative dynamic of the firm arises from two key aspects of the resources it has: their indivisibility and their differential performance. As long as assets and human resources –and their multiple combinations - are not perfectly scalable, the firm has incentives to push the use of resources up to is maximum capacity. Then, it will search for innovations within the same resources. At the same time, since the performance of the resources depends on how they are used, new allocations or new people (skills), could lead to different performances. Similar to the conclusion that arises from the capability-based approach, the complexity and dynamism of the competitive process as well as the resources and the managerial capabilities of the firm explain the persistence of heterogeneous situations and trajectories at the micro level.

The knowledge-based approach is based on the acknowledgement of the impact of the environment as an historical force shaping the characteristics of the firm –something less visible in the other two approaches- and analyzes the observable outcome of innovation and performance. Under this approach, knowledge creation and recombination is at the center of the dynamic of the capitalist competition, where innovation is, in fact, a new combination of existing knowledge. Then, the competitive position of the firm –how it takes advantage of the selection process- depends on its ability to learn, therefore, it depends on the firm´s competences (Lundvall et al., 2009, Arundel et al., 2007; Lundvall and Lam, 2007).

In dynamic terms, the process of competence building allows the firm to face environmental changes and make profits out of knowledge. In practical terms, how internal competence building, external knowledge and network positioning are combined in order to transform knowledge into innovations is a matter of strategic decisions.

Beyond the semantic difference among the three presented approaches, there is a set of common elements that allow the definition of the firm´s strategy. If the firm is defined as the set of

resources, capabilities and interactions aimed at making profits out of the competition process, then **the strategy of the firm will be the set of choices regarding how it will face this process and it can be observed by looking at the structure (organization), the resources (assets and investments) and the capabilities (competences and interactions).**

Another common element of these approaches is the economic idea of strategy, which is an ex-post explanation of more or less planned actions. The process that goes from the selection of the strategy up to the final impact in terms of profits –if successful- is surrounded by uncertainty. As long as the strategy is being transformed into concrete actions, the level of uncertainty tends to decrease because the amount of information regarding potential benefits and costs has increased, but also because the process itself triggers learning processes that enhance the competences of the firm and its understanding of the possible outcomes. Within the process, the strategy of the firm would probably be adjusted based on the new information and certainties (Ansoff, 1973; Lall, 2001; Fagerberg, 2003).

This dynamic process of strategic decisions, implementation and adjustment explains why Nelson´s (1991) sustains that the evolution of the structure of the firm (its organization in Lundvall´s terms) can only by *"dimply foreseen"*. It also explains why Freeman and Soete (1997) argue that successful strategies, which can be perfectly explained ex post, can hardly be defined ex ante. In other words, **the strategy of the firm can be observed by looking at the structure in an ex-post perspective.**

1.2. Empirical evidence on innovative strategies

Freeman (1974) provided one of the first empirical contributions to the understanding of the innovative strategies. Based on a large set of empirical studies, the author identifies six different "ideal types" of innovative strategies: offensive, defensive, imitative, dependent, traditional and opportunist. The author observed that, at a given period, firms adopt a specific strategy, which consists of the combination of resources and scientific and technological skills the firm allocates to compete on the market (structure and capabilities in Nelson´s terms).

Offensive firms are those constantly trying to move the technological frontier based on the performance of science-based activities. Firms with a defensive strategy also based their structure on the performance of R&D but not to move the frontier but to improve the first mover´s innovation. Imitative firms focus on the search for a superior competitive position based on the

acquisition of innovations developed somewhere else (by intra-firm technology transfers or licenses) or constant cost reductions by means of process innovations. Dependent firms are similar to imitative ones as long as they implement innovations developed somewhere else, but as an adaptive response to their clients´ demands. Both imitative and dependent firms have high capabilities in engineering and industrial design but almost non-existent investments on science and technology. Traditional are those whose product remains the same so they base their survival in the quick adaptation to this fashion changes. Their capabilities are concentrated in the improvement of the process as well as the quality assurance, with almost non-existent investments on R&D. Finally, there is the opportunistic strategy, based on the quickly identification and exploitation of short-term niches in rapidly changing markets by supplying a product or service which does not require R&D but no one else would provide it.

A second key empirical contribution is the one made by Pavitt in 1984. While Freeman analyzes the strategies at the firm level, Pavitt (1984) looks at the productive structure and distinguishes four types of sectors, based on the source of technological change: science-based, specialized suppliers, scale intensive and supplier dominated. The innovative strategy of the firm is defined the observable manifestation of how technological change occurs within the sector it belongs to: among science-based firms is the performance of R&D; among scale intensive and specialized suppliers by innovations in the productive process to reduce costs; specialized suppliers are capable of quickly respond to their customers 'needs , more focus on the performance on the goods than the price-competitive position; and finally, among supplier dominated sectors the product tends to remain the same and technological change is incorporated through embodied technology (capital goods and raw materials).

More than 20 years after these pioneer classifications of innovative strategies, and thanks to the multiplication of available information, several studies have been performed based on these strategies[1]. These studies use the information provided by national innovation surveys and find different clusters of firms, which are associated with different combinations of innovation efforts, different trajectories in terms of economic and productive impact of innovations and different

[1] See Cesaratto and Magnano (1993) for the case of Italian firms; Arvanitis and Hollenstein (1998) for the case of Swiss firms, Leiponen and Drejer (2007) for the case of Danish and Finish firms; Clausen et al. (2011); Yurtseven and Tandoğan (2012) for Turkish firms; de Jong and Marsili (2006) for Dutch micro-enterprises; Fraga et al. (2008) for Portuguese firms and Srholec and Verspagen (2012), Bottazzi et al. (2010) and Frenz and Lambert (2009) for cross-country comparisons.

types of interactions with other agents of the system. In all cases, although Pavitt´s taxonomy and national specificities explain part of the groupings, these are not the only determinant of the innovative dynamism of firms and Freeman´s strategies can be found in both dynamic and traditional activities. These studies also confirm that different innovation strategies could lead to the same results and, conversely, the same innovative strategies could lead to different outcomes. Therefore, innovation is neither a linear nor an automatic process.

1.3. Discussion of the literature about the innovative strategies

The reviewed studies have significantly contributed to the understanding of the micro-heterogeneity and the complex nature of the innovative process. They have also provided evidence to support the Penrose´s ideas regarding the different performance of resources due to the different capabilities; the Nelson´s ideas in respect of the different innovative structures, the Ludnvall´s stats regarding the different ways of transforming knowledge into innovations and the Pavitt´s and Freeman´s studies regarding the source of technical change within the firm.

However, they also share a static perspective of the strategic process of innovation. They can explain why a firm shows a better performance but they cannot shed light on how firms react to that better performance or, in Nelson´s terms, how the selection processes triggers learning processes that improve routines. They can also explain why a firm has innovated but they fail to predict if the firm will persist as an innovator or, in Penrose´s terms, the probability of the firm to achieve long-term growth. They can explain how the firm´s innovative strategy is based on a high level of capabilities but they cannot explain how learning processes that arise from these capabilities feedback the strategic decisions or, in terms of Lunvdall, how the firms learn and transform knowledge into innovations.

If the firm has invested in the search for a new product and it successfully introduced it to the market (R&D expenditure), it will probably invest on marketing or process innovations (engineering and machinery) in the next period to maximize the impact of the original innovation. If the firm didn´t succeed on the innovation, it will probably change its strategy. The presented analysis provide valuable information regarding the situation of a particular productive structure in a particular time and space, however, they fell short on providing elements to predict how firms will react to the different results or to changes in the environment. In short, they cannot explain how firms adjust and change their strategies.

This is a missing aspect also within the theoretical approximations. In the case of the capability-based approach, there is no clear explanation about how the interaction between the dynamic capabilities and the ordinary ones leads to the disappearance of some routines and the installation of others. In the case of the resource-based approach, none explanation is provided regarding how the knowledge created during the productive process leads to realign strategic objectives with resources and capabilities. Within the knowledge-based approach, there are only a few attempts to explain how a firm manages to escape from the environmental determinants given by the national history and the institutional framework. In short, although all the approaches and taxonomies base their explanation on the dynamic process of innovating and competing, they fell short in explaining the dynamic process of strategic change at the firm level.

2. Model and methodology

2.1. Conceptual issues

The methodology is based on three conceptual elements that arise from the literature. Firstly, the firm´s **strategy is an ex post concept**. This means that although it can be characterized by looking backwards, it does not necessarily arise from a conscious planning and decision process at the firm level. (Freeman and Soete, 1997) Secondly, **the strategy of the firm can be observed by looking at its structure and capabilities**. (Nelson, 1991) At a given moment and space, the structure of the firm (resources, investments and organization) accounts for the implementation of the strategy while the capabilities for the performance of that resource allocation as well as future strategic adjustments. Thirdly, given the complexity of the process, **there are non-observable characteristics: the idiosyncrasy of the firm**. The observable innovative behavior of the firm is just one dimension of a more complex process crossed by both firm-level specificities and environmental determinants. (Lundvall, 1992)

Another element of the methodology has to do with the fact that while the reviewed literature assumes that all firms somehow chose an innovative strategy – due to data restrictions or given the theoretical assumptions-, we will start one step backwards and will analyze the differential impact of engaging on an innovative strategy or not. Firms with expenditure on knowledge creation, incorporation and combination (hereinafter innovative activities) are performing an innovative strategy; those without expenditure are not. If the firm continuously allocates resources to innovate, then it is performing a continuous innovative strategy.

Both the theoretical analysis and the empirical evidence sustain that the frequency of the expenditure on innovation should be higher in those firms with a more coherent and articulated strategy. The combination of Lundvall´s modes of learning (Jensen et al., 2007), the articulation of efforts on R&D and engineering in terms of Freeman (1974) and the existence of routines to innovate in terms of Nelson and Winter (1982) are just some of the possible explanations that support the validity of the assumption regarding the positive relationship between the frequency of the expenditure and the virtuosity of the strategy.

This assumption also finds strong empirical support in the Argentinean case, where different analysis confirm the predominance of innovations based on the acquisition of capital goods, the scarce efforts on the endogenous creation of knowledge, the low technological complexity of the produced goods and the biased to the production of low added value goods explains most of the innovative dynamic of Argentina firms (Katz and Stumpo, 2001; Anlló, 2008 ; Lugones et al., 2008; Suarez, 2009). Therefore, if a firm persistently invests on innovation, it is investing on complementary forms of knowledge creation, adaptation and incorporation, therefore a more complex innovative strategy.

2.2. The hypothesis

Given this conceptual issues, the hypotheses to test are:

H1: The frequency of the expenditure on innovation is a good classification criterion of the innovative strategies

H1.1: Different frequencies of expenditure on innovation are corresponded with differences in the innovative dimensions among groups of firms;

H1.2: Changes in frequencies of the innovation expenditure correspond with changes in the innovative strategy and so with changes in the innovative structure.

H2: Different innovative strategies present different innovative structures

H2.1: Firms with a continuous innovative strategy have higher levels of innovation efforts, capabilities and resources, a balanced innovation behavior and more linkages with other organizations of the national innovation system;

H2.2: Given the changes in the environment, some firms change their innovative strategy with consistent changes in the innovative structure.

2.3. The data

The model will be applied to a balanced panel data that comes from the Argentinean Innovation Surveys, with information for the period 1998-2006 for 800 manufacturing firms form different sectors (ISIC from 15 to 36), sizes and capital ownership (INDEC, 2010). The data was gathered by the Argentinean National Institute of Statistics and Census using a CIS-type questionnaire in all cases.

Given the request of having participated in the four surveys, all firms were established before 1998 (first year of the first innovation survey) and they all survived the worst crisis in Argentina's history. That means that the sample is biased towards those firms who managed to cope better with the recession of 1998-2001. Merged innovation surveys (a micro-data panel) have an additional bias given by the higher survival rate among innovator firms. The bias, however, do not undermine the usefulness of the database, as long as it allows the study of a relative large group of firms over time, within a period of deep macroeconomic changes. At the same time, since all the surveys ask a large number of questions to both, innovator and non-innovator firms, behaviors can be analyzed comparing several variables among different innovative performances.

The panel covers a period of 9 year (from 1998 to 2006) although unequally distributed among surveys. This nine-year period was segmented into 3 sub-periods: 1998-2001, 2002-2004 and 2005-2006, so the panel is compound by three observations for each case (firm). This is based on both the fact that innovation is a process that may go beyond the calendar year and also due to data restrictions. From these sub-periods, continuous variables were recalculated as annual averages and those in local currency were deflated by the producer price index, base 1998 at three digits ISIC on a yearly basis. For dichotomous variables, the criterion was that of a positive response in at least one year of the sub-period.

2.3. The model and the variables

Formally, the model can be written as follows:

$$IS_{it} = \begin{cases} f(IS_{it-1}; Istr_{it}; Env_{it}) & Iexp_{ti} > 0 \\ 0 & Iexp_{ti} = 0 \end{cases} \qquad \textit{(Eq. 1.1)}$$

Where:

$$Istr_{it} = f(II_{it}; IB_{it}; QHR_{it}; Link_{it}; Rec\_ext_{it}) \quad \textit{(Eq. 1.2)}$$

$$Env_{it} = f(Size_{it}; OK_i; Sector_i; T_t) \quad \textit{(Eq. 1.3)}$$

The model states that a firm i has chosen an innovative strategy (IS_{it}) in the period t when it has declared expenditures on innovation ($Iexp_{it} > 0$). Then, the innovative strategy is a function of its past innovative strategy (IS_{i-1}), to account for the path dependence, its innovative structure ($Istr_{it}$) and its environmental determinants (Env_{it}).

To account for the innovative structure ($Istr_{it}$), three dimensions were included: innovative efforts, capabilities and resources. The innovative efforts consist of the innovation expenditures based on two measures: intensity (II_{it}) and distribution (IB_{it}). The four innovation surveys asked for the performance of 10 different innovation activities in terms of the total amount expended in each year of the reference period, regardless the results. The innovative activities are: internal and external research and development (R&D), acquisition of capital goods, hardware, software, technology transfer, training, engineering and industrial design and consulting.

For the estimation of the innovation intensity (II_{it}), the average innovation expenditure for the period was divided by the total sales. The underlying assumption is that the higher the expenditure, the greater the firm's commitment to the search for innovations; an assumption widely confirmed in the reviewed literature and empirically tested in other papers with the same data but different models and panels (Chudnovsky et al., 2004; Lugones et al., 2007; López and Arza, 2008).

The distribution of the innovation expenditure –innovation balance (IB_{it}) - is another indicator proved to have impact on the innovative dynamic. (Lugones et al., 2007; Yoguel et al., 2011) The argument supporting this relationship indicates that the generation and application of new knowledge (or a new combination of an existing one), and its introduction to the market in the form of innovations, is the result of deliberate efforts, more or less planned, in the pursuit of technological and organizational improvements. These efforts must combine the incorporation of knowledge developed outside the firm (exogenous knowledge) with the endogenous creation of new one, in order to absorb and transform them into an innovative product or process. Even in cases where innovation happens purely and exclusively through the acquisition of capital goods, the impact is greater when the firm also invests on activities to select, adapt and improve it (e.g.,

engineering and industrial design). For the calculation of the indicator the formula developed by Lugones, Suarez and Le Clech (2007) was applied.

The general notation of the index is: $IB_i = \frac{n - \sum_{i=1}^{n} \frac{\left| \left(g_j / AI \right) - \alpha_j \right|}{\left(g_j / AI \right) + \alpha_j}}{n}$ con $0 < IB_i \leq 1$

Where *i* is the identifier of the firm, *j* is the identifier of each category of expenditure, *g* is the expenditures in each category (*j*), *AI* is the cumulative total expenditures (in constant prices 1998) on innovation activities, α is the weighting coefficient for each *j* (in this case 0.25 for each set of activities, so the sum is equal to 1), *n* is the total number of categories analyzed (4 in this case). (Table 1.)

Table 1: Innovation Expenditure Categories

Category (j)	Description	Weight (α)
A	Research and Development (internal and external)	0,25
B	Engineering and industrial design + training	0,25
C	Capital goods + Hardware	0,25
D	Technology transfer (TT) + Consulting + Software	0,25

Source: Lugones, Suárez y Le Clech (2007).

The cumulative expenditure will be used in each sub-period because it is expected that the firm will distribute the costs between the innovation activities based on funding availability and the ability to spread the cost (e.g.: after the purchase of a capital asset, efforts on engineering and training to optimize its use should be allocated, the latter will probably be lower than the former but not less important in terms of the pursued innovation).

The index does not aim at finding an optimal value of innovation balance, but to analyze how different balances impact on the innovation process. Then similar weights to each category are assigned (0.25). Results go from the perfectly balanced firm (index equal to 1) to the perfectly unbalanced one (values tending to 0). Of course, this index is reduced to the group of innovative firms (firms that reported spending on innovation, regardless of the results) given its denominator. For the non-innovative firms, the IB was set to zero in order to avoid the loss of observations.

To account for the capabilities of the firm, the relative endowment of qualified human resources (QHR_{it}) and the linkages with the national innovation system were included ($Link_{it}$). QHR_{it} is a

continuous variable estimated as the quotient between the number of professionals and the total employment of the firm. The assumption is that the higher the number of years of formal education, the higher the average level of skills, and therefore higher the level of the firm´s capabilities. (Crépon et al., 1998; Raymond et al., 2010; Yoguel et al., 2011; Srholec and Verspagen, 2012)

The linkages of the firm with the national innovation system was included as a proxy of capabilities, assuming that interactions with other agents increase firm´s competences. Despite the disappointing empirical results (low rates of cooperation), evidence shows that interactions happen when the firm has crossed a threshold of minimum competencies. (Tether and Swann, 2003; Erbes et al., 2004; Suarez, 2009) Then, if the firm has established linkages, then it has crossed that minimum threshold of competences and has higher skills than a firm which has not.

In two of the surveys (1998-2001 and 2005), respondents were asked to inform interactions with universities, public organizations, related firms (headquarters and subsidiaries), other firms, suppliers, clients, R&D laboratories and technological centers (public and private). $Link_{it}$ is a dummy variable that takes the value 1 if the firm reported interactions and zero if it has not. Given that there are gaps on the information (information for 2002-2004 is not comparable), this variable is included as two time-invariant dummies, one for the period 1998-2001 ($link_{t-2}$) and one for the period 2005-2006 ($link_t$) and they will be activated for the correspondent period.

The last variable associated with the innovative structure is the access to external resources. (Rec_ext_{it}) The innovation surveys ask about the access to external resources to fund the innovation expenditures (banks, suppliers, clients, other firms, public organizations, non-governmental organizations, international organizations, universities, other sources). Rec_ext_{it} is equal to 1 if the firm accessed to external resources and 0 if it has not. Given the fact that the lack of resources has been signaled in all surveys as the most important obstacle to the realization of innovations, the assumption behind this variable is that if the firm has managed to overcome that barrier it will be in a better financial position. Of course, one could argue that if the firm is in a good financial position, then it will probably won´t to access to external funds (for instance, given the high interest rate) and in this case better situations will be somehow punished. Evidence, however, seems to point to the other way around (Porta, 2007).

Besides these innovative dimensions, the usual structural control variables were added. The size control refers to the total employment of the firm measured as the average annual value for each sub-period, in total number of persons ($Size_{it}$). To control for the sectorial specificities, continuous variables were divided by the sectorial average, based on the International Standard Industrial Classification Revision 3), at two-digit desegregation ($Sector_i$). Then, firm´s values are analyzed in respect of the average sectorial value. A "company with participation of foreign capital" is defined as a firm that has more than 1% of their shares owned by foreign capital in 2002-2004 (OK_i)[2].

Given these assumptions and the classification criteria, four types of strategies were estimated according to the firm was or was not an innovative one during the current period and the immediately previous one. This way, a change in the innovative conduct is allowed. (Table 2)

Table 2.: Combinations of innovative strategies*

<table>
<tr><th></th><th colspan="3">Sub-period</th></tr>
<tr><th rowspan="9">Innovacion expenditure</th><th>1998-2001</th><th>2002-2004</th><th>2005-2006</th></tr>
<tr><td rowspan="4">YES</td><td rowspan="2">YES
Continuous</td><td>YES
Continuous</td></tr>
<tr><td>NO
Sporadic</td></tr>
<tr><td rowspan="2">NO
Sporadic</td><td>YES
New</td></tr>
<tr><td>NO
Non innovative</td></tr>
<tr><td rowspan="4">NO</td><td rowspan="2">YES
New</td><td>YES
Continuous</td></tr>
<tr><td>NO
Sporadic</td></tr>
<tr><td rowspan="2">NO
Non innovative</td><td>YES
New</td></tr>
<tr><td>NO
Non innovative</td></tr>
</table>

* Yes (no) means that the firm declared (did not declare) innovation expenditure in at least one of the consulted activities for at least one year of the sub-period. Source: own elaboration based on INDEC (2010)

Thus, the innovative strategy is determined whether the firm had or had not made innovative efforts in two consecutive periods. The four types of Innovative conducts are:

[2] The average level of participation of foreign capital within foreign owned firms is high enough (70%) to control the specificities that arise from this feature of the firm with a dummy variable.

- Non-innovative (NI): firms that did not make innovation efforts during two consecutive sub-periods;
- Sporadic innovative (Spor): enterprises engaged on innovative efforts only in the first of the two sub-periods;
- New innovative (New): firms that were non-innovative in the first sub-period and made innovative efforts in the second sub-period;
- Continuous innovative (Cont): firms that made innovative efforts in two consecutive periods.

The combination of the four types of strategies and the three sub-periods results in 8 different situations, schematized in Table 3.

Table 3: Innovative strategies

t-2/t-1	t-1/t	t-2/t
Continuous	Continuous	C-C
	Sporadic	C-S
Sporadic	New	S-N
	Non innovative	S-NI
New	Continuous	N-C
	Sporadic	N-S
Non innovative	New	NI-N
	Non innovative	NI-NI

Based on this classification, the testing of the hypothesis will be based on a cluster analysis aimed at measuring the correlations, levels and signs of the relationships between the innovative strategy and the innovative structure of the firm.

Since variables and groups are part of the hypothesis, a confirmatory analysis is required and a discriminant cluster technique was chosen. Similar to the factor analysis, this analysis is based on the identification of discriminant functions (the same as the scores of factor analysis) which are linear combinations of variables that separate the cases into specific groups based on the maximization of distances between categories. The same as the k-means cluster analysis, the discriminant analysis has to be provided with the number of groups (clusters). In this case, the 8 combinations of strategies were defined as the clusters to test.

One of the advantages of this technique is that it doesn´t force the case within a group but estimates the probability of a case to be correctly assigned to a group with similar medias for a set of variables (Fix and Hodges, 1951; Anderson, 2003). Another distinctive feature of the model is

that it allows the inclusion of continuous and binary data (Klecka, 1980; Tu and Han, 1982), so all the variables selected as proxies of the innovative structure can be jointly analyzed.

The estimation of the discriminant functions is formally defined as follows:

$$d_{ik} = \beta_0 + \beta_1 X_{ai} + \cdots + \beta_n X_{ni}$$

Where d_{ik} is the discriminant function for the group k ($1 \leq k \leq 8$, being group 1 the control one) for the case i (800 cases); β the average coefficient (weight) of each variable X, X_{ai} is the value of the variable a for the case i, being n the number of predictor variables $(1 \leq n \leq 5)$. A constant β_0 is added in order to control the different scales and stating values of each category and variable.

To combine the three dimensions of analysis (cases, variables and evolution over time), the panel data was transformed into a cross-sectional dataset where each variable accounts for an innovative characteristic in an specific time, for the 800 cases of the panel. Then, even though the transformation of the dataset eliminates time as a variable, the reading of the results has to be made by looking at the evolution of sets of three interrelated variables (one for each sub-period).

The same as in the factor analysis, the discriminant functions are assumed to be uncorrelated, predictors (the variables) are assumed to have a normal distribution and cases to be independent. However, discriminant analysis has been proved to be robust even when these assumptions are not fulfilled (Lachenbruch, 1975; Klecka, 1980).

After the discriminant functions were estimated, and similar to the hierarchical and the k-means cluster techniques, the procedure is based on the sequential addition of discriminant functions up to the point where a single discriminant score is produced. It starts from the one that separates each group the most, then the second discriminant function is taken into account, then the third one and so on up to the last one, which is equal to $d = \min(k-1; n-1)$. Since each innovative variable (the ns) will be included for each sub-period $n = 5x3 = 15$ the minimum number is reached by the combination of innovative strategies (the ks) and seven discriminant functions will be estimated.

Based on the discriminant functions, cases are assigned to estimated categories and contrasted with the observed classification. Standard software offers some tests and contrasts statistics in

order to analyze the incidence of each variable on the category, the probability of a correct or wrong classification and the corroboration of the assumptions of the model.

3. Results

3.1. Cluster analysis and econometric estimations

Table 4 summarizes the discriminant functions and the average value for each variable[3]. Three of the seven discriminant functions explain 98% of the variability among strategies over time, the first two ones with eigenvalues closer than one and a canonic correlation over 0.7. Functions 1 and 2 represent those balanced firms with medium level of innovation intensity and high probability of interacting with other organizations from the national innovation system, although in the case of Function 2, efforts, balance and linkages become strong determinants in t-1. Function 3 accounts from the inverse situation: low and balanced efforts during t-2 and even lower and biased innovation expenditures from t-1. Function 4 accounts for the levels of qualified human resources and function 5 and 6 account for those cases where high relative levels of the variables are observed but only in one specific sub-period, being low during the rest of them. Function 7 shows inverse relationship between the level of expenditure during t-2, meaning that this variable is close to zero.

Table 4: Discriminant functions

		Discriminant functions						
		1	**2**	**3**	**4**	**5**	**6**	**7**
II_{it}	t-2	,216	-,102	-,045	-,063	,176	**,503**	**-,555***
	t-1	,092	,226	-,349	**,377**	**,477***	-,002	-,314
	t	,108	,204*	,152	,056	-,052	-,057	-,172
IB_{it}	t-2	**,749***	-,389	-,034	-,099	,140	-,217	,057
	t-1	**,445**	**,530***	**-,511**	-,071	-,219	-,044	,167
	t	**,403**	**,542***	**,463**	-,045	,148	,124	,063
QHR_{it}	t-2	,132	,010	,191	**,232**	-,024	**-,373***	-,197
	t-1	,023	,072	,055	**,359***	,090	**,319**	,277
	t	,065	,004	,167	**,418***	,251	-,176	**,336**
$Link_{it}$	t-2	,360	-,068	,070	**,619***	**-,544**	,094	-,050
	t	**,267**	**,396***	,185	-,089	-,046	**-,302**	-,027
Rec_ext_{it}	t-2	**,280***	**-,198**	,047	,252	,160	-,023	,267
	t-1	,072	,170	-,165	,195	**,430***	-,110	,068
	T	,162	,138	,160	-,097	**,212**	**,194**	**,261***

[3] The complete estimation is presented in Appendix 1.

OK_i	t-1	,118	,064	-,060	-,092	,022	,063	,181*
$Size_i$	t-2	,157	,059	-,008	-,276*	-,157	-,258	,250
Eigenvalue		2,458	,914	,329	,045	,017	,010	,008
Accumulated %		65,0	89,2	97,9	99,1	99,5	99,8	100,0
Canonic correlation		,843	,691	,498	,207	,128	,099	,088

Obs: 800. * = highest correlation. Source: own elaboration based on INDEC (2010)

In table 6, the centroid value of each function for each strategy is shown. As expected, NI-NI firms reach higher positive levels among the last functions and an inverse relationship (negative sign) among the first ones. On the contrary, C-C and N-C show the inverse pattern, with high average values for functions 1 and 2 and negative in functions 6 and 7. In the case of N-C firms, the higher average value in the case of Function 4 is explained by a high level of qualified human resources, which is even higher than the one observed in C-C, especially for the period t-1. For the rest of the strategies, functions 3 to 5 have the highest explicative power.

Table 6: Centroid values – Strategies and Discriminant functions

	Discriminant función						
	1	**2**	**3**	**4**	**5**	**6**	**7**
NINI	-2,106	-,601	-,105	-,226	-,057	**,071**	**,063**
NIN	-1,686	,267	**1,042**	-,115	,038	-,123	-,185
SPNI	-,339	-1,913	,060	**,423**	-,146	-,229	,097
SPN	,440	-,975	**1,479**	,420	,284	,241	,069
NSP	-1,893	,303	-1,461	,022	**,573**	-,167	,045
NC	-,874	**1,747**	-,173	**,247**	-,080	,029	,016
CSP	,410	-1,499	-1,182	**,231**	-,048	,144	-,252
CC	**1,689**	,104	-,003	-,103	,001	-,013	,012

Obs.: 800. Canonic discriminant functions non-standarized. Average value for each group.
Source: own elaboration based on INDEC (2010)

Table 7 shows final cluster estimation. The classification criteria accounts for significant differences in the innovative structure (efforts, capabilities and resources) and the cluster membership based on these variables accounts for the 77,5% of the firms. That is to say, when firms are classified according to their innovative strategy (frequency), more than 3 out of 4 of them will end up within a group with similar characteristics in terms of the innovative structure.

The largest absolute differences between the observed and the predicted classification are among the predicted non-innovative firms, where the estimation places also many sporadic ones, meaning that those firms with an sporadic innovative strategy present a similar structure to those that do not invest on innovation at all.

Table 7: Cluster analysis – Estimated and observed cluster membership

Observed		Estimated								Total
		NINI	NIN	SPNI	SPN	NSP	NC	CSP	CC	
Number of cases	NINI	**139**	2	1	0	0	0	0	0	142
	NIN	25	**42**	0	0	0	0	0	0	67
	SPNI	18	0	**29**	0	0	0	0	0	47
	SPN	6	4	4	**11**	0	0	0	8	33
	NSP	16	0	0	0	**6**	3	0	0	25
	NC	17	10	0	0	2	**91**	0	0	120
	CSP	10	0	4	0	1	0	**22**	4	41
	CC	8	3	4	4	0	24	2	**280**	325
% of cases	NINI	**97.9**	1.4	.7	0.0	0.0	0.0	0.0	0.0	100.0
	NIN	37.3	**62.7**	0.0	0.0	0.0	0.0	0.0	0.0	100.0
	SPNI	38.3	0.0	**61.7**	0.0	0.0	0.0	0.0	0.0	100.0
	SPN	18.2	12.1	12.1	**33.3**	0.0	0.0	0.0	24.2	100.0
	NSP	64.0	0.0	0.0	0.0	**24.0**	12.0	0.0	0.0	100.0
	NC	14.2	8.3	0.0	0.0	1.7	**75.8**	0.0	0.0	100.0
	CSP	24.4	0.0	9.8	0.0	2.4	0.0	**53.7**	9.8	100.0
	CC	2.5	.9	1.2	1.2	0.0	7.4	.6	**86.2**	100.0

Obs: 800. 77,5% of cases correctly classified, estimations over the within groups covariance. 93% correctly classified if the separate groups covariance matrix is used. Wilks´Lambda significant at 99% for all variables and for discriminant functions 1 to 3 (98% of variability). MANOVA test performed, significant multivariate correlation between the sequence of strategies and the innovative structure.
Source: own elaboration based on INDEC (2010)

3.2. Discussion of the findings

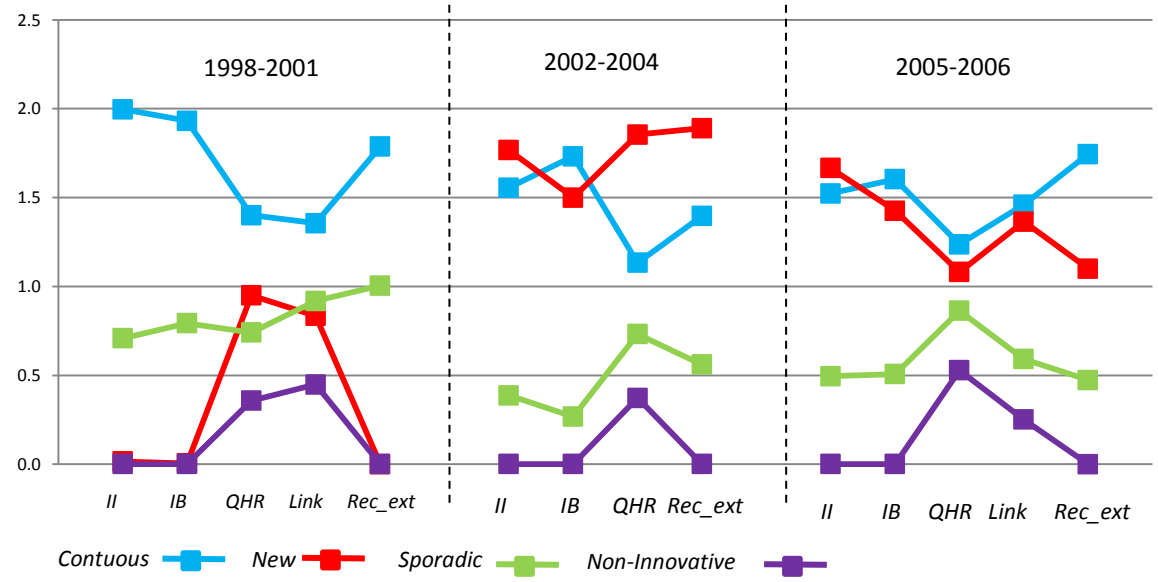
During the period 1998-2006, four types of strategies can be observed among the Argentinean manufacturing firms: the continuous, the new, and the sporadic strategies among the innovative firms, and a non-innovative group (Graph 6.1.).

Results show that some firms persistently invested on innovation (C-C), combining endogenous with exogenous efforts on knowledge, with a high level of qualified human resources and strong interactions with the national innovation system. Although affected by the economic crisis (1998-2001), these firms manage to sustain high levels of investment and a high endowment of skilled employees. When economic growth started again (2002-2004), they reinforced their strategy and investments and qualified employment grew.

The composition of this group is heterogynous and firms from all sectors, all sizes and different capital ownership are observed. The existence of these firms provides evidence of the possibility

of a dynamic innovative strategy regardless the instability of the macro environment and regardless the structural determinants. Moreover, they provide evidence about the need of new classification criteria when it comes about understanding firm-specificities.

Graph 6.1: Innovative strategies and innovative structure



Continuous: C-C; New: N-C; Non-innovative: NI-NI; Sporadic: rest of the firms. Values estimated as the quotient between the average value of the strategy and the average value of the panel, for each sub-period. Obs: 800.
Source: own elaboration based on INDEC (2010)

Another group of firms present a shift in the innovative strategy. The new innovative firms (N-C) started investing on innovation after the crisis and they persisted on that behavior during the recovery and growth phases. Evidence shows a significant and sustained increase in the level of expenditures and qualified human resources, which also includes a more-than-proportional increase on investments and human resources at the beginning of this new strategy (2002-2004). This catch-up phenomenon differentiates these firms from the rest of the innovative (the different sporadic behaviors) and supports the idea of a deep strategic change.

The why of the change is most likely to deserve a complete research project. However, the evidence presented in this paper sheds some light on the subject. Even though these firms shared the lack of investments on innovation with a larger group of firms during the four years included in the sub-period 1998-2001, the new innovative firms had high levels of human resources and higher linkages with other organization of the national innovation system. Therefore, capabilities were a pre-existent condition.

Another feature of the new innovative firms is that they are from different sectors and sizes and both, national and foreign firms. The same as with the continuous firms, a dynamic innovative behavior is not a strategy exclusive of high-tech firms. Moreover, the fact that these firms also present balance expenditures provides evidence regarding the importance of both endogenous and exogenous creation of knowledge.

The innovative dynamic of sporadic firms is the most heterogeneous one, although they share the erratic behavior. The level of expenditure ranges from remarkably high to zero and the endowment of human resources seems to depend more on the denominator (employment) than on the actual hiring of skilled personnel. Efforts on innovation are biased, in most of the cases towards the acquisition of capital goods, strongly related to the access to external sources of funding. This group of firms is also compound by enterprises with different sectorial belonging, different size and different capital ownership. In this case, they are a proof of the lack of direct association between a high-tech sector and a more high-profile innovative strategy.

Finally, there is the group of non-innovative firms. These are firms that did not invest on knowledge for almost a decade, with low interactions with the national innovation system and a reduced level of skilled human capital. They survived the crisis and grew afterwards and prove the fact that innovation is one out of many competitive strategies. They also prove that macro incentives are not enough to trigger long-term dynamic innovative strategies.

In relation with the reviewed literature, the strategies and the sectorial belonging do not show any significant correlation, which means that the four identified strategies are present in all groups, and all groups are compound by the four strategies (Table 8) On the one hand, these findings confirm the possibility of a high-profile innovative strategy in the so called low-tech sectors (such as textiles) but also, and conversely, the existence of firm with a non-innovative strategy in those sectors expected to have a high profile in this subject (such as chemicals). On the other hand, these findings disagree with the literature that finds strong sectorial correlation when it comes about the dynamism of the innovative behavior (de Jong and Marsili, 2006; Leiponen and Drejer, 2007), and of course they agree with the evidence regarding the possibility of increasing profitability and reaching long-term growth based on the incorporation of knowledge regardless the sector (Arvanitis and Hollenstein, 1998; Fraga et al., 2008; Bottazzi et al., 2010; Srholec and Verspagen, 2012; Yurtseven and Tandoğan, 2012).

Table 8: Composition of the strategies – Selected sectors (%)

ISIC	Continuous	New	Sporadic	NI
Food and beverage	16,31	17,50	19,25	16,31
Textiles	7,69	4,17	9,86	7,69
Paper	1,54	3,33	3,76	1,54
Chemicals	12,62	8,33	4,23	12,62
Basic metals	3,69	2,50	2,35	3,69
Metal products	4,00	5,00	6,10	4,00
Machinery	12,31	11,67	6,57	12,31
Electrical machinery	5,23	3,33	1,88	5,23
Vehicles	4,31	5,83	3,29	4,31
Furniture	2,77	3,33	5,16	2,77
Total	**100**	**100**	**100**	**100**

Obs. 800. Continuous: C-C; New: N-C; Non-innovative: NI-NI; Sporadic: rest of the firms. ISIC: rev. 3.1.
Source: own elaboration based on INDEC (2010)

These results only partially agree with the literature about the innovative strategies and the existence of micro-heterogeneity. Coincidences are found on the existence of different innovative strategies which are the result of different choices made by the firm and the cause of different innovative structures, associated with the investments on innovation and capabilities of the firm.

Differences among this study and the reviewed literature are found in the way national and sectorial specificities are taken into account. Clausen et al. (2011) and Srholec and Verspagen (2012) find different innovative strategies, which resemble Pavitt´s taxonomies but at the firm level. Among their findings, more dynamic innovative firms are those with high intensity of investments and focus on specific goals in terms of results (product-, market-, process-oriented, etc.), which are associated with an specific type of expenditure. In this respect, our results show that high-profile innovators are in fact those who balance the innovation expenditure. Then, high-profile innovators within the literature are biased firms in our study. The explanation of these different results lays, on the one hand, on the lack of proper sectorial controls among the review studies. To the extent that sectorial specificities are not properly accounted for, the results are biased and more determined by the productive structure than by the individual decisions. Then, national specificities will not be relevant because they are captured by the type of the innovative strategy: there will be more R&D intensive firms in those countries with a higher participation of high-tech industries and more technology-buyer firms in those countries with more participation of traditional large-scale intensive sectors. These type of classifications, although useful to

describe a specific situation fells short on accounting for elements to identify those firms that escape the average levels, which are in fact, the true source of micro-heterogeneity.

On the other hand, part of the explanation lies on the static nature of the conceptual approach. From a static perspective, a firm could focus its efforts on one type of activity (for instance, the development of a new product). However, it is difficult to think of a firm which, once it has achieved an innovation, it automatically initiates a new innovation process, aimed at reaching a similar result (following with the example, the search for a new product). On the contrary, once the innovation has been achieved, a different set of efforts should be allocated to exploit and improve it. In this case, existent literature can explain different strategies from a static perspective but it falls short on explaining how the particular set of strategies will evolve over time. Our results show that allowing the firm to pursue different strategies could contribute to understand the evolving nature of the strategy, how they react to the environmental changes and, specially, how feedback, accumulation and learning processes can alter the innovative behavior of the firm. They also agree with those explanations of the innovation process based on the product cycle life, the evolution of technologies and the dynamic of the Schumpeterian competition (Nelson and Winter, 1982; Nelson, 1991; Dosi et al., 2010).

4. Conclusions

This paper was aimed at testing the existence of different innovative strategies based on the frequency of the innovative expenditure under the hypothesis of a positive relationship between a theoretically defined strategy and an innovative structure. In order to do so a confirmatory cluster analysis was run on a panel compound by 800 manufacturing Argentinean firms for the period 1998-2001.

Results show that the four different strategies grouped firms with similar innovative behaviors: continuous firms present a high level of complementary investments and capabilities sustained over the whole period under analysis; new innovative firms seem to have caught up in terms of efforts based on pre-existent high levels of capabilities, and sporadic firms show an opportunistic behavior, based on short term process innovations associated with the incorporation of machinery. Of course, non-innovative firms show the poorest results and a consistent innovative behavior over time. Therefore, H1.1 and H1.2 are confirmed.

H2.1 and H2.2 are also confirmed. Continuous firms present higher levels on all indicators which are also sustained over time (show low oscillations). Among the new continuous innovative firms (N-C), the correlation between the initial condition and the evolution of the indicators is quite the opposite. These firms show a change in the strategy by 2002-2004, increasing the levels of efforts. However, the capabilities were present before that. Although these firms share the lack of investment during 1998-2001 with many other ones, they present relatively higher levels of qualified human resources and linkages in respect of the rest of non-innovative firms, which could be understood as the platform from where the innovative strategy was drawn.

Finally, results also confirm the importance of analyzing the innovative strategies in dynamic terms. According to our results, the significant changes in the levels of the indicators and how the variables are combined provide evidence regarding the importance of accounting for the learning processes and the adaptive reaction of firms, that is to say, the dynamic process of innovation. Photo-type analyses are not enough to capture this phenomenon and they could lead to wrong conclusions showing low levels which are in fact the result of infinite variations (from zero to something) and high levels which are part of a catch-up short-term process, so they are prone to decline.

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Appendix 1

Table 1: Summary of the variables

Label	Detail	Calculation	Value
Innovative Strategy			
$Iexp_{it}$	Innovation expenditure	Innovation expenditure >0 in at least one year of the sub-period.	0;1
$Cont_{it}$	Continuous innovative firm	$Iexp_{it}$>0 in t & t-1 / t-1 & t-2	0;1
New_{it}	New innovative firm	$Iexp_{it}$>0 in t / t-1	0;1
$Spor_{it}$	Sporadic innovative firm	$Iexp_{it}$>0 in t, t-1 / t-2	0;1
NI_{it}	Non-innovative firm	$Iexp_{it}$=0 in t & t-1 / t-1 & t-2	0;1
Innovative Structure			
Expenditure on innovation			
II_{it}	Innovative intensity	Innovation expenditure to sales. Annual average of the subperiod.	0 - ∞
IB_{it}	Innovative balance	Distribution of the total innovation expenditure of the subperiod.	0-∞
Capabilities			
QHR_{it}	Qualified human resources	Total number of professionals to employment. Annual average of the subperiod.	0 - ∞
$Link_{it}$	Linkages	At least one linkage in the subperiod. Variable available for t and t-2.	0;1
Resources			
Rec_ext_{it}	Access to external sourcer of funding	At least one external source of funding in the subperiod.	0;1
Innovative Results			
$Inno_{it}$	Product, process, organization or commercialization innovator	At least one innovation in the sub-period.	0;1
Environmental determinants (structural variables)			
$Size_{it}$	Total employment	Total employment of the firm, average value of the sub-period.	0 - ∞
KO_i	Capital ownership	A firm that has more than 1% of their shares owned by foreign capital in t-1	0;1
$Sector_i$	Sectorial belonging	2-digit ISIC classification Rev. 3 in t-1.	0;1
T_t	*Sub-period*	t = *2005-2006* $t-1$ = *2002-2004* $t-2$ = *1998-2001*	0;1
Subindexes			
i	Case	Manufacturing firm with more than 10 employees.	1-800

Table 2: MANOVA test – $IS_{it} = f(II_{it}; IB_{it}; QHR_{it}; Link_{it}; Rec\_ext_{it}; OK_i; Size_{it})$

	Model	IS	t	$IS_{it} * t$
Wilks' lambda	0.3512*	0.4689*	0.9788*	0.8355*
Pillai's trace	0.78*	0.5721*	0.0212*	0.1664*
Lawley-Hotelling trace	1.4943*	1.0469*	0.0217*	0.1946*
Roy's largest root	1.2367*	0.9608*	0.0217*	0.1823*

Obs: 2400. *Significant at 99%. Residuals: 1599. t-2: control group. Source: own elaboration based on INDEC (2010)

Table 3: Media test

		Wilks´Lamda	F
II_i	t-2	0,885*	14,752
	t-1	0,894*	13,408
	t	0,930*	8,474
IB_i	t-2	0,397*	171,776
	t-1	0,546*	94,061
	t	0,575*	83,702
QHR_i	t-2	0,944*	6,691
	t-1	0,986	1,628
	t	0,971*	3,335
$Link_i$	t-2	0,743*	39,198
	t	0,752*	37,402
Rec_ext_i	t-2	0,811*	26,400
	t-1	0,949*	6,027
	t	0,916*	10,418
$Size_{it-2}$		0,936*	7,773
Ok_i		0,962*	4,511

Obs. 800. *Significant at 99%. Degrees of freedom 7/792. Source: own elaboration based on INDEC (2010)

Table 4: Contrast of the Discriminant functions

Contrasts	Wilks´Lamda	Chi-square	DF
1 to 7	,105*	1772,685	112
2 to 7	,364*	796,221	90
3 to7	,696*	285,396	70
4 to 7	,925	61,332	52
5 to 7	,966	26,973	36
6 to 7	,983	13,883	22
7	,992	6,137	10

Obs. 800. . *Significant at 99%. Source: own elaboration based on INDEC (2010)

Table 5: Covariance matrix

		II_i			IB_i			QHR_i			$Link_i$		Rec_ext_i			$Size_{it-2}$	Ok_i
		t-2	t-1	t	t-2	t-1	t	t-2	t-1	T	t-2	t	t-2	t-1	t		
II_i	t-2	8,282															
	t-1	1,428	5,796														
	T	,773	,847	8,019													
IB_i	t-2	,263	,050	,087	,201												
	t-1	,156	,242	,214	,089	,266											
	T	,082	,105	,173	,083	,141	,300										
QHR_i	t-2	,058	,089	,169	,127	,090	,082	1,103									
	t-1	-,110	1,342	,433	,058	,117	,102	1,151	10,26								
	T	,001	,109	,101	,078	,048	,050	,480	1,371	1,050							
$Link_i$	t-2	,248	,068	,089	,091	,062	,060	,097	,116	,063	,234						
	T	,122	,138	,222	,046	,104	,119	,077	,123	,087	,054	,250					
Rec_ext_i	t-2	,300	,046	,029	,059	,030	,029	,025	,017	,018	,049	,010	,158				
	t-1	,028	,094	,081	,008	,026	,016	,018	,119	,022	,007	,019	,012	,077			
	T	,052	,032	,164	,027	,031	,040	,042	,110	,022	,022	,030	,016	,032	,112		
$Size_{it-2}$		28,204	58,76	32,34	37,12	41,38	27,91	47,73	48,83	28,69	28,30	26,845	20,835	3,452	6,591	184305	
Ok_i		,051	,030	,061	,018	,030	,025	,087	,078	,074	,024	,037	,003	-,001	,002	30,753	,134

Obs. 800. Source: own elaboration based on INDEC (2010)