FOREIGN MULTINATIONALS AND DOMESTIC COMPANIES IN PORTUGAL: ARE THERE SIGNIFICANT PERFORMANCE GAPS?

ABSTRACT

Firm Performance is an important research matter in International Business. Multinational corporations coordinate their activities by objectives and compete to seek competitive advantage via performance. This paper investigates if foreign owned (FO) and domestic owned (DO) firms differ in comparative performance, and if those performance gaps vary with different performance measures. The paper draws on industrial organisation and on international business theories, and conducts econometric tests on a large scale recent sample including the Portuguese top largest firms. The empirical models involve estimations by ordinary least squares (OLS) with robust standard errors and by quantile regressions. The results are unequivocal: FO firms have a positive and significant impact in firm performance in both types of performance measures used (profitability and productivity). Our findings suggest a significant performance difference between FO and DO firms in the manufacturing industry in Portugal. This study also contributes to the debate about relevant policy measures, notably related to inward investment promotion, performance externalities and effects of inward investments in local economies.

Keywords: Multinational Corporations, Foreign Owned firms, Domestic Owned firms, Performance, Foreign Direct Investment.

INTRODUCTION

Multinational companies (MNCs) have an outstanding role in nowadays' global economy. A vast number of studies analyzed their impact at multiple levels, related to their direct influence on several key variables (e.g., employment, exports, technology diffusion, tax, revenue – see: Dunning, 1993; Caves, 1996) and to their more indirect but potentially significant impact on domestic firms' behaviour (Bellak, 2004a).

It is recognized that MNCs' impact is related to their performance, both in absolute terms and relatively to their domestic counterparts (Bellak, 2004a). Performance has been measured by many different variables – profitability (Lecraw, 1983; Geringer and Hebert, 2001), return on assets (Geringer *et al*., 1989; Kim *et al*., 1989; Qian, 1996; Boardman *et al*., 1997; Delios and Beamish, 1999; Mathur *et al*., 2001), return on investment (Douglas and Craig, 1983; Demirag, 1990; Chen, 1999; Khan *et al*., 2002), return on sales (Grant, 1987; Geringer *et al*., 1989; Sullivan, 1994; Tallman and Li, 1996; Lu and Beamish, 2001; Capar and Kotabe, 2003; Qian *et al*., 2003), gross margin (Christmann *et al*., 1999; Elango and Prakash, 2007), among others (Globerman *et al.*, 1994). Even though performance is such an important issue, studies on MNCs and performance are relatively scarce (Bellak, 2004a) comparing the performance of foreign owned (FO) *vis-à-vis* domestic owned (DO) firms (Williamson, 1977; Luo and Tan, 1998). In spite of the fact that there are relevant studies that compare FO and DO firms (Michel and Shaked, 1986; Aitken and Harrison, 1999; Qian *et al*., 2003; Barbosa and Louri, 2005; Kimura and Kiyota, 2007), they are more oriented to matters such as ownership, productivity, multinationality, strategic perspectives, international environmental factors and determinants of capital structure rather than to the analysis of the determinants of performance between FO and DO firms and performance gaps. This paper's theoretical background relies on (and relates) two

major strands: industrial organisation theories (IO) (Teece, 1985; Davies and Lyons, 1988; Bellak, 2004a) and international business theories (IB) (whether economic-based, Dunning, 1993; Hennart, 2001; or management-based, Bartlett and Ghoshal, 1989); and uses this background to understand the determinants of firms' performance and the possible existence of performance gaps between FO and DO firms. This framework is tested against a large scale cross-section data sample of manufacturing firms located in Portugal, an intermediate developed country (Molero, 1996). Such an exercise enables to discuss relevant policy implications, notably on inward investment promotion, performance externalities and effects of inward investments in local economies (Hanson, 2001; Aitken and Harrison, 1999; Markusen and Venables, 1999; Barbosa and Louri, 2005).

To summarise, this paper seeks to address the following research questions:

1. Are there performance differences between foreign MNCs and domestic firms? I.e., does foreign ownership have an impact on firm's performance?

2. Do performance differences between foreign multinationals and domestic firms vary across different performance measures?

The remainder of the paper is divided into four sections. The first section contains a literature review on FO/DO performance gaps related to the main theoretical approaches, and the second provides a review of empirical literature addressing FO/DO performance gaps, and the distinct performance measures and proxies used in the main empirical studies on this theme. The third section explains the empirical methodology and makes some considerations about the data and variables, reporting also the results and the discussion. The last section includes the conclusions and policy implications.

THEORETICAL BACKGROUND: INDUSTRIAL ORGANISATION AND INTERNATIONAL BUSINESS THEORIES

The purpose of this section is to review the two theoretical literature branches underlying this study (IO and IB) and introduce some brief considerations about the theoretical expectations on the performance of MNCs, and on performance gaps between FO and DO firms.

Industrial Organisation theory and relevant concepts

From an IO perspective; any inquire on firm performance needs to give particular attention to the structure of the market, the concentration in the industry, the rivalry among firms and the barriers to entry.

Market structure

Market structure refers to size, entry barriers, firms' cost structure, etc. Such structure determines the behavior of firms which, in turn, influences the performance of the industry (Porter, 1981; Clarkson and Miller, 1982; Peltzman, 1991). The traditional IO paradigm (structure-conduct-performance), developed by Bain (1956) and Mason (1939), suggests that the structural conditions of the industry determine firm conduct (strategic behaviour) within the industry. Thus, firm conduct determines the performance of firms in the market, as can be seen in figure 1.

Figure 1 about here

Within this tradition the effect of a foreign entry on the market´s structure will change the game conditions for established DO firms, with a new type of competition that will affect the conduct and performance of the domestic incumbents (Bellak, 2004). However, Dunning and Lundan (2008:533) evoke two conflicting hypotheses. The first one is that FO firms may increase competition in their host countries and hence reduce industrial concentration. The second is

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related to ownership-specific advantages (Dunning, 1993), i.e., those advantages FO firms tend to have (superior efficiency, aggressive business practices) when approaching new markets and thus creating barriers to competition and to the operations of DO firms. In either case for FO to have such an important impact on market structure, there is an implicit expectation that FO's performance is at least as high as the higher-performing DO firms.

Concentration and oligopoly theory

The effect of concentration on firm and industry performance has been widely studied in the literature. Bain (1956) and Mason (1939) view "concentration as the starting point in the casual chain leading eventually to performance variables such as profitability and productivity" (Davies and Lyons, 1988: 92). In the international context, Dunning and Lundan (2008) go further and stress that MNCs' activities "are most pronounced in sectors where the market structure is best described as an amalgam of oligopolistic and monopolistic competition". It is interesting to note that even though FOs have disadvantages deriving from the foreign environment and the costs of information when compared with DOs, firms in oligopolistic industries have propensity to become MNCs (Caves, 1996:83). Here the expectation is clearly FO by acting in more concentrated industries should have higher performance than DO firms.

Competition / rivalry among firms

Competition is an ongoing process (Shepherd, 1986: 26) and "[multinational] ownership links can affect the competitiveness of markets" (Caves, 1996: 97). The effect of FOs on competition in local markets is a relevant issue. Several studies (Aitken and Harrison, 1999; Hanson, 2001) found evidence that the presence of FDI has a positive effect on DO firms' productivity and on the development of exports activity (Markusen *et al*., 1999). However, despite their positive effect on DOs, FOs tend to be larger than DOs (Dunning, 1993:151; 427) and also

geographically more disperse (Dunning, 1993:73). This is important difference as it enables them to be in a better position to take advantage of economies of scale and scope (Shepherd, 1986; Dunning, 1993), and generates an expectation that FOs should perform better than DO firms Barba Navaretti and Venables (2004: 42).

Barriers to entry

Barriers to entry are "conditions that allow established firms or incumbents to earn abnormal profits without attracting entry" (Bain, 1956:3) and Caves (1996:108) suggests that "the same features of market's structure that explain the coming of [FO] firms also can give rise to barriers to the entry of new firms". Entry barriers impact negatively on new entrants, implying an additional economic effort when comparing with the established advantages of incumbent firms (Caves and Porter, 1977). Benefiting from their international presence, FOs have advantages to reap scale economies, notably in industries where capital requirements, advertising and R&D are critical - compared to DO firms, which tend to be more limited in size and investment capacity. Thus we have again an expectation that FOs should perform better than DO firms.

International Business theory and Relevant Concepts

The IB literature has been greatly developed in the last four decades (cf., among others, Dunning, 1993; Caves, 1996; Dunning and Lundan, 2008). It is multidisciplinary and includes an eclectic set of related areas (e.g. Rugman and Brewer, 2001; Dunning and Lundan, 2008). The IO and IB strands are closely inter-related, since the IB literature was influenced by a neoclassical approach in the 1960s and 70s, strongly marked by "profit-maximisation models of the firm" (Dunning and Lundan, 2008:126).

Firm-specific advantages: Hymer's contribution and Dunning's eclectic paradigm

Certain IB approaches establish that MNCs invest abroad because they have firm-specific

advantages that are not available to purely domestic firms, and that this can make up for their costs (or liability) of foreignness (Hymer, 1960/1976; Zaheer, 1995) *vis-à-vis* DO firms. This argument stresses the 'stylized' fact that MNCs have *per se* a superior performance, as they display such advantages over their domestic counterparts (Dunning, 1993; Caves, 1996).

According to the Eclectic Paradigm (Dunning, 1993), also known as the OLI (Ownership, Location and Internalization) Framework, MNCs have two types of ownership-specific advantages. The first type relates to proprietary assets detained by the firm – notably related to property rights and intangible assets (Oa), like firm-specific technology, innovatory capacity, etc. The second type of ownership advantage (Ot) is the combination of Oa advantages with complementary (transaction-related) assets – size, product diversity and learning experiences, such as economies of scope and specialization. According to this perspective, foreign MNCs (in order to be viable, given the Hymerian concept of 'costs of foreignness') need to have better specific assets and the possibility of benefiting from greater scale and scope economies then purely domestic firms. Again, the expectation is that FOs should perform better than DO firms.

Internalization theory

Buckley and Casson (1976) developed internalization theory, as an alternative theory of IB, that argues that internalization is related to the fact that firms aim to maximise profits by internalizing intermediate markets across national boundaries because of natural and structural market imperfections. This theory gives considerable relevance to R&D, as "MNCs tend to operate in knowledge-based industries" (Ietto-Gillies, 2005: 107). Moreover, Hennart (2001: 145) suggested that "MNCs exist because the combination of the assets more efficiently [managed] within an MNC than through spot markets or contracts", and Cantwell (2000:19) considered that MNC "may increase profits through the restriction of competition in final product markets".

Thus from the internationalization perspective, the expectation is also that FOs should perform better than DO firms.

Network theory

Here it is argued that FO firms, as they belong to an international network, perform more efficiently, achieve supra-normal profits and are more competitive than DOs. Cantwell (2000:39) stressed that firms with weakest/fewest ownership advantages in general "hold their position more easily in domestic markets than in international markets" and have high unit costs *vis-à-vis* other firms in industry. We can bridge this argument with FOs and DOs in terms of size, efficiency and profitability, arguing that it is likely that FOs have superior network advantages than DOs. Thus generating the expectation that FOs should perform better than DO firms.

Resourced-based view

The resourced-based view (RBV) of the firm explains how firm resources and capabilities may create competitive advantage (Penrose, 1959; Barney, 1991). In this approach, firms with valuable, rare, costly to imitate and non-substitutable resources can obtain larger gains than their competitors. It considers that "valuable resources are those that competitors cannot immediately imitate" (Foss *et al.*, 1995: 11) and that those "competences and capabilities lead to sustained superior returns" (Tan and Mahoney, 2007). Here, the performance gaps between FOs and DOs could be related to differences in advantages at the firm level. And as long as FOs are expected to have superior resources than DOs, the expectation is that FOs should perform better than DOs. All considered, IB and IO are complementary perspectives in the analysis of firm performance, and help to understand why the expectation is for FO firms to have superior performance *vis-à-vis* DOs. Moreover, although not always complementary to IB and IO frameworks, internationalization theory, network theory, and the resource-based view seem also to point

towards a similar expectation regarding the FO vs. DO performance gap. And, in some sense it could be said that expectation that FOs should perform better than DO firms is a common denominator across these diverse paradigms.

EMPIRICAL LITERATURE ON MNCS AND PERFORMANCE AND HYPOTHESES

FO/DO Performance Gaps: Main Empirical Studies

This review classifies studies according to several dimensions (theoretical base, research focus, the ways in which performance is measured, proxies used, period and country focus).

Table 1 shows a summary of empirical studies on FOs and DOs' performance, highlighting different aspects and results, and so, in a clear and synthetic way, contributing to this debate. Generally, these empirical studies are based in IO and IB theories and intend to compare the performance of FOs and DOs in different contexts (e.g. in less developed countries, Williamson, 1977; e.g. emerging markets, Luo and Tan, 1998) and with distinct approaches (productivity, ownership, profitability, etc). As patent in Table 1, the empirical studies that emphasized that DOs perform better than FOs suggest that the comparison between these two groups of firms is somewhat ambiguous (e.g. Barbosa and Louri, 2005). Table 1 shows that the different performance measures used in these studies may influence the performance gap between FOs and DOs. This will be addressed in the next section.

Table 1 about here

FO/DO Relevant Performance Proxies

Firm performance has been considered a crucial research matter in IB, notably whether FDI affects firm performance (Ruigrok and Wagner, 2003). The concept of performance has been widely studied (Gomes and Ramaswamy, 1999; Contractor *et al*, 2003), in particular concerning whether there is a systematic relationship between multinationality and performance. As a result of these studies, four models have been developed: linear, U-shaped, inverted U-shaped, S-shaped. The first one, the positive and linear model (Grant, 1987; Tallman and Li, 1996) argues that, if a firm increases its degree of internationalization, there is a positive and linear impact on its performance. Other researchers (Gomes and Ramaswamy, 1999) presented the positive but diminishing returns model that states that the impact of multinationality is greater at the beginning but over time this impact diminishes the marginal returns. The second and the third models have opposite theories, as one shows evidence of a U-shaped multinationality-performance relationship (Ruigrok and Wagner, 2003; Capar and Kotabe, 2003) and the other presents an inverted-U multinationality-performance relationship (Gomes and Ramaswamy, 1999; Elango and Sethi, 2007). The U-shaped relationship model found evidence that firms initially face a negative performance in their internationalization process, but with international experience this situation tends to improve and become positive. The inverted-U relationship model states a different behavior, i.e. there is a positive performance at the beginning that at high levels of multinationality turns negative. Finally, the sigmoid relationship model (Contractor *et al*., 2003) argues that there is a multi-shaped curve, starting negative at low foreign sales level, then turns positive, and finally turns negative again as a result of foreign sales increases.

Table 2 about here

Thomas and Eden (2004) made a relevant contribution, considering a variable other studies had not discussed – the importance of the time dimension in measuring performance. This, in their view, influences the impact of multinationality. The empirical studies previously presented were important as they contributed to the conceptualization of several performance measures and, though the main focus of these studies relates to foreign ownership and performance, they allow to identify two main typologies: an accounting based one, which reflects historical performance (accounting measures like sales, margins, profitability ratios, etc) and a market based one, which considers and measures investment expectations of future performance (such as Jensen's α and Tobin's q). Table 3 shows the tendency in the 1980s-90s, marked by the appearance of other assessment measures not only focused on accounting matters, but also on return on value-added, total factor productivity, value added productivity, market-to-book, market value, among others. Even so, there is a consensus that the majority of the measures analysed in empirical studies (e.g. Mathur *et al*., 2001; Kotabe *et al*., 2002 Khan *et al*., 2002) indicates that the conceptualization of performance is in general an accounting based measure, as can be seen below in Table 3.

Table 3 about here

Table 3 summarizes various performance measures used in empirical research.

The preceding discussion thus leads to the following hypotheses:

- Hypothesis 1 (h1): Foreign ownership has a positive impact on firm's performance;

- Hypothesis 2 (h2): The magnitude of performance differences between FO and DO varies with the use of different performance measures.

These hypotheses will be tested econometrically in the next section.

METHODOLOGY, VARIABLES, RESULTS AND DISCUSSION

Empirical Model

The econometric model used to test the factors impacting on performance has the following general functional form:

$Performance_i = \beta 1 + \beta 2\ AGE1_i + \beta 3\ AGE2_i + \beta 4\ SIZE1_i + \beta 5\ SIZE2_i + \beta 6\ CR4_i + \beta 7\ RDSLAG_i + \beta 8\ FO_i + \beta 9\ INTERN_i + \beta 10\ M1_i \ldots \beta 27\ M18_i + u_i$, (1)

Where

"i" represents the firm in the sample: with "i" =1 to 5509 firms of the manufacturing sector

FO = foreign ownership dummy = value of 1 if the FO equity >= 50, 01% and 0 otherwise;

M = manufacturing sub-sector (j) dummies = Dj-1= D19-1= 18 dummies (D) = Do…D18, where

j = 1…19 and Do corresponds to the base dummy of "other manufacturing"

INTERN = international openness dummy =1 if firms have export activity and 0 otherwise.

RDSLAG = represents the ratio of the 5 years lag (2002-2006) of R&D on sales of 2006.

Proxies for the Dependent Variables

Several accounting and financial measures allow to test the existence of performance gaps between FOs-DOs and if those gaps vary with distinct performance proxies (McGowan, 2007). Two types of performance models are suggested - profitability and productivity models. Proposed profitability models include that with a margin based variable (capturing the effect of operating revenue) – profit margin/PM (Christmann *et al*., 1999; Elango and Sethi 2007) and another with a return based variable (capturing sales revenue effect) – return on sales/ROS (Grant, 1987). The productivity model is based on gross value added per employee - GVAEMPL (Davies and Lyons, 1991). The operationalization of all variables in the models is

summarized in Table 4.

Table 4 about here

Proxies for the Explanatory Variables

Main explanatory variable: foreign ownership (FO)

The main variable of interest (FO) is a dummy that assumes the value 1 if the share of foreign ownership on the focal firm's equity is greater or equal to 50,01% (FO firms – majority ownership) and 0 otherwise. It is expected that FO firms have a superior performance than DO firms, as explained earlier in the theoretical and empirical literature reviews.

Other explanatory variables

Firm's age: the relation between a firm's age and its performance has no consensus in the literature (Majumdar, 1997). Firm age (AGE1) is represented by the log of the number of years since the firm was founded and it is the most used proxy in the literature (Delios and Beamish, 2001; Goerzen and Beamish, 2003; Barbosa and Louri, 2005). Older firms are expected to have a superior performance than younger ones. The impact of firm's age on performance is expected to be significant (Jovanovic, 1982), though the direction of the effect has not yet been unequivocally established. We introduced the variable AGE2 (log of the number of years squared, since establishment) in order to test the shape of the age-performance curve.

Firm size is a relevant measure affecting performance (Shepherd, 1986) and is often measured by the log of the number of total employees (Gomes and Ramaswamy, 1999). Other studies use the log of firm's assets (Grant, 1987) and the log of total sales as alternative measures of firm size (Thomas and Eden, 2004). Here, SIZE1 is operationalized as the log of the number of total employees. This criterion is related to the fact that sales are already proxied (or somewhat

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included) in profitability dependent variables, and also because sales are a more volatile measure than the number of employees. SIZE2 is SIZE1, squared (same approach as in age). It is expected that firm size has a positive effect on firm performance.

Industry concentration (CR4), a very frequent measure in the literature, is measured as the share of employees in the manufacturing sub-sectors in the four largest firms. The use of this measure helps analyzing the impact of concentration on firm performance. As mentioned before, industry concentration facilitates collusion practices and hence firms can exert market power and generate extra profits and also retaliate against entrants. In this vein, it is expected that industry concentration has a positive impact on firm performance.

R&D intensity (RDSLAG) is relevant for testing differences in firm-specific resources (Penrose, 1959; Barney, 1991). The ratio results from a 5 years' lag (2002-06) of R&D expenditure on 2006's sales. The use of this lag relates to the R&D effort along the period and its impact on 2006's performance. The impact of R&D effort in a certain year is not immediately felt; this approach aims to capture more realistically the contribution of R&D to firm performance, and the expectation that consistent investments planned along 5 years will impact on performance. A positive relation between R&D intensity and firm performance is expected.

International openness (INTERN) is a dummy aiming to proxy the international openness of firms (= 1 if firms have export and import activity, 0 otherwise). It is expected that firms with international openness have better performance (a positive effect is posited).

Industry effects are controlled by a set of manufacturing sub-sector dummy variables, based on sector code of activity (CAE-93 Rev.1).

Table 4 above presents a synthesis of the effects expected with the model estimation, having the literature review and the empirical studies as a basis.

Data and Descriptive Statistics

Firm-level data were extracted from the SABI (*Sistema de Análise de Balanços Ibéricos* - Coface MOPE) database that includes the top 30.744 largest firms in Portugal. The year 2006 was selected due to data availability and quality, as recent years have less missing values. Our focus is on the manufacturing industry, which represents approximately 22% of the dataset's population. Services are not considered, as the number of observations of the manufacturing industry was already considerable and able to warrantee sound econometric modelling and exploration of the issues at stake, without need to introduce further areas of focus.

The initial manufacturing industry sample included 6.739 firms (6.424 DO firms and 315 FO firms). After a preliminary analysis of missing values for the relevant variables, the sample was adjusted to 5.585 firms. Another procedure undertaken was the ID checking for each firm in the sample, in order to detect inconsistency or data duplication. The final sample included 5.509 observations, corresponding to 5.275 DO firms and 234 FO firms.

Table 5 shows a summary of the descriptive statistics of the dependent and independent variables. When comparing DO with FO firms we noticed relevant performance differences, and that the profitability of FOs is higher than that of DOs. The performance gap is relatively higher comparing productivity as measured by GVA per employee - FO firms are more productive than DOs. FOs tend to be in more concentrated sectors and have greater propensity to develop export and import activity. It shows that on average FO firms are three times more profitable than DOs (PM 3.552 vs. 1.0440, and ROS 4.2484 vs. 1.559). Moreover, on average, FO productivity is almost the double of that in DOs (GVAEMPL 58.827 vs. 30.007).

Table 5 about here

Estimation Procedures

Preliminary performance models were estimated through Ordinary Least Squares (OLS). Before analyzing the results presented on table 6, some considerations on cross-section data should be made. There is a common concern about empirical studies that use cross-section data, notably the presence of heteroscedasticity in the error terms. A White test (White, 1980) indicated the presence of heteroscedasticity. That implies that OLS estimates of the standard errors are biased. So as to obtain consistent estimates of the standards errors on the coefficients, regressions were corrected by using the heteroscedasticity–consistent covariance matrix estimation (White, 1980). OLS models were complemented by a quantile regression estimation, analyzing the effect of the explanatory variables on performance, both in firms that present high performance as well as in those that present lower performance. The quantile estimation (Koenker and Bassett, 1978) has been used in empirical studies about firm performance (Barbosa and Louri, 2005). The quantiles consist on a measure of location dividing the sample in equal shares in a group organized by size. However, the existence of heteroscedasticity is frequent in models with cross-section data, as previously explained. In this case, the regression lines are no longer parallel and here lies the interest in estimating the model by quantile regression. The same independent variables of the model influence each quantile of the dependent variable differently. Quantile regression techniques allow a better understanding of the underlying relationship between foreign ownership and firm performance.

In this way, the model to estimate each of the quantiles is the following:

$$\mathbf{Q_q}\text{ (}\mathbf{Performance}\text{) }i = \beta1(q) + \beta2(q)\ \mathbf{AGE1}i + \beta3(q)\ \mathbf{AGE2}i + \beta4(q)\ \mathbf{SIZE1}i + \beta5(q)\ \mathbf{SIZE2}i +$$

$$\beta6(q)\ \mathbf{CR4}i + \beta7(q)\ \mathbf{RDSLAG}i\ + \beta8(q)\ \mathbf{FO}i + \beta9(q)\ \mathbf{INTERN}i + \beta10(q)\ \mathbf{M1}i \ldots\beta27(q)\ \mathbf{M18}i +$$

ui ,   (2)

The quantile regression model (Koenker and Bassett, 1978) is operationalised as follows:

$$yi = x'i\beta\theta + u\theta it \qquad \text{with} \qquad \text{Quant}\theta(yi|xi) = x'i\beta\theta \qquad (3)$$

Where

yi are the performance (dependent) variables, x is a vector of regressors and β is the vector of parameters to be estimated, and u is a vector of residuals.

Q can assume any value of the interval $(0,1)$. We estimated the model for Q,10, Q,25, Q,50, Q,75, Q,90, to find out the differences of effect of the independent variables over the dependent variables (PM, ROS, GVAEMPL).

As introduced by Koenker e Basset (1978), the definition of the *qth* regression quantile (*θth* regression quantile, $0 < \theta < 1$) solves the following problem:

$$\text{Min} \ \Sigma i \ | \ ui| \ hi \qquad (4)$$
$$C, \beta$$

Where

$$hi= \quad \begin{cases} 2q \text{ if } \mu i > 0, \\ 2(1-q) \text{ if } \mu i < 0. \end{cases} \qquad (5)$$

The pseudo R-squared of quantile regressions is not directly comparable across estimators or quantiles. Considering the large number of observations and the vast number of factors influencing firm performance, R-squared coefficients are usually low because of the cross-sectional nature of the data, and the fact that firms are very distinct units among themselves. Notwithstanding, the F-test result supports the global significance of the estimated models.

Empirical Results and Discussion

OLS regression results

The OLS regression results (with the White correction, presented in model 2 in table 6), we confirm the first hypothesis (h1), that is, in all estimations after controlling for firm and industry characteristics, the impact of foreign ownership on firms' performance is positive and significant. As concerns the second hypothesis (h2), and considering what we have seen in the descriptive statistics, FO firms show a superior performance when compared to their domestic counterparts, even when using different measures of performance.

The impact of foreign ownership is considerable on both profitability and on productivity. FOs' impact increases on average the profit margin in 2.13 p.p. and 2.04 p.p. in return on sales. The impact of foreign ownership on firm performance is on average approximately 3 times higher.

The results suggest a relatively less significant impact of foreign ownership on performance when productivity is used as a proxy for performance. Hence, the strength of the impact of foreign ownership is more pronounced when this proxy for performance is employed.

As we suspected in our preliminary analysis of descriptive statistics, it is confirmed that the impact was still considerable as regards productivity, for which on average FO firms' impact on performance is 17.09 (K Euros). It suggests the relevance of multinationality of firms *per se* as a determinant of superior productivity. Moreover, it must be kept in mind that the existence of firm-specific advantages can be additive to (the already confirmed) superior performance of FOs. The empirical evidence supports the idea that FOs perform better that their domestic counterparts. However, the role of MNCs in the economy may have different interpretations for stakeholders like managers and politicians. For managers, profitability may be the most important objective in the short term, but for politicians productivity may as well be the right

stimulus for the economic structure and for competition in the long run.

When MNCs establish abroad they differ from local firms because they bring technology and other proprietary assets, allowing them to compete with local firms, which have a better understanding and knowledge of local market (Hymer, 1960/1976; Dunning, 1993;).

The results are in line with the evidence found by other studies, such as Davies and Lyons (1991). When characterizing the relative performance of manufacturing firms in the UK, they stressed that FO firms had a productivity advantage over DO firms. Furthermore, evidence by Globerman *et al.* (1994) shows that FO firms enjoy higher value-added per worker than DO Canadian firms. These findings may corroborate that foreign firms have better access to foreign markets that allows operating in a more profitable manner at a larger scale.

A question that may arise is that of the relatively higher productivity of FO firms, that may cause stronger competitive pressure on Portuguese manufacturing and may also lead to the crowding out of DO firms by the entry of FOs (De Backer and Sleuwaegen, 2003).

Other relevant issue is the size of the gaps between FOs-DOs. If gaps were larger, government should enact policies to improve attraction conditions for FDI, increasing the share of FOs and thus increasing the performance of the economy, even with lower performance of DO firms.

Table 6 about here

As mentioned in the literature review, firm-specific characteristics are *inter alia* important determinants of performance gaps, notably size effects and efficiency. Taking AGE1 into account, such variable appears to influence performance significantly. In this situation, age has an inverted U-shape relationship with performance (in the PM and in the ROS models). The results for the age variables give evidence of a positive sign in coefficient AGE1 and a negative sign in coefficient AGE2. This suggests that firms in the early stage of their life cycle have a

better performance than more experienced firms (Qian *et al*, 2003).

The results for firm size revealed a negative sign for coefficient SIZE1 and a positive sign for SIZE2. This possibly indicates that large firms may reap economies of scale and have better industry knowledge than small firms. Another interpretation is that firm size may be correlated with market power (Shepherd, 1986). However, the theory is equivocal on the "precise relationship between size and performance" (Majumdar, 1997: pp.233). Observing that firm size (SIZE1) was statistically significant and negative, we assume that there is some tendency that the larger the firm size, the lower the firm's performance.

In our first regressions CR4 has a positive and significant impact on firm performance for all profitability (PM/ROS) and productivity (GVAMPL) performance models. Results show a positive relationship between industry concentration and firm performance (Hay and Morris, 1991; Caves, 1996). This is the evidence that, in more concentrated sectors, the tendency for market power increases, hence extra profits arise, and higher performance exists. As MNCs tend to be present in concentrated industries, this may encourage entry of more FOs in Portuguese manufacturing (De Backer and Sleuwaegen, 2003). As noted before, this strategic behavior (IO approach) may result in the creation of excess capacity in incumbent FOs, hindering competitors' entry (Lyons, 1987). Yet, there are specific sectors that, by their structural nature (and associated with large capital investments) are naturally concentrated. Although these sectors have high concentration ratios, it is not necessarily true that they are characterized by lack of competition.

Concerning R&D intensity on sales (RDSLAG), our findings indicate that RDSLAG has a non-significant (negative) effect on firm performance. This finding is contrary to general literature (Kim and Lyn, 1990; Pegels and Thirumurthy, 1996; Lööf and Heshmati, 2002; Hanel and St-Pierre, 2002) and so contradicts the expectation of a positive impact on performance. Empirical

studies about technological capability and performance have found that R&D intensity on sales had a negative impact on performance and that some firms measure R&D in a different way (Coombs and Bierly, 2006). This study stresses that some firms develop/experiment new products and processes as part of the manufacturing process.

The results for the variable INTERN show a positive and significant impact of international openness on performance, notably on the models using PM and ROS as proxies for performance. The import and export activity enables firms to have more experience in international markets and to be able to extend operations or to develop international partnerships with other firms. Another important and related aspect is that the more open an economy is, the more diversified is its product composition. DO firms may strengthen their activity by increasing and diversifying their sales ranges, increasing profit stability and diminishing the performance gaps to FO firms (Kim *et al*., 1989).

Quantile regression results

In order to complement the OLS results, quantile regressions were estimated for all performance measures. Other studies compared both results (Barbosa and Louri, 2005). For comparison purposes, we maintain in each model the OLS results. Quantile regression (Koenker and Bassett, 1978), as already mentioned, allows to model firms' performance (i.e. underperforming or overperforming firms) and is robust to the presence of outliers. When analysing the impact of FO in performance along the quantiles we observe differences across the lower to the higher quantiles. It seems to show that, as we move from lower to higher quantiles, the estimated effect of FO on performance (profitability and productivity) becomes positive and significant.

The same tendency of the previous profitability regression (PM) was observed. Again, foreign ownership tends to have a positive and significant impact on firm performance in the upper

quantiles (q50, q75, q90). Moreover, foreign ownership appears to have an increasingly larger impact the more restrictive the quantile becomes.

In contrast with the two previous profitability models (PM and ROS), the productivity model (GVAEMPL) allows us to witness that FO is positive and significant in almost all quantiles, both in lower and in upper quantiles (q25, q50, q75 and q90).

Table 7 about here

The three former quantile estimations complement the OLS results (with White correction and robust standard errors) and permit to conclude that FO impacts on firm performance for the higher quantiles (upper to q50) for all performance measures. Even using different performance proxies, the impact of foreign ownership on firm performance is still evident and significant, although the quantile regression is a median based estimator.

CONCLUSIONS AND POLICY IMPLICATIONS

Conclusions

This paper tested the existence of performance gaps between foreign MNCs and domestic firms (i.e., does foreign ownership have an impact on firm's performance) and if those differences between foreign MNCs and DO firms vary with distinct performance measures.

The paper's main contribution is that it represents a novel, large scale and robust empirical examination of the relationship between foreign ownership and firm performance in the Portuguese manufacturing industry.

The impact of foreign ownership on firms' performance is positive and significant.

Our findings suggest a significant performance difference between FO and DO firms in the

Portuguese manufacturing industry. FOs have a positive and significant impact on firm performance in both types of performance measures used (profitability and productivity).

The variables related to size, market concentration and international openness have a significant and positive impact on all performance models. FO firms exploit sources of competitive advantage not available to DO firms. The findings may suggest that FO firms exploit economies of scale better than their domestic counterparts. This may be explained as, in addition to a size advantage, FO firms benefit from better access to foreign markets and have more management capabilities to operate in more complex environments.

MNCs' specific characteristics (such as size, R&D expenditure, management capabilities, among others) are an advantage *vis-à-vis* DO firms. At the same time, FO firms contribute to the improvement of the average performance of Portuguese manufacturing industry.

Policy implications

Our results point to some relevant policy implications. First, they support foreign MNCs' attraction, as these are more productive than the domestic sector. This superior performance generates a competition and a demonstration/benchmark effect (Markusen and Venables, 1999).

Second, and related to the fact that not all MNCs have the same quality or potential impact, these results indicate that Portuguese authorities should, when proactively seeking new foreign investors, think about trying to attract those companies whose performance levels are higher in their industries. Third, when attracting new projects from foreign MNCs already established in Portugal, authorities should devote more effort to those firms with greater performance levels.

Fourth, and considering the performance gap clearly identified between FOs and DOs, specific programs aiming to transfer best practices from FOs to DOs should be implemented. Such programs could focus, for instance, on promoting linkages between DOs and FOs (e.g. supply

linkages – as foreign MNCs would impose standards and transfer practices to their suppliers, and other mechanisms of sharing knowledge/managerial practices – e.g. the current strategy aiming to set up a cluster policy, enhancing linkages between DOs and FOs, SMEs and larger firms).

More specific policy implications deriving from the present results are as follows. The higher profitability of FO firms implies higher tax returns per unit of input used, hence meaning a higher tax efficiency of FOs *vis-à-vis* DOs. The result of higher GVA per employee is related to better working conditions and higher compensation packages for local employees (Hanson, 2001), meaning that FOs, in this regard, contribute to the general welfare of the host economy. The combination of the results of higher FOs' profitability with higher GVA per employee and the larger size of FOs points to the creation of more, better and more sustainable employment.

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Figure 1 - The Traditional Bain IO Paradigm

| Industry Structure | → | Firm Conduct | → | Performance |
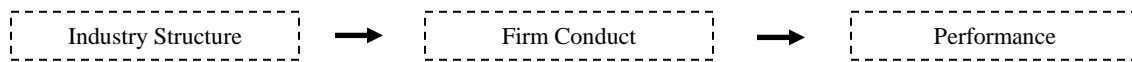
Source: Adapted from Porter (1981: 611)

Table 1 - Summary of empirical studies concerning FO and DO firms performance

FO vs DO firms	Research Focus concerning FO vs DO firms	Theory	Performance Measure	Country Focus	Period	Reference
FO (+)	FO versus DO firms in LDCs	IO	Sales	LDCs	1970-1973	Williamson (1977)
FO (+) (debt)	FO vs. DO firms: international environmental factors and determinants of capital structure	IO	Debt, Asset Size,	US	1964-1983	Lee and Kwok (1998)
DO (+)	FO and DO firms financial performance and characteristics	Finance	Risk-adjusted returns (Treynor and Jensen)	US	1973-1982	Michel and Shaked (1986)
DO (+)	FDI Theories and the performance of FO operating in the U.S	IO and IB	Profitability	US	1980-1984	Kim *et al.* (1990)
FO (+)	Market performance comparison of U.S. firms active in domestic, developed and developing countries	Finance	Risk-adjusted returns (Treynor and Jensen)	LDCs & DCs	1976-1985	Collins and Markham (1990)
FO (+)	Characterising relative performance: the productivity advantage of FO firms in the UK	IO	Productivity (Gross Value Added)	UK	1971-1987	Davies and Lyons (1991)
DO (+)	A comparison of FO and DO firms in an emerging market: a strategic choice perspective	IO and IB	ROS, ROA	China	1994	Luo and Tan (1998)
FO (+)	Comparisons of FO and DO in asian manufacturing over time	IO and IB	Productivity (VA per plant)	Asia	1970-1996	Ramstetter (1999)
FO (+)	Does multinationality affect profit performance? an empirical study of U.S. SMEs	IO and IB	ROS	US	1998	Qian *et al.* (2003)
n.a.	How DO and FO firms differ and why does it matter?	IO and IB	Review of selected studies	-	-	Bellak (2004a)
FO (+)	Corporate performance: does ownership matter? a comparison of FO and DO firms	IO and IB	ROA, Net ROA, Gross ROA	Greece Portugal	1992 1997	Barbosa and Louri (2005)
FO (+)	FO versus DO Firms: economic performance in Japan	IO and IB	ROA, ROE, VAP, TFP	Japan	1994-2000	Kimura and Kiyota (2007)

Source: Own elaboration

Table 2 - Representative studies of the relationship between multinationality and performance

Effects	Theory	Main ideas	Reference
U	U-shaped relationship	U-shaped nonlinear relationship between MNCs diversification and financial performance	Mathur *et al.* (2001) Ruigrok & Wagner (2003) Capar & Kotabe (2003)
_____	Linear relationship	Multinationality was positively associated with superior profitability; Interactions of international diversity and product diversity indicates a weak effect from increasing internationalization on the performance effect of product diversity	Grant (1987) Tallman & Li (1996)
∩	Reverse U-shaped relationship	Increasing levels of multinationality imply positive performance, but up to a optimum level, than it started to decrease; Inverted U-shaped relationship: larger economies with moderate trade	Gomes & Ramaswamy (1999) Elango & Sethi (2007)
∿	S-shaped – Unified three-stage theory (sigmoid model)	Multishaped curve: negative at low foreign sales level; turns positive; and turns negative (foreign sales increase)	Contractor *et al.* (2003) Thomas & Eden (2004)

Source: Own elaboration

Table 3 - Summary of Performance Measures, Country Focus and Period

Y	Reference	Research Focus	Performance Measure	Main Control Variables	Country/ Period
1970s	Williamson (1977)	Multinational vs. Local Corporations in LDCs	Sales	Industry, Degree of FO	LDCs 1970-1973
1980s	Douglas & Samuel (1983)	Performance of U.S. MNCs in foreign markets	ROI, Market Share/ Mix	New product, R&D , Sales, Marketing expenditures	US
	Lecraw (1983)	Performance of MNCs in LDCs	Profitability	Market Share, R&D, Tariffs, Capital/Advertising intensity	LDCs 1978-79
	Michel & Shaked (1986)	MNCs & DMCs financial performance and characteristics	Risk-adjusted returns	-	1973-82
	Benvignati (1987)	Domestic profit advantages of multinational Firms	Profitability	Size, R&D, Assets, CR4, imports & exports, market share, advertising intensity	US 1975
	Grant (1987)	Relationship multinationality & firm performance	RONA, ROE, ROS	Firm size	1972-84
	Lee & Kwok (1998)	MNCs vs. DMCs: international environmental factors and determinants of capital structure	-	Debt, Asset Size	US 1964-83
	Geringer et al. (1989)	Diversification strategy, interna tionalization & MNCs performance	ROS, ROA	-	1982-83
	Kim et al. (1989)	Global diversification strategy and corporate profit performance	ROS, ROA	-	1982-85
1990s	Kim et al. (1990)	FDI theories & performance of foreign MNCs operating in U.S	Profitability	Firm size	US 1980-84
	Demirag (1990)	MNC performance measures & relation with contextual variables	ROI, ROE, RI, PROFIT	Firm size	1982-84
	Collins & Markham (1990)	Market performance comparison of U.S. firms active in domestic, developed & developing countries	Risk-adjusted returns	-	LDCs/DCs 1976-85
	Davies & Lyons (1991)	Relative Performance: Productivity Advantage of FOs in UK	Productivity GVA	Industry	UK 1971-87
	Habib & Victor (1991)	Strategy, structure & comparative performance of U.S. service MNCs	ROA	-	US 1987
	Sullivan (1994)	Measuring the degree of internationalization of a firm	ROA, ROS	R&D Intensity, advertising Intensity	1990
	Qian (1996)	Effect of multinationality measures on risk-return performance	ROA, ROE	Firm size	US 1981-90
	Tallman & Li (1996)	Effects of international diversity and product diversity on the performance of MNCs	ROS	Firm size, Leverage Industry Growth	1987
	Boardman et al. (1997)	Role of agency costs in explaining superior performance of FOs	ROA	Firm size, Industry	1986-91

Y	Reference	Research Focus	Performance Measure	Main Control Variables	Country/ Period
	Gomez-Mejia & Palich (1997)	Cultural diversity and the performance of multinational firms	ROA, MTB	Debt, Size, R&D, Advertising, Industry, Product Relatedness	1985-89
	Majumdar (1997)	Impact of size and age on firm-level performance: evidence from India	Productivity, Profitability (ROA)	Firm size, Age, Advertising, Capital Intensity, Debt, Sales	India 1988-94
	Wan (1998)	International and industrial diversification and firm performance of Hong-Kong MNCs	ROE	Firm size, Industry	Hong Kong 1990-92
	Luo & Tan (1998)	Comparison of multinationals & DOs in an emerging market	ROS, ROA	Firm size, Industry, Market Position, Defender, Analyzer	China 1994
	Aitken & Harrison (1999)	Do domestic firms benefit from direct foreign investment?	TFP	Firm size, Industry	Venezuela 1976-89
	Chen (1999)	International Performance of MNCs: a Hybrid model	ROI, Market Share	Firm size, R&D Industry	1986-93
	Christmann et al. (1999)	Influence of country conditions, industry structure & business strategy on MNCs performance	Gross Margin	Development, Industry Size, Population, TAX, Political	1980-84
	Delios & Beamish (1999)	Geographic scope and performance of Japanese firms	ROA, ROE, ROS	Industry, Leverage, grow, concentration	1996
	Gomes & Ramaswamy (1999)	Form of the relationship between multinationality and performance	ROA, OPSAL	Firm size, Industry	1990-93
2000s	Andersson et al. (2001)	Subsidiary performance in MNCs: importance of technology	Sales, AMV	-	1990-95
	Delios & Beamish (2001)	Financial performance of MNCs, foreign subsidiary survival	Profitability	Firm age, Firm size Parent firm size	1987-96
	Geringer & Hebert (2001)	Measuring Performance of IJVs	Profitability	Market Share, Technology Quality, Productivity	1988-1989
	Lu & Beamish (2001)	Internationalization and Performance of SMEs	ROA, ROS	R&D, SME size Product diversification	1986-1997
	Mathur et al. (2001)	The evidence from Canadian firms on multinational diversification and performance	ROE, ROA, OPMARG	Firm size, Leverage Growth, Efficiency	1992–94 and 1997
	Khan et al. (2002)	Foreign direct Investment and the performance of MNCs.	ROA, ROI, AMV	Firm size, Investment intensity of R&D, Industry	1999
	Kotabe et al. (2002)	Multinationality and Firm performance.	ROA, OPSALINV	Firm size, R&D Intensity, Marketing Intensity	1988-93
	Capar & Kotabe (2003)	Relation between international diversification and performance in service firms	ROS	Firm size, Industry effects (industry dummy's)	1997-99
	Contractor et al. (2003)	A three-stage theory of international expansion: link between multinationality and performance in the services sector	ROS, ROA	Firm size, Sector effect Home country effect	1983-90

Y	Reference	Research Focus	Performance Measure	Main Control Variables	Country/ Period
	Goerzen & Beamish (2003)	Geographic scope and MNEs' performance	Sharpe's measure, Jensen's alpha, ROA, MTB	Product diversity, Industry, Firm age, Capital structure, R&D, Firm size	1999
	Qian *et al.* (2003)	Multinationality & profit performance? Study of US SMEs	ROS	Firm size, Firm age, R&D, Advertising, leverage	1998
	Ruigrok & Wagner (2003)	Internationalization & performance: organizational learning perspective	ROA, OPSAL	Firm size, Industry dummy	1993–97
	Bellak (2004a)	How domestic and foreign firms differ and why does it matter?	Review of selected tudies	-	-
	Thomas & Eden (2004)	Shape of the multinationality-performance relationship	ROE, ROA, EMV, AMV	R&D/Sales, Firm size, Debt/Equity, Industry	1990-94
	Barbosa & Louri (2005)	Corporate performance: a comparison of FO and DO firms	ROA, Net ROA, Gross ROA	Firm size, Firm age, R&D, Industry, Debt ,CR4	1992/ 1997
	Chiao *et al.* (2006)	Performance, internationalization, and SMEs' firm-specific advantages in a newly-industrialised economy	ROS	Firm size, Debt Ratio, R&D, Advertising,	Taiwan 1996
	Elango & Sethi (2007)	Relation country of origin & internationalization- performance	OPMARG, GPM	Firm size, R&D, Debt Ratio, Firm, Grow, Exchange rate	1995-2000
	Glaum & Oesterle (2007)	Internationalization & performance	ROE, ROA, ROS	-	-
	Li (2007)	Multinationality and performance	-	-	-
	Kimura & Kiyota (2007)	FO vs DO firms: economic performance in Japan	ROA, ROE, VAP, TFP	Age, R&D, Survive, Industry, Capital, Labor , Average wage	Japan 1994-2000
	Short *et al.* (2007)	Firm, strategic group, and industry influences on performance	ROA, Tobin's Q, Altman's Z	Firm, Industry, Strategic group	US 1991-95
	Gaur & Kumar (2008)	International diversification, business group affiliation and firm performance	ROS ROA	Firm age, Firm size Industry	India 1997-2001

Source: Own elaboration

Table 4 - Variables definition, measures and expected signs of influence on performance

Variable	*Unit**	*Description and measures*	*Expected signs*
Dependent variables			
PM	%	Operating profit margin =operating profit/operating revenue	
ROS	%	Return on sales (earnings before taxes/sales and services)	
GVAEMPL	K eur	Gross value added per employee	
Main variable of interest			
FO	-	**Foreign ownership dummy: 1 if foreign share in the firm's equity is greater or equal to 50,01% (FO firms), 0 otherwise**	+
Other variables			
AGE1	-	Log of the number of years since firm was founded	+
AGE2	-	Log of the number of years since firm was founded, squared	-
SIZE1	-	Log of the number of employees	-
SIZE2	-	Log of the number of employees, squared	+
		R&D intensity: R&D expenditure/total sales	+
RDSLAG	K eur	R&D results from a 5 year lag (2002-06); assumption: missing values equal to the inexistence of R&D in the firms concerned	
CR4	%	Share of employees included in the four largest firms in manufacturing sub-sectors	+
INTERN	-	International openness of firms: dummy that takes the value 1 if firms have export and import activity, 0 otherwise	+
Mi	-	Sub-Sector code of activity (CAE-93 Rev.1): manufacturing sub-sector dummies =Di-1= 20-1 (i=1 to 19)	

Source: Own elaboration   *K eur = 1000 euros unit

Table 5 - Descriptive Statistics by type of ownership

Type		Pm	Ros	Gvaempl	Age1	age2	size1	size2	cr4	Rdslag	Intern
DO	Mean	1.0440	1.559	30.007	2.971	9.320	3.734	1.492	0.1399	0.347	0.609
	Median	1.3900	1.577	23.115	3.042	9.252	3.714	1.379	0.109	0	1
	Sd	11.582	13.072	44.684	0.700	3.929	0.991	7.675	0.106	2.355	0.488
	Var	134.15	170.89	1996.67	0.4903	1.544	0.981	5.890	0.0113	5.547	0.238
	Count	5275	5275	5275	5275	5275	5275	5275	5275	5275	5275
FO	Mean	3.552	4.2484	58.837	2.987	9.517	4.530	2.257	0.200	0.321	0.777
	Median	3.375	4.112	42.241	2.915	8.496	4.639	21.523	0.129	0	1
	Sd	16.480	177.729	87.383	0.772	4.548	1.434	1.280	0.160	1.518	0.416
	Var	271.59	315.88	7635.8	0.596	2.068	2.055	1.639	0.025	2.303	0.174
	Count	234	234	234	234	234	234	234	234	234	234
All	Mean	1.1505	1.6735	31.294	2.972	9.328	3.769	15.254	0.142	0.346	0.616
	Median	1.43	1.6304	23.606	3.037	9.224	3.714	13.791	0.109	0	1
	Sd	11.841	13.315	47.623	0.704	3.957	1.026	8.105	0.110	2.326	0.486
	Var	140.20	177.29	2268.5	0.495	1.567	1.052	65.704	0.012	5.409	0.236
	Count	5509	5509	5509	5509	5509	5509	5509	5509	5509	5509

Source: Own elaboration based on STATA statistical analysis

Table 6 - Regression Results – OLS White and Quantile regression

Performance Models	OLS White Correction (1)			OLS White Correction (2)			Quantile Regression		
Variables	**Pm**	**Ros**	**Gvaempl**	**Pm**	**Ros**	**Gvaempl**	**Ros**	**Pm**	**gvaempl**
Age1	3.76***	2.38	-0.78	3.49***	2.16	1.48	1.53***	1.83***	-0.28
	(1.21)	(2.08)	(6.66)	(1.23)	(2.16)	(6.38)	(0.31)	(0.34)	(1.49)
Age2	-0.80***	-0.50	0.53	-0.74***	-0.47	-0.15	-0.31***	-0.38***	-0.07
	(0.23)	(0.41)	(1.12)	(0.23)	(0.42)	(1.05)	(0.06)	(0.06)	(0.26)
Size1	-2.17***	-1.95**	-72.74***	-2.62***	-2.33***	-71.98***	-0.84***	-1.07***	-27.22***
	(0.68)	(0.80)	(15.67)	(0.69)	(0.81)	(15.68)	(0.18)	(0.20)	(0.87)
Size2	0.22**	0.21**	8.50***	0.28***	0.27***	8.52***	0.11***	0.13***	3.20***
	(0.09)	(0.10)	(1.85)	(0.09)	(0.10)	(1.85)	(0.02)	(0.03)	(0.11)
Cr4	5.31***	5.31***	18.21**	5.40**	7.48**	57.63***	3.79***	3.37***	26.67***
	(1.54)	(1.79)	(8.09)	(2.55)	(3.37)	(21.47)	(0.80)	(0.85)	(3.73)
Rdslag	-0.61***	-0.85***	-0.11	-0.60***	-0.85***	-0.15	-0.18***	-0.30***	-0.02
	(0.16)	(0.32)	(0.14)	(0.17)	(0.33)	(0.17)	(0.02)	(0.02)	(0.08)
Fo	2.16*	2.17*	20.26***	2.13*	2.04*	17.09***	2.05***	1.81***	14.42***
	(1.17)	(1.25)	(6.10)	(1.14)	(1.22)	(5.91)	(0.21)	(0.23)	(1.00)
Intern	1.15***	1.22***	1.26	1.19***	1.41***	3.98***	0.10	0.13	2.91***
	(0.40)	(0.44)	(0.90)	(0.40)	(0.45)	(0.96)	(0.10)	(0.10)	(0.45)
Constant	1.01	2.17	168.88***	2.44	2.91	152.55***	0.98*	1.06*	73.32***
	(1.91)	(2.88)	(36.79)	(1.98)	(2.98)	(35.77)	(0.57)	(0.62)	(2.69)
Sub-sector dummies	No	No	No	Yes	Yes	Yes	Yes	Yes	Yes
Observations	5509	5509	5509	5509	5509	5509	5509	5509	5508
R-squared	0.03	0.03	0.14	0.04	0.04	0.16	0.05	0.04	0.32
Adj. R-squared	0.03	0.03	0.14	0.04	0.04	0.17	0.05	0.05	0.32

Robust standard errors in parentheses

Level of significance: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Source: Own elaboration based on STATA regression analysis

Table 7 - Regression Results – OLS White and Quantile regression

VARIABLES	OLS White Pm	Quantile Regression PM q10	q25	q50	q75	Q90	Quantile Regression ROS q10	q25	q50	q75	q90	Quantile Regression GVAEMPL q10	q25	q50	q75	q90
age1	3.49***	6.32**	2.98***	1.83***	1.20	-1.53	7.00***	2.14***	1.53***	1.10	-3.60	4.93***	2.09*	-0.28	-1.22	5.16
	(1.23)	(2.54)	(0.61)	(0.32)	(0.98)	(2.16)	(2.22)	(0.61)	(0.31)	(0.89)	(2.29)	(1.65)	(1.19)	(1.54)	(2.45)	(4.65)
age2	-0.74***	-1.39***	-0.65***	-0.38***	-0.25	0.27	-1.60***	-0.45***	-0.31***	-0.21	0.67	-0.85***	-0.40*	-0.07	0.06	-1.09
	(0.23)	(0.44)	(0.11)	(0.06)	(0.17)	(0.39)	(0.40)	(0.12)	(0.06)	(0.15)	(0.42)	(0.29)	(0.21)	(0.27)	(0.42)	(0.78)
size1	-2.62***	-1.13	-0.51*	-1.07***	-1.79***	-4.83***	-0.79	-0.29	-0.84**	-1.63***	-5.18***	-7.35***	-14.52***	-27.22***	-47.79***	-94.66***
	(0.69)	(0.77)	(0.26)	(0.39)	(0.56)	(1.61)	(0.78)	(0.22)	(0.37)	(0.63)	(1.59)	(1.51)	(1.42)	(2.48)	(4.77)	(9.70)
size2	0.28***	0.04	0.04	0.13***	0.24***	0.62***	0.02	0.02	0.11**	0.25***	0.67***	0.78***	1.64***	3.20***	5.78***	11.53***
	(0.09)	(0.11)	(0.04)	(0.05)	(0.07)	(0.20)	(0.12)	(0.03)	(0.05)	(0.08)	(0.19)	(0.18)	(0.17)	(0.30)	(0.61)	(1.19)
cr4	5.40**	-1.91	0.92	3.37*	6.85	14.90***	-2.33	0.67	3.79**	7.69	26.40**	-1.15	16.80**	26.67**	85.72**	181.76***
	(2.55)	(6.42)	(1.15)	(1.88)	(4.87)	(5.39)	(6.63)	(1.19)	(1.88)	(4.90)	(13.23)	(10.31)	(7.50)	(10.82)	(38.11)	(57.68)
Rdslag	-0.60***	-2.07**	-1.11***	-0.30**	-0.18**	-0.27***	-1.95***	-1.29**	-0.18	-0.15***	-0.28***	-0.17	-0.15**	-0.02	-0.00	0.03
	(0.17)	(0.93)	(0.26)	(0.15)	(0.08)	(0.08)	(0.60)	(0.50)	(0.15)	(0.05)	(0.06)	(0.20)	(0.08)	(0.16)	(0.19)	(0.23)
Fo	2.13*	-0.36	0.67	1.81***	3.89***	6.22***	-0.65	0.64	2.05***	4.46***	7.55***	2.98	7.65***	14.42***	24.66***	36.71***
	(1.14)	(1.45)	(0.58)	(0.56)	(1.04)	(1.84)	(1.62)	(0.63)	(0.59)	(1.14)	(1.90)	(2.05)	(1.74)	(2.03)	(4.50)	(9.07)
Intern	1.19***	1.77***	0.34**	0.13	-0.14	0.31	1.29**	0.29***	0.10	-0.26	-0.13	1.75***	2.05***	2.91***	4.39***	4.62***
	(0.40)	(0.58)	(0.15)	(0.11)	(0.25)	(0.53)	(0.59)	(0.11)	(0.12)	(0.25)	(0.56)	(0.32)	(0.29)	(0.42)	(0.64)	(1.20)
Constant	2.44	-4.96	-1.67**	1.06	4.88**	16.12***	-5.48*	-1.17	0.98	4.24**	17.85***	22.91***	41.39***	73.32***	111.00***	188.89***
	(1.98)	(3.61)	(0.81)	(0.81)	(2.15)	(4.47)	(2.96)	(0.81)	(0.78)	(2.08)	(4.83)	(4.28)	(3.32)	(5.35)	(10.57)	(20.94)
Observations	5509	5509	5509	5509	5509	5509	5509	5509	5509	5509	5509	5509	5509	5509	5509	5509
Adj. R-squared	0.04															
R-squared	0.04	.	.	.	.	.										
Pseudo R-squared		0.0797	0.0314	0.0177	0.0310	0.0494	0.083	0.0191	0.0175	0.0310	0.0484	0.0667	0.10117	0.1262	0.1654	0.2287

*** p<0.01, ** p<0.05, * p<0.1

Robust standard errors in parentheses