ESSAYS IN EXPORTS AND OWNERSHIP OUTCOMES

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Introduction

The first three chapters address the international strategy of firms, and the implications for firm participation and behavior in both domestic and international markets. The first chapter addresses the question of whether firms facing poor domestic market performance react by adjusting their position in foreign markets. This response can occur both by having non-exporting firms entering export markets, or by having existing exporters expand exports. We test this hypothesis in a period of large variation in exports to find that small firms enter export markets in response to poor domestic market performance, but that firms cannot easily make up for lost domestic sales with increases in exports.

The second chapter addresses the question of whether the establishment of subsidiaries abroad by domestic firms is accompanied with a decrease in firm export intensity in the domestic market. This would be expected if established subsidiaries abroad were constituted by firms to relocate exported home production to local production in the host country, in order to better supply the host country. We find little evidence in support of this hypothesis and discuss how subsidiary establishment might be done to build distribution networks that would benefit home exports.

The third chapter compares survival prospects of domestic and foreign firms over their life cycle. It is found that comparable foreign firms exit more than domestic firms, both due to decreasing exit rates by domestic firms and to increasing exit rates by foreign firms. It is argued that foreign firms, while possibly subject to a liability of foreignness which should decrease over time, are also intrinsically footloose and that this characteristic ultimately leads to increasing exit rates for foreign firms as they age.

The fourth chapter looks at firm differences in another dimension of ownership, that of public versus private ownership of firms. It analyses the impact of a privatization process on several labor outcomes, using the banking sector. It is found that there are no distinguishable differences on wages per hour between private and public banks. However, employment in a private bank implies a lower median employment duration, which suggests that public banks may create differentials relatively to private banks on job security rather than on wages.

Domestic Market and Export Decisions

1. Introduction

The expectation that exports can promote economic growth has led countries to adopt "export-led growth" strategies, regardless of their initial country development level (Marin, 1992). Export promotion policies are also pursued at the micro level, including support for export promotion agencies or government subsidies in support of export activity (Bernard & Jensen, 2004). Interest in the behavior of the export supply function has increased, as some countries view alternative currency and fiscal policy instruments as unavailable or undesirable tools to promote short-run economic growth (Eichengreen, 2007).

While disturbances in the export behavior of firms are strongly influenced by movements in exchange rates, microeconomic studies on the exporting behavior of firms have identified productivity as the main firm level determinant of the export decisions of firms (Bernard et al., 1995). Thus, movements in the export supply function of countries that share a common currency with their main trading partners could be expected to accompany movements in the overall productivity of firms in those countries. For instance, an expansion of the export supply is expected for countries without a national currency as a result of high unemployment, as high unemployment puts a downward pressure in labor costs that feeds back to firms as higher productivity per unit labor cost (Wolf, 2011).

We focus on the hypothesis that negative shocks in the domestic demand can lead some firms to initiate or expand an already existing position in international markets, as a result of the shock. As a negative shock in the domestic demand does not directly impact the individual productivity of firms, we discuss how international market entry or expansion could still be expected, and is consistent with standard models of international trade with heterogeneous firms. We look for empirical evidence of this effect in a sample of manufacturing firms of several countries during a period of large exports growth. We find evidence that poor performance in the domestic market is associated with entry of

small firms in export markets. However, we do not find evidence that the exports of existing exporters or even the exports of entrant exporters, either at the year of entry or at subsequent years, are substantially increased as a result of poor domestic market performance.

2. Theoretical Framework

The productivity of firms is the main determinant of their participation in international markets, and the relationship between firm performance and participation in international markets has been widely researched, both at the empirical level (Wagner, 2007; Wagner, 2012) and at the theoretical level (Melitz, 2003). Some of main findings of this research are that firms that participate in international markets have higher productivity than firms that do not, and that gains in the productivity of exporting firms, for instance, are achieved several years before the occurrence of firm entry in international markets. This finding is taken as evidence of self-selection of the more productive firms into international markets. The higher productivity of firms participating in international markets is seen as necessary for firms that participate in international markets, as placing goods in international markets requires that firms bear substantial additional costs relative to domestic operations (Melitz, 2003).

While most of the research focuses on firm entry in international markets, there is also evidence that firm productivity determines firm exit from international markets. Looking at productivity trajectories of plants that have ceased exporting, Clerides et al. (1998) found that these plants had remarkably poor performance when compared to either plants that participated continuously in export markets, to plants that did not participate in export markets or to plants that were just starting participation in export markets. It was also found that the performance of plants that ceased exporting decreased steadily in the years prior to their exit from foreign markets. Thus, productivity is an important determinant for both firm entry and exit from international markets, and poor productivity may force firms to exit international markets.

It is frequently proposed in the business press that firms might decide to enter foreign markets in response to negative shocks in the domestic demand. However, benchmark models of international trade with heterogeneous firms rely on the interaction between costs of international trade and individual firm productivity to explain

international market participation (Grossman et al., 2006). Thus, a negative shock in the domestic demand does not directly imply firm participation in international markets, as it has no direct influence in either individual firm productivity or costs of international trade. In fact, if a firm did not have a sufficiently high productivity to profitably incur in the costs associated with participation in international markets prior to a negative domestic shock, it could face even worse prospects while trying to do so afterwards, as it might have to handle a worse position in the domestic market.

While there are no direct effects of domestic market contractions in the productivity of firms, there may be some indirect effects. A demand contraction could contribute to decreases in wages or factor prices in general, which would indirectly increase firm productivity. For instance, a large negative shock in domestic demand, if accompanied with high unemployment, might result in higher productivity for firms due to the downward pressure put on wages, which may feed back into firms as higher productivity per labor unit (Wolf, 2011). Even without high unemployment, there may still be wage concessions at the firm level, as negative product market shocks have been shown to reduce wage growth (Hamermesh, 1988). However, this process is necessarily not immediate in time, and not sufficient to explain recent cases of surges in the export supply, as the export supply expands before significant drops in unit labor costs or other factor prices take place.

Firms might engage in international markets in response to an adverse shock in the domestic demand due to the short-run cost structure in place at the time of the shock or due to non-profit firm goals such as reduction of sales volatility or firm survival, even if there are no immediate effects in productivity. Firms might also exert efforts to increase their productivity ahead of an internationalization goal.

Internationalization may be a profitable short-term strategy in response to a negative demand shock due to the short-run cost structure of firms. If firms face a sufficiently large demand decrease, it may be profitable for firms to choose to sell their products in international markets as long as international prices are sufficiently high to cover both variable costs of production and the added costs of internationalization. This would require that firms face small costs associated with ad hoc exporting. Thus, it is expected that in industries where costs are predominantly fixed as opposed to variable,

the likelihood of internationalization due to a negative shock in domestic demand is higher.

Currency devaluations provide evidence that firms have the ability to shift production from domestic to international markets. Thus, firms should also have the ability to shift production in the event of a negative domestic market shock (Roberts & Tybout, 1997). If the increased expected profit of operating in international markets resulting from a currency devaluation is sufficient to make firms shift production from domestic to international markets, the incentive to do so should also exist in the case of a negative domestic demand shock. Given their installed capacity, firms might face a low opportunity cost of entering markets if they are not able to place their production domestically, unlike the case of a currency devaluation where the value of domestic sales is just smaller.

However, effective substitution of domestic sales with sales abroad could be moderated by firm access to distribution networks. The internationalization of firms has been often, although not universally, described as a slow and gradual process along which firms build a network of ties with distinct agents in foreign markets (Johanson & Vahlne, 1977; Oviatt & McDougall, 2005). The gradual nature of the process suggests the existence of hurdles that constrain the ability of firms to substitute domestic market sales with sales abroad in the short run. Thus, we expect existing exporters and in particular exporters that are more advanced in the internationalization process, to be more able to redirect production from domestic to foreign markets than non-exporters or firms with smaller international market experience. We also expect that foreign firms, due to their membership in a multinational network of affiliates, are also more able to redirect production from domestic to foreign markets.

Regardless of initial export entry or expansion motives, the effects in the export supply may be longer lasting. Internationalization motives may only exist in the short-run and have sporadic exports as a single goal, and thus export entry could be conceived as not having long-term consequences. Firms can also be forced out of export markets due to low productivity (Clerides et al., 1998). However, initial export motivation does not necessarily hamper the significance of entry in export markets, as history matters for export behavior. As has been shown in the case of currency devaluations, even temporary currency shocks can lead to permanent changes in the export supply, thus generating

export hysteresis (Baldwin & Krugman, 1989; Dixit, 1989). In fact, exposure to past exporting episodes increases the likelihood of future exporting behavior (Roberts & Tybout, 1997). It has been found that temporary devaluations in currency rates have had persistent effects in trade flows (Baldwin, 1988). The persistence effect can be generated with simple models, in which it results from the sunk costs firms have to incur when entering in international markets (Baldwin, 1986). Firms necessarily incur in some sunk costs when they enter in international markets, and as long as these costs are not completely depreciated, they decrease the barriers to further reentry in international markets, and make exit less likely. An alternative source of persistence could be the existence of acquired tastes in international markets, which would increase demand for the products of new exporting firms right after an initial exposure of these products to international markets (Baldwin, 1988).

There are internationalization benefits in other dimensions of firm performance other than increased profitability. As long as export sales are not perfectly correlated with domestic sales, the volatility of total sales of the firm will be smaller than the combined volatility of domestic and foreign sales, even if foreign markets can be conceived as being more competitive and inherently riskier. Due to a portfolio effect, firms could decrease the total risk they face by engaging in a riskier project. Accordingly, engaging in exports would provide the non-profit benefit of total sales stabilization for firms, as has been documented empirically (Hirsch & Lev, 1971). Thus, firms facing domestic market instability or uncertainty may seek foreign markets as a risk hedging strategy.

There is also evidence of links between firm survival and international trade. Exporters are found to survive longer than non-exporters, even after accounting for the characteristics of exporters that grant them higher survival (Wagner, 2012). The effect of sales stabilization mentioned earlier could contribute to higher survival of firms that engage in international markets, although it may not be the sole contributor. If holding international distribution networks grants firms the option value of shifting production from the domestic to foreign markets, when faced with negative economic conditions at home, firms could be expected to internationalize in order to establish and sustain these international distribution networks in less profitable foreign markets. Therefore, a negative domestic shock, or evidence of uncertainty in the performance of the domestic

market, might lead firms to internationalize if they perceive that investing in less profitable foreign markets would lead to an increase in firm survival.

While the productivity of firms is an important determinant on the ability of firms to internationalize, forward looking behavior of firm managers might make the link between productivity and international market participation partially endogenous. If firm managers have the ability to make decisions that enhance the productivity of firms as they ramp-up to become exporters, when facing a negative shock in the domestic demand, then productivity may not be completely exogenous and stochastically determined, but endogenous and the result of forward looking decisions taken by the firm (Hallward-Driemeier et al., 2002). According to this view, firms consciously self-select by introducing new technologies or increasing R&D expenditures in order to be able to export high-quality goods and increase their productivity in the process (López, 2005). In fact, Alvarez (2004) provides evidence of persistent exporters resorting to a more intensive use of publicly available programs partially designed to promote exporting activity, than sporadic exporters. So, persistent export market participation can be partially traced to higher voluntary firm participation in export promoting activities. Thus, firms facing negative prospects in the domestic demand would have an added incentive to import, develop, or somehow acquire technology that allows the firm to be more productive, with the intention of future international market participation.

Summing up, we expect negative growth in the domestic market to lead to firm entry in export markets. We expect this effect to be larger when negative domestic shocks hinder firm survival or create sales volatility, as may be the case in large domestic shocks or prolonged negative growth. We expect negative growth to permanently enhance the stock of exporters and that firms place production abroad when domestic market performance is poor, particularly firms with more access to international distribution networks.

3. Data and Methods

To conduct our empirical analysis, we use data from the Amadeus dataset, provided by Bureau van Dijk. The dataset contains a large number of firms from several European countries and provides comprehensive standardized information from balance sheet and profit and loss account items of firms, as well as firm ownership information.

We could not use data for all countries in the Amadeus dataset, as some countries had no export data, no data for key firm variables such as sales or number of employees, or very irregular exports coverage with respect to officially recorded exports. We have managed to extract data for three European Union countries: France, Hungary and Portugal. Data comprises firms operating from 2007 until 2012, in the manufacturing sector, thus classified by having primary activity labeled within NACE Rev. 2 codes 10 to 33.

Bureau van Dijk compiles a collection of firm ownership links on an international basis and tries to identify a global ultimate owner for each firm, by following firm ownership upstream links that are above 51%. We classify firms as foreign if a global ultimate owner has been identified and is located in a different country than the country of operation of the firm. Information on the number of firm subsidiaries is also obtained, although no minimum ownership percentage between owner firm and subsidiary firm is required to validate the ownership link.

Both ownership and industry data are limited to the status at the date of data collection, although we do not expect it to be a significant source of error given the short span of years covered in the panel and the infrequent nature of changes in primary industry or the dimensions of ownership information we have used.

All nominal variables have been deflated with national GDP deflators obtained from Eurostat and are at constant prices of 2012. Information on industry growth by country was also obtained from Eurostat. We have also performed the following data cleaning procedures in our sample. We drop observations with negative values for any on the variables sales, assets, added value or exports. We kept only firms that are active in all of the years of the panel, and thus have positive values for sales and number of employees. The choice of a balanced panel was made in order to ensure that changes in overall exports are not due to a lack of coverage of large exporters in some years of the panel. Thus we cannot observe exports from firms that have started operations after 2007, or exports from firms that have stopped operating during the time span of the panel. Finally, we also drop firms for which the information provided consisted of consolidated accounts, in order to ensure that recorded exports do not include exports from subsidiary firms.

Our final sample includes a total of 28,366 firms from Portugal, Hungary and France. All countries belong to the EU27, and only Hungary does not belong to the Eurozone. As shown in Table 6a and Table 6b, most firms are from Portugal (19,410 firms), followed by France (6,133 firms) and Hungary (2,823); and most firms are domestic, with 771 firms being foreign and 360 of domestic firms having registered subsidiaries in other countries. Thus, data coverage of firm population differs significantly across countries. Coverage is very good for Portugal, as data is compiled from administrative sources and almost all firms are legally mandated to file balance sheet data and most firms comply with this legal obligation. According to figures provided by Bureau van Dijk, only about 40% of Hungarian firms are legally mandated to file accounts, in accordance to their legal form, although companies do not generally comply with this obligation. For France, most limited liability companies are legally mandated to file accounts, although only about 65% of firms comply with this requirement. Firms seem to comply with the requirement intermittently, since the requirement of a balanced panel is particularly severe for French firms, and 82% of French observations in the several years of the panel firms are lost with this requirement.

We were not able to obtain data for all variables in all years of the panel, and for all countries equally, as data is obtained from different primary providers, and firms delivered data to original sources to conform to different national legal obligations. The most notable gap is that we do not have export data for Portugal in 2007.

Our sample panel represents a stable share of total product exports across the years of the panel for any country in the sample, as can be observed in Table 6c. The average share of product exports covered with the sample is very high for Hungary and Portugal, while France has a much more narrow coverage in comparison to the other countries, at only around 4% of total product exports. However, this share is the most stable across the years of the panel, and it is comprised of a very large number of firms, at around 6,000 firms. For both Hungary and Portugal, the share of product exports covered with the sample is usually above 50%. The share of product exports covered would be somewhat stable across the years of the panel for these two countries, except for the decrease in coverage in 2009 for Portugal, which does not occur again in 2010, thus suggesting that Portuguese firms in the sample have contracted more drastically than Portuguese firms in the population. However, sample coverage of total exports does not

worsen after 2009 relative to the years before the shock in 2009. Thus, firms outside the panel do not contribute proportionately more than firms in the panel for any growth in exports after the demand shock of 2009.

The large coverage of exports achieved with the sample, and the relatively low number of Hungarian firms, suggests that our panel of Hungarian firms is mostly comprised of large firms, or at least that we able capture most of the large exporters in our sample. The large size of Hungarian firms relative to Portuguese or French firms is confirmed in Table 7a and Table 7b. The average Hungarian firm employs more workers, has larger sales and total assets than the average firm in the other countries. Hungarian firms are also more likely to be exporters, export more of their output and operate in industries with higher final output exported. The average French firm is also larger than the average Portuguese firm, regardless of the size measure being number of employees, sales or total assets. The proportion of French firms that are exporters is slightly smaller than the proportion of Portuguese firms, and French firms operate in industries that export less, but the average French firm still exports more than the average Portuguese firm.

Thus, the sample seems to capture larger Hungarian firms, smaller French firms, and even smaller Portuguese firms. Most of the differences between these groups of firms are accounted by the difference in average firm size, as larger firms tend to employ more inputs, export more, have less debt, higher profits, and a higher likelihood of being foreign. For any of the countries in the sample, the distribution of firms by industry is not too uneven, with firms in almost all two-digit industries. The distributions of firms by industry are similar across countries, with all countries sharing the same two two-digit industries with the highest number of firms: manufacturing of metal products and manufacturing of food products (Table 7c).

The export supply function response at the intensive and the extensive margins are both important to examine. The decision of firms to enter foreign markets is an important export supply response to examine because firms are required to undergo important investments ahead of market entry, and thus corresponds to a deliberate and arduous effort by firms. As firms may not be able to export considerable volumes in an initial stage due to lack of international distribution network, the intensive margin remains the most immediately observable export supply function response. We are going

to describe how the stock of exporters changed for each of the countries in our panel and use logit regressions to test the hypothesis of firm entry due to poor performance of the domestic market.

Although the intensive margin is the most directly observable export supply function response, the main short run reason why firms may want to use foreign markets in response to poor performance in domestic markets is to substitute lost domestic sales due to unmet domestic demand with sales abroad. If firms are able to perform this substitution we must observe increased exports after we observe poor domestic market performance. We are going to detail how exports have responded after the large demand shock of 2009 in our sample panel and we are going to regress firm exports on a measure of domestic market performance, using fixed effects regressions, to evaluate firm export response at the extensive margin.

4. Results

Table 1 displays real GDP growth for all countries and years in the panel. Real GDP growth in any of the countries shares the common large drop in 2009 and subsequent recovery in 2010, in line with the wider EU27 growth. All countries have growth close to zero in 2008, a substantial decline in growth in 2009, and a slight recovery in 2010. While the recovery proceeds in 2011 for Hungary and France, Portugal enters a recession. In 2012, all countries worsen their growth position, with Portugal further deepening its recession, Hungary entering a recession, and France facing stagnation.

Table 1. Real GDP Growth (%)

	Year					
	2007	2008	2009	2010	2011	2012
EU27	3.2	0.4	-4.5	2.0	1.7	-0.4
Portugal	2.4	0.0	-2.9	1.9	-1.3	-3.2
Hungary	0.1	0.9	-6.8	1.1	1.6	-1.7
France	2.3	-0.1	-3.1	1.7	2.0	0.0

Source: Eurostat

In order to measure domestic and European demand faced by individual firms, we have used added value real growth in the industry in which the firm is located, both at the domestic and EU27 level. These figures are provided by Eurostat, discriminated at the two-digit NACE industry (although some industries are lumped together). Table 8a and Table 8b provide average firm growth, median firm growth, and average firm growth, weighted by firm size (measured by number of employees), of the domestic and EU27 industry growth figures provided by Eurostat, for each country and year in the sample. There are some differences in how the manufacturing sector performs relative to the overall economy. The manufacturing sector experiences a much larger drop in activity than the overall economy in 2009; and the recovery in 2010 and 2011 is also larger than the overall economy, with the manufacturing sector still having positive growth in 2011 for Portugal, in spite of the contraction in the overall economy (Table 1). The EU27 growth figures are different but similar across countries in each year of the panel (Table 8b), as the distribution of firms by industry is also close across countries (Table 7c). In general, as occurs at the domestic level for each country, the manufacturing sector of the EU27 seems to be much more volatile than the overall economy (Table 1). There is a large decrease in activity in 2009 and a recovery in the years 2010 and 2011, as also occurs at the domestic level for each country.

In Table 9a we present aggregate exports in constant prices, obtained from Eurostat, and the respective yearly percentage change is presented in Table 9b. While in 2008 we observe small or negative exports growth in any country, in 2009 we observe a common large drop in exports. This drop in 2009 is in line with the international trade collapse of 2008-2009. This huge demand shock has two main causes. First, a sudden drop in commodity prices and the consequent reduction in demand of countries reliant on these goods; and second, on the decision by consumers, firms and investors alike to postpone all investment and purchasing decisions when faced with an extremely high level of uncertainty during the period (Baldwin, 2009). In agreement with the postponement of expenditures in 2008-2009, there is a large recovery in exports in 2010. The recovery continues in 2011 and in 2012, except for Hungary, which does not grow in 2012. The exports growth of Portugal is stronger than in the remaining countries. In 2010 exports from Portugal grow only slightly less than Hungary, although Hungary had a larger drop in 2009; and in 2011 and 2012 Portugal is always the country with the fastest

growing exports. By 2011, only Portugal has managed to export more in real terms than in 2008. However, the much worse domestic market performance in Portugal in 2011 and 2012 relative to the other countries is accompanied by a relatively small advantage in exports growth in these two years relative to the other countries.

Table 10a and Table 10b are the sample counterparts of tables Table 9a and Table 9b. Differences between sample manufacturing exports and official exports records are expected as we have obtained a balanced panel of firms for the period, and the coverage across countries is irregular, with the sample from Portugal having a much larger number of small firms relative to any of the other two countries. Nevertheless, we still observe the same overall pattern for exports in the panel. For any country in our sample, we again observe the huge drop in exports in 2009 and the recovery in 2010 and 2011. Again, Portugal seems to recover much more quickly than the two other countries in the three subsequent years to the 2009 shock.

Table 10c details the number of exporters in every year of the panel, and Table 10d the respective yearly percentage growth in the number of exporters. Similarly to the behavior in aggregate exports, Portugal is the only country with large net gains in the number of exporters, with net gains of around 6% in both 2010 and 2011. Both France and Hungary register low yearly increases or decreases in the stock of exporting firms.

Table 11a to Table 11c compare mean real exports growth and growth in the number of exporters in each country with changes in real factor costs and real changes in domestic market sales. As can be observed for France and Portugal, there is no decrease in median labor cost per worker justifying the growth in exports or in the number of exporters, as the decrease in median labor costs seems to lag behind the increase in exports. There is a generalized decrease in material costs per million of sales across all countries, but only in 2009, and is always positive in subsequent years, where exports growth continues to occur. The drop in average domestic market sales seems to be more severe and more persistent than any changes in factor costs.

Table 12a presents a breakdown of net firm entry in export markets into gross firm entry and gross firm exit in exports markets for each year and country. In every year of the panel there are high levels of gross entry and exit of firms from export markets, in spite of the low levels of net entry. For France, more than 200 firms both enter and exit export markets in every year, around 4% of total French firms in the panel. For Portugal,

more than 1,000 firms both enter and exit export markets in every year, around 6% of total Portuguese firms in the panel. Only Hungary faces permanently low levels of both entry and exit from export markets, even when relative sample sizes are accounted for. Countries with lower average firm size have higher gross entry and exit rates from export markets, suggesting that small firms are responsible for most export supply function adjustments at the extensive margin. Only Portugal, the country with the lowest average firm size, registers substantial net entry rates after the demand shock of 2009. In 2010 and 2012 Portugal adds up more than 400 firms, or 2% of total firms in sample, to the stock of exporters. The increased net entry in export markets by Portuguese firms seems to be a response to the severe 2009 demand shock and not a response to the recession years of 2011 and 2012.

However, entrant exporters usually export a very small amount of overall exports in the entry year, in spite of the high gross entry rates for most years and countries. For Portugal, that has highest gross entry rates in any year, entrant exports are only a substantial part of overall exports in the year 2010, where we might observe rebound exports from delayed purchases in the year 2009. In all other years, entrant exports never surpass 3% of overall Portuguese exports. For our sample of French firms, the weight of entrant exports in overall exports is more erratic. Entrant exports are a substantial part of overall French exports in the years 2008 and 2009, but not in subsequent years, and thus entrant exports cannot account for the overall exports growth in response to the demand shock of 2009. Finally, for Hungary, the country with the largest average firm, entrant exports have almost no weight in overall country exports.

Table 12b to Table 12f detail the number of exporters and corresponding exports of each of the 2008 to 2012 cohorts of entrant and incumbent exporters, both at the time of entry as well as before and after entry, so that we can track new exporter survival after entry, past exporting experience of new exporters, and exports growth in the years after entry.

Entrant exporters are a substantial part of the number of exporting firms for any cohort, with samples with lower average firm size having higher rates of entrant exporters. Entrant exporters represent 4 to 6% of exporters in the year of entry in Hungary, 11 to 14% of exporters in the year of entry in France, and 17 to 22% of exporters in the year of entry in Portugal. Again, we only find evidence of increased entry

after the demand shock of 2009 for Portugal, and the single largest year over year increase in the rate of entrant exporters is recorded in Portugal in 2010, where entrant exporters are 22% of exporters in that year, following a rate of entrant exporters of 17% in 2009.

We find high survival rates of entrant exporters, with most failure to remain in export markets occurring in the year after entry. Of the 312 new French exporters in 2008, 148 remain in export markets in 2012, of the 74 new Hungarian exporters in 2008, 53 remain in export markets in 2012, and of the 1,192 new Portuguese exporters in 2009, 707 still remain in export markets in 2012. Out of any of the 2009 to 2012 cohorts of new exporters, many firms are also recurring exporters. For instance, out of the 2010 cohort of new exporters, 91 out of 259 new exporting French firms had been exporters in 2008, as well as 15 out of 50 Hungarian firms, or 582 out of 1,635 Portuguese firms. Thus, around one third of new exporters in 2010 had exported two years earlier. This behavior could be expected for new entrants in 2010 if many firms had failed to export in 2009 due to delayed purchases from their customers. However, for the cohort of new exporters in 2011, again around a third of new exporters are former exporters relative to 2009. Thus, for any cohort, new exporters are a substantial part of the pool of exporters, particularly in samples with small firms. Survival of entrant firms is high, particularly if the firm survived the second year in export markets, and export recurrence is also common.

If we track the exports associated with surviving exporting firms of any cohort of entrants, in the years after the entry year, we find that exports from cohorts of French firms remain relatively stable, although erratic, and that exports from cohorts of Portuguese and Hungarian firms increase steadily in any of the subsequent years, even though the group of entrants in any year is made smaller in the following years as some firms exit export markets.

Regardless of this increase, exports from cohorts of new exporters do not seem to make up for a large amount of country exports, even several years after entry, with the exception of the cohort of entrant exporters in 2010. Moreover, although cohorts of new exporters register growing exports in subsequent years, they do not seem to grow much faster than the corresponding cohort of incumbent exporters, as the rate of entrant exports to total exports is only slightly increasing, and thus we expect exports growth to occur as much through incumbent exporters as it does through entrant exporters. We could still

have some compounded effect of entrants in a few consecutive years making up for a substantial amount of country exports in a given year, but entrant exports do not seem to be very cumulative as cohorts of entrant exporters seem to be substantially made up of firms that had already exported in the past.

Table 13a to Table 13c detail exporting behavior of firms that reenter export markets after one year of interruption. We can observe that about one fourth to one half of export market quitters in any given year and country seem to reenter in two years time. For instance, out of 1,237 Portuguese firms that ceased exporting in 2008, 582 have resumed exporting in 2010, and only 655 have not resumed exporting in 2010; however, 185 out of these 655 firms have also resumed exporting in 2011. Firms that reenter export markets two years after exit seem to resume exports at levels that are similar to those of the year of exit. In particular, the large value of entrant exports of 5,115M€ in Portugal in the year 2010 has a large contribution of 4,854M€ by firms that had already exported 4,749M€ in 2008, but did not export at all in 2009, which is in line with the importance of delayed purchases in the year 2009 in explaining export behavior during this period. Thus, although entrant firm survival in exports markets is high, much of firm entry and associated exports is also reentry in export markets, as many firms participate intermittently in export markets, which goes against the possibility of cumulative entrant exports over a few years making up for a large contribution in overall country exports.

Table 14a to Table 14d show with greater detail the behavior of the entrant exporters in any of the years of the panel. As shown before, entrant exporters tend to have worse survival prospects in the first year after entry and better survival prospects in subsequent years, and to grow exports steadily over the subsequent years of the panel. Both firm median exports and firm average exports tend to grow very quickly. In nearly every cohort of new exporters median domestic market growth is negative in the year of entry in export markets, with the sole exception being French entrant exporters in 2011, whose domestic market grew by 0.08%. Thus, either through firm reentry or not, export market entry is simultaneous with poor domestic market performance, which suggests that firms may be shifting sales from domestic to foreign markets at the year of export market entry, which in line with our hypothesis.

Summing up, we find large volumes of gross firm entry and exit in export markets during the years of the panel. Firm entry and exit is more intermittent than permanent but

we seem to observe permanent increases in the stock of exporters after the demand shock of 2009, although only for Portugal which is the country with more small firms. Portugal also seems to have better export performance during the period. However, the better performance of exports is not due to entrant exports, as these have low importance in overall exports, with the exception of the year 2010 where they can justified with large amounts of rebound exports from the 2009 demand shock, and seem to take several years after initial entry trying to increase exports. Moreover, the low volumes of entrant exporters do not behave significantly different from the exports of incumbent exporters for any cohort of entrants. Thus, substantial increases in exports due to poor domestic market performance must be reflected in incumbent exporter exports.

Table 2 presents the regression output from performing logit regressions of firm exporter status on domestic market performance in five different specifications. All specifications include lagged values of the logarithm of total assets in millions of euros and the logarithm of the number of employees to control for firm size. We include country dummies when more than one country is included in the sample to control for individual country effects, as well as sets of year and three-digit industry dummies to control for year and industry effects. Domestic market performance is measured with the added value real growth of the two-digit industry in which the firm is located, our variable of interest. Added value real growth of the two-digit industry in which the firm is located at the EU27 level is also included to measure changes in international demand, as the EU27 is the main trading bloc of these countries and we expect that increases in overall demand of the European market would lead to increases in overall added value at the European industry level. Both of these added value real growth variables are also lagged and in percentage points. Finally, we have included a dummy for previous period exporter status, as out interest is in explaining changes in exporter status and not which firms are exporters.

Table 2. Logit Regressions of Exporter Status

Dependent Variable: Exporter Status, *t*

	(1)	(2)	(3)	(4)	(5)
	Full Sample	Portugal	Hungary, France	Large Firms	Full Sample
ln(Total Assets), *t-1*	0.415***	0.415***	0.404***	0.194***	0.349***
	35.966	31.149	16.738	5.590	26.331
ln(Number Employees), *t-1*	0.174***	0.214***	0.135***	0.269***	0.156***
	12.741	12.881	4.970	8.437	9.758
Exporter, *t-1*	3.364***	2.954***	4.240***	3.635***	3.993***
	171.592	128.177	111.085	81.346	174.205
France	-0.395***		0.236***	-0.527***	-0.479***
	-15.426		5.179	-9.381	-15.731
Hungary	-0.710***			0.032	-0.385***
	-24.561			0.522	-11.480
EU27 Industry growth, *t-1*	0.001	0.002	-0.000	-0.002	0.001
	0.269	0.578	-0.049	-0.468	0.463
Industry growth, *t-1*	-0.003***	-0.005**	-0.001	-0.003	-0.004***
	-3.353	-2.027	-1.186	-1.356	-3.426
Constant	-1.890***	-1.538***	-2.936***	-2.350***	-2.695***
	-24.122	-13.633	-22.408	-14.236	-28.420
Industry Dummies	*YES*	*YES*	*YES*	*YES*	*YES*
Location Dummies	*YES*	*YES*	*YES*	*YES*	*YES*
Year Dummies	*YES*	*YES*	*YES*	*YES*	*YES*
Number of observations	122 420	77 640	44 780	27 355	122 420
Log-Likelihood	-38 438.70	-27 210.22	-10 629.15	-7 441.32	-30 015.08

Note: *** p<0.01, ** p<0.05, * p<0.1, *t-statistics* in parenthesis

Specification (1) is run over the entire sample of firms in the panel. Both coefficients of size related variables have the expected positive effect on the log odds of exporting. Exporter status in the previous year has the largest *t-statistic* of any predictor in this specification and thus is the best predictor for current exporter status. Growth in the wider European industry does not have a significant impact on the log odds of exporting in the following year, although the coefficient is positive as would be expected. In agreement with the hypothesis that firm entry occurs due to poor domestic market performance, the coefficient on added value real growth at the domestic level is negative and significant at the 1% level. Thus, a one percentage point decrease in the added value

real growth in the domestic two-digit industry would lead to an increase in the log odds ratio of becoming an exporter in the following year by 0.003.

Specifications (2) and (3) have the same functional form as the previous specification, but are run over a sample of Portuguese firms and a sample of pooled French and Hungarian firms, respectively. In the logit regression that is run over the sample of Portuguese firms we still have a significant negative effect of domestic industry added value real growth on the log odds of being an exporter in the following year, even after controlling for size related variables. However, the effect is no longer significant for the sample of pooled French and Hungarian firms, which have the largest average firms in the panel. These results are confirmed in specification (4), which is run over a sample of firms whose total assets exceed two millions of euros. Thus, the significance of the negative effect of domestic industry added value real growth disappears by either removing the country with the largest number of small firms from the sample, or by explicitly removing small firms from the sample. Specification (5) presents a simple robustness check in which we change the definition of exporting firms as those whose exports exceed 5% of total firm sales. With this more demanding definition of what constitutes an exporter firm we expect the new group of exporters to be composed of firms that have made a more deliberate effort in becoming exporters. For specification (5), the coefficient on added value real growth in the domestic two-digit industry is still negative and significant at the 1% level, and even larger. Thus, we find evidence for firms entering exports markets in response to poor domestic market performance, but only when small firms are included in the sample.

Table 3 presents the output results from performing fixed effects regressions of the logarithm of exports on domestic market performance in five different specifications. We have used the fixed effects estimator in order to control for any possible time invariant unobserved heterogeneity at the firm level. For the preferred specification (1), the test that all firm fixed effects are zero is rejected with p-value<0.0001, thus invalidating usage of a pooled OLS regression. The null hypothesis of random effects against the alternative of fixed effects is also rejected with a Hausman test with p-value<0.0001, thus invalidating use of the random effects estimator. All specifications include, as before, lagged values of the logarithm of total assets in millions of euros and the logarithm of the number of employees, in order to control for firm size. We again

include domestic and EU27 lagged value added real growth of the industry in which the firm is located to measure changes in domestic demand and international demand, respectively. We control for previous year exporting level by including the lagged value of exports in logarithm, and thus we only explain growth relative to the previous year export level of the firm. By including the logarithm of previous year exports and by having as the dependent variable the logarithm of current export level, our sample only has firms that were already exporters and that continue exporting.

Specification (1) is run over the full sample of continuing exporters. The coefficients of size related variables associated with total assets and number of employees, are both positive and significant and thus both variables have the expected positive and significant impact on exports. The lag of the logarithm of exports also has the expected positive and significant impact on current exports. Also expected is the positive impact of EU27 growth in current exports, meaning that exports are largely determined by the EU27 economic cycle. Thus, although growth in the EU27 market is not sufficient to drive entry in exports markets, it determines how much existing exporters will export. However, the coefficient of interest, which is associated with added value real growth in the domestic market, is not significant and very close to zero. Thus, we conclude that, although existing exporters increase exports when there is growth in international demand, they are not able to export more as a result of poor domestic market performance. Specifications (2) and (3) present the same regression as specification (1) run over a sample of Portuguese continuing exporters and a sample of pooled French and Hungarian continuing exporting firms, respectively. The coefficient of interest, which is associated with domestic market performance, is insignificant and close to zero in either specification, thus confirming the results in specification (1).

Finally, we run two additional specifications run over the full sample of existing exporters, where we interact the variable associated with domestic market performance with either a foreign ownership dummy or a dummy for domestic firms indicating whether they have subsidiaries in other countries. In these specifications we check whether firms that belong to international networks of affiliates are more able to redirect production from home to export markets when domestic market performance is poor. In both specifications (4) and (5), we find that the coefficient on the interaction term is not significant, although negative, and thus we do not find evidence that even firms that

belong to international networks of affiliates are able to place production abroad when domestic market performance is poor.

Table 3. Fixed Effects Regressions of Exports

Dependent Variable: ln(Exports), *t*

	(1)	(2)	(3)	(4)	(5)
	Full Sample	Portugal	Hungary, France	Full Sample	Full Sample
ln(Total Assets), *t-1*	0.369***	0.378***	0.346***	0.369***	0.369***
	12.072	9.467	7.449	12.070	12.074
ln(Number Employees), *t-1*	0.240***	0.255***	0.210***	0.239***	0.239***
	7.095	6.208	4.237	7.087	7.093
ln(Exports), *t-1*	0.073***	0.032***	0.136***	0.073***	0.073***
	7.170	2.720	7.379	7.166	7.170
EU27 Industry growth, *t-1*	0.002***	0.002*	0.003***	0.002***	0.002***
	3.041	1.659	2.649	3.051	3.045
Industry growth, *t-1*	0.000	0.001	0.000	0.000	0.000
	0.475	0.623	0.265	0.770	0.512
Ind. growth × Foreign, *t-1*				-0.001	
				-0.909	
Ind. growth × Subsidiary Abroad, *t-1*					-0.001
					-0.443
Constant	-2.028***	-2.545***	-1.440***	-2.027***	-2.028***
	-17.559	-19.702	-7.430	-17.537	-17.557
Number of observations	40 645	24 399	16 246	40 645	40 645
Log-Likelihood	-36 216.98	-21 610.25	-14 533.74	-36 216.50	-36 216.92

Note: *** p<0.01, ** p<0.05, * p<0.1, *t-statistics in parenthesis*

Table 4 and Table 5 present regressions of exporter status and exports on additional regressors. We checked that growth of labor cost per worker does not help us explain which firms respond to poor domestic market performance with entry or expansion in export markets, as suggested by descriptive statistics. We also present a test on whether a short run cost structure that is more reliant on fixed rather than variable costs leads to higher response to poor domestic market performance on export markets.

Table 4 presents two additional specifications with logit regressions. Specification (1) includes the same variables as specification (1) of Table 2, yielding a significant and

negative coefficient for value added real growth at the domestic industry level, significant and positive coefficients for the size related variables and past exporter status, and an insignificant coefficient for value added real growth at the European industry level. Specification (1) also controls for the importance of fixed costs on the overall cost structure of the firm, measured by the depreciation to added value ratio, which is included as a standalone term and as an interaction term with domestic industry growth. Firms with a higher depreciation to added value ratio are expected to have higher fixed rather than variable costs and thus, as mentioned earlier, are expected to respond more strongly to a negative shock in the domestic market. Thus, we would expect a negative coefficient for the latter interaction term, as firms with higher reliance on fixed costs should respond more strongly to decreases in the domestic market. However, both the standalone term for the depreciation to added value ratio and the interaction of this variable with domestic market growth are insignificant. Thus, we do not find evidence that firms with a cost structure that is more reliant on fixed costs respond more strongly to a negative domestic market shock with export market entry.

Specification (2) includes the same variables as specification (1) in Table 2, and has identical results with respect to the magnitude and significance of the coefficients in common with specification (1) in Table 2. Specification (2) has added controls for firm labor cost per worker growth. We have added yearly percentage point growth of firm labor cost per worker both as a standalone term and interacted with value added growth for the domestic industry in which the firm is located. We removed a few outliers where labor cost per worker grew more than 100% in a single years, the majority of which where firms who employed one or two workers. Coefficients for both terms are insignificant. This is evidence that firms that respond to negative growth in the domestic market with export market entry do not do so as a result of decreases in labor costs per worker.

Table 4. Logit Regressions of Exporter Status

Dependent Variable: Exporter Status, *t*

	(1)	(2)
	Full Sample	Full Sample
ln(Total Assets), *t-1*	0.417***	0.413***
	27.781	34.139
ln(Number Employees), *t-1*	0.107***	0.180***
	6.060	12.326
Exporter, *t-1*	3.177***	3.309***
	139.811	162.864
France	-0.436***	-0.398***
	-13.835	-15.114
Hungary	0.419***	-0.719***
	6.726	-23.855
EU27 Industry growth, *t-1*	-0.000	0.001
	-0.097	0.379
Industry growth, *t-1*	-0.004*	-0.003***
	-1.809	-3.533
(Depreciation / Added Value), *t-1*	-0.135	
	-1.168	
Industry Growth × (Depreciation / Added Value), *t-1*	0.008	
	0.639	
Labor cost per worker growth / 100, *t-1*		0.032
		0.625
Industry growth × Labor cost per worker growth / 100, *t-1*		-0.003
		-0.767
Constant	-1.594***	-1.895***
	-15.984	-24.643
Industry Dummies	*YES*	*YES*
Location Dummies	*YES*	*YES*
Year Dummies	*YES*	*YES*
Number of observations	33 791	37 113
Log-Likelihood	-29 204.08	-32 056.95

Note: *** p<0.01, ** p<0.05, * p<0.1, *t-statistics in parenthesis*

Thus, firm entry in export markets as a response to poor domestic market performance is not associated with either decreases in labor costs per worker nor with a short run cost structure that is more reliant on fixed costs rather than variable costs.

Table 5 presents two additional specifications with fixed effects regressions. Both specifications (1) and (2) include the same variables as specification (1) of Table 3.

Specification (1) introduces a standalone term for the variable that measures reliance on fixed costs rather than variables costs, the depreciation to added value ratio, and an interaction term of this variable with domestic industry growth. Likewise, specification (2) includes a standalone term for the growth of labor costs per worker and an interaction of this variable with domestic market growth. The introduced terms are insignificant in both specifications. Thus we conclude that, neither higher reliance on fixed costs, nor larger decreases in labor costs per worker, result in existing exporters increasing exports in response to poor domestic market performance.

Table 5. Fixed Effects Regressions of Exports

Dependent Variable: ln(Exports)*, t*

	(1)	(2)
	Full Sample	Full Sample
ln(Total Assets)*, t-1*	0.382***	0.366***
	11.174	10.947
ln(Number Employees)*, t-1*	0.196***	0.199***
	6.419	5.026
ln(Exports)*, t-1*	0.070***	0.034***
	6.044	3.171
EU27 Industry growth*, t-1*	0.003***	0.002***
	3.328	2.591
Industry growth*, t-1*	-0.000	0.000
	-0.308	0.537
(Depreciation / Added Value*, t-1*	0.125	
	1.332	
Industry growth × (Depreciation / Added Value)*, t-1*	0.002	
	0.623	
Labor cost per worker growth / 100*, t-1*		-0.015
		-0.502
Industry Growth × Labor cost per worker growth / 100*, t-1*		0.001
		0.498
Constant	-1.882***	-2.065***
	-17.589	-15.744
Number of observations	79 838	112 908
Log-Likelihood	-27 836.65	-36 057.43

Note: *** p<0.01, ** p<0.05, * p<0.1, *t-statistics in parenthesis*

We find evidence of a modest positive impact of poor domestic market performance on the decision to become an exporter, although only for small firms. However, these firms do not initiate exports with high levels of exports, neither at the year of entry or in the years following entry, in spite of high growth rates for exports in the years following entry. We find evidence that incumbent exporters are able to increase exports in response to increases in international demand, but we do not find evidence of a significant relationship between poor domestic market performance and increases in exports, even for firms with established distribution networks that could be presumed to have higher access to international markets. We also do not find that either having an overall cost structure with a higher weight of fixed costs, or facing negative growth of labor cost per worker changes the response of firms to poor domestic market performance with export market entry or expansion.

5. Conclusion

The international trade collapse of 2009 was followed by several years of strong exports growth in several countries. This strong growth in exports does not seem to be easily explained with changes in factor prices or firm productivity. We have tested the hypothesis that firms respond to poor domestic market performance by either entering foreign markets or by increasing existing exports. We have found that firm entry is associated with poor domestic market performance, although only for small firms. However, firm entry in export markets does not cause a substantial increase in overall exports, as entrant exporters start out with very low exports, which continue to be small several years after entry in spite of strong exports growth in these years. Large exports associated with entrant exporters do occur in 2010, but are mostly rebound exports from delayed purchases from the year 2009. Incumbent exporters are largely responsible for changes in overall exports, but changes in incumbent exporters are not accountable with poor performance in the domestic market. Thus, we do not find evidence that most firms are able to easily substitute lost domestic sales with sales in foreign markets, and poor domestic market performance does not account for differences in country exports growth.

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Tables

Table 6a. Number of Firms by Country

Country	No.
France	6,133
Hungary	2,823
Portugal	19,410
Total	28,366

Table 6b. Number of Foreign Firms and Domestic Firms with Foreign Subsidiaries

	Foreign	DFS	Total
Country	No.	No.	No.
France	386	101	6,133
Hungary	181	32	2,823
Portugal	204	227	19,410
Total	771	360	28,366

Table 6c. Share of Sample Exports in Overall Country Product Exports

	Year					
	2007	2008	2009	2010	2011	2012
France	0.036	0.039	0.041	0.039	0.040	0.039
Hungary	0.617	0.587	0.600	0.624	0.581	0.596
Portugal	-	0.522	0.438	0.571	0.570	0.549

Source: Eurostat

Table 7a. Firm Level Summary Statistics

(mean)	France	Hungary	Portugal	Total
Employees	36.5	137.2	22.7	37.1
Cost per Worker (k€)	44.0	12.3	13.3	19.8
Added Value per Worker (k€)	63.3	30.3	22.6	31.2
Number of Employees / Assets	17.2	32.4	41.8	35.5
Material Costs (M€)	4.3	28.1	1.9	3.9
Sales (M€)	9.1	23.6	3.0	6.4
Added Value (M€)	3.7	6.6	0.9	1.8
EBITDA (M€)	0.7	1.7	0.3	0.5
Exports (M€)	2.7	16.7	1.1	3.2
Exporters (%)	36.1	48.4	38.2	38.8
Exports / Sales (%)	7.4	24.2	12.0	12.3
2d Industry Exports / Sales (%)	19.6	57.3	30.8	31.0
Total Assets (M€)	7.0	18.5	2.9	5.3
Fixed Assets / Assets (%)	30.0	44.8	28.8	30.7
Long Term Debt / Assets (%)	9.7	2.7	16.1	13.4
Foreign firms (%)	6.3	6.4	1.1	2.7
Depreciation (M€)	0.3	1.1	0.2	0.2
Depreciation / Added Value	0.1	0.2	0.1	0.1
Labor cost per worker growth (%)	1.5	-1.8	2.0	1.7

Table 7b. Firm Level Summary statistics

(median)	France	Hungary	Portugal	Total
Employees	8.0	40.0	8.0	9.0
Cost per Worker (k€)	40.2	10.0	11.6	13.3
Added Value per Worker (k€)	52.7	20.4	17.4	21.0
Number of Employees / Assets	12.7	20.0	22.6	19.4
Material Costs (M€)	0.2	4.1	0.1	0.2
Sales (M€)	0.8	2.6	0.3	0.5
Added Value (M€)	0.8	2.0	0.2	0.3
EBITDA (M€)	0.1	0.2	0.0	0.0
Exports (M€)	0.0	0.0	0.0	0.0
Exporters (%)	0.0	0.0	0.0	0.0
Exports / Sales (%)	0.0	0.0	0.0	0.0
2d Industry Exports / Sales (%)	18.5	57.8	30.5	29.7
Total Assets (M€)	0.5	2.0	0.3	0.4
Fixed Assets / Assets (%)	23.0	45.0	25.7	27.0
Long Term Debt / Assets (%)	2.9	0.0	1.9	1.0
Foreign firm (%)	0.0	0.0	0.0	0.0
Depreciation (M€)	0.0	0.2	0.0	0.0
Depreciation / Added Value	0.1	0.1	0.1	0.1
Labor cost per worker growth (%)	0.8	-3.2	0.5	0.5

Table 7c. Distribution of Firms by Industry

NACE Rev. 2 – 2-digit	Country					
	France		Hungary		Portugal	
	No.	%	No.	%	No.	%
10 - Man. of food products	1,381	23	309	11	2,711	14
11 - Man. of beverages	88	1	74	3	257	1
12 - Man. of tobacco products	0	0	5	0	3	0
13 - Man. of textiles	118	2	54	2	989	5
14 - Man. of wearing apparel	109	2	62	2	1,967	10
15 - Man. of leather	60	1	21	1	963	5
16 - Man. of products of wood and cork	295	5	93	3	1,328	7
17 - Man. of paper products	72	1	71	3	213	1
18 - Printing & reproduction of rec. media	388	6	71	3	991	5
19 - Man. of coke and ref. petroleum prod.	4	0	5	0	1	0
20 - Man. of chemicals and chemical prod.	142	2	80	3	300	2
21 - Man. of basic pharmaceutical prod.	25	0	21	1	55	0
22 - Man. of rubber and plastics products	228	4	287	10	560	3
23 - Man. other non-metallic mineral prod.	305	5	139	5	1,345	7
24 - Man. of basic metals	62	1	56	2	134	1
25 - Man. of fabricated metal products	942	15	627	22	3,621	19
26 - Man. of computer, electronic prod.	151	2	120	4	102	1
27 - Man. of electrical equipment	131	2	105	4	271	1
28 - Man. of machinery and equipment	313	5	285	10	666	3
29 - Man. of motor vehicles, trailers	117	2	106	4	242	1
30 - Man. of other transport equipment	30	0	20	1	75	0
31 - Man. of furniture	180	3	95	3	1,120	6
32 - Other manufacturing	296	5	54	2	665	3
33 - Repair & installation of machinery	696	11	63	2	831	4
Total	6,133	100	2,823	100	19,410	100

Table 8a. Domestic 2-digit Industry Growth Faced by Firms (%), as provided by Eurostat

		Year				
	Country	2007	2008	2009	2010	2011
Firm average	Portugal	3.2	-1.6	-8.8	3.4	2.7
Median firm	Portugal	2.9	-0.1	-9.0	3.1	2.6
Size weighted average	Portugal	2.4	-2.0	-8.8	5.8	3.7
Firm average	Hungary	7.8	3.5	-11.7	13.7	1.2
Median firm	Hungary	9.3	3.0	-17.4	10.4	1.9
Size weighted	Hungary	8.0	0.2	-15.4	16.1	6.7
Firm average	France	2.1	-3.1	-7.2	2.1	2.4
Median firm	France	1.8	-3.2	-6.1	1.4	3.6
Size weighted average	France	2.3	-2.8	-8.6	4.2	2.1

Table 8b. EU27 2.digit Industry Growth Faced by Firms (%), as provided by Eurostat

		Year				
	Country	2007	2008	2009	2010	2011
Firm average	Portugal	2.3	-2.9	-13.4	6.6	3.8
Median firm	Portugal	1.6	-3.0	-14.8	4.9	3.5
Size weighted average	Portugal	2.4	-3.0	-13.9	8.1	4.1
Firm average	Hungary	3.7	-2.1	-15.1	9.9	4.8
Median firm	Hungary	3.0	-1.1	-14.8	10.9	4.5
Size weighted average	Hungary	5.0	-2.4	-15.3	13.1	5.6
Firm average	France	3.2	-2.6	-11.6	7.0	3.7
Median firm	France	1.7	-3.4	-11.3	4.6	3.2
Size weighted average	France	4.0	-1.9	-13.8	9.8	4.3

Table 9a. Total Product Exports (constant prices, M€)

	Year					
	2007	2008	2009	2010	2011	2012
France	442,392	442,489	358,448	404,015	434,014	442,643
Hungary	83,892	84,323	64,616	75,508	82,775	80,612
Portugal	40,724	40,175	32,270	37,594	42,935	45,259

Source: Eurostat

Table 9b. Change in Total Product Exports (%)

	Year					
	2007	2008	2009	2010	2011	2012
France	-	0.0	-19.0	12.7	7.4	2.0
Hungary	-	0.5	-23.4	16.9	9.6	-2.6
Portugal	-	-1.3	-19.7	16.5	14.2	5.4

Sources: Eurostat

Table 10a. Sample Aggregate Exports (constant prices, M€)

	Year					
Country	2007	2008	2009	2010	2011	2012
	No.	No.	No.	No.	No.	No.
France	15,852	17,095	14,596	15,743	17,523	17,149
Hungary	51,775	49,536	38,758	47,113	48,060	48,047
Portugal	-	20,959	14,131	21,457	24,485	24,827

Table 10b. Change in Sample Aggregate Exports (%)

	Year					
	2007	2008	2009	2010	2011	2012
France	-	7.84	-14.62	7.86	11.31	-2.13
Hungary	-	-4.32	-21.76	21.55	2.01	-0.03
Portugal	-	-	-32.58	51.85	14.11	1.40

Table 10c. Number of Exporting Firms

	Year					
Country	2007	2008	2009	2010	2011	2012
	No.	No.	No.	No.	No.	No.
France	2,225	2,261	2,225	2,192	2,203	2,170
Hungary	1,334	1,354	1,367	1,374	1,374	1,390
Portugal	-	6,983	6,938	7,370	7,824	7,934

Table 10d. Change in the Number of Exporting Firms (%)

	Year					
Country	2007	2008	2009	2010	2011	2012
	No.	No.	No.	No.	No.	No.
France	-	1.62	-1.59	-1.48	0.50	-1.50
Hungary	-	1.50	0.96	0.51	0.00	1.16
Portugal	-	-	-0.64	6.23	6.16	1.41

Table 11a. Change of Selected Firm Variables by Year for Portuguese Firms (%)

	Year				
	2008	2009	2010	2011	2012
Firm Exports (mean)	-	-32.6	51.8	14.1	1.4
Domestic Sales (mean)	-	-4.8	-4.8	2.9	-3.1
Exporting Firms (0%)	-	-0.6	6.2	6.2	1.4
Exporting Firms (5%)	-	-1.0	6.8	10.6	4.8
Labor Productivity (median)	1.0	-1.9	0.7	-0.9	-2.7
Labor Cost per Worker (median)	1.9	1.4	2.6	0.2	-1.6
Material Costs/Sales (median)	-0.7	-5.0	0.5	2.5	0.1

Table 11b. Change of Selected Firm Variables by year for French Firms (%)

	Year				
	2008	2009	2010	2011	2012
Firm Exports (mean)	7.8	-14.6	7.9	11.3	-2.1
Domestic Sales (mean)	-4.6	-12.2	2.3	4.9	0.4
Exporting Firms (0%)	1.6	-1.6	-1.5	0.5	-1.5
Exporting Firms (5%)	1.5	-1.5	-0.1	0.3	-1.5
Labor Productivity (median)	-1.6	-7.8	5.0	2.7	-0.7
Labor Cost per Worker (median)	1.1	-1.7	1.7	3.0	0.8
Material Costs/Sales (median)	1.1	-4.8	0.8	2.8	-0.2

Table 11c. Change of Selected Firms Variables by Year for Hungarian Firms (%)

	Year				
	2008	2009	2010	2011	2012
Firm Exports (mean)	-4.3	-21.8	21.6	2.0	0.0
Domestic Sales (mean)	-4.6	-18.5	-5.1	-3.5	1.8
Exporting Firms (0%)	1.5	1.0	0.5	0.0	1.2
Exporting Firms (5%)	2.7	0.9	1.3	1.5	1.5
Labor Productivity (median)	-5.5	-6.1	-3.2	-9.9	9.1
Labor Cost per Worker (median)	-3.9	-9.3	-4.9	-7.8	12.2
Material Costs/Sales (median)	-1.8	-4.3	3.4	2.7	0.3

Table 12a. Firm Entry and Exit from Export Markets and Entrant Aggregate Exports (M€)

		Year				
Country		2008	2009	2010	2011	2012
Number of firms (No.)						
France	Entry	312	245	259	284	275
	Exit	276	281	292	273	308
	Net entry	36	-36	-33	11	-33
Hungary	Entry	74	65	50	48	52
	Exit	54	52	43	48	36
	Net entry	20	13	7	0	16
Portugal	Entry	-	1,192	1,635	1,512	1,328
	Exit	-	1,237	1,203	1,058	1,218
	Net entry	-	-45	432	454	110
Number of firms, relative to country sample size (%)						
France	Entry	5.09	3.99	4.22	4.63	4.48
	Exit	4.50	4.58	4.76	4.45	5.02
	Net entry	0.59	-0.59	-0.54	0.18	-0.54
Hungary	Entry	2.62	2.30	1.77	1.70	1.84
	Exit	1.91	1.84	1.52	1.70	1.28
	Net entry	0.71	0.46	0.25	0.00	0.57
Portugal	Entry	-	6.14	8.42	7.79	6.84
	Exit	-	6.37	6.20	5.45	6.28
	Net entry	-	-0.23	2.23	2.34	0.57
Exports (M€)						
France	Entrant exports	1,550	1,400	276	727	232
	Incumbent exports	15,545	13,196	15,467	16,797	16,918
	Rate of entrant exports	*0.091*	*0.096*	*0.018*	*0.041*	*0.014*
Hungary	Entrant exports	152	43	42	82	27
	Incumbent exports	49,384	38,715	47,071	47,978	48,020
	Rate of entrant exports	*0.003*	*0.001*	*0.001*	*0.002*	*0.001*
Portugal	Entrant exports	-	376	5,115	454	194
	Incumbent exports	-	13,754	16,342	24,031	24,634
	Rate of entrant exports	-	*0.027*	*0.238*	*0.019*	*0.008*

Table 12b. Number of Exporters and Corresponding Exports of the 2008 Cohort of the Entrant and Incumbent Exporters

		Year					
Country	Entrant Exporter in 2008	2007	2008	2009	2010	2011	2012
Number of Exporters							
France	No	1,949	1,949	1,780	1,696	1,672	1,632
	Yes	0	312	200	167	158	148
Rate of entrant exporters		0.000	0.138	0.101	0.090	0.086	0.083
Hungary	No	1,280	1,280	1,243	1,223	1,214	1,203
	Yes	0	74	59	62	54	53
Rate of entrant exporters		0.000	0.055	0.045	0.048	0.043	0.042
Aggregate Exports (M€)							
France	No	15,647	15,545	12,059	12,713	14,540	14,090
	Yes	0	1,550	1,137	1,404	1,605	1,464
Rate of entrant exports		0.000	0.091	0.086	0.099	0.099	0.094
Hungary	No	51,750	49,384	38,545	46,849	47,675	47,520
	Yes	0	152	170	173	207	269
Rate of entrant exports		0.000	0.003	0.004	0.004	0.004	0.006

Table 12c. Number of Exporters and Corresponding Exports of the 2009 Cohort of the Entrant and Incumbent Exporters

		Year					
Country	Entrant Exporter in 2009	2007	2008	2009	2010	2011	2012
Number of Exporters							
France	No	1,780	1,980	1,980	1,772	1,724	1,671
	Yes	82	0	245	161	144	134
Rate of entrant exporters		0.044	0.000	0.110	0.083	0.077	0.074
Hungary	No	1,243	1,302	1,302	1,270	1,256	1,240
	Yes	14	0	65	54	48	44
Rate of entrant exporters		0.011	0.000	0.048	0.041	0.037	0.034
Portugal	No	-	5,746	5,746	5,033	5,115	4,953
	Yes	-	0	1,192	702	700	707
Rate of entrant exporters		-	0.000	0.172	0.122	0.120	0.125
Aggregate Exports (M€)							
France	No	14,990	16,349	13,196	13,926	15,295	15,231
	Yes	130	0	1,400	1,541	1,280	1,376
Rate of entrant exports		0.009	0.000	0.096	0.100	0.077	0.083
Hungary	No	51,707	49,485	38,715	47,006	47,857	47,720
	Yes	1	0	43	64	109	149
Rate of entrant exports		0.000	0.000	0.001	0.001	0.002	0.003
Portugal	No	-	16,146	13,754	15,889	18,035	17,730
	Yes	-	0	376	453	555	561
Rate of entrant exports		-	0.000	0.027	0.028	0.030	0.031

Table 12d. Number of Exporters and Corresponding Exports of the 2010 Cohort of Entrant and Incumbent Exporters

		Year					
Country	Entrant Exporter in 2010	2007	2008	2009	2010	2011	2012
Number of Exporters							
France	No	1,687	1,772	1,933	1,933	1,758	1,700
	Yes	98	91	0	259	161	133
Rate of entrant exporters		0.055	0.049	0.000	0.118	0.084	0.073
Hungary	No	1,227	1,270	1,324	1,324	1,293	1,274
	Yes	16	15	0	50	33	39
Rate of entrant exporters		0.013	0.012	0.000	0.036	0.025	0.030
Portugal	No	-	5,033	5,735	5,735	5,265	5,072
	Yes	-	582	0	1,635	1,047	994
Rate of entrant exporters		-	0.104	0.000	0.222	0.166	0.164
Aggregate Exports (M€)							
France	No	14,861	16,120	14,387	15,467	16,431	16,472
	Yes	387	369	0	276	366	330
Rate of entrant exports		0.025	0.022	0.000	0.018	0.022	0.020
Hungary	No	51,665	49,424	38,743	47,071	47,934	47,804
	Yes	20	21	0	42	44	94
Rate of entrant exports		0.000	0.000	0.000	0.001	0.001	0.002
Portugal	No	-	15,835	13,863	16,342	18,346	17,969
	Yes	-	4,749	0	5,115	5,685	6,261
Rate of entrant exports		-	0.231	0.000	0.238	0.237	0.258

Table 12e. Number of Exporters and Corresponding Exports of the 2011 Cohort of Entrant and Incumbent Exporters

		Year					
Country	Entrant Exporter in 2011	2007	2008	2009	2010	2011	2012
Number of Exporters							
France	No	1,638	1,699	1,758	1,919	1,919	1,734
	Yes	131	131	110	0	284	161
Rate of entrant exporters		0.074	0.072	0.059	0.000	0.129	0.085
Hungary	No	1,216	1,254	1,293	1,326	1,326	1,300
	Yes	14	14	11	0	48	38
Rate of entrant exporters		0.011	0.011	0.008	0.000	0.035	0.028
Portugal	No	-	5,181	5,265	6,312	6.312	5,664
	Yes	-	569	550	0	1,512	942
Rate of entrant exporters		-	0.099	0.095	0.000	0.193	0.143
Aggregate Exports (M€)							
France	No	15,028	16,321	14,256	15,535	16,797	16,717
	Yes	490	500	142	0	727	201
Rate of entrant exports		0.032	0.030	0.010	0.000	0.041	0.012
Hungary	No	51,597	49,375	38,689	47,050	47,978	47,894
	Yes	36	55	10	0	82	126
Rate of entrant exports		0.001	0.001	0.000	0.000	0.002	0.003
Portugal	No	-	20,438	13,742	21,315	24,031	24,123
	Yes	-	256	215	0	454	510
Rate of entrant exports		-	0.012	0.015	0.000	0.019	0.021

Table 12f. Number of Exporters and Corresponding Exports of the 2012 Cohort of Entrant and Incumbent Exporters

		Year					
Country	Entrant Exporter in 2012	2007	2008	2009	2010	2011	2012
Number of Exporters							
France	No	1,611	1,655	1,693	1,734	1,895	1,895
	Yes	129	125	112	99	0	275
Rate of entrant exporters		0.074	0.070	0.062	0.054	0.000	0.127
Hungary	No	1,208	1,244	1,275	1,300	1,338	1,338
	Yes	15	12	9	13	0	52
Rate of entrant exporters		0.012	0.010	0.007	0.010	0.000	0.037
Portugal	No	-	5,182	5,259	5,664	6,606	6,606
	Yes	-	408	401	402	0	1328
Rate of entrant exporters		-	0.073	0.071	0.066	0.000	0.167
Aggregate Exports (M€)							
France	No	14,984	16,180	14,109	15,271	16,698	16,918
	Yes	124	95	103	85	0	232
Rate of entrant exports		0.008	0.006	0.007	0.006	0.000	0.014
Hungary	No	51,602	49,405	38,681	47,035	48,047	48,020
	Yes	3	6	3	2	0	27
Rate of entrant exports		0.000	0.000	0.000	0.000	0.000	0.001
Portugal	No	-	20,136	13,491	20,726	23,866	24,634
	Yes	-	118	89	80	0	194
Rate of entrant exports		-	0.006	0.007	0.004	0.000	0.008

Table 13a. Export Market Reentry of Firms that Cease Exporting in 2008

		Year					
Country	Reentry in 2010	2007	2008	2009	2010	2011	2012
Number of Exporters							
France	Yes	67	91	0	91	66	63
	No	102	190	0	0	40	46
Hungary	Yes	8	15	0	15	6	9
	No	29	37	0	0	6	7
Portugal	Yes	0	582	0	582	450	426
	No	0	655	0	0	185	211
Aggregate Exports (M€)							
France	Yes	355	369	0	192	327	308
	No	302	377	0	0	523	15
Hungary	Yes	18	21	0	15	21	59
	No	25	30	0	0	5	9
Portugal	Yes	0	4,749	0	4,854	5,361	5,953
	No	0	65	0	0	31	34

Table 13b. Export Market Reentry of Firms that Cease Exporting in 2009

		Year					
Country	Reentry in 2011	2007	2008	2009	2010	2011	2012
Number of Exporters							
France	Yes	76	91	110	0	110	69
	No	99	117	182	0	0	36
Hungary	Yes	8	8	11	0	11	8
	No	22	24	32	0	0	2
Portugal	Yes	0	384	550	0	550	408
	No	0	329	653	0	0	180
Aggregate Exports (M€)							
France	Yes	165	156	142	0	145	131
	No	95	74	67	0	0	4
Hungary	Yes	31	50	10	0	31	66
	No	13	12	6	0	0	0
Portugal	Yes	0	222	215	0	244	292
	No	0	89	52	0	0	31

Table 13c. Export Market Reentry of Firms that Cease Exporting in 2010

		Year					
Country	Reentry in 2012	2007	2008	2009	2010	2011	2012
Number of Exporters							
France	Yes	71	73	76	99	0	99
	No	76	91	99	174	0	0
Hungary	Yes	8	8	7	13	0	13
	No	19	23	24	35	0	0
Portugal	Yes	0	209	221	402	0	402
	No	0	225	249	656	0	0
Aggregate Exports (M€)							
France	Yes	112	84	94	85	0	85
	No	108	84	37	122	0	0
Hungary	Yes	1	4	3	2	0	3
	No	87	66	50	60	0	0
Portugal	Yes	0	90	75	80	0	107
	No	0	55	46	62	0	0

Table 14a. Export Behavior of the Cohort of New Exporters in 2008

Country	2007	2008	2009	2010	2011	2012
Number of Exporters						
France	-	312	200	167	158	148
Hungary	-	74	59	62	54	53
Aggregate Exports (M€)						
France	-	1,550	1,137	1,404	1,605	1,464
Hungary	-	152	170	173	207	269
Exports Growth (median, %)						
France	-	-	-9.34	9.22	8.00	-6.09
Hungary	-	-	4.39	8.03	8.11	16.28
Firm Exports (median, M€)						
France	-	0.02	0.03	0.06	0.04	0.04
Hungary	-	0.25	0.50	0.55	1.36	1.24
Domestic Sales Growth (median, %)						
France	-	-3.76	-11.96	3.65	3.40	-1.03
Hungary	-	-3.60	-20.55	0.69	-9.48	2.27

Table 14b. Export Behavior of the Cohort of New Exporters in 2009

Country	2008	2009	2010	2011	2012
Number of Exporters					
France	-	245	161	144	134
Hungary	-	65	54	48	44
Portugal	-	1, 192	702	700	707
Aggregate Exports (M€)					
France	-	1,400	1,541	1, 280	1, 376
Hungary	-	43	64	109	149
Portugal	-	376	453	555	561
Exports Growth (median, %)					
France	-	-	23.23	-0.95	2.06
Hungary	-	-	56.31	33.60	-2.99
Portugal	-	-	26.53	23.29	13.38
Firm Exports (median, M€)					
France	-	0.02	0.03	0.04	0.07
Hungary	-	0.08	0.18	0.41	0.42
Portugal	-	0.01	0.03	0.04	0.05
Domestic Sales Growth (median, %)					
France	2.40	-16.74	5.78	6.51	-0.97
Hungary	4.17	-18.62	2.06	-7.70	7.44
Portugal	-	-12.48	1.43	-7.52	-9.35

Table 14c. Export Behavior of the Cohort of New Exporters in 2010

Country	2009	2010	2011	2012
Number of Exporters				
France	-	259	161	133
Hungary	-	50	33	39
Portugal	-	1,635	1,047	994
Aggregate Exports (M€)				
France	-	276	366	330
Hungary	-	42	44	94
Portugal	-	5,115	5,685	6,261
Exports Growth (median, %)				
France	-	-	8.79	0.56
Hungary	-	-	2.53	18.94
Portugal	-	-	16.35	6.99
Firm Exports (median, M€)				
France	-	0.02	0.03	0.07
Hungary	-	0.08	0.46	0.63
Portugal	-	0.01	0.04	0.05
Domestic Sales Growth (median, %)				
France	-7.45	-2.39	3.65	-2.18
Hungary	-13.74	-6.75	8.88	6.27
Portugal	-3.58	-5.42	-6.46	-9.06

Table 14d. Export Behavior of the Cohort of New Exporters in 2011

Country	2010	2011	2012
Number of Exporters			
France	-	284	161
Hungary	-	48	38
Portugal	-	1,512	942
Aggregate Exports (M€)			
France	-	727	201
Hungary	-	82	126
Portugal	-	454	510
Exports Growth (median, pp)			
France	-	-	3.02
Hungary	-	-	27.67
Portugal	-	-	19.99
Firm Exports (median, M€)			
France	-	0.02	0.07
Hungary	-	0.36	0.92
Portugal	-	0.01	0.03
Domestic Sales Growth (median, %)			
France	4.18	0.08	-2.13
Hungary	9.80	-7.85	10.65
Portugal	6.18	-11.10	-9.36

Table 14e. Export Behavior of the Cohort of New Exporters in 2012

Country	2011	2012
Number of Exporters		
France	-	275
Hungary	-	52
Portugal	-	1,328
Aggregate Exports (M€)		
France	-	232
Hungary	-	27
Portugal	-	194
Exports Growth (median, %)		
France	-	-
Hungary	-	-
Portugal	-	-
Firm Exports (median, M€)		
France	-	0.02
Hungary	-	0.13
Portugal	-	0.01
Domestic Sales Growth (median, %)		
France	6.23	-5.31
Hungary	-3.08	-11.03
Portugal	-4.33	-12.05

Productivity and Export Intensity

1. Introduction

Exports are perceived to play an important role in fostering economic growth and are a topic of ongoing research interest. Research at the firm level has concluded that the main determinant of export market participation is firm productivity (Bernard et al., 1995; Wagner, 2007). However, firm export market participation is only the first step of a more comprehensive internationalization process that might lead to the establishment of manufacturing subsidiaries abroad, as a way to avoid trade costs associated with exports from the home country, in a process which is also largely determined by productivity (Johanson & Vahlne, 1977; Dunning, 1980; Brainard, 1993; Grossman et al., 2006). Thus, while firms are required to have high productivity to initiate exporting activities, further productivity increases might eventually have a detrimental effect on firm exports. This might occur if the optimal international strategy of firms is changed from one where firms export from their home country to host countries to one where they become multinationals and establish local subsidiaries to supply the host country, with possibly no exports from the home to host countries.

If the optimal international strategy of firms changes as their productivity increases, this implies that the more productive exporting firms eventually relocate manufacturing activities to host countries. The impact of this relocation can be relevant for country exports as these are sometimes dependent on a small number of large exporting firms. We examine the relationship between productivity and multinationality of domestic firms, and the relationship between productivity and the export behavior of non-multinational domestic firms, domestic multinational firms and foreign affiliates of multinationals. We compare the results obtained with predictions from the literature on international trade with heterogeneous firms. First, we look at the participation of domestic firms in international markets as productivity increases, both in terms of export intensity and subsidiary establishment. Second, we look for evidence related with the hypothesis that subsidiary establishment of domestic firms is associated with a decrease

in export intensity behavior at home. Third, as countries are FDI recipients as well as FDI contributors, we examine the relationship between productivity and export orientation of foreign affiliates operating in a host country, and compare with findings for other countries.

Using recent data on manufacturing firms operating in Portugal we find that domestic multinationals and foreign affiliates of multinationals account for a very large share of overall country exports. We find that domestic firms with low productivity focus on the domestic market, domestic firms with higher productivity export more, and domestic firms with the highest productivity are multinationals. We find little support that domestic multinationals with higher productivity export less intensely, and we discuss how this finding could result from initial subsidiaries being established as non-manufacturing sales outposts. We find no support for a direct relationship between productivity and export orientation of foreign affiliates of multinationals, and discuss how the international integration strategies of foreign affiliates, as determined by host country factors such as transport and labor costs, might contribute to this finding.

2. Theoretical Framework

2.1 High productivity firms become exporters

A persistent finding in the empirical literature on exports is that exporting firms are larger and more productive than non-exporting firms (Wagner, 2007). It has been found that the high productivity of exporters is better explained by the selection of high productivity firms into exporting than by the existence of accrued productivity benefits attained after firms begin exporting and become exposed to international markets. In fact, the superior performance characteristics of exporting firms have been found to precede exporting status of firms by several years (Bernard & Jensen, 1999), while there is no significant empirical support for additional performance benefits to exporters due to firm engagement in export activities (Clerides et al., 1998).

The existence of productivity requirements for exporting is expected, as exporting activity requires that firms bear additional costs relative to domestic activity. Entry in export markets requires that firms bear fixed costs of entry associated with the

establishment of distribution or service networks, workforce training or product compliance (Baldwin, 1988). While some of these costs may be sunk, continued operation in export markets requires that firms repeatedly incur in transport costs and thus remain high productivity firms.

2.2 High productivity firms also become multinationals

Multinationals must be high productivity firms, as they bear high fixed costs of FDI, and as they must possess firm-specific advantages to overcome the costs of operating in foreign countries (Dunning, 1980). Some of these firm-specific advantages are ownership of firm-specific intangible assets. In fact, the decision to become a multinational firm has been derived as the optimal mode of serving a foreign market, in opposition to alternatives such as licensing agreements or exporting, when firms attempt to prevent the dissipation of proprietary knowledge-based assets (Ethier & Markusen, 1991). The multinational firm is then viewed as an international network of affiliates with access to firm-specific intangible assets, related to expertise in engineering, management or marketing (Horstmann & Markusen, 1987), and which are available inside the multinational firm as public goods.

The decision to become a multinational firm has also been derived as the result of high productivity firms choosing to spread production internationally, as international organization of production allows multinationals to exploit scale economies and international factor price differentials (Dunning, 1993). However, only high productivity firms, with sufficiently low variable costs of production, could profitably attain those cost related advantages and thus become multinationals (Grossman et al., 2006).

2.3 Most affiliates of multinationals do not export from the host country, in spite of their high productivity

Multinationals set up affiliates for different reasons. Whether affiliates are set up as exporting firms or not depends on the motive to set up affiliates in the first place. On the one hand, if multinationals set up affiliates with fear of dissipation of knowledge-based assets as a primary motive, it is in part because the alternative of exporting from

the home to the host country is costly, and thus we expect that foreign affiliates established under this motive will focus on production for the domestic market of the host country. Multinational firms establish subsidiaries in host countries, in part, to prevent the transport costs associated with international trade between home and host countries (Brainard, 1993), and the majority of foreign affiliates have a predominantly domestic market oriented activity (Kneller & Pisu, 2004). Thus, costly exporting due to transport costs precludes a significant exporting behavior for the affiliates of multinationals in both the home or host country.

On the other hand, some multinational firms do establish exporting affiliates in host countries. Noting a growing importance of intra-firm trade, Hanson et al. (2005) show that multinationals organized in vertical production networks place labor-intensive input-processing activities in low-wage countries, thus leading to the establishment of exporting subsidiaries abroad in order to exploit low labor costs in host countries. The establishment of exporting affiliates is not restricted to vertically integrated multinational firms. Export platform production, where multinational firms establish manufacturing affiliates abroad in order to export to third countries or to the home country, is also an empirically important outcome as found by Hanson et al. (2005). Export platform production in low-cost low-demand countries has been derived as an optimal multinational location strategy to serve demand in a free-trade area such as the EU or the NAFTA. This strategy allows for the large scale economies associated with production in a single plant inside a larger regional bloc to serve its demand, while holding the ability to exploit factor price differentials (Ekholm et al., 2007).

Summing up, some foreign affiliates have exporting activities in the host country, although most foreign affiliates are not expected to have exporting activities. The exporting activity of foreign affiliates in host countries can be accounted for with concentration of production in order to achieve scale economies, or with intermediate production in order to draw from favorable factor price differentials, in particular labor prices. Multinational exporting behavior at the home country is left undetermined for the abovementioned strategies. While multinationals are always expected to maintain headquarter services in the home country, whether they displace manufacturing activities from the home country to host countries depends on the overall motives for establishing subsidiaries.

2.4 Higher productivity allows exporters to become multinationals

Firms usually follow a gradual internationalization process that starts with ad hoc exporting, to deals with intermediaries in foreign markets, and that may progress until the establishment of subsidiaries, first as sales organizations, and later on as local manufacturers (Johanson & Vahlne, 1977). Progress along internationalization stages necessarily alters the exporting role for the multinational firm at home. In particular, if firms establish manufacturing subsidiaries in host countries, it may be in substitution of home exports to the host country. However, the effect of subsidiary establishment on home export behavior is not clear, as subsidiaries may be established as non-manufacturing sales outposts in the host country, to be used as distribution or service networks, in which case they could actually increase home exports.

Progress over the various internationalization stages requires, however, that firms overcome several productivity hurdles, as discussed earlier. In fact, international trade models usually model FDI and international trade decisions of firms as linked and dependent on the learned productivity of individual firms. The derived outcome is that low productivity firms operate in domestic markets, as they cannot profitably incur in the additional transport and trading costs of export markets, and high-productivity firms participate in foreign markets, with the most productive among these opting to serve foreign markets with manufacturing in host countries, due to FDI being more costly than exporting (Helpman et al., 2003). This relationship between the productivity of firms and participation in international markets still holds when firms face richer integration choices, namely, when firms are able to conduct one or more stages of production internationally. Grossman et al. (2006) show that, in the absence of transport costs, as assumption that immediately invalidates horizontal location motives where multinationals set up non exporting affiliates in host countries, firms might still locate in a low-demand low-wage country as part of an export platform or vertical FDI international production strategy. As in the case of a single stage of production, only firms with sufficiently high productivity can incur the fixed costs of any manufacturing FDI activity, as these firms are granted larger variable cost savings associated with production in the low-wage low-

demand country. Firms with insufficiently high productivity must remain in home production and resort to exports to serve foreign markets (Grossman et al., 2006).

Thus, productivity is the key determinant of the optimal international integration strategy of firms, and determines both which firms export or not and which firms establish subsidiaries or not. An increase in productivity of firms that are already exporters might lead them to establish manufacturing subsidiaries abroad. Thus, for sufficiently high productivity firms, and in contrast to the effect found at earlier stages of the international process, further increases in productivity might have a negative effect on home exports due to a partial or complete displacement of exports from the home to the host country with local production in the host country.

2.5 The impact of productivity increases on the home country export behavior of multinationals varies with existing levels of firm productivity

The impact of productivity increases in the home country export behavior of firms depends on the nature of the subsidiaries being established in the host countries. On the one hand, establishment of manufacturing subsidiaries abroad is expected to have a negative impact in home country export behavior of firms, at least initially, as most subsidiary establishment is done for horizontal motives (Brainard, 1993), and thus it is likely that most manufacturing subsidiaries being established abroad are established in order to perform local production for local markets. On the other hand, multinational firms may wish to build distribution networks and thus establish non-manufacturing subsidiaries in order to achieve that purpose. The establishment of non-manufacturing subsidiaries should have a positive effect on home country export behavior.

The establishment of non-manufacturing subsidiaries is sometimes the first stage in a process leading to the establishment of manufacturing subsidiaries. It has been found that some firms establish subsidiaries abroad as part of setting up a distribution network and then gradually increase the number of manufacturing stages performed at the subsidiary (Johanson & Vahlne, 1977). Multinational firms that choose to initiate manufacturing activities, where they had previously only set up distribution networks, are likely to have higher productivity than firms that do not initiate manufacturing

subsidiaries. In fact, when firms choose between establishing more plants that have associated higher fixed costs, and establishing fewer plants but with distribution networks that have have associated lower fixed costs but higher variable costs, only the most productive firms choose the former option, as the most productive firms are more interested in minimizing variable costs of operation due to having higher levels of production than less productive firms (Lu et al., 2010).

Thus, if the initial subsidiary establishment is mostly done as an effort to enhance the distribution network of the firm, rather than to perform manufacturing activities, we expect initial productivity increases to translate into higher home country export intensity for multinational firms. By establishing subsidiaries to perform the role of distribution networks firms increase their ability to sell their products and thus improve their export performance in their home country. However, we expect further increases in productivity to eventually result in the establishment of manufacturing subsidiaries that can lead firms to, at least partially, withdraw from home market exports as they perform production locally in the host country.

2.6 The impact of productivity increases on the host country export behavior of manufacturing affiliates of multinationals is undetermined at the outset

Most of the previous discussion addresses how the establishment of subsidiaries might influence the export behavior of multinational firms in their home country, under the assumption that most multinationals establish manufacturing affiliates for horizontal motives. While this motive might be valid for most firms (Brainard, 1993), particularly for those at the early stages of the internationalization process (Johanson & Vahlne, 1977), it does not foresee any exporting role for foreign affiliates on host countries and thus cannot explain the disproportionate share of country exports held by foreign affiliates (Kneller & Pisu, 2004). The strategies of vertical integration and export platform mentioned earlier, account for the exporting behavior of foreign affiliates operating in a host country. Concentration of final or intermediate production in a single country host country leads to the prediction of a positive relationship between productivity and export intensity for manufacturing affiliates in host countries, as the

higher production levels of the more productive firms cannot be fulfilled with production in alternative plants, as in the case of horizontally integrated multinationals.

Contrary to this hypothesis, Lu et al. (2010) find that, in China, exporting foreign affiliates are less productive than non-exporting foreign affiliates. The authors develop a model similar to the model developed by Grossman et al. (2006) to illustrate how a negative relationship between productivity and the export status of foreign affiliates can be derived, if firms choose between establishing individual plants to serve local markets and establishing a single plant with distribution networks to serve both the local market and markets abroad. In this setting, as discussed earlier, non-exporting foreign affiliates are required to have higher productivity, in order to be able to bear the higher fixed costs associated with establishing individual plants over establishment of distribution networks. Unlike domestic firms, the firms now considered are at a more advanced internationalization stage, since they are productive enough to establish manufacturing subsidiaries abroad, but face a choice between an export platform strategy that concentrates production in a single country and a horizontal integration strategy that disperses production in independent countries. The selection of higher productivity foreign affiliates into local host country manufacturing is driven by a change in the optimal integration strategy from export platform production to local production in independent locations when productivity is sufficiently high. This argument would predict, for instance, that some high productivity firms would eventually displace activities from low-cost host countries to their home countries when faced with positive productivity shocks, which might be an empirically relevant result (Sirkin et al., 2012).

However, the result found by Lu et al. (2010) can be dependent on the considered setting. In fact, the result is driven under the assumption of a large domestic demand, both theoretically and in the empirical setting used. If domestic demand is low, the productivity threshold to make firms abandon an export platform strategy in favor of local production should be higher. Thus, a low domestic demand could be insufficient to drive a large number of high productivity firms to establish local manufacturing plants to the point of inducing a significantly negative relationship between productivity and export status for foreign affiliates. Additionally, if the low demand country is located inside a large free-trade region with low transport costs with neighboring countries, these costs subsequently reduce the value of exclusively local production and make it less

likely to occur. While multinationals might take the larger regional market as the relevant market, and consider installing manufacturing plants at a regional level to substitute distribution networks, this might still not have a visible effect in the export intensity of the local affiliate if the affiliate is accustomed to supply neighboring markets, and thus not contributing to induce a negative relationship between productivity and export intensity. In out setting we will consider a low-demand low-wage country located inside a larger regional free trade area, to test the relationship between productivity and export intensity of foreign affiliates, as countries with this profile have been conjectured to be the most likely recipients of export platform motivated FDI (Ekholm et al., 2007).

3. Data and Methods

3.1 Data

We use data from the SABI dataset which is provided by Bureau van Dijk, and whose primary source in Portugal is "Informação Empresarial Simplificada", a mandatory yearly survey conducted by administrative entities. Almost the entire population of Portuguese firms is legally required to hand in these surveys, although some legal forms are exempted, mostly non-profit or unlimited liability organizations. The information collected contains balance sheet and income statement data, including information on export activity for recent years.

Firms are also required to provide ownership information, including shareholder and subsidiary stakes along with the country of origin or destination of these stakes. Bureau van Dijk combines this ownership information with exhaustive ownership information collected from firm public reports on an international basis, in an effort to identify the ultimate shareholder of the firm and its nationality by following all known majority shareholder upstream links for the firm.

Unfortunately, we are only provided with ownership information at the date of data collection, and are not able to identify firm ownership changes, although we expect firm ownership data to be stable. We use information on the nationality of the ultimate shareholder of the firm to assign foreign status to firms, and are also able to identify domestic multinationals, defined as domestic firms that report established subsidiaries abroad.

We have access to a panel of firms operating in Portugal from 2008 until 2011, from which we select firms with primary activity in the manufacturing sector, and thus classified within ISIC Rev. 4 codes 10 to 33. We restrict our analysis to manufacturing firms, as our earlier discussion does not conform to the determinants of exports and subsidiary establishment decisions of firms operating in the services or in the primary sector. Industry classification data is also only available at the date of data collection, although we also expect that it is not a significant source of error, as we do not expect that many firms change their main industry during the short time span of the data.

Additionally, we drop firms with missing values for any of the following variables: fixed assets, number of employees and added value. In order to comply with the requirements of our estimation procedures, we also drop a small number of firms with negative values for added value and firms operating in three-digit ISIC sectors with less than 10 firms in total. Finally, due to irregular coverage of data, we use a constant sample of firms that are observed in every year of the panel and satisfy all of the cleaning procedures described above. The choice to have a balanced panel was made due to the nature of exports data. A few firms contribute disproportionately to total Portuguese exports in any given year. By choosing to have a balanced panel, we ensure that our results are not influenced by irregular coverage in some years of a few small firms that contribute disproportionately to overall exports. We also expect that the risks incurred in having a balanced panel are minimized since we do not expect that most firms that participate or that are at risk of participating in international markets are firms that enter or exit operation during the time span of the panel, due to the productivity requirements in the participation in international markets.

Our final sample includes 15,580 non-multinational or purely domestic firms, 100 domestic multinationals and 209 foreign firms. All nominal variables are deflated with the GDP price deflator and reported at 2011 prices.

3.2 Empirical Strategy

We follow a two-step approach. First, we estimate input coefficients of Cobb-Douglas production functions separately for each individual industry, in order to obtain total factor productivity (TFP) estimates for individual firms. Second, for each firm ownership type, we regress firm export orientation on firm productivity, using the estimates of firm productivity obtained in the first step.

3.2.1 Production Function Estimation

To obtain TFP estimates for individual firms we estimate several specifications of the following equation:

$$y_{it} = \beta_0 + \beta_l l_{it} + \beta_k k_{it} + \omega_{it} + \eta_{it}$$

where y_{it} is the logarithm of value added, used to measure of firm output, and l_{it} and k_{it} are the logarithm of labor and capital, respectively. The error term is assumed separable into ω_{it}, a productivity component and η_{it}, an i.i.d component.

Estimation of the previous equation presents several challenges. The first problem is the simultaneity of input choice. If firms with higher productivity choose higher input levels, then productivity and input usage will be positively correlated and the OLS estimator will be biased upwards for both input coefficients.

We could also have a selection bias. If firms find capital inputs harder to adjust than labor inputs, negative productivity shocks are less likely to lead to firm exit in firms with higher levels of capital. This effect would generate a downwards bias in the OLS estimator of the capital coefficient (Van Beveren, 2012). However, selection bias is found to be much less important empirically than the simultaneity bias (Levinsohn & Petrin, 2003).

There are several alternatives to overcome these problems. The procedures introduced by Olley and Pakes (1996) and Levinsohn and Petrin (2003) are frequently used and make use of assumptions on the timing and dynamics of input usage and TFP, as well as the relationship between inputs and TFP, in order to obtain semi-parametric estimators that are consistent in the presence of a simultaneity bias and even for the less severe selection bias effect in the case of the first procedure.

A less structural approach is to use a fixed effects estimator (Pavcnik, 2002; Levinsohn & Petrin, 2003; Eberhardt & Helmers, 2010). The fixed effects estimator will provide consistent estimates for input coefficients under the assumption that ω_{it} is firm specific but time invariant, that is, assuming $\omega_{it} = \omega_i, \forall_t$, which would be unreasonable if firms had time to adjust inputs to their realized productivity. As the fixed effects estimator only uses within firm variation, it is not subject to the simultaneity bias. Assumption of time-invariant fixed effects for firms rules out the selection bias from exit that is due to the realization of low productivity shocks by assumption.

However, fixed effects estimation may be appropriate to our setting. The assumption of time invariant fixed effects may be suited to our short panel. Also, the time period used in out panel provides particularly high within firm variation, thus minimizing the downfall of only using within firm variation instead of cross section variation. Accordingly, we perform fixed effects regressions by each manufacturing sector in our panel, both using two-digit and three-digit ISIC sectors. For comparison purposes, we also perform equivalent OLS regressions for each manufacturing sector in our panel.

3.2.2 Export Intensity Regressions

After obtaining TFP estimates, we estimate several specifications of the following equation with OLS regressions:

$$EI_{it} = DOM\times(\beta_0^{DOM} + \beta_1^{DOM}TFP_i) + DMNE\times(\beta_0^{DMNE} + \beta_1^{DMNE}TFP_i) + \\ + FOR\times(\beta_0^{FOR} + \beta_1^{FOR}TFP_i) + \gamma_{it} + \epsilon_{it}$$

where EI_{it} is firm export intensity, the share of firm output that is exported, DOM, DMNE and FOR are dummies for firm ownership type, indicating whether the firm is a (purely) domestic firm, a domestic multinational or a foreign affiliate. γ_{it} stands for a set of common control variables which include, according to specification, 4 year dummies, 21 location dummies and 74 three-digit industry dummies (corresponding to 22 two-digit industries).

4. Results

Table 16 presents aggregate values for performance and input variables in 2011 for our sample. Aggregate value added in our sample is roughly 4% of the GDP of Portugal, which was 185 billion euros in 2011. This low percentage is due to the restriction to manufacturing sectors only, as manufacturing only accounts for about 13% of the GDP in Portugal (World Bank data for 2010; data not available for 2011, but with overall decreasing trend). However, firms in our sample account for a stable share of about 30% of total Portuguese exports in the sample period, as can be seen in Table 17. Thus, the contribution of the manufacturing sector to overall exports is disproportionate to the overall importance in the GDP, and we should study the manufacturing sector in detail in order to understand export behavior.

We can also observe in Table 16 that domestic multinationals account for around 10% of aggregate sample values in assets, sales, exports and value added, and a substantially smaller share of the number of employees. Foreign affiliates account for around 20% of aggregate assets, value added and sales in our sample, and also account for a substantially smaller share of employees. Nevertheless, foreign affiliates are responsible for a very large share of exports, particularly EU exports as they account for 40% of EU exports in our sample.

Table 18 displays the distribution of firms by each two-digit ISIC Industry. The aggregate number of firms is around 15,000, which compares to a population of around 38,000 manufacturing firms (data from Statistics Portugal). Thus we are able to account for around 30% of manufacturing output and 40% of the number of firms. Although these shares are imprecise, they may indicate an overrepresentation of smaller firms in our sample. Both domestic multinationals and foreign affiliates seem to be moderately well distributed across sectors, although the distribution of domestic multinationals seem to follow more closely that of domestic firms.

Table 19 displays averages of key variables in our sample by firm ownership type. The distribution of some of these variables is depicted in Figure 1. Variables that are directly related with input use such as assets, fixed assets, number of employees, labor costs, skill and labor productivity, are all similar among domestic multinationals and foreign affiliates, although the similarity is smaller for labor related variables, as foreign affiliates seem to hire less workers but more skilled ones, when compared to domestic

multinationals. For any of these variables, foreign affiliates and domestic multinationals have significantly higher average values than domestic firms. Figure 1 illustrates how the distributions of input usage variables and performance variables are similar among domestic multinationals and foreign affiliates, and dissimilar between domestic firms and either domestic multinationals and foreign affiliates. In spite of this similarity, the distributions of input usage and performance variables of foreign affiliates are more left skewed and exhibit higher dispersion than the distributions of domestic multinationals.

Foreign affiliates export considerably more than domestic multinationals, although they are not located in industries with higher levels of export orientation and a higher percentage of domestic multinationals are exporters. Foreign affiliate export intensity is more polarized than that of domestic multinationals, as most foreign affiliates either export most of their production or a small amount of their total production, in contrast with a much more even distribution of domestic multinational firms over export intensity. This helps us understand the relative left skew of the distribution of characteristics for foreign affiliates relative to that of domestic multinationals, as an important number of foreign affiliates are domestic market oriented and thus can operate at a smaller scale than domestic multinationals. Foreign affiliate exports are more EU market oriented than those of domestic multinationals, and the latter group of firms seems to perform better than foreign affiliates in non-EU markets, as illustrated in Figure 1. Domestic firms have a poorer export performance than any other group of firms, with lower exports, a low percentage of exporters and low export intensity among exporters.

Table 20 and Table 21 present estimates for input coefficients obtained with a set of pooled OLS regressions by both two and three digit industries. As discussed above, the output variable used is deflated value added. The labor input variable used is the number of employees and the capital input variable is deflated fixed assets. Average coefficients for labor and capital are similar in the two-digit or three-digit industry specifications. In the case of a two-digit industry specification, the average capital input coefficient is 0.92 and the average labor input coefficient is 0.15. Average sum of coefficients is 1.08, in favor of returns to scale, with almost no sector reporting negative returns to scale. In the latter case of a three-digit industry specification, the average capital input coefficient is slightly higher at 0.94 and the average labor input coefficient is slightly smaller at 0.14.

Average sum of coefficients is still 1.08, again in favor of returns to scale for almost all sectors.

In Table 22 and Table 23 we report the input coefficients obtained using a fixed effects estimator (within estimator). As expected from the existence of a simultaneity bias leading to an upward bias in OLS estimates, there is a drop in average input coefficient estimates for both input types. In the two-digit case, the average labor input coefficient is now 0.61 and the average capital input coefficient is 0.07, with an average sum of coefficients of 0.68, in favor of decreasing returns to scale, although two sectors still exhibit increasing returns to scale and the overall distribution of the sum of coefficients is larger. In the three-digit case, average labor input coefficient, average capital input coefficient and average coefficient sum are all the same as in the two-digit case.

The capital input coefficient appears to be small, although these input coefficient estimates are similar to those generally found performing fixed effects estimations with value added as the output variable. In particular, Eberhardt and Helmers (2010) find fixed effects estimation to hold a capital input coefficient of around 0.2, sometimes near 0.1, depending on specification. Additionally, fixed assets are generally 25% to 30% of total assets (Table 16). Total assets include intangible assets, which are one the discussed sources of firm productivity, and thus should be excluded. If we were to include total assets as our capital input variable and perform fixed effects regressions we would obtain input coefficients of 0.53 for both labor and capital at the two-digit level and 0.52 and 0.50 for labor and capital, respectively, at the three-digit level (not reported).

In Figure 2 we plot the distribution of TFP estimates according to these 4 specifications and firm ownership type. The distribution of TFP estimates obtained with pooled OLS estimations at the two-digit or three-digit industry level appears to be unreasonably different from the distributions of any performance related variables in Figure 1. On the other hand, either of the two distributions obtained under fixed effect estimations seems to agree with the overall shape of performance variables in Figure 1. As the pooled OLS estimator results in larger estimates for the capital and labor input coefficients, groups of firms with higher productivity and input usage will have more of their performance attributed to the higher input usage, resulting in smaller productivity residuals than in the fixed effect estimation case and smaller differences in estimated productivity across firm ownership groups. As can be seen in Table 24, TFP estimates

according to a two or three-digit industry level are also highly correlated for any chosen estimator and do not seem to hold considerable differences, although less so in the fixed effects case.

Table 26 reports the distribution of firm TFP estimates for our preferred specification of fixed effects regression at the three-digit level, by firm ownership type. It illustrates the similarity in the distribution of TFP estimates for foreign affiliates and domestic multinationals, a higher overall productivity of firms in any of these two groups relative to domestic firms, and also a slightly higher dispersion of productivity of foreign affiliates relative to domestic multinationals. At the last two classes of TFP estimates, we find only 0.4% of domestic firms, but 15% of domestic multinationals and 16.3% of foreign affiliates.

Figure 3 depicts how the TFP of firms of any ownership type increases as firm age increases. Accordingly, the slope of the lines fitted for any firm ownership type is always positive. The firm age coefficient of a simple linear regression of TFP estimates on firm age is always positive and significant at $p<0.001$, for foreign and purely domestic firms. For domestic multinationals it is still positive but not significant. This result is consistent with gradual productivity increases over time and can justify firms' gradual progress over internationalization stages (Johanson & Vahlne, 1977).

Figure 4 depicts a non-parametric local polynomial regression of export intensity on TFP estimates by firm ownership type. Domestic multinationals and foreign affiliates share overall similar levels of productivity, that are much higher than those for domestic firms. Domestic firms exhibit a positive relationship between productivity and export intensity. For foreign affiliates the relationship between productivity and export intensity appears to be negative, while for domestic multinationals the relationship between productivity and export intensity appears to be mostly flat, but negative for very high productivity levels.

We now turn to the second stage estimation results.

Table 15 displays the results of this estimation procedure in 4 different specifications. Export intensity is measured in percentage points. The first two specifications are performed with no additional control variables, while the last two specifications include three sets of dummy variables, including year dummies, location dummies at the district level, and industry sector dummies at the three-digit level. Specifications (1) and (3) include different intercepts and linear terms for each firm ownership type, while specifications (2) and (4) also include one quadratic term on productivity in order to allow for a non-linear effect of productivity on firm export intensity. Reported t-statistics are computed with robust standard errors, clustered at the firm level.

The specification in column (1) shows that foreign affiliates and domestic multinationals alike are much more export oriented than domestic firms. Both firm ownership dummies are above 50 percentage points, and thus we expect multinational firms of any type to export more than half of their output. We are not able to reject the null hypothesis that the dummies for foreign affiliate and domestic multinational are equal (*p-value* = 0.733). However, their response to an increase in productivity is different. While foreign affiliates exhibit a negative effect of productivity on export intensity, the effect of productivity on export intensity for domestic multinationals is not significant (*p-value* 0=0.943). Domestic firms, on the other hand, have an intercept of 12.6 percentage points, much lower than the intercepts of other ownership types, but a higher effect from productivity increases. Although the effect is strong enough to generate the predicted negative export intensity values for the range of productivity estimates for domestic firms in our sample, the threshold value is very low at -1.05, and thus it only occurs for a small group of firms (Table 25).

The specification in column (2) includes a quadratic term in productivity for every firm ownership type. All dummy coefficients seem similar to the estimates in specification (1). Again, we are unable reject the null hypothesis of equality of dummy coefficients for foreign affiliates and domestic multinationals. Domestic firms exhibit a significant linear coefficient estimate, which is similar in magnitude to the one found in specification (1), but also exhibits a positive and significant estimated coefficient for the quadratic term. The linear and quadratic coefficients for foreign affiliates are both negative, but no longer significant individually, although the *p-value* for the test of joint

significance of both coefficients is only 0.0503. Both the linear and quadratic coefficients for domestic multinationals are significant, but it is the only firm ownership type with estimated coefficients of different signs. Thus, the linear term is positive and the quadratic term is negative, thus implying initial positive effects of productivity on export intensity, but subsequent increases with diminishing positive effects. The coefficient estimates imply negative marginal effects of TFP from level 1.93 of TFP onwards, a region where 15% of domestic multinationals are located.

As discussed earlier, specifications (3) and (4) contain estimation results from OLS regressions that include sets of year, location and industry dummies as control variables. The results obtained are similar to those in specifications (1) and (2). Due to the inclusion of control variables, only differences in ownership dummies remain interpretable, not individual ownership dummy levels. We continue to fail to reject the null hypothesis of equality between the foreign affiliate dummy and the domestic multinational dummy, and these remain higher than the domestic dummy. In specification (3) all linear coefficients have the same sign and the magnitude only decreases considerably for domestic multinationals, while remaining not significant, relative to specification (1). The only change in significance levels is that the linear coefficient for foreign affiliates is no longer significant (*p-value* of 0.148). Specification (4) also holds similar results to specification (2). In particular, we are unable to reject the null hypothesis that ownership dummies for domestic multinationals and foreign affiliates are equal. Linear and quadratic coefficients for domestic firms are similar to specification (2). The sign and lack of significance for the linear and quadratic terms for foreign affiliates are also similar to specification (2), although it is even harder to reject the null hypothesis that the coefficients are jointly significant (*p-value* = 0.3645). For the linear and quadratic terms of domestic multinationals we have the same magnitude, sign and significance as in specification (2). The coefficient estimates for the linear an quadratic terms of domestic multinationals now imply negative marginal effects of TFP from level 2.44 of TFP onwards, a region where only 6% of domestic multinationals are located.

Table 15. OLS Regressions of Export Intensity

Dependent Variable: Export Intensity (in percentage points)

	(1)	(2)	(3)	(4)
Domestic	12.608***	11.686***	-2.031	-3.358**
	(65.893)	(52.806)	(-1.306)	(-2.118)
Domestic X TFP	11.969***	11.912***	12.357***	12.236***
	(34.119)	(34.059)	(37.914)	(37.990)
Domestic X TFP^2		2.291***		2.802***
		(6.509)		(8.518)
Foreign	53.453***	52.757***	33.251***	33.149***
	(12.641)	(11.073)	(7.690)	(6.811)
Foreign X TFP	-5.534**	-3.662	-3.600	-2.943
	(-2.080)	(-0.686)	(-1.447)	(-0.569)
Foreign X TFP^2		-0.666		-0.053
		(-0.496)		(-0.042)
DMNE	51.409***	47.445***	31.197***	26.797***
	(12.090)	(11.140)	(6.821)	(5.235)
DMNE X TFP	0.185	6.918*	1.065	7.832*
	(0.072)	(1.750)	(0.423)	(1.760)
DMNE X TFP^2		-1.788***		-1.606**
		(-2.919)		(-2.307)
Industry Dummies	*NO*	*NO*	*YES*	*YES*
Location Dummies	*NO*	*NO*	*YES*	*YES*
Year Dummies	*NO*	*NO*	*YES*	*YES*
Number of observations	63,556	63,556	63,556	63,556

Note: *** p<0.01, ** p<0.05, * p<0.1. *t-statistics* in parenthesis

A robustness check is performed to ensure that the choice of a linear probability model does not influence results in the presence of a fractional dependent variable that is bounded to the unit interval. We follow Papke and Wooldridge (1993) in using a method that combines the usual logistic transformation of the dependent variable with a binomial distribution, in order to allow the dependent variable to take extreme values of zero or one (not reported). For the subsets of firms that we are mostly interested, namely domestic multinationals and foreign affiliates, the only change in significance for the interaction terms with productivity is that the linear term for domestic multinationals in the equivalent specification to specification (3) is now significant, although still positive, which is still in agreement with our results. All significant productivity interaction terms have the same sign as before. Robustness of results for these groups of firms is expected

as they have non extreme export intensity values, as seen in Figure 4. However, as Figure 4 illustrates, domestic firms have some extreme values near to zero, and thus we expect that the convexity could be partially induced by the imposition of a linear probability model. Accordingly, the quadratic terms for domestic firms are negative in this regression. Thus we should interpret the quadratic term for domestic firms with caution when using the simpler and more easily interpretable linear probability model, although and we expect no bias in our results for the groups of multinational firms.

Our results suggest that, unconditional on productivity levels, domestic multinationals and foreign affiliates do not have significantly different export intensity levels, which stresses the importance of multinationality status for export performance, irrespective of the type of established subsidiaries. Hence, domestic multinationals and foreign affiliates alike seem to export at least a share of 30% of their output more than domestic firms, even if we control for industry, year and location.

However, the effect of an increase in productivity is different for domestic multinationals and foreign affiliates. The effect of productivity on the export intensity of domestic multinationals is initially positive and later on negative, as expected. Nevertheless, the threshold productivity level required to induce a negative marginal effect of productivity on export intensity of domestic multinationals is very high and thus unlikely to affect a significant number of domestic multinationals. These results are coherent with initially established subsidiaries performing a non-manufacturing distribution role, while subsequent subsidiaries may perform manufacturing roles. Although this effect does not seem to be very large, it is large enough to break down the overall positive association between productivity and export intensity. Finally, we cannot account for how much this particular setting influences the findings, as a low domestic demand might encourage the establishment of distribution networks. Also, a low-wage country located inside a larger regional free trade area is a good candidate to perform manufacturing activities, or at least, some input processing operations and thus we cannot account for how much Portuguese low labor costs relative to other countries inside the same free trade area are a deterrent to firm relocation of manufacturing activities into other countries, since our panel is comprised of a single country.

The international involvement of domestic firms according to their productivity level seems to be as follows: low productivity domestic firms are focused on the domestic market; the most productive domestic firms are exporters; the highest productivity domestic firms are multinationals. This results holds before and after controlling for industry, year and location and is consistent the predictions of the literature.

The productivity of foreign affiliates does not seem to have a significant effect on their export intensity, after industry, year and location are accounted for. Although the coefficient for the productivity variable is negative and significant before addition of control variables, and remains negative in specifications (3) and (4), we fail to reject the hypothesis that there is no effect of productivity on the export intensity of foreign affiliates in both specifications (3) and (4). Thus, we cannot reject the negative effect of productivity on export intensity of foreign affiliates, as found in Lu et al. (2010). While the persistently negative sign of the coefficients on productivity may suggest that the failure to find a negative relationship is due to a lower sample size than the one used in Lu et al. (2010), in particular since a clear relationship exists for domestic multinationals which constitute a smaller group of firms, it is consistent with the findings of other studies. It has been found that the export intensity of foreign affiliates in the United Kingdom is similarly unresponsive to individual firm characteristics when compared to domestic firms (Kneller & Pisu, 2004). This finding has been taken as evidence of the existence of complex integration strategies of multinationals whose strategic decisions are not explained in a linear fashion by firm characteristics, which is in agreement with our hypothesis that a low-demand low-wage setting moderates the effect of productivity on export intensity of foreign affiliates.

5. Conclusion

We studied the relationship between productivity and international participation of purely domestic firms, domestic multinationals and foreign affiliates of multinationals. We have found a direct relationship between the productivity of domestic firms and both export intensity and multinationality status, with the productivity hierarchy being the one predicted by the international trade literature, that is, low productivity domestic firms are domestic market oriented, higher productivity domestic firms export more, and the highest productivity domestic firms are multinationals.

We have found that multinationals as a whole make up for a very important share of exports and that the impact of productivity on the export intensity of multinational firms is different from that of purely domestic firms and thus the multinationality status of firms is important in assessing export behavior. Among multinational firms, domestic multinationals and foreign affiliates also respond differently to productivity, although they share similar characteristics and an overall similar level of export orientation.

We have found that domestic multinationals do not exhibit a negative relationship between export orientation and productivity, unlike what could be expected from the FDI literature. A possible explanation for this finding is the importance of the establishment of subsidiaries as sales outposts at an intermediate internationalization stage, as documented in the business literature.

We were not able to find a direct relationship between productivity and export intensity for foreign affiliates. Although we cannot reject the negative relationship that is found in other studies, this is evidence of a larger heterogeneity within foreign affiliates, as domestic multinationals have a clear relationship between productivity and export intensity, while constituting a smaller group of firms. The heterogeneity of foreign affiliates may be related to host country characteristics, as export platform and vertical integration strategies are more likely to be pursued by multinationals in low-demand low-wage countries. Thus, identification of the pursued integration strategies by foreign affiliates may be required in order to obtain better predictions of their export behavior.

Acknowledgments

I am grateful to Claudia Alves and Sharmin Sazedj for comments and suggestions and to Fundação para a Ciência e Tecnologia for financial support.

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Tables and Figures

Table 16. Aggregate Values for 2011

	Ownership Type						
	DOM		DMNE		FOR		Total
Assets (€ '000 000)	30,177	*71%*	4,493	*11%*	7,900	*19%*	42,570
Fixed Assets (€ '000 000)	8,986	*73%*	1,054	*9%*	2,243	*18%*	12,283
No. Employees	320,875	*83%*	23,835	*6%*	40,680	*11%*	385,390
Sales (€ '000 000)	28,672	*66%*	4,140	*9%*	10,831	*25%*	43,642
Exports (€ '000 000)	10,158	*54%*	1,844	*10%*	6,871	*36%*	18,873
EU Exports (€ '000 000)	8,222	*52%*	1,301	*8%*	6,237	*40%*	15,761
Value Added (€ '000 000)	7,867	*73%*	874	*8%*	2,104	*19%*	10,844

Table 17. Aggregate Exports by year (Millions of Euros)

	Ownership Type					
Exports	DOM	DMNE	FOR	Sample Total	Portugal	Sample
2008	8,892	1,646	5,769	16,307	59,144	27.6%
2009	7,828	1,577	4,793	14,198	49,311	28.8%
2010	8,800	1,694	6,102	16,595	55,577	29.9%
2011	10,158	1,844	6,871	18,873	62,232	30.3%
Note: Portuguese Exports include non-manufacturing exports						

Table 18. Distribution of Firms by Industry and Firm Ownership Type

	Ownership Type			
ISIC Rev.4 - two digits	DOM	DMNE	FOR	Total
	No.	No.	No.	No.
10 - Manufacture of food products	2,030	13	23	2,066
11 - Manufacture of beverages	194	3	5	202
13 - Manufacture of textiles	824	7	10	841
14 - Manufacture of wearing apparel	1,498	10	4	1,512
15 - Manufacture of leather	850	3	6	859
16 - Manufacture of products of wood and cork	1,094	5	6	1,105
17 - Manufacture of paper products	179	3	8	190
18 - Printing and reproduction of recorded media	810	2	0	812
20 - Manufacture of chemical products	235	2	22	259
21 - Manufacture of pharmaceutical products	31	2	6	39
22 - Manufacture of rubber and plastics products	472	5	12	489
23 - Manufacture non-metallic mineral products	1,076	5	18	1,099
24 - Manufacture of basic metals	117	1	7	125
25 - Manufacture of fabricated metal products	2,985	19	18	3,022
26 - Manufacture of electronic products	70	1	5	76
27 - Manufacture of electrical equipment	212	5	11	228
28 - Manufacture of machinery and equipment	566	9	8	583
29 - Manufacture of motor vehicles, trailers	179	1	29	209
30 - Manufacture of other transport equipment	49	0	0	49
31 - Manufacture of furniture	920	3	1	924
32 - Other manufacturing	508	0	5	513
33 - Repair and installation of machinery	681	1	5	687
Total	15,580	100	209	15,889

Table 19. Summary Statistics (2008-2011)

	Ownership Type			
averages	DOM	DMNE	FOR	Total
Sales (€ '000 000)	1.8	39.9	47.0	2.6
Valued Added (€ '000 000)	0.5	9.0	10.0	0.7
Assets (€ '000 000)	1.9	42.6	38.3	2.6
Fixed Assets (€ '000 000)	0.6	10.3	11.3	0.8
No. Employees	20.5	234.7	199.0	24.2
Labor Costs (€ '000 000)	0.3	4.8	5.2	0.4
Skill (Cost per Worker, € '000)	13.5	20.8	27.4	13.8
Labor Productivity (VA per Worker, € '000)	21.2	40.2	55.0	21.7
Exports (€ '000 000)	0.6	16.9	28.2	1.0
Exporter Dummy	0.429	0.985	0.891	0.438
Exports as Share of Output	0.123	0.516	0.470	0.130
EU Exports as Share of Exports	0.779	0.709	0.834	0.780
Sector Exports as Share of 2D Sector Output	0.368	0.381	0.403	0.369
Sector Exports as Share of 3D Sector Output	0.352	0.419	0.409	0.353
Export Intensity Classes				
0%	0.571	0.015	0.109	0.562
>0 - 20%	0.248	0.195	0.289	0.248
20 - 40%	0.053	0.180	0.089	0.055
40 - 60%	0.037	0.210	0.080	0.039
60 - 80%	0.032	0.163	0.100	0.034
80 - <100%	0.053	0.238	0.315	0.058
100%	0.005	0.000	0.018	0.005

Figure 1. Distribution of Key Variables by firms Ownership Type of Exporter

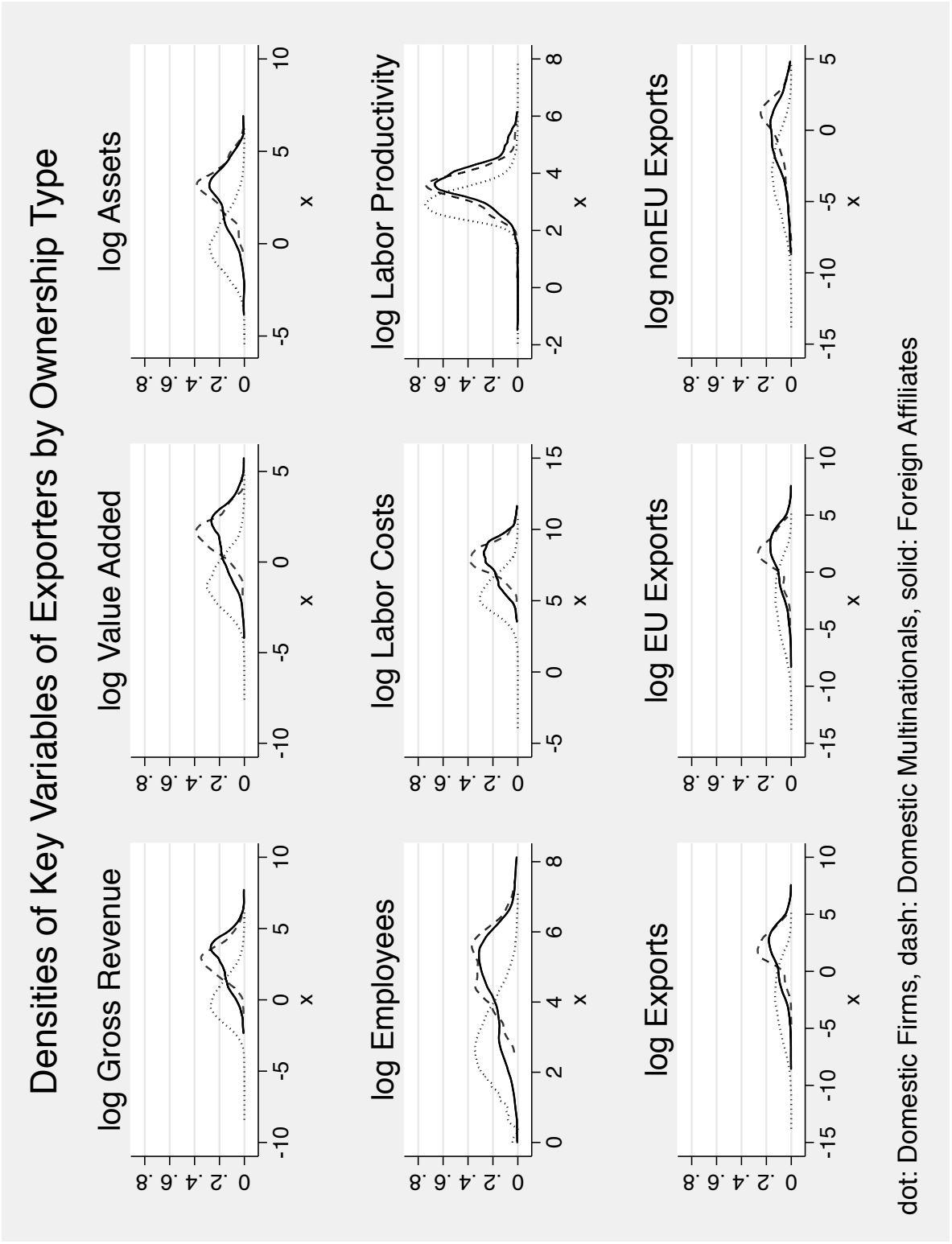

Table 20. Input Coefficient Estimates from Pooled OLS at the two-digit level

ISIC Rev4 2D Description	Firms No.	Labor Coef.	Capital Coef.	Coef. Sum
Man food products	2,066	0.91	0.18	1.09
Man beverages	202	0.79	0.28	1.07
Man textiles	841	0.87	0.14	1.01
Man wearing apparel	1,512	0.85	0.14	1.00
Man leather	859	0.79	0.20	0.99
Man products of wood and cork	1,105	0.94	0.14	1.08
Man paper products	190	0.93	0.19	1.12
Reproduction of recorded media	812	0.93	0.15	1.08
Man chemical products	259	0.98	0.20	1.18
Man pharmaceutical products	39	1.44	-0.13	1.30
Man rubber and plastics products	489	0.89	0.18	1.07
Man other mineral products	1,099	0.97	0.17	1.14
Man basic metals	125	0.96	0.13	1.09
Man fabricated metal products	3,022	0.94	0.15	1.09
Man electronic products	76	0.97	0.11	1.09
Man electrical equipment	228	1.01	0.10	1.11
Man machinery and equipment	583	0.94	0.13	1.07
Man motor vehicles, trailers	209	0.98	0.11	1.10
Man other transport equipment	49	0.89	0.07	0.96
Man furniture	924	0.98	0.11	1.09
Other manufacturing	513	0.93	0.11	1.04
Repair & installation machinery	687	1.02	0.12	1.14
Averages weighted by number of firms		0.92	0.15	1.08

Table 21. Input Coefficient Estimates from Pooled OLS at the three-digit level

Sector	Firms	Labor	Capital	Sum
101	205	0.92	0.15	1.07
102	60	0.80	0.18	0.98
103	76	0.88	0.20	1.08
104	61	0.97	0.15	1.12
105	105	1.04	0.16	1.20
106	41	0.99	0.19	1.18
107	1,343	0.99	0.09	1.08
108	116	0.85	0.21	1.06
109	59	0.83	0.18	1.01
110	202	0.79	0.28	1.07
131	46	0.90	0.01	0.91
132	79	0.89	0.12	1.01
133	132	0.74	0.22	0.96
139	584	0.89	0.14	1.03
141	1,347	0.84	0.15	0.99
143	165	0.93	0.09	1.02
151	90	0.75	0.24	0.99
152	769	0.80	0.19	0.99
161	248	0.98	0.14	1.12
162	857	0.94	0.15	1.08
171	12	0.75	0.33	1.08
172	178	0.91	0.18	1.09
181	812	0.93	0.15	1.08
201	54	0.82	0.33	1.15
203	62	1.07	0.11	1.18
204	75	1.08	0.09	1.17
205	68	0.95	0.22	1.17
212	39	1.44	-0.13	1.30
221	56	1.05	0.05	1.10
222	433	0.87	0.20	1.07
231	155	1.20	0.09	1.29
233	61	0.95	0.21	1.16
234	121	0.94	0.14	1.08
235	14	1.25	0.25	1.50
236	197	0.95	0.18	1.12
237	523	0.96	0.14	1.11
239	28	0.70	0.34	1.05
242	12	1.29	-0.01	1.28
243	18	1.01	0.15	1.16
244	32	0.96	0.12	1.08
245	63	0.96	0.10	1.06
251	1,337	1.01	0.12	1.14
252	50	0.95	0.13	1.08
253	10	0.69	0.08	0.77
255	119	0.98	0.12	1.10
256	506	0.95	0.13	1.08
257	505	0.85	0.18	1.03
259	495	0.91	0.15	1.05
261	28	1.01	0.03	1.04
262	12	1.12	0.03	1.14
263	11	0.97	0.18	1.14
265	25	0.82	0.20	1.01
271	78	1.00	0.09	1.09
273	17	1.26	-0.02	1.25
274	55	1.06	0.10	1.16
275	32	0.90	0.15	1.05
279	46	1.21	0.10	1.31
281	53	0.96	0.12	1.08
282	226	0.94	0.12	1.06
283	45	0.98	0.15	1.14
284	42	0.86	0.19	1.05
289	217	0.95	0.12	1.07
291	11	1.01	0.13	1.14
292	76	1.02	0.05	1.07
293	122	0.92	0.15	1.07
301	23	0.89	0.05	0.94
309	26	0.92	0.11	1.03
310	924	0.98	0.11	1.09
321	148	0.98	0.09	1.07
323	16	0.91	0.27	1.18
325	174	0.99	0.12	1.11
329	175	0.90	0.10	1.00
331	554	1.00	0.11	1.11
332	133	1.01	0.14	1.15
Weighted Avg.		0.94	0.14	1.08

(continues)

Table 22. Input Coefficient Estimates from Fixed Effects at the two-digit level

ISIC Rev4 2D Description	Firms No.	Labor Coef.	Capital Coef.	Coef. Sum
Man food products	2,066	0.42	0.05	0.48
Man beverages	202	0.23	0.29	0.53
Man textiles	841	0.56	0.06	0.62
Man wearing apparel	1,512	0.62	0.05	0.67
Man leather	859	0.72	0.10	0.82
Man products of wood and cork	1,105	0.66	0.09	0.74
Man paper products	190	0.53	0.11	0.64
Reproduction of recorded media	812	0.50	0.09	0.59
Man chemical products	259	0.64	0.03	0.66
Man pharmaceutical products	39	0.32	0.12	0.44
Man rubber and plastics products	489	0.71	0.11	0.82
Man other mineral products	1,099	0.71	0.05	0.76
Man basic metals	125	1.09	0.06	1.15
Man fabricated metal products	3,022	0.61	0.07	0.69
Man electronic products	76	1.07	0.13	1.20
Man electrical equipment	228	0.72	0.08	0.79
Man machinery and equipment	583	0.58	0.10	0.69
Man motor vehicles, trailers	209	0.49	0.09	0.58
Man other transport equipment	49	1.01	-0.01	1.00
Man furniture	924	0.70	0.07	0.76
Other manufacturing	513	0.59	0.05	0.64
Repair & installation machinery	687	0.66	0.06	0.72
Averages (weighted by firm number)		0.61	0.07	0.68

Table 23. Input Coefficient Estimates from Fixed Effects at the three-digit level

Sector	Firms	Labor	Capital	Sum
101	205	0.48	0.05	0.53
102	60	0.56	0.05	0.61
103	76	0.29	0.00	0.29
104	61	-0.16	0.02	-0.14
105	105	0.43	0.19	0.62
106	41	0.15	0.04	0.19
107	1,343	0.51	0.04	0.55
108	116	0.37	0.07	0.44
109	59	0.19	0.15	0.34
110	202	0.23	0.29	0.53
131	46	1.26	-0.01	1.25
132	79	0.33	0.08	0.40
133	132	0.51	0.00	0.51
139	584	0.57	0.09	0.66
141	1,347	0.63	0.05	0.67
143	165	0.58	0.04	0.62
151	90	0.73	0.16	0.89
152	769	0.71	0.09	0.81
161	248	0.61	0.15	0.75
162	857	0.66	0.08	0.74
171	12	1.62	0.12	1.74
172	178	0.53	0.11	0.63
181	812	0.50	0.09	0.59
201	54	0.59	0.20	0.79
203	62	0.38	-0.02	0.36
204	75	0.75	-0.01	0.74
205	68	0.58	0.03	0.62
212	39	0.32	0.12	0.44
221	56	1.00	0.07	1.07
222	433	0.68	0.12	0.80
231	155	0.93	0.09	1.02
233	61	0.79	-0.00	0.79
234	121	0.53	0.01	0.55
235	14	0.78	-0.42	0.36
236	197	0.69	0.06	0.75
237	523	0.70	0.04	0.75
239	28	0.29	0.09	0.38
242	12	2.34	-0.49	1.85
243	18	0.85	0.09	0.94
244	32	0.52	0.08	0.60
245	63	0.59	0.03	0.63
251	1,337	0.68	0.08	0.77
252	50	0.83	-0.03	0.81
253	10	0.84	-0.06	0.78
255	119	0.47	0.06	0.52
256	506	0.56	0.06	0.62
257	505	0.50	0.06	0.56
259	495	0.60	0.09	0.69
261	28	1.74	-0.04	1.70
262	12	0.79	0.18	0.97
263	11	0.76	0.26	1.01
265	25	0.79	0.09	0.88
271	78	0.78	0.02	0.80
273	17	0.42	0.05	0.47
274	55	0.41	0.07	0.48
275	32	0.90	0.18	1.07
279	46	0.57	0.18	0.75
281	53	0.19	0.06	0.26
282	226	0.52	0.17	0.70
283	45	0.39	0.05	0.44
284	42	0.48	-0.01	0.48
289	217	0.77	0.04	0.81
291	11	0.41	0.14	0.56
292	76	0.44	0.11	0.55
293	122	0.52	0.08	0.60
301	23	1.03	0.04	1.07
309	26	0.98	-0.12	0.85
310	924	0.70	0.07	0.76
321	148	0.61	0.04	0.65
323	16	1.00	-0.19	0.81
325	174	0.52	0.04	0.56
329	175	0.61	0.09	0.70
331	554	0.67	0.06	0.73
332	133	0.60	0.08	0.68
Weighted Avg.		0.61	0.07	0.68

(continues)

Figure 2. Distribution of Firms TFP Estimates by Estimator

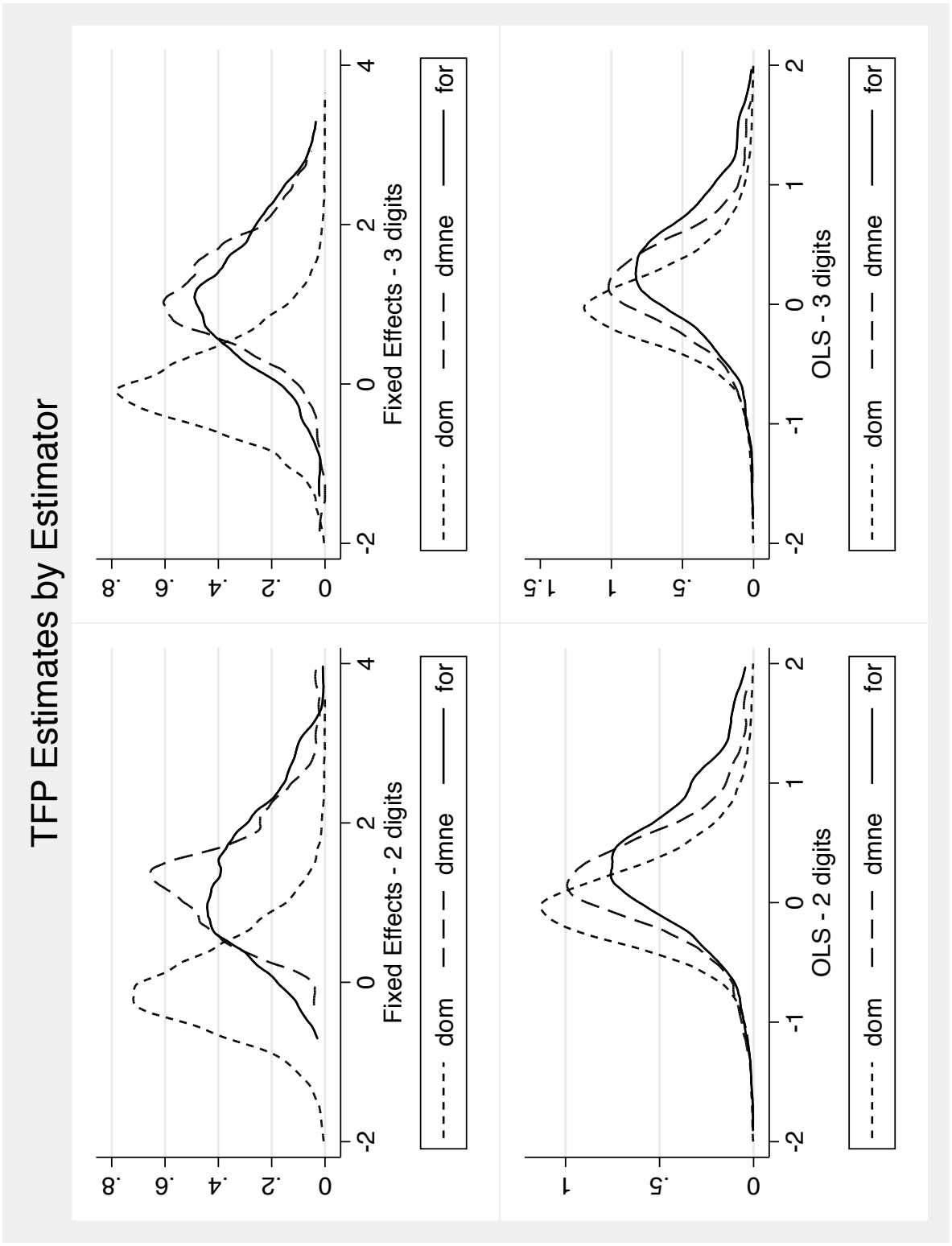

Table 24. Correlation of TFP Estimates across Estimators

	FE2D	FE3D	OLS2D	OLS3D
FE2D	1.000			
FE3D	0.929	1.000		
OL2D	0.528	0.494	1.000	
OL3D	0.503	0.509	0.972	1.000

Table 25. Summary Statistics of TFP Estimates (FE3D) by Firm Ownership Type

TFP	DOM	DMNE	FOR	Total
N	15,580	100	209	15,889
mean	-0.024	1.246	1.166	-0.000
sd	0.633	0.965	0.936	0.662
min	-3.687	-1.850	-1.401	-3.687
p10	-0.739	0.338	0.156	-0.733
p25	-0.398	0.775	0.547	-0.392
p50	-0.055	1.179	1.080	-0.043
p75	0.339	1.670	1.730	0.363
p90	0.761	2.267	2.351	0.814
max	4.431	6.076	5.367	6.076

Table 26. Distribution of TFP Estimates (FE3D) by Firm Ownership Type

TFP Classes				
	DOM	DMNE	FOR	Total
]-∞,-4]	0.000	0.000	0.000	0.000
] -4,-2]	0.005	0.000	0.000	0.004
] -2, 0]	0.538	0.050	0.081	0.529
] 0, 2]	0.454	0.800	0.756	0.460
] 2, 4]	0.004	0.130	0.153	0.007
] 4, ∞[	0.000	0.020	0.010	0.000

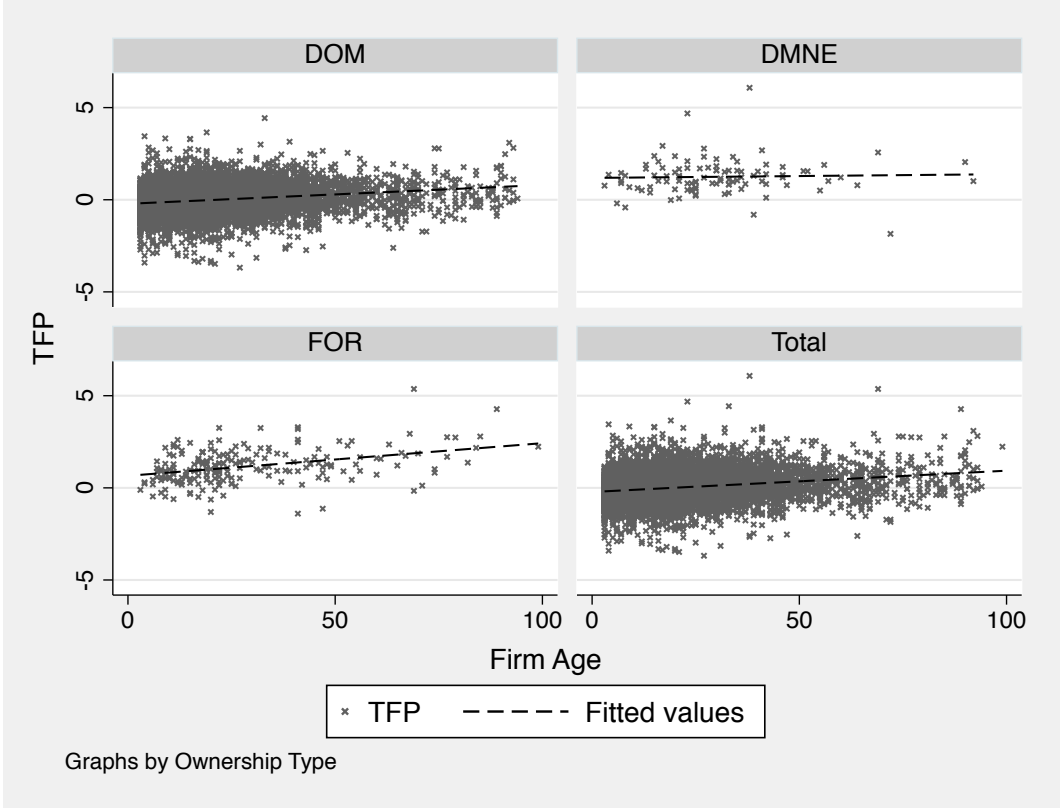

Figure 3. Firm Age and TFP by Firm Ownership Type

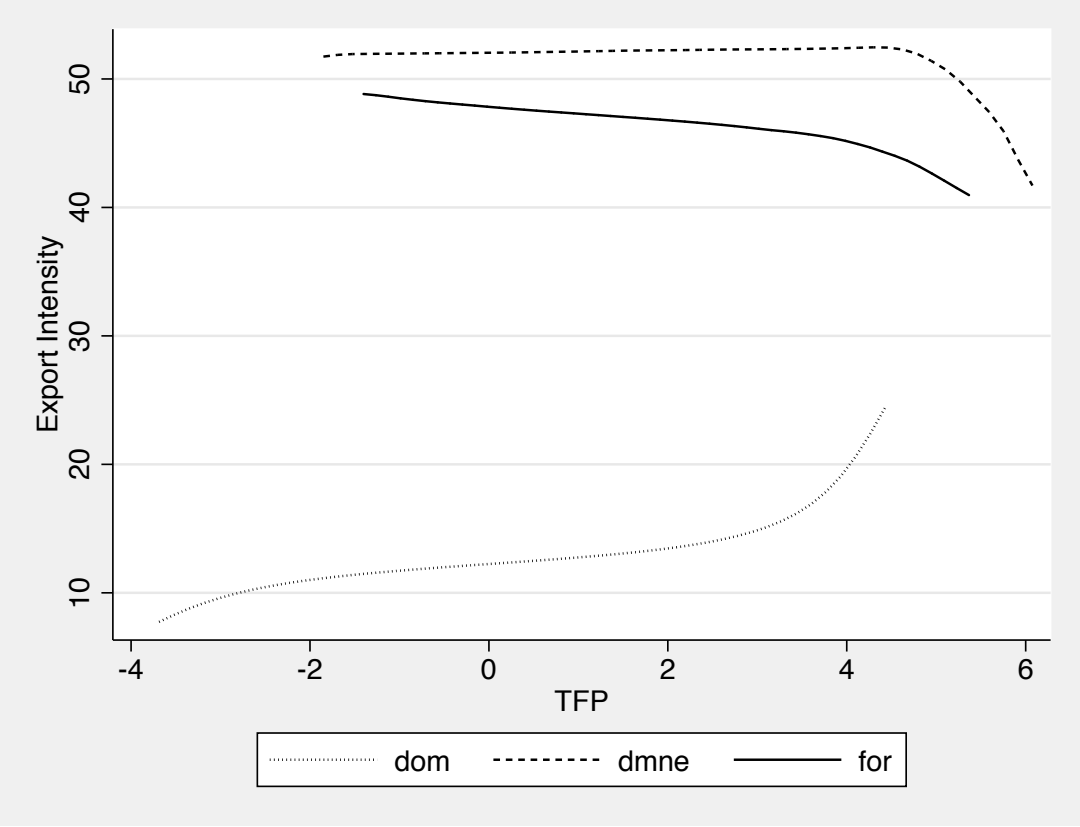

Figure 4. Non-Parametric Local Polynomial Regressions of Export Intensity on TFP by Firm Ownership Type

Foreignness and Exit Over the Life Cycle of Firms

with José Mata

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Abstract

Received wisdom indicates that, due to a liability of foreignness, foreign firms exit with greater likelihood than do comparable domestic firms and that the difference attenuates as firms age and overcome the liability. We posit that foreign firms are also intrinsically more volatile and footloose than domestic ones and that this leads to an increasing divergence between the exit rates of foreign and domestic firms. Empirically, we find that the difference between exit rates of foreign firms and domestic firms increases with age, as exit of foreign firms increases with age while that of purely domestic firms decreases. Exit rates of domestic based multinationals do not change significantly with age; they are between those of foreign and purely domestic firms, but are closer to the latter. This suggests that the footlooseness observed for foreign firms is due to foreignness more than to multinationality.

1. Introduction

Do foreign firms exit with less or greater likelihood than their domestic counterparts? How does this relative likelihood of exiting vary over the life cycle of firms? Many studies have investigated the survival of firms in foreign markets (Bane & Neubauer, 1981; Delios & Beamish, 2001; Li, 1995; Mitchell, Shaver, & Yeung, 1994; Mudambi & Zahra, 2007; Shaver, 1995; Shaver, Mitchell, & Yeung, 1997; Tsang & Yip, 2007; see Morschett, Donath & Schramm-Klein, 2011 for a recent survey). Most of these studies, however, do not compare these patterns with those of domestic firms and thus lack an appropriate benchmark to answer the first question above. In addition, the few studies that have compared exit by foreign and domestic firms either did not distinguish

exit by the time of exit, or focused only on the first years and thus cannot answer the second question.

In one of the earliest studies that compared the survival of foreign and domestic firms, Li and Guisinger (1991) reported lower exit rates for foreign companies, but they did not control for many factors that are known to be different for foreign and domestic firms. Kronborg and Thomsen (2009) analyzed matched pairs of foreign and domestic firms established in Denmark between 1895 and 2005. They found no significant differences between the pairs that were established in the last 20 years, although they found a greater propensity of domestic firms to exit in earlier periods. In another study, Mata and Portugal (2002) followed a sample of new firms over their first years and found that foreign firms were indeed more likely to survive, but once a relatively small number of characteristics that were different between foreign and domestic firms were accounted for, foreign firms became more likely to exit, although not significantly so. Görg and Strobl (2003) and Bernard and Sjöholm (2003) found that, after controlling for characteristics that make foreign firms different from domestic ones, foreign firms exited with greater likelihood in Ireland, the US and Indonesia.

The most common view on why foreign firms exit more easily than their domestic counterparts is perhaps that associated with the work by Zaheer (1995) and subsequent literature. This literature identifies an increased propensity to exit with liabilities of foreignness, that is, cost disadvantages that foreign firms face *vis-à-vis* their domestic counterparts. While the term "liability of foreignness" is relatively new, the concept is certainly not, as is acknowledged by its advocates. Its origins can be traced back to the pioneering work of Hymer, and one of the fundamental pillars of the theory of international firms is that firms operating in foreign markets must have some sort of ownership advantage to compensate them for the increased costs of doing business abroad, the "liabilities of foreignness". However, another view, associated with earlier writers on foreign divestment (e.g. Boddewyn, 1979; Flamm, 1984), posits that foreign investment is inherently "volatile". According to this view, foreign firms are more footloose and should be more likely to exit, as they are less attached to a particular location than are domestic firms. When changes in the host economy make that economy less attractive or changes elsewhere increase the attractiveness of other locations, relocation is seen more favorably by foreign firms than by domestic ones.

While both the liability and footlooseness arguments indicate that foreign firms may be more likely to exit markets, they lead to different perspectives with respect to the temporal evolution of exit rates. The liability of foreignness argument implies that the exit rates of foreign and domestic firms should converge as time goes by and firms overcome the liabilities. On the contrary, the footlooseness argument implies that multinationals should become more and more likely to exit as time goes by. While footlooseness is seen as a permanent characteristic, its impact upon exit is likely to become more and more evident as changes in the host and other countries come about.

The few studies that have compared the survival of foreign and domestic firms typically cover only a very limited period in the life of firms, and thus are not able to shed light on the implications of the two views above. In this paper, we compare the survival of foreign and domestic firms over a long period. We use data on firms operating in Portugal that include information on the nationality of the most important owners of each firm and on whether the firm has a major stake in other firms in foreign countries. This information allows us to identify and compare foreign owned firms with purely domestic ones and with domestic-based multinationals. Our data are available for the period 2006-2008. We identify exiting firms, by finding firms that are active in one year, but not in the subsequent year. Because the data include information on the date each firm was established as a legal entity in Portugal, we are able to calculate age at the time of exit and to estimate exit patterns for firms of all ages.

An earlier study by Mata and Portugal (2000) examined the survival of newly established domestic and foreign firms in Portugal. While that study focused on the first seven years of operation, in the current work we use a much more comprehensive data set that includes domestic and foreign firms of all ages. This enables us to estimate the probabilities of exit for the whole life of firms and to compare the survival of domestic and foreign firms from a long-term perspective. To our knowledge, the only study that has adopted a long-term perspective is a recent paper by Kronborg and Thomsen (2009). One of the novel aspects of their study is that the authors identified foreign and domestic firms that were established in different epochs, from the late nineteenth century to the present and followed all of them until the current time. However, the study includes only a little more than 500 pairs of firms, most of which were relatively young and most of which had not exited by the end of the sample period. Because our data set concentrates

on a narrow calendar time frame, we are able to control for heterogeneity in world conditions that may easily interfere with the exit patterns when one observes cohorts of firms over long periods of time, such as in Kronborg and Thomsen (2009).

The paper is organized as follows. The next section discusses the reasons that may lead to increasing and decreasing exit of foreign firms over time. Section 3 discusses the data and the methods used in the analysis and gives an overview of the basic patterns found in the data. Section 4 presents our estimation results and Section 5 discusses the implications of these results. Finally, Section 6 concludes the paper.

2. Literature and Hypothesis

Liabilities and advantages of foreign owned firms

The recent interest in the liability of foreignness (LOF) originated with a study of Zaheer (1995). In this study, the author analyzed foreign exchange trading rooms in New York and Tokyo and found that the average profits per trader were higher in rooms operated by local banks than in those operated by foreign ones. She concluded that this was due to a cost disadvantage faced by foreign firms in doing business abroad, which she termed "liability of foreignness". In a subsequent study, Zaheer and Mosakowski (1997) used a multi-country sample of trading rooms and found that foreign firms were more likely to exit, in particular during the first years of life. In another multi-country study, Miller and Parkhe (2002) found that foreign banks were less efficient than their domestic counterparts, and other authors found that foreign firms exit more than domestic ones with similar characteristics (e.g. Colombo & Delmastro, 2000; Pennings & Sleuwaegen, 2000; Bernard & Sjöholm, 2003; Görg & Strobl, 2003).

Not all exits of foreign firms are due to liabilities of foreignness, of course. Hennart, Roehl, and Zeng (2002) analyzed 32 exits of Japanese subsidiaries from the US and found that in several of them the Japanese subsidiaries indeed exited following problems in managing human resources, or in dealing with the US government, motives that may be considered to be related with LOF. Another reason for exiting - overoptimism in forecasting demand - can also be linked to an inability to understand the market, although it is difficult to contend that all domestic firms would forecast demand

in a flawless fashion. In other cases, however, exits were determined by problems in the parent firm, because they had accomplished the mission for which they had been created, or because they were acquired by the American partner. Other reasons included oil price increases, which would affect all firms in the industry whether they were local or foreign. Therefore, in order to test the LOF hypothesis with data on exits it is essential to compare the exit patterns of foreign firms with those of their domestic counterparts, rather than consider the exit of foreign firms alone.

Foreign companies may, of course, compensate for the LOF. They can do it, not only because of the advantages they possess before entering the host market as a result of general ownership advantages, of the type known in the international business literature since the pioneering work of Hymer, but also because of the specific strategies they choose for the host market. For example, Elango (2009) shows that foreign insurance firms operating in the US offer greater product variety than their American counterparts in order to offer greater choice to a market that they do not know as well, concentrate in fewer and highly populated geographic markets to reduce the need to learn about many different local environments, and are more likely to be affiliated with intracorporate networks through which they obtain information about the host market. Elango shows that while foreign firms perform less well than the average American firm, they perform as well as the local firms that follow comparable strategies, a finding that can also be seen as indicating that foreign firms are pushed into less attractive niches.

But foreignness can also be thought of as an intrinsic advantage, because foreign firms are typically less constrained by the host country's informal institutions than are their local counterparts. Foreign firms are better able to deal with periods of institutional changes in the host countries (Pinkse & Kolk, 2011) and are in a favorable position to recognize inefficiencies in local institutions. For example, Siegel et al. (2011) observed that foreign firms operating in Korea were able to recognize that women were strongly discriminated against in the labor market and to take advantage of that fact by hiring a disproportionate number of women for managerial positions. The ability to escape the norms of the host country has also been emphasized by Edman (2009) in his analysis of the operations of Citibank in Japan. He argues that the negative effects of foreignness prompted Citibank to develop practices that differed from the dominant practices of local firms. By doing so, Citibank was able to stay in niches with little competition and thus

avoid the negative effects of foreignness. While these practices remained atypical in the market, foreignness became an advantage for Citibank, as they protected it from local firms and delayed imitation. When its practices were eventually imitated by local firms, Citibank became again disadvantaged and was pushed into a new wave of innovation. In the same line, Un (2011) argues that the need to cope with consumers that tend to be biased against foreign products forces the subsidiaries of foreign MNEs to be more innovative than domestic firms. Both this evidence and the Citibank episode indicate that foreign firms were able to cope with foreignness because they possessed what can be called an ownership advantage: the ability to innovate and adapt (although in a disruptive manner) to the local environment.

Foreign firms may thus possess advantages and disadvantages relative to domestic units and the net effect of foreignness depends on the balance between these advantages and disadvantages. For example, Nachum (2003) observed that foreign financial service firms operating in London were, in general, more successful than British firms, and asserted that the liability of foreignness did not exist in there. More generally, Nachum (2010) attempted to identify and measure the sources of advantages and disadvantages and found that while, on average, foreign and domestic firms were not significantly different on the costs dimension, foreign firms possessed advantages relative to the purely local firms, albeit not relative to multinationals based in the UK.

The LOF view predicts that, after controlling for these ownership advantages, foreign firms should incur extra costs relative to local firms and should, therefore, experience greater likelihood of exit. This should hold irrespective of the comparison group being purely domestic firms or domestic based multinationals. The extent to which these firms possess ownership advantages varies across firms, domestic based multinationals being likely to have developed such assets to a greater extent than purely local firms. Once these assets are controlled for, however, both purely domestic and domestic based multinationals should be less likely to exit than foreign firms, as they do not suffer from the foreignness disadvantage. Therefore, our first hypotheses are formulated as

Hypothesis 1a. The exit probabilities are greater for foreign firms than for purely domestic firms.

Hypothesis 1b. The exit probabilities are greater for foreign firms than for domestic based multinationals.

The evolution of LOF over the life of firms

A more complete test of the implications of the LOF calls for an examination of the evolution of exit rates in addition to the level of exit rates of domestic and foreign firms. Zaheer (1995) cited four sources of "liabilities of foreignness": lack of familiarity of foreign firms with the *modus operandi* of local markets, lack of legitimacy of foreign firms in the eyes of customers and other firms (suppliers, for example), the costs associated with distance (transportation, coordination), and restrictions imposed by the host country. Identifying the nature of the LOF is important because, depending on the reasons that cause it in the first place, one may expect it to disappear more quickly or slowly as firms grow older. Lack of familiarity and legitimacy are likely to disappear over the tenure of foreign firms in the host country. Distance and restrictions from the host country may also change over time, but these changes are more related to calendar time than to the length of the firm's tenure in the country.

Although they did not specifically investigate the causes of the liability of foreignness, the findings of Zaheer and Mosakowski (1997) suggest that the LOF vanishes as firms' tenure in the host country increases. They followed foreign exchange trading rooms in different countries over a period of 19 years, and found that immediately after being set up, foreign trading rooms were more likely to exit than domestic ones. However, the initial differences in exit rates diminished over time. By the end of the sample, they were more or less comparable, a finding that the authors attributed to the erosion of the liability of foreignness.

In another study Mezias (2002) analyzed the number of labor law suits faced by foreign and American firms in the US courts to find that foreign firms operating in the US faced more labor suits in American courts than did their local counterparts. Mezias interpreted this finding as evidence of a liability of foreignness, due to foreign firms being less accustomed with American industrial relations than local firms. Supporting his view, Mezias presented evidence that the intensity of labor law suits was reduced for subsidiaries that had a wider operation in the US and for those that used American top

officers. Older subsidiaries also faced fewer law suits at the state level, presumably because they had greater opportunities to learn how to deal with industrial relations over time. Different firms may overcome the LOF at different paces and active engagement in learning about the host country may speed up the process. Petersen and Pedersen (2002) showed that those foreign firms that invest in learning about the host country tend to report higher perceived familiarity with foreign markets than those which do not and that tend to stick to standardized international business routines and are less willing to adapt their products and practices to local markets.

The LOF argument predicts that foreign firms start by displaying an increased chance of exiting. As time goes by and the LOF are gradually overcome, exit probabilities become closer to those of comparable domestic firms. Because the source of the LOF is lack of familiarity with local markets, the argument should hold for foreign firms in comparison both with purely domestic firms and domestic based multinationals. Therefore our next two hypotheses are:

Hypothesis 2a. Exit probabilities of foreign owned firms become closer to those of purely domestic firms as firms age.

Hypothesis 2b. Exit probabilities of foreign owned firms become closer to those of domestic based multinationals as firms age.

Footloose multinationals

Earlier writers on foreign divestment have sustained that multinationals would be more volatile than their local counterparts (Flamm, 1984). According to Boddewyn (1983), this pattern of behavior would be explained by two key reasons: the greater range of geographical options that foreign firms would consider relative to those considered by the domestic firms, and the fact that managers responsible for implementing the divestment would be emotionally less involved with the divested firm if the firm were located elsewhere than in their home country.

The first idea was developed by Kogut and Kulatilaka (1994), who argued that multinational networks provide options for relocating production among the different units. Multinationals may invest in units where single firms would not because, on top of

their intrinsic value, these units carry an extra option value for the network. Indeed, multinationals have been observed to maintain duplicate production structures (Zander, 1998) and to shift production from one country to another as a consequence of unfavorable evolution of labor costs in the former (Belderbos & Zou, 2007). The ability to take advantage of such flexibility may require firms to specifically prepare for it (Rangan, 1998; Chung, Lee, Beamish, & Isobe, 2010), and apparently many firms are able to do so. When labor costs in countries where the multinational operates change, the shift of production between countries sometimes takes the extreme form of divestment from subsidiaries operating in those countries in which labor costs increased, in particular when the value of keeping options open is not particularly great, such as when uncertainty is low or the firm has other subsidiaries in the country (Belderbos & Zou 2009).

Many of the changes that induce multinationals to exit from a country also affect other firms in the same industries, and some domestic firms may eventually shut down their production facilities and exit as a consequence of these changes. However, when multinationals contemplate re-location what matters is not whether or not they are making a profit in their current location, but whether or not they can make higher profits elsewhere. In addition, multinationals respond to changes in not only the host country, but also in all the other possible locations they contemplate. Should any of these alternate locations become more attractive, they will contemplate re-location. A recent example of this is the concern that emerged regarding the most recent enlargement of the European Union that firms might be de-locating from some areas toward others (see Konings & Murphy, 2006). The longer the period of tenure in a country, the more likely it is that the environment changes and that these changes will trigger the decision to exit. A factor that has long been emphasized as important in the determinants of the exit decisions of multinationals from a certain location is the evolution of the product life cycle (Vernon, 1979). If multinational firms choose their international locations based on product life cycle considerations, then it is likely that any location is temporary and that multinationals change location as industries evolve along their life cycle. As time goes by it is more likely that it becomes optimal to change location.

Multinationals thus have reasons for investing in units in which single country firms would not and for divesting from units from which single country firms would not.

Their investment and divestment decisions thereby become volatile compared to their single country counterparts, and it is not surprising that multinationals have been observed to be quicker to adapt to changing conditions than single country firms (see Dunning, 1993: 428).

Although most of the arguments above were originally developed in the context of comparing local and foreign firms, they apply to a large extent to the comparison between purely local firms and domestic based multinationals, as domestic based multinationals also take other locations into consideration. Berry (2010) showed that the number of divestments of home-country operations is affected by the investments that firms make abroad as shutting down domestic operations is easier if the firm has alternatives abroad. Also, the reason why multinationals are able to close units more easily than single country firms is not specific to being foreign. In the domestic UK steel casting industry, multi-plant firms have been found to close plants more easily than single plant firms for the same reason: because multi-plant units can more easily re-deploy their labor and productive facilities elsewhere (Baden-Fuller 1989).

These considerations lead us to our next hypotheses, which are formulated as:

Hypothesis 3a. Exit probabilities of foreign owned firms diverge from those of purely domestic firms as firms age.

Hypothesis 3b. Exit probabilities of domestic based multinationals diverge from those of purely domestic firms as firms age.

Foreignness and multinationality

While both domestic and foreign multinationals may seek to explore opportunities in other locations, divesting a foreign operation and a domestic one are often not the same (Benito, 1997). Tsetsekos and Gombola (1992) studied the impact of divestments upon stock prices and found that stock prices react to closing of domestic, but not to foreign plants, which they interpreted as indicating that, while closing of a foreign plant does not indicate problems in the parent firm, closing a domestic unit does. Firms even consider changing the location of their headquarters but, while this may have increased in recent times, the numbers are still small (Voget, 2011). As many relocations of headquarters are

dictated by tax reasons (Voget, 2011), these relocations do not imply the divestiture of production or selling activities from the original "home" country.

Differences in the patterns of foreign and domestic divestment may be due to a particular attachment of domestic firms to their home country as suggested by Boddewyn (1983). Divestments are decisions that are described as difficult, painful and subject to cognitive biases (Duhaime & Schwenk 1983). Much of the decision making in these processes is made at the headquarters, not at the subsidiaries (Ghertman, 1988) and managers resist divesting the units they are personally involved with (Nees, 1981), both because their jobs may be at stake and because they may be emotionally attached to the business. Livengood and Reger (2010) observed that divestment from firms' "home" business, such as Singer's sewing machines, Greyhound's bus lines, and GE's light bulbs, was delayed long after what was economically sound because of the emotional attachment of executives to these lines of business. It has also been shown that divestment from foreign operations is more likely when a new CEO has just been appointed (Shimizu, 2007) and that, prior to divestment, the management of the subsidiary to be divested is often replaced (Ghertman, 1988), presumably because recently appointed managers have lower emotional attachment to the unit to be divested. Likewise, it has been found that relocation of multinational headquarters is more likely when ownership is dispersed and the percentage of equity that is held by foreigners is high (Birkinshaw, Braunerhjelm, Holm, & Terjesen, 2006) and when as a result there is no significant owner that is strongly attached to the country. This suggests that domestic multinationals are less likely to exit than foreign ones.

The prediction that foreign multinationals will be more likely to exit than domestic ones is also supported by the classical obsolescing bargain argument. Foreign companies are often attracted to the host country with incentives that do not apply to domestic investment (Blomström & Kokko, 2003). After having invested, foreign investors become vulnerable to opportunistic behavior from host country governments, which may wish to force them to reduce their stake in firms in host countries or to accept a less favorable treatment over time (see, e.g., Vachani, 1995). More recent studies have acknowledged that the relationship between foreign firms and host governments is more complex than this earlier view suggests. This relationship may include not only adversarial, but also cooperative dimensions, namely because the stake to be shared is not

necessarily constant over time and may be augmented with efforts from both sides (Luo, 2001; Agmon, 2003). This relationship may also involve a more complex scenario in which actors other than the multinational firm and the host country government (such as NGOs, international organizations, other governments, and the potential future presence of other multinational firms) play a role and may change the distribution of bargaining power (Nebus & Rufin, 2010; Eden, 2002). Still, to the extent that there remains any threat of expropriation, foreign firms will likely adopt investment policies that ease their decision to exit more than their domestic counterparts.

The above arguments lead us to our next hypothesis, which is formulated as follows.

Hypothesis 4. Domestic based multinationals are less likely to divest their home country operations than foreign owned firms that operate in the same country.

In summary, foreign firms are predicted to exit with greater probability than purely domestic firms (hypothesis 1) and domestic multinationals (hypotheses 1 and 4). It is unclear whether these exit rates should converge or diverge over the life of firms, as the LOF and footlooseness views make different predictions. LOF predicts that they should converge (hypotheses 2), but the footlooseness view suggests that exit of foreign firms should diverge from that of purely domestic ones (hypothesis 3a) and does not make a clear prediction regarding domestic multinationals. The footlooseness argument, however, also predicts that exit rates of purely domestic firms and domestic multinationals should diverge (hypothesis 3b).

3. Methods

3.1 Data

For testing the hypotheses above, we use a data set on firms operating in Portugal (SABI) provided by Bureau van Dijk. The primary source of these data is an administrative source that includes information on firms' accounts that limited liability firms are annually required to report. In 2006 the data collection and processing was re-structured, and since then this information has been used by all major state institutions for

different purposes and is regarded as highly reliable. The tax administration office uses it for processing corporate taxes and the central bank, and the statistical office, among others, use it as the main source of annual information on business activity. Aside from information on a number of balance sheet and profit and loss account items, the data include the date of firm creation along with detailed information on geographic location and industry affiliation. Also included is information on the largest owner of each firm, enabling us to classify firms as being controlled by domestic or foreign interests, although it does not allow us to tell joint-ventures from wholly-owned firms. In addition, the data include information on which domestic owned firms operate subsidiaries abroad, and this enables us to identify domestic based multinationals. The data are available from 2006 to 2008. We use the data from 2006 and 2007 and classify firms as exits if they are not active in the subsequent year. Because we have information on the year the firm started operating in Portugal, we are able to identify their age at exit. Of course, for foreign firms, this means that we control for age in Portugal and any other age effect is left unobserved. We will discuss the implications of this further below.

We measure exit for purely domestic firms, and for domestic based and foreign multinationals, exit being defined as the end of operations in Portugal. First, note that we are able to account for full divestment only. Foreign and domestic based multinationals may partially divest their operations from Portugal, with or without relocation of the divested operations elsewhere in the world. We do not account for these divestments in the same way that we do not account for contraction of purely domestic firms. Second, these are rather different sets of firms, and exit may have different implications for each of them. Most foreign firms exiting a host country will probably continue their operations elsewhere without dramatic changes in these locations. In contrast, domestic based multinationals abandoning their home country will likely entail considerable changes, namely headquarter changes. Finally, for most purely domestic firms, exit most likely means that the firm stops operating altogether. Also, if for purely domestic firms exit means going out of business and is often (although not always) associated with failure, exit of a domestic based multinational may well be associated with success on a wider scale. While the data do not allow closer inspection of these issues, they need to be kept in mind when looking at the comparisons below.

3.1.1 Selecting comparable firms

To increase comparability between domestic and foreign firms in our sample, we excluded industries in which there were no foreign or domestic firms in at least one year. For each of the remaining industries, we sought to exclude those domestic firms whose characteristics were markedly different from foreign firms in the same industry. For this, we estimated a score model for the likelihood of being foreign for each firm. This is a probit model in which the dependent variable is 1 if the firm is foreign and 0 if it is domestic. The covariates include sales, profitability (Return on Assets), and leverage (Debt to Assets), plus sets of dummies for location (22) and industry (210 3-digit NACE industries). From these regressions we recovered the estimates of the probabilities of being foreign for each firm in our sample. We compared the probability of each domestic firm being foreign with that of each one of the foreign firms operating in the same industry. Domestic firms for which we could not find a foreign counterpart with a reasonably similar probability of being foreign (probabilities in the vicinity of 0.1% of each other) were excluded from the sample. The remaining domestic firms in our sample are thus only those for which we can find at least one "comparable" foreign firm.

Table 27. Proportion of firms excluded in 2-digit NACE industries

NACE	Industry	Initial number of observations	% excluded with industry criterion	% excluded with firm criterion
41	Distribution of water	141	100	0
64	Post and telecommunications	353	53	0
20	Manufacture of wood and wood products	4,950	32	0
92	Recreational, cult. and sporting activities	2,703	22	0
27	Manufacture of basic metals	392	5	0
71	Renting of mach. and household goods	1,368	5	0
40	Electricity, gas, and hot water supply	239	4	4
15	Manufacture of food and beverages	6,726	2	0
33	Manufacture of precision instruments	801	1	0
23	Manufacture of coke, refined petroleum	8	0	25
73	Research and development	100	0	1
34	Manufacture of motor vehicles	553	0	1

Note: Table includes only 2-digit industries in which more than 1% of firms were excluded. All the analysis is performed at the 3-digit industry level.

Table 27 indicates the 2-digit NACE industries from which at least 1% of the total number of firms was excluded. The criterion of requiring that at least one foreign and one domestic firm be active in the 3-digit industry is the one that excludes most of the firms. The industries in which this exclusion was most important are not surprising. In the water distribution sector all firms were excluded and the same was true with 53% percent of the firms in the postal and telecommunications sector. The criterion of requiring the presence of "similar" foreign and domestic firms is much less important and when it is met, it is mostly in relatively small sectors, as in the manufacture of coke and refined petroleum. In only one industry – the electricity, gas, steam, and hot water supply sector – both criteria excluded firms.

After performing these exclusions our data include over 300,000 purely domestic firms, over 3,500 foreign owned, and 367 domestic firms owning a major stake of firms in foreign countries. The number of firms and the exit rates for different age classes in our final sample are shown in Table 28. The age structure of the different type of firms is rather different, purely domestic firms being the youngest and domestic multinationals being the oldest firms. Overall, foreign firms exit in greater proportions than domestic. While the figures are comparable at the earliest ages (exit rates for foreign firms are even lower than those of domestic firms aged 0-4), the age patterns of exit are rather different; the exit rate of domestic firms is decreasing with age (flattening out after age 20), whereas the exit rate of foreign firms seems to be much more constant, perhaps increasing somewhat with age. Domestic multinationals have a lower overall exit rate, but with two peaks at the youngest and oldest age classes.

Table 28. Exit Rates

	Domestic		Foreign		Domestic Multinationals	
Age	Firms	Exit rate (%)	Firms	Exit rate (%)	Firms	Exit rate (%)
0_4	60,206	9.5	424	8.5	36	11.1
5_10	104,433	7.1	814	8.7	68	2.9
11_20	92,489	5.6	1,301	8.6	105	1.9
21_30	35,420	5.1	422	11.6	53	3.8
31_50	22,261	4.9	387	8.8	78	5.1
51_99	6,390	4.9	200	13.0	27	14.8
Total	321,199	6.7	3,548	9.2	367	4.9

The number of observations in each of the categories is very different and the precision of the corresponding estimates is, of course, different. In addition, these figures do not take into account that firms differ in a number of aspects (to be discussed below). To account for these differences and to measure the precision of the different estimates, we resort to appropriate regression models.

3.2 Estimating the Probabilities of Exit

To estimate the probabilities of exit, we use a probit model where the dependent variable is whether or not a firm exited (1 for exit, 0 for survival). We allow age to have non-linear effects by including age, age squared, and age cubed in the regressions. In addition, because we wish to allow the age effects to be different for the different types of firms, we interact age with appropriate dummies for purely domestic, domestic multinational, and foreign firms.

In order to properly appraise the effect of foreignness and multinationality we need to control for characteristics that make these firms different. Our regressions include controls for firm size, intangibles, profitability, and leverage, plus sets of dummies that control for different location (22), and industry affiliation (210). Foreign and domestic firms vary considerably with respect to size and the use of intangible assets (Dunning & Lundan, 2008), and size has been consistently found to be related to the survival of firms (Mitchell, 1994). The largest firms in our sample are domestic multinationals and the smallest are purely domestic firms; this holds irrespective of measuring firm size by sales, employees or assets (Table 29). Intangibles are measured by the average wage paid by firms (Conyon, Sourafel, Thompson, & Wright, 2002) and we find little difference in wages paid by domestic and foreign multinationals, but purely domestic firms pay significantly lower wages. Profits (measured by return on assets and return on equity) are higher in foreign owned firms than in purely domestic firms or in domestic multinationals in our sample. Profitable firms are less likely to exit than non-profitable ones, and while the three groups of firms do seem to use leverage (measured by the ratio of debt to assets) to different degrees, there may be heterogeneity in the use of debt within groups, and debt has been found to be related to exit (Zingales, 1998).

Table 29. Control Variables

	Domestic	Foreign	Domestic Multinationals
Sales (thousand Euros)	1,154	31,175	68,085
Number of Employees	12	115	477
Assets (thousand Euros)	669	25,316	95,217
Average Wage (thousand Euros)	11	29	26
ROA	0.037	0.059	0.038
ROE	0.046	0.101	0.032
Debt to Assets	0.620	0.604	0.634

4. Results

Table 30 reports the results of our regressions. The starting point for the regressions in this table is a regression with three dummies (for domestic firms, domestic multinationals, and foreign firms) which, of course, does not include a constant, but does include the control variables previously defined. We augmented this specification by including interactions of the category dummies with Age, Age squared and Age cubed. Interactions between the Domestic dummy and the three age terms were significant. The only interaction of the Age terms with the Foreign dummy that was significant was the interaction with Age, while none of the interactions with Domestic Multinationals was significant. Accordingly only these terms were retained. The results of several variants of this final specification (in which different control variables are included) are reported in Table 30. Results for age do not change, regardless of the control variables in the regression.

Table 30. Regression Results

	(1)	(2)	(3)	(4)
Domestic	-1.329***	-1.104***	-1.202***	-1.329***
	(-118.12)	(-31.03)	(-111.62)	(-117.96)
Age	-0.0214***	-0.0248***	-0.0239***	-0.0216***
	(-14.81)	(-16.92)	(-16.50)	(-14.92)
Age squared / 100	0.0426***	0.0519***	0.0506***	0.0441***
	(7.71)	(9.28)	(9.12)	(7.94)
Age cubed / 10,000	-0.0240***	-0.0311***	-0.0304***	-0.0256***
	(-4.46)	(-5.69)	(-5.59)	(-4.72)
Foreign	-1.226***	-1.074***	-1.144***	-1.226***
	(-25.85)	(-17.78)	(-23.77)	(-25.69)
Foreign x Age	0.00509***	0.00390**	0.00487***	0.00519***
	(2.90)	(2.20)	(2.77)	(2.94)
Domestic Multinationals	-1.403***	-1.330***	-1.202***	-1.329***
	(-12.38)	(-10.95)	(-111.62)	(-117.96)
Average Wage	-0.00216***	-0.00575***	-0.00540***	-0.00207***
	(-3.45)	(-7.00)	(-7.53)	(-3.32)
Debt to Assets	0.174***	0.126***	0.139***	0.172***
	(11.64)	(8.26)	(9.31)	(11.38)
ln(Sales)	-0.0609***			-0.0632***
	(-19.37)			(-20.11)
ln(Assets)		-0.0124***		
		(-3.73)		
ln(Employees)			-0.0464***	
			(-11.37)	
ROA	-0.285***	-0.335***	-0.334***	
	(-13.52)	(-15.05)	(-15.26)	
ROE				-0.0498***
				(-13.90)
Log-likelihood	-78,184.5	-78,424.6	-78,350.9	-77,226.6

Notes: N=325,114. All regressions include 210 industry and 22 location dummies. t statistics in parentheses. Stars (***, **, and *) indicate significance at 1, 5, and 10%, respectively.

Starting with the results of the control variables, we find that larger firms, those that use a greater amount of intangible assets, those that are more profitable, and those that use less debt are less likely to exit. Results are robust to different measures of size

(sales, employment, and total assets) and profits (Return on Assets and Return on Equity).

It is not easy to immediately appreciate the substantive meaning of the regression results with respect to the effect of age in the table. On the one hand, the dummies and the age polynomial for domestic firms would make the evaluation of the effect of age difficult even in the context of ordinary least squares regression. On the other hand, unlike the situation in ordinary least squares regression, the estimated coefficients in the probit model do not reflect marginal effects. For permitting an easier appreciation of the regression results, Figure 5 shows the estimated probabilities implied by our model, evaluated at the different ages and at the mean values for all other variables. We see that for domestic firms, the estimated probability of exit decreases in the first years and then stays more or less constant after the age of 40 or so. The pattern of the plot for domestic firms is very much in accordance with results established in the literature on new firms from different research streams. Using data on several populations of firms that, in some cases, are covered for over one century, Freeman, Carroll, and Hannan (1983) report a decreasing probability of exit with age, while Dunne, Roberts, and Samuelson (1988) report similar patterns using data that cover all new firms from the US Census of Manufacturing over a period of 40 years (see also Shepherd, Douglas, & Shanley, 2000 for an overview of the findings in the small business literature).

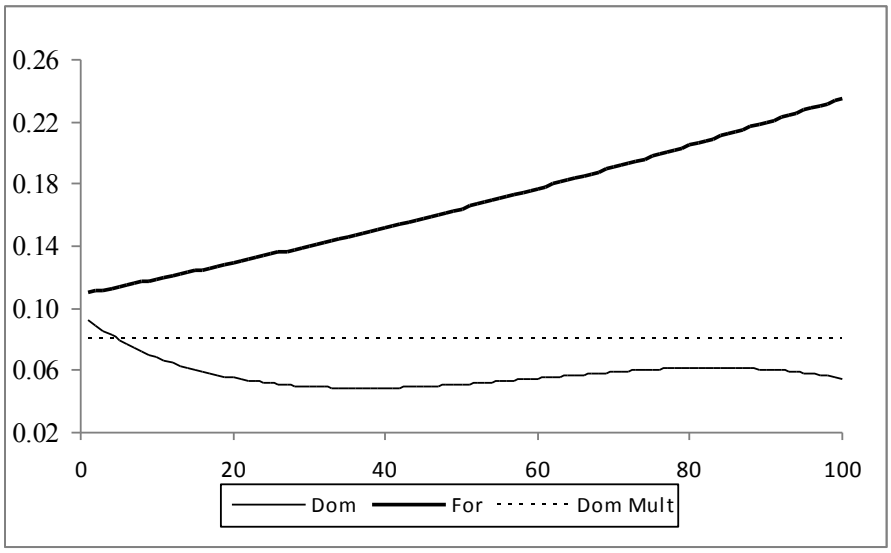

Figure 5. Conditional Exit Probabilities

The exit probabilities for foreign firms are estimated to be close to those of their domestic counterparts at the earliest ages and then increase linearly. This suggests support for the footlooseness hypothesis, rather than the liability of foreignness hypothesis.

Domestic multinationals are estimated to confront a constant exit rate. This constant exit rate is at a level that is higher than that of purely domestic firms at their earliest ages, but that becomes greater after age 4. This seems to indicate that domestic multinationals are, indeed, more likely to exit than purely domestic firms, presumably because they have greater ease in relocating their activities elsewhere. Still, they are much less likely to exit than comparable foreign firms at all ages.

Using the estimated variances and covariances of the exit probabilities in Figure 5, we can test hypotheses on the equality of these probabilities. Using a critical level of 1%, we find that the exit probabilities are significantly different right from age 1 for domestic and foreign firms. These probabilities are significantly different from age 25 and thereafter for foreign and domestic multinationals, while they are never different for purely domestic firms and domestic multinationals.

Therefore, in a nutshell, we find that the patterns of exit of foreign firms are rather different from those of purely domestic firms, that they are somewhat different from domestic multinationals, and that exit patterns of domestic multinationals are not distinguishable from those of purely domestic firms.

4.1 Robustness

4.1.1 Age of Foreign Parents

Even though we are able to control for a large number of characteristics of firms, there remain differences we cannot control for. Particularly important for our analysis, it is most likely that foreign firms have been active for some time number before they begin operating in Portugal. It is plausible that this previous experience contributes to decreasing exit. A foreign subsidiary whose parent is 5 years old when it starts will have an overall experience that is longer than that of a domestic firm when it starts.

While we cannot measure the actual effect of this experience, we can conduct a robustness analysis by adding a constant to the age of the foreign firms and see if this has a sizeable impact on our estimates of the effect of age. Of course, not all parents are of the same age when they start operating in Portugal. As we do not control for this variability in the age of parents, this dispersion is transmitted to the error term and our estimates are less precise than what they would be if we were able to control for it. We performed this check by repeating the estimations after having incremented the age of foreign firms by 5, 10, and 20 years. The results reveal an effect of age that is slightly flatter than it is in the baseline estimation, but the qualitative results do not change in any significant manner. The same shapes for the exit probabilities that were reported in Figure 1 persist. Exit probabilities that were estimated in our baseline case to be different for foreign and domestic firms since age 1 are now estimated to be different since age 3, 4, and 8 when age is incremented by 5, 10, and 20 years. The corresponding figures for the comparison between foreign and domestic multinationals are 30, 35, and 45, while in the baseline case it was 25. Purely domestic firms and domestic multinationals are never different, as in the baseline case.

4.1.2 Firms and industries that were excluded for being very different

We performed a series of operations to guarantee that when comparing foreign and domestic firms we were not comparing firms that were operating in radically different environments or firms that were clearly very different in their characteristics. Because of that, we excluded industries in which there was not at least one domestic and one foreign firm, and also those domestic firms whose characteristics made them very different from any foreign firm in the same industry. We checked whether these exclusions affect our results by running the same regressions including these observations in the sample, but results are not sensitive to this inclusion. The same shapes for the exit probabilities that were reported in Figure 1 persist. The only observed change in the results is that foreign and domestic multinationals are estimated to confront different exit probabilities since age 21, and not 25 as in the baseline estimation.

4.1.3 Estimating the effect of age with age classes

We also estimated the effect of age by including a series of dummies for different age categories. Results indicate that we cannot reject the hypothesis that the exit rate is constant for domestic multinationals (χ square = 9.20 p-value= 0.102), but that we should reject the corresponding hypothesis for foreign firms (χ square = 14.26 p-value= 0.014), and for domestic firms (χ square = 630.34 p-value< 0.0001). Figure 6 reports the estimated exit probabilities with such a model and displays a pattern which is close to that in Figure 5.

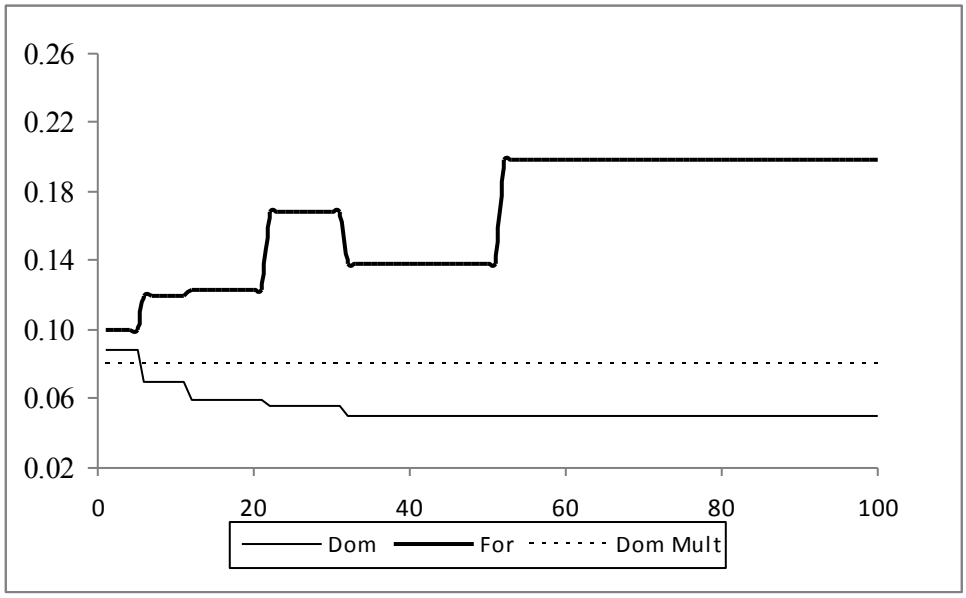

Figure 6. Conditional Exit Probabilities (age class)

The conditional probabilities of exit are higher for foreign than for domestic firms for all age classes, and formal tests of equality of these estimated probabilities indicate that they are statistically different except for very young firms up to 4 years The χ square statistics for these tests are 0.58 (p-value = 0.45) for age 0-4 and greater than 22, with the corresponding p-values being less than 0.0001, for all others ages. The hypothesis that the effect of age for foreign and domestic firms differs only by a constant is soundly rejected (χ square = 38.07), clearly above any conventional levels.

5. Discussion

Our results do not lend support to the idea that the liability of foreignness is decisive in shaping the patterns of exit of foreign firms relative to their domestic counterparts. The hypothesis that such a liability gradually disappears over time implies that the hazard rates of domestic and foreign firms should converge. In contrast, we find that the hazard rates diverge. At the earliest ages the two rates are rather similar but they diverge, as a consequence of domestic firms confronting a decreasing exit rate and foreign firms an increasing rate as they grow older. Even if they are footloose, foreign firms are unlikely to exit much during the first years. On the one hand, environmental conditions are unlikely to change much, both in the host country and elsewhere. On the other hand, the entry costs incurred by foreign firms are typically substantial and of a larger magnitude that those incurred by comparable domestic firms. Consequently, foreign firms may require longer periods in activity in order to decide to exit.

Our results are at odds with those reported by Zaheer and Mosakowski (1997), in which the exit rates of foreign and domestic firms converge during the first 19 years of life. This result is largely driven by an increase in the exit rate of domestic firms that the authors found to hold between ages 10 and 19. We can only speculate on why the exit rate for domestic firms increases in the sample of Zaheer and Mosakowski (1997), but we note that this pattern is rather atypical and does not conform well to the liabilities of newness or of adolescence, which have been found to hold in most survival studies that do not discriminate between foreign and domestic firms. It is also possible that this is somewhat related to an industry-specific shock. However, we note that in Zaheer and Mosakowski (1997), time is measured from the moment the study begins, not from the moment firms actually started their operations, and that the sample also includes firms that were already operating in the first year of the study. If these are a large proportion of the sample, then the effect that is attributed to age can, in fact, be due to calendar time. This should be more and more important as time elapses, as fewer new firms remain in the sample. In our study, age is measured from the moment at which a legal entity was created in Portugal.

The divergence that we observe between exit of foreign and domestic firms is the consequence of two rather disparate evolutions of the hazard rates. The exit rate of foreign firms increases rather markedly, while that of domestic firms decreases, albeit at

slower paces as firms age. The fact that we observe a much greater contrast in the exit rates of domestic and foreign firms than did Zaheer and Mosakowski (1997) is, however, quite plausible, especially taking into account that our data refer to a period and a context in which more changes occurred than in the case of Zaheer and Mosakowski (1997). On the one hand, there might have been an overall increase in globalization from the period 1974-1993 used by Zaheer and Mosakowski (1997) to the years 2006 and 2007 which we use. In addition, ours is also the period immediately following the greatest enlargement of the European Union. Ten Eastern European countries became members of the European Union in 2004 and two more in 2007. This enlargement of the EU generated a great deal of speculation on whether firms would de-locate from other places in Europe in order to take advantage of the new locations with cheaper labor. This debate, first held in the popular press, is more recently making its way into more academic type of research (Konings & Murphy, 2006), and is particularly relevant for a periphery country such as Portugal, which received a massive FDI inflow in the late 1980s immediately after joining the EU.

It is quite possible that this specific context increased the importance of "footlooseness" relative to that of the liabilities of foreignness. Note, however, that our evidence does not suggest that exiting firms are mostly those that invested in Portugal after the country became an EU member in 1986. These firms would be aged 20 or less in 2006, and, if anything, it is the age class 21-30 that exhibits what seems to be an abnormally high exit rate.

Note also that our evidence does not necessarily support the argument that flexibility is more valuable today than it used to be (although neither does it invalidate the argument). The argument implies that firms that invest in foreign countries today may adopt more flexible arrangements than those that were adopted by their older counterparts when they were established. This is consistent with the findings of Kronborg and Thomsen (2009), in which foreign firms that were established long ago were less likely to exit than their domestic counterparts, but that these differences in the last 20 years increased their propensity to exit relative to domestic counterparts. If this were dominant in our data, we would observe an increased propensity to exit in the younger foreign firms but not in more mature ones. In contrast, we observe that the conditional probability of exit increases persistently with age, and this holds for firms established 50 years ago

and more, much before the value of flexibility may have increased. Therefore, the increased propensity of firms which are 50 and older to exit cannot be taken as evidence of the effect of globalization and the corresponding changes in the entry strategies.

6. Conclusion

Recent research comparing the survival of foreign and domestic firms has emphasized the liabilities of foreignness and largely neglected that foreign firms are inherently footloose, that is, firms are less attached to foreign markets than to their own.

Liabilities of foreignness, the disadvantages experienced by firms when they operate in a foreign country, are to a large extent temporary, as many sources of this liability can be overcome with time. Footlooseness, on the contrary, is rather more permanent and refers to the greater willingness of firms to abandon a country, because they contemplate alternative locations more easily than do purely domestic firms. While footlooseness may always be there, its impact upon exit is likely to become more and more evident, as environment conditions change, both in the host country and elsewhere.

This study analyzes the survival of foreign and domestic firms using a long-run perspective that enables us to acknowledge both forces and evaluate their impact upon the survival of foreign firms. It uses a unique data set of firms operating in Portugal in 2006 and 2007 that contains information on the age of firms and the share of foreign-owned equity. This allows us to compare the probability of exit of foreign and domestic firms over their life cycle and to uncover differences in the likelihood of exiting at different moments in time. In addition, the data also include information on which domestic owned firms have major stakes in firms operating in foreign countries, which enables us to identify domestic based multinationals. This enables us to contrast the exit patterns of these three different groups of firms.

We find that, taking differences between foreign and domestic firms into account, the exit rates of foreign and domestic firms become more and more different as firms age. This is the result of a decreasing exit rate for domestic firms and an increasing rate for foreign firms. The pattern found for domestic firms is consistent with a liability of newness that has been found to prevail in many studies that do not distinguish domestic from foreign firms. The pattern found for foreign firms suggests that the effect of a

liability of foreignness, which may exist early in the life of foreign firms, is not strong enough to dominate the effect of the intrinsic footlooseness of these firms. Our results also suggest that this finding is due more to foreignness than to multinationality. First, we did not detect any specific age pattern for exit of domestic based multinationals. Second, although domestic based multinationals exit with greater likelihood than purely domestic firms, the difference is not statistically significant, while, in contrast, domestic based multinationals exit less than foreign ones, and this difference is statistically significant for most of the age span covered.

This finding has implications for public policy toward foreign investment. Many countries actively pursue such policies (see UNCTAD, 2000), under which incentives for foreign investment are available during a limited period of time. A rationale for providing incentives that are limited in time is that these incentives should compensate for the initial liabilities of doing business abroad, the implicit assumption being that, after that initial period, foreign firms would naturally remain in the country. Our evidence shows that, on the contrary, foreign firms are less and less likely to remain in the country as they grow older. This suggests that the benefits a country expects to obtain from the presence of foreign firms, against which the costs of the incentives are weighed, should probably be discounted more heavily than they currently are. Our findings should also alert policy makers for the fact that the emphasis typically placed on the moment of entry and on attracting foreign investment may be misplaced, and equal attention should be given to the retention of foreign firms. Our results cannot, of course, be taken as an indication that domestic multinationals should be neglected by policy makers, but they nevertheless indicate that these firms may have reasons of their own to remain in the home country.

Our results also have implications for managers. First, our results imply that managers should be careful when investing in a foreign country. It is likely that conditions that led to entry will eventually change and exit may be necessary. Creating exit options may, therefore, be a valuable strategy. Second, managers of domestic multinationals may be tempted to threaten to leave the home country in an attempt to obtain benefits from their countries' governments. This threat may suffer from lack of credibility, since our evidence shows that, in general, domestic multinationals do not leave often. If one is to make this threat, it is important to be aware of the need to establish credibility.

Our implications for managers extend to those operating purely domestic companies. One of the channels through which foreign firms are expected to exert their positive impact on the economy of the host country is via their upstream linkages. Entry of foreign firms is commonly seen as an opportunity for developing a set of suppliers to these firms. Managers of these suppliers must be aware that the likelihood of seeing their clients leave the country does not decrease over time. It is therefore important to remain cautious and avoid significant specific investments without appropriate safeguards. Finally, for managers of firms that operate in the same industry as exiting foreign firms, this exit may be an opportunity. Closing of such firms is often done by selling productive facilities, which makes skilled labor available for hire. Scouting the horizon for possible exits and moving fast when the time comes may be critical to take advantage of the opportunities.

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Private vs Public Ownership: Labor Outcomes in the Banking Industry

with Tiago Pires and Claudia Alves

Abstract

This paper identifies and estimates the differences between private and public firms on median employment duration, hazard rate, type of employment contract and wages. A second contribution is to analyze a privatization process and to identify the winners and losers with that process. In our empirical application we consider the Portuguese banking industry.

We find no distinguishable differences on wages per hour by working in a private bank rather than in a public bank. In contrast, employment in a private bank implies lower median employment duration but increases the likelihood of an open-ended contract. We find that the marginal treatment effect on log of wages per hour has the expected shape, decreasing in the likelihood of working in a public bank. In fact, workers with a higher likelihood of working in a private bank have a high wage premium by working in a private bank. The marginal treatment effect on log employment duration is increasing in the likelihood of working in a public bank for workers very likely to be working in a private bank but it is decreasing in the likelihood of working in a public bank for workers very likely to be working in a public bank. Indeed, workers with a high likelihood of working in a private bank have a negative MTE on log employment duration. Thus, for these workers the choice of a private bank implies a trade-off between wages and employment duration.

Privatization improved workers compensation, particularly in the banks that remained public. Furthermore, it increased the job stability on public banks relatively to private banks.

Keywords: banking sector, state ownership, wage differentials
JEL Classification: C21, J31, J45, L32, L33

1. Introduction

Differences between private and public firms[1] and the effects of privatizations are frequent themes in the political debate. The debate gained a new importance with the wave of privatization processes that started in the early 1980's.[2] Despite the importance of the question, until the 1990's, the economic literature on this topic was relatively scarce and the results obtained were often questionable by the limitations of the data and incapacity to control in a proper way for the endogeneity of ownership and workers' choice. The access to new data sets and the wave of privatizations in the former communist countries created new opportunities for researchers interested in the analysis of the ownership effects.

We contribute to the existent literature by analyzing the effects of ownership on labor outcomes. Our goal is to identify and to measure the gains (or losses) on median employment duration, hazard rates, type of employment contract and wages of working in a private firm rather than in a state-owned firm. A second contribution is to analyze a privatization process and to identify the winners and losers with that process.

Our paper has two main novelties. First, we analyze ownership effects on the type of employment contract (i.e., the choice between fixed-term and open-ended contracts), median duration and hazard rates, while the extant literature is usually focused in wage differentials. Second, we identify the marginal treatment effect of ownership on labor outcomes.

In our empirical application we consider the banking industry in Portugal. This empirical application offers some specificities and characteristics that are very appropriate given our goals. On one hand, public and private firms keep coexisting in a competitive market environment. On the other hand, liberalization and privatization

[1] In this paper a public firm is a state-owned firm, that is, a firm whose main stockholder is the national state. On the other hand, a private firm is a firm whose main stockholders are private entities. In particular, in our empirical application we define a private firm as a firm where fifty percent or more of the equity is owned by private investors while a public firm is defined as a firm where fifty percent or more of the equity is owned by the Portuguese State.

[2] Despite the fact that most people associate modern privatization programs with Thatcher's government privatization program in the 1980's, the first large-scale privatization program started in the early 1960's in the Federal Republic of Germany.

processes occurred in the eighties and nineties (formally, these processes finished in 1997), thus creating the necessary event to study the effects of privatization. Furthermore, the analysis of ownership effects in this industry is particularly relevant because, as pointed by La Porta, Lopez-de-Silanes and Shleifer (2002), around the world, government ownership of banks has had significant consequences for economic and financial development.

Since we restrict the analysis to a particular industry in a particular country, in the interpretation of our results we should take external validity considerations into account and hence we can only interpret them with respect to our particular application (the banking industry in Portugal). Nonetheless, we hope that our results could provide some insights for what happens in similar situations.

In our study we use the data of Quadros de Pessoal (henceforward QP), a survey conducted by the Portuguese Ministry of Employment and Social Security. This survey is done since 1985 and covers the work force of all firms employing paid labor in Portugal. Its longitudinal nature, where a unique number identifies both firms and workers, makes it possible to follow firms and workers over time and identify ownership changes. This data source enables to identify in which sector each firm is and to observe the evolution of labor outcomes over time. Thus, it is a valuable source to analyze differences on labor outcomes between the private and the public sector. The QP survey is mandatory for all firms, either public or private, therefore the data should be immune to bias resulting from differences in survey questionnaires and from no compliance with the survey.

In order to identify and to estimate the effects of ownership structure on labor outcomes, we consider some of the methodologies proposed by the literature on the econometric evaluation of social programs and the literature on "causal inference". In particular, we derive a propensity score matching estimator, a difference-in-differences (DID) propensity score matching estimator and a marginal treatment effect estimator (MTE). Under the suitable assumptions the propensity score matching estimator and the difference-in-differences (DID) propensity score matching estimator enable to identify the average treatment effect on treated. The MTE estimator is also a useful tool since it allows us to identify the effects of a treatment on individuals that are indifferent between participating or not in the treatment.

Our results show no distinguishable differences on wages per hour of working in a private bank rather than in a public bank. Conversely, we find that employment in a private bank implies a lower median employment duration which can be partially explained by the higher positive state dependence of employment spells in private banks. This suggests that a worker in a private bank would have longer employment spells if she worked in a public bank.

This lower employment duration and the positive state dependence of employment spells in both sectors help to explain the lower hazard rates associated with employment in a private bank. In order to understand this, consider the following example. For sake of simplicity ignore that the coefficients associated with the regressors are different in each sector and consider two identical individuals at the beginning of their working life. One is employed in a public bank and the other in a private bank. After 10 years, the probability of remaining in the same job is higher for the worker who started working in the public bank. However, since she remains in the same bank and the probability of exiting increases with the employment spell length, then her hazard rate is higher than the hazard rate of the other worker.

Finally, we find that the likelihood of an open-ended contract is higher in private banks. Nevertheless, due to the large proportion of this type of contracts in the banking industry, the difference is relatively small.

We find that the marginal treatment effect on log wages per hour has the expected shape, since it is decreasing in the likelihood of working in a public bank. In fact, workers with a high likelihood of working in a private bank have a high wage premium by working in a private bank while workers with a low likelihood of working in a private bank have a penalty. The marginal treatment effect on log employment duration is increasing in the likelihood of working in a public bank for workers with a high likelihood of working in a private bank but it is decreasing in the likelihood of working in a public bank for workers very likely to be working in a public bank. Indeed, workers very likely to be working in a private bank have a negative MTE on log employment duration. Therefore, for these workers the choice of a private bank implies a trade-off between wages and employment duration. For these workers a job in a private bank implies higher wages but losses in the employment duration.

Despite the negative MTE on log employment duration for workers with a high likelihood of working in a private bank, the MTE on log employment duration is positive for a large range of values of the propensity score, suggesting that for a large proportion of workers there are gains on employment duration by working in a private bank rather than in a public bank. The negative MTE for the individuals more likely of receiving the treatment explains the aforementioned negative average treatment effect on the treated. That is, some of the workers that are receiving the treatment are the workers that have few benefits (in terms of employment duration) of receiving it. In fact, some of these workers have a penalty.

The marginal treatment effect on the log hazard rate is always positive, suggesting that the choice of an employment in a private bank rather than in a state-owned bank may have negative effects on the probability of terminating the employment spell.

Our results show that the gender wage gap is lower in public banks. In both sectors, *ceteris paribus*, the employment spell for women terminates faster than for men and is even faster in public banks. Women that were working in a private bank in 2005, given their characteristics, had on average lower wages and lower median employment duration by working in a private bank rather than in a state-owned bank. Younger workers also had a lower wage and a lower median employment duration by working in a private bank rather than in a public bank. These results give some support to the hypothesis that state-owned firms protect groups in a weaker position in the labor market.

The returns to education are higher in private banks rather than in state-owned banks. This helps to explain why workers with at least 10 years of schooling have a higher probability of being employed in a private bank.

Finally, our evaluation of the privatization processes suggests that privatization improved workers compensation, particularly in the banks that remained public. Furthermore, it increased the job stability on public banks relatively to private banks.

The paper is organized as follows. Section 2 briefly places our work in the context of the related literature. In Section 3 we describe the Portuguese banking industry, the liberalization and privatization processes during the 1980's and 1990's. Section 4 proposes a model to analyze sectoral-choice decisions and to identify the effects of the different treatments on the labor outcomes. Section 5 discusses the empirical strategy to identify the value of switching from the public to the private sector. Section 6 proposes a

theoretical framework for each of the outcomes analyzed. In Section 7 we describe the data and outcomes while in Section 8 we present the results obtained using our identification strategy. Section 9 evaluates the privatization process and its impact on the labor outcomes and differences between ownership structures. Section 10 concludes the paper.

2. Literature Review

Our paper is essentially related with the literature on ownership effects[3]. This literature has studied, for example, differences in performance, efficiency[4] and labor outcomes due to ownership structure. In our paper we are interested in the latter point.

Although many papers analyzed public wage differentials between the public and the private sector for the United States, there is not a consensus in the results[5]. For instance, papers such as Smith (1977) and Gyourko and Tracy (1988) found that federal employees earnings are nearly 20 percent higher than their otherwise equivalent private sector counterpart. According to Belman and Heywood (2004), the wage differential remains after controlling for occupational differences, but it is slightly lower. In contrast, papers such as Hartman (1983) showed that, when properly defined positions are compared, federal workers are underpaid. Such conflicting results were also found at the state and local level. For example, Moore and Newman (1991) found a positive wage differential for the Houston metropolitan transit workers while Moore and Raisian (1991)

[3] See Shirley and Walsh (2000), Megginson and Netter (2001) and/or Dysney (2007) for a survey in the empirical literature on privatization. Megginson (2005) provides a survey specific for the banking industry.

[4] Some examples of papers that analyze the effects of ownership structure on performance and efficiency are Boardman and Vining (1989), Ehrlich et all (1994), Galal et all (1994), La Porta, Lopez-de-Silanes (1999), D'Souza, J. and W. Megginson (1999), Dewenter and Malatesta (2001), La Porta, Lopez-de-Silanes and Shleifer (2002), Bhaumik and Dimova (2004). Al-Obaidan (2002) examines the macroeconomic/efficiency effects of privatization in developing countries.

[5] Bender (1998) and Gregory and Borland (1999) provide surveys of the literature on the wage differential between the public and the private sector. According to them, most of the studies show that, on average, the public sector pays more than the private sector, even after controlling for differences in the productive characteristics of workers.

and Belman and Heywood (1995) found very small differentials at the state level and negative differentials at the local level.[6]

Katz and Krueger (1991) studied the changes in the structure of wages in the public and private sectors for the US during the 1970's and 1980's. They found that the rise in skill differentials in the 1980's was essentially a private sector phenomenon since education differentials and wage inequality only slightly increased in the public sector. These findings suggest that relative wages in the public sector responds only sluggishly to shifts in relative wages in the private sector. Katz and Krueger (1991) also provided evidence of a public-sector wage premium for women and less educated workers.

Due to data limitations, these papers usually restricted their analysis to wages differentials without taking non-wage compensations into account. Yet papers such as Bellante and Long (1981) and Quinn (1979) examined compensation differentials taking into account fringe benefits, employment stability and working conditions. Bellante and Long (1981)'s findings suggest that, once public/private ratios are adjusted for fringe benefits and employment stability, significant rents exist for public employees. Quinn (1979)'s findings also suggest public employees would be receiving rents, even after controlling for other forms of compensation.

In recent years some papers analyzed the effects of privatization processes on labor outcomes for particular countries. Brainerd (2002) studied the mass privatization process in Russia after 1992 to explore the effects on wages of changing ownership. She found evidence of a wage premium in private firms. The limitations of her data do not allow to completely identify the sources of the higher wages in private firms. Nevertheless, there is some evidence that one of the reasons for this differential was the increase of workers' power in private firms, explained by the particular characteristics of

[6] It is also important to mention the seminal paper of Blank (1985) that estimates the extent to which workers with different personal characteristics have different probabilities of choosing the public versus the private sector employment. The results of this paper show that public employment is preferred by the "protected" groups of veterans, nonwhites and women. Highly educated and more experienced workers are also more likely to choose the public sector. Furthermore, the results reveal that sectorial choice is influenced by more than wage comparison.

the privatization process[7]. A private sector wage advantage, particularly pronounced for University-educated workers, was also found in Poland by Adamchik and Bedi (2000).

Pendleton (1999) examined for the United Kingdom's bus industry the effect of ownership structure and the consequences of the privatization process on labor relations, wage and the level of employment. He also analyzed the effects of competition on these outcomes. His paper found very little support for the hypothesis that privatization will lead to institutional changes in labor relations. He found that average wages are lower in private firms but the increases on wages are higher in private firms. This suggests that the impact of privatization on wages occurs in the early stages of the process.

The ownership effects on wages in Canada were analyzed by Mueller (2000). He showed that, on average, public-sector employees tend to be paid a wage premium compared with their otherwise equivalent counterparts in the private sector. This premium is unambiguously higher for females.

Ho et all (2002) analyzed the effects on wage structures of privatization in China. In particular, they examined how returns to human capital and the gender inequalities changed with the privatization of rural industry in China. This paper also analyzed the effects of ownership on returns to human capital (education and experience) and the gender gap. They found that post-privatization ownership effects on the returns to human capital characteristics and gender wage gaps are not significant. However, privatization was associated with an increase in wages and with earnings inequality. Both the returns to education and the gender wage discrimination increased after the privatization. The returns to experience also increased for mid-aged workers.

Our paper is closely related with Monteiro (2010) who analyzed the effects on wages of the Portuguese banking's privatization. In order to identify the treatment effect on the treated, Monteiro (2010) considered Propensity Score Matching and Difference-in-Differences (DID) Propensity score matching estimators. She found a positive relation between wages and the timing of the privatization in the long-run and a negative relation in the short-run for workers that remained in the firm. Moreover, her results show that

7 In the Russian privatization process some share of the firms stocks was delivered to firm employees.

privatization affects more intensely the most educated, experienced and the best paid workers.

An important difference between our paper and Monteiro (2010) is that our main interest is not the analysis of the privatization *per se* but to study how ownership structure affects labor outcomes.[8] This allows us to consider all bank workers instead of restricting the analysis to workers who remained within the firm after the privatization as in Monteiro (2010). Furthermore, our paper has two important novelties. First, we do not restrict the analysis to wages, since we also analyze the effects of ownership on type of employment contract, median employment duration and hazard rates. Second, we identify the Marginal Treatment Effect (MTE) on labor outcomes associated with ownership.

Two other papers closely related to ours are Figueiredo, Figueiredo and Monteiro (2008) and Monteiro and Portela (2009). Figueiredo, Figueiredo and Monteiro (2008), using a STATIS approach, examined labor adjustments in ten Portuguese banks after switching from public to private. In particular, they studied the changes experienced by the privatized banks during the privatization process in terms of wages, employment, occupation, seniority, market share, profitability and capital-labor ratio. The paper showed that the privatization process was complex and firms adjustment to it differed in speed and path. Moreover, pay level was the workforce attribute that changed more, which is explained by substantial changes in terms of workforce's composition.

Monteiro and Portela (2009) estimated how wages in the Portuguese banking industry depend on the employers' ability to pay. In their analysis they take into account that rent sharing may vary according to the bank ownership structure. They found that wages are strongly positively correlated with rents even after controlling for firm and workforce characteristics. Furthermore, the elasticity of wages with respect to rents is higher in state-owned firms.

In a paper close to ours, Chong and Leon (2007) compared labor indicators of privatized, private and public firms. Using firm-level data for different countries they analyzed ownership effects on wages, benefits, labor composition, education, training,

[8] The effects on wages of the Portuguese banking industry's privatization are also examined in Monteiro (2009). In this paper the focus is not exclusively in the privatization process of the banking industry but also in the liberalization of this industry, which occurred in the second half of the eighties.

unionization and quality of management. They found that labor productivity increases after privatization and is higher on private firms. However, these differences are not reflected on average wages.

3. Privatization of the banking industry in Portugal

On April 25th of 1974 a military coup ended the dictatorship that ruled Portugal for 48 years. The collapse of the dictatorship led to struggles among the former opposition groups and parties as to who would exercise power and what sort of regime would be created. This created an economic and political turmoil in the eighteen months after the revolution. During that period, the movement that took power followed an anti-monopolistic policy, where large private enterprises were understood as monopolies. One of the measures approved within this anti-monopolistic policy was a nationalization process that affected several economic sectors, including the banking sector (Nunes, Bastien and Valério 2005).

The policies followed in the post-revolutionary period had persistent and long-term effects. In the 1980's the Portuguese banking industry was almost exclusively in public hands and there were several controls that constrained financial operations. The liberalization of the banking industry only started in 1983, with the adoption of the first laws to allow freedom of entry for private banks[9] (law 11/83 of 16th August 1983, decree-law 406/83 of 19th November 1983 and decree-law 51/84 of 11th February 1984).

A consequence of this liberalization was an increase in the number of banks and a subsequent rise in competition, which stimulated financial innovation. This liberalization process cannot be disentangled from the goal of joining the European Community. This goal motivated several financial market reforms whose objectives were to increase efficiency, improve macroeconomic management and the international competitiveness of Portugal (OECD 1999, Monteiro 2009, Bação 1997). The improvement in efficiency was seen as essential for the sustainability of the industry in a common european market,

[9]After the nationalization of the banking sector and until the new legislation of 1983, private banks were forbidden to operate in Portugal. However, mutual and cooperative banks were allowed to operate during this period.

This explains why institutions such as Montepio Geral and Caixa de Credito Agricola, which were not state-owned, were able to be active during this period.

since, prior to 1984, the industry was almost exclusively composed of a small number of public firms, which were overstaffed and inefficient, and by small and inefficient mutual and cooperative banks. Therefore, the banking industry in Portugal was in weak conditions to compete with foreign firms. (OECD,1999)

The deregulation reforms and the opening of financial intermediation to the private sector can be seen as the first phase of the reform of the banking industry and covered almost all second half of the eighties. In 1989, the privatization process started and with it the second phase of reforms. The first law adopted to start the privatization process (law 84/88) was approved in 1988. However, it only allowed a partial privatization of public firms since the law required that at least 51 per cent of the equity remained state-owned. Deeper privatization required a Constitutional amendment, since the Constitution approved after the 1974's revolution imposed that all nationalized firms had to remain state-owned. The necessary Constitutional amendment was approved in 1989 and enabled the adoption in 1990 of the laws allowing the privatization of previously nationalized firms (decree-law 11/90). Ten out of twelve public banks were privatized between 1989 and 1996.[10] The two public banks that remained state-owned were CGD and BNU[11]. It is important to notice that the reasons that were given as to why these banks remained public were historical and not economic. In fact, it is usually emphasized that CGD remained public because, in contrast with the other banks, it was not nationalized after the revolution, since it was founded as a public entity in the nineteenth century and always remained state owned. The non-privatization of BNU is also explained by the specificities associated with its foundation and operational characteristics.

In contrast with other economic sectors (e.g. electricity and telecommunications), the government adopted a policy of no interference in the public banks during the period before the privatization (Monteiro, 2010).

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[10] BTA was privatized in 1989, BPA was privatized in 1990, BES and BFB were privatized in 1991, CPA was privatized in 1992, UBP was privatized in 1993, BPSM, BFN and BBI were privatized in 1994 and BCA was privatized in 1996.

[11] BNU had a very particular ownership structure since 60 per cent of the equity was owned by CGD and the other 40 per cent was owned by the public Treasure. Subsequently, the BNU was fully merged into CGD.

The privatization program aimed to improve the performance of enterprises. To do that, it was necessary to modernize them, to increase their competitiveness, and to broaden the participation of Portuguese citizens (particularly workers and small shareholders) in the ownership of enterprises. The first two objectives were attained through significant improvements in terms of productivity and efficiency levels. However, the third objective failed to be attained. Instead, a managerial type of ownership emerged with many of the privatized enterprises returning to their pre-nationalization owners. The privatization program was also seen as vital in the context of the European Monetary Union (Bação 1997).

The reform period induced changes in labor outcomes. With the increase in competition, the number of banks operating in the market rose during the privatization process period (1990 to 1996). Nonetheless, in the post-privatization period the number of banks started to decrease (see Table 31). Efficiency and demand for skilled workers increased, thus leading to employment growth. In the public sector, the average firm size decreased during the privatization process but increased from then onwards. In private banks, there was an increase in the level of employment, particularly during the privatization process, when employment growth was sharper. The employment growth is explained by the increase in the average firms' size rather than in the number of banks.

Despite the increase in the average firms' size, labor productivity rose, reflecting the increase in working hours, in the share of full time employees and in the use of more skilled workers. The increase in wages was more evident in the private sector, but there was also an increase in wage dispersion among privatized firms, suggesting dissimilar wage impacts from the privatization process (see Figure 11 and Figure 12). Banks also experienced the impact of the regulatory reform. During the initial period of increased competition, from 1985 to 1989, profits turned down but recovered in the following periods reflecting a boom in the credit activity. (Monteiro 2009, 2010)

In the analysis of the liberalization process, the privatization process, and the performance of the banking activity after these processes, it is important to mention the rule of unions. The oldest labor unions represent all employees in the bargaining process regardless of the ownership structure. Each year, trade unions and banks meet to negotiate the vertical collective bargaining agreement. This collective agreement regulates the employment conditions, the remuneration and the duration of work. It

delimits the starting wage level and the compulsory wage progressions. Though the unionization in the sector expanded, it did not go against the reforms being done.

By 2005, most of the financial sector was in private hands (nearly 78 percent of share in terms of assets and nearly 70 percent of share in terms of workforce) and was among the most profitable and solvent in Europe. The reform process is considered a success not only because its main objectives were achieved but also because this achievement was done without the instability experienced by many other countries. For instance, one can mention the absence of strikes during the privatization process as a measure of the smoothness of reforms. This stable transition is justified with the prudent macroeconomic policies and adequate supervision adopted by the Portuguese authorities. As previously mentioned, unions also had an important role for this stable transition.

Although the state continued to hold significant ownership in the banking sector, through the fully state-owned CGD (one of the two largest banks in the country), this was not seen as a factor distorting the market due to the prudent and market-oriented supervision. In spite of the high concentration of the industry, competitive conditions were robust. The financial liberalization, the deregulation and the creation of the European Monetary Union helped boost the consolidation in the banking industry.

Portuguese banks continued to enjoy robust growth and strong profitability despite the difficult operating environment. Portugal's regulatory framework is modern and highly compliant with international standards, as proved by the participation of banks and other specialized entities in the securities market. In 2005, there were 61 banks including 22 branches of institutions authorized in other EU member states, 168 other credit institutions and 105 financial institutions under the Banco de Portugal's supervision (IMF 2006).

4. Theoretical Framework

The empirical analysis in this paper follows some of the methodologies proposed by the literature on the econometric evaluation of social programs and the literature on "causal inference". In particular, we consider a treatment effect approach. We define the treatment as the type of ownership structure of the firm where the worker is employed. Thus, the treatment is characterized by the dummy variable D defined as

$$D_i = \begin{cases} 1 & \text{if } i\text{works in a private bank} \\ 0 & \text{if } i\text{works in a public bank} \end{cases}$$

Given the rich data available and our goals, we consider as unit of observation each worker in each year. As we explain latter, one of the advantages of this approach is to take worker heterogeneity into account.

4.1 - A Simple Sector-Choice Model

Since we consider a free labor market, the assignment of a worker to a specific sector implies that both worker and firm are happy with the match. That is, workers prefer that sector and there is at least one firm in the sector that wants to hire that worker.

Let V_{ij}^{k} be the utility that worker i gets from working in firm j in sector k, given that firm j wants to hire the worker. Assume that this utility can be described by

$$\begin{aligned} \mathrm{V}_{\mathrm{ij}}^{\mathrm{k}} &= \mathrm{V}_{\mathrm{i}}^{\mathrm{k}} + \alpha_{\mathrm{j}} \\ &= \delta_{\mathrm{k}}\mathrm{Z}_{\mathrm{i}} + \varepsilon_{\mathrm{ik}} + \alpha_{\mathrm{j}} \end{aligned}$$

where Z_i is a vector of personal and job characteristics that includes age, gender, educational levels, and dummies for different geographic regions and occupations, ε_{ik} includes worker's and sector's unobserved characteristics and α_j is a firm fixed effect[12].

This specification implies that the utility is separable in the value created by the sector and by the firm. Furthermore, the value created by the firm is equal for all workers.

Worker i chooses the private sector instead of the public sector if and only if

$$\max_{\mathrm{j}\in\{\mathrm{k}=1\}} \mathrm{V}_{\mathrm{ij}}^{1} \geq \max_{\mathrm{j}'\in\{\mathrm{k}=0\}} \mathrm{V}_{\mathrm{ij}'}^{0}$$

$$\Leftrightarrow \delta_1 Z_i + \varepsilon_{i1} + \max_{j\in\{k=1\}} \alpha_j \geq \delta_0 Z_i + \varepsilon_{i0} + \max_{j\in\{k=0\}} \alpha_j$$

$$\Leftrightarrow \varepsilon_{i0} - \varepsilon_{i1} \leq \left(\max_{j\in\{k=1\}} \alpha_j - \max_{j\in\{k=0\}} \alpha_j \right) + (\delta_1 - \delta_0) Z_i$$

$$\Leftrightarrow \eta_i \leq \gamma_0 + \gamma_1 Z_i$$

Thus,

[12] The firm fixed effects include for example specific pension plans offered by each firm.

$$\begin{aligned} P(Z) &= P(D = 1 \mid Z) \\ &= P(\eta_i \leq \gamma_0 + \gamma_1 Z_i) \\ &= F_\eta(\gamma_0 + \gamma_1 Z_i) \end{aligned}$$

We assume that ε_0 and ε_1 are independent and type 1 extreme-value distributed. Hence, $\eta = \varepsilon_0 - \varepsilon_1$ is logistically distributed and thus

$$P(Z_i) = \frac{\exp(\gamma_0 + \gamma_1 Z_i)}{1 + \exp(\gamma_0 + \gamma_1 Z_i)}$$

Our specification for the sector-choice model is in line with the models proposed in Blank (1985) and Lewis and Frank (2002) because it takes into account some of the most important factors influencing worker's choice of sector. First, the public sector may place greater weight on social welfare commitment than the private sector and thus some groups that are in a weaker position in the labor market (such as women and older workers) may receive both wage and non-wages advantages (e.g. increased probability of being hired and better advancement opportunities over the long-run) from public employment.[13] Second, the lack of profit pressures in the public sector leads those more concerned with job security to seek jobs in the public sector.[14] Third, the demand for workers' skills may be different in each sector. Finally, geographic preferences may also affect sectorial employment choice since the availability of public or private employment varies among geographic regions.[15]

4.2 - Model of Worker's outcomes and Treatment Parameters

We use a model of potential outcomes to examine worker's outcomes and treatment parameters. Let Y_{it}^1 and Y_{it}^0 denote the individual's outcome associated with

[13] However, as pointed by Mueller (2000), the public-sector is subjected to taxpayer scrutiny to a degree rarely encountered by private-sector firms and this might limit the ability to provide wage and non-wage advantages for the groups in a weaker position.

[14] However, since we do not have a good measure of risk aversion, we cannot identify how important this factor is in the case studied.

[15] The model is also flexible enough to consider the possibility that some individuals are motivated by particular notions of "public service" or duty. Despite not being possible to identify the effects of this characteristic, it is taken into account by the unobserved characteristics term ε.

private and public sector, respectively. Y_{it}^{k} with $k = \{0,1\}$ is assumed to be a function of worker's characteristics. For sake of simplicity and expositional convenience, assume in this subsection that the potential outcomes can be described by[16]

$$\mathrm{Y_{it}^{k}} = \beta_{\mathrm{k}}\mathrm{X_{it}} + \mathrm{U_{it}^{k}}$$

At any given period t either Y_{it}^{1} or Y_{it}^{0} is observed, but not both. Thus, we can write the observed outcome Y_{it} as

$$\mathrm{Y_{it}} = \mathrm{D_{it}}\times\mathrm{Y_{it}^{1}} + \mathrm{Y_{it}^{0}}\times(1 - \mathrm{D_{it}})$$

or

$$\mathrm{Y_{it}} = \mathrm{Y_{it}^{0}} + \Delta_{\mathrm{i}}^{\mathrm{t}}\times \mathrm{D_{it}}$$

where $\Delta_i^t = Y_{it}^1 - Y_{it}^0$ represents the individual level treatment effect parameter of working in a private bank instead of working in a state-owned bank in period t. In this paper we propose a strategy to identify and estimate:

- The average treatment effect on treated $\Delta_t^{TT} = E(\Delta_i^t \mid D_i = 1)$
- The marginal treatment effect $\Delta_t^{MTE} = E(\Delta_i^t \mid X = x, P(Z) = p)$

5. Empirical Strategy

5.1 - Propensity Score Matching

One of the methods we propose to identify and to estimate the average treatment effect on treated (Δ_t^{TT}) is the propensity score matching estimator. Formally, we consider a propensity score matching estimator defined as

$$\hat{\alpha}_M = \frac{1}{n_1}\sum_{i\in I_1\cap S_p}\left[Y_i^1 - \hat{E}[Y_i^0 \mid D_i = 1, P(Z_i)]\right]$$

where

[16] In section 6 we propose and discuss a particular specification for each of the outcomes analyzed in the paper.

$$\hat{E}[Y_i^0 \mid D_i = 1, P(X_i)] = \sum_{j \in I_0} W(i,j) Y_j^0$$

and Y^1 denotes the outcome of receiving the treatment, Y^0 the outcome of not receiving the treatment, I_1 the set of individuals treated, I_0 the set of individuals in the control group, S_p the region of common support and n_1 is the number of individuals in the set $I_1 \cap S_p$. $W(i,j)$ is a weight matrix, which in the case of Kernel matching is defined as

$$\mathrm{W(i,j)} = \frac{\mathrm{K}\left(\frac{\mathrm{P(Z_j)} - \mathrm{P(Z_i)}}{\delta_n}\right)}{\sum_{\mathrm{k} \in \mathrm{I_0}} \mathrm{K}\left(\frac{\mathrm{P(Z_k)} - \mathrm{P(Z_i)}}{\delta_n}\right)}$$

where $K(.)$ is a kernel function and δ_n is a bandwidth parameter. In this paper, the propensity score matching estimation is performed using a bi-weight kernel with replacement for the control group. For each estimator we present bootstrap standard errors based on 100 replications. As propensity score we use the probabilities derived from the sector-choice model described in subsection 4.1. According to our framework being treated means to work in a private bank while the control group contains the individuals that work in a public bank.

The propensity score matching estimator allows identification of the average treatment effect on treated under the following assumptions[17]

$$\begin{array}{ccc} \mathrm{P(D = 1 \mid Z)} & < & 1 \\ \mathrm{E(Y_0 \mid D = 1, P(Z))} & = & \mathrm{E(Y_0 \mid D = 0, P(Z))} \end{array}$$

The first assumption (overlap assumption) ensures that for each value of the regressors each treated individual has an analog on the control group, and thus the matching between them can be done. The second assumption (conditional mean

[17] These assumptions are weaker than the assumptions

$$: \quad P(D = 1 \mid Z) < 1$$
$$Y^0 \perp D \mid P(D = 1 \mid Z)$$

frequently mentioned in the literature. However, since we are only interested in evaluating the effect on the mean they are sufficient.

independence assumption) can be seen as a strong assumption in our framework since it requires that the outcome in a state-owned bank does not determine participation (i.e. does not affect the choice between a private and a public bank). There are several situations where that might not be true. Therefore, to obtain identification of the average treatment effect on treated we have to rule out all these situations.

The utilization of a propensity score matching estimator to identify the average treatment effect on treated avoids the selection problem resulting from the workers possibility of choosing between the two sectors and the firms freedom to hire or not the worker. The propensity score matching estimator also avoids the potential bias resulting from labor market mismatch commonly observed in observational studies (Monteiro, 2010). Furthermore, this estimator has the advantage of not requiring a functional specification for the outcome.

5.2 - Diff-in-Diff Propensity Score Matching

Another approach to identify Δ_t^{TT} is to use a Difference-in-Differences (DID) propensity score matching estimator. Formally, we define the DID-Propensity Score Matching estimator as:

$$\alpha_{\mathrm{DIDM}} = \frac{1}{\mathrm{n}_1} \sum_{\mathrm{i} \in \mathrm{I}_1 \cap \mathrm{S}_\mathrm{p}} \left[\left(\mathrm{Y}_{\mathrm{it}}^1 - \mathrm{Y}_{\mathrm{it}'}^0 \right) - \sum_{\mathrm{j} \in \mathrm{I}_0 \cap \mathrm{S}_\mathrm{p}} W(\mathrm{i},\mathrm{j}) \left(\mathrm{Y}_{\mathrm{jt}}^0 - \mathrm{Y}_{\mathrm{jt}'}^0 \right) \right]$$

where I_1, I_0 denote the treatment and comparison group, Y_t^1 denotes the outcome of the treated at time t, Y_t^0 the outcome of the control group in time t, $Y_{t'}^0$ the outcome of the control group in time t', S_p the region of common support, n_1 is the number of individuals in the set $I_1 \cap S_p$. and $W(i,j)$ is a weight matrix. The treatment group is composed by workers in the private sector in t and the control group is composed by workers in the public sector in t.

Since we want to use panel data, we have to restrict the treated and control sample to workers that were employed in a public bank in period t' and that remained employed in the banking industry in period t (but maybe in a different bank). This difficults the comparison between this estimator and the propensity score matching estimator described in the previous subsection because the samples considered in each case are different.

Indeed, the sample for the DID-Propensity Score Matching estimator is a subsample of the sample for the Propensity Score Matching estimator. If the former is not representative of the latter, the treated group in each case should be seen as different.

The identification of the treatment effect on treated by the DID-Propensity Score Matching estimator requires

$$\mathrm{E}\left(\mathrm{Y}_{\mathrm{t}}^{0} - \mathrm{Y}_{\mathrm{t}'}^{0} \mid \mathrm{P}, \mathrm{D} = 1\right) = \mathrm{E}\left(\mathrm{Y}_{\mathrm{t}}^{0} - \mathrm{Y}_{\mathrm{t}'}^{0} \mid \mathrm{P}, \mathrm{D} = 0\right)$$

$$0 < \mathrm{P}(\mathrm{D} = 1 \mid \mathrm{Z}) < 1$$

These assumptions show that a difference-in-differences propensity score matching estimator allows for temporally invariant differences in outcomes between workers in the treatment and control groups. This estimator is analogous to the usual DID estimator, but it does not impose the linear form restriction in estimating the conditional expectation of the outcome variable and it reweights the observations using the weight matrix $W(i, j)$.

In comparison with the usual Propensity Score Matching estimator, the DID Propensity Score Matching has the advantage of allowing for systematic differences between treated and control outcomes even after controlling on observables. Furthermore, the DID Propensity Score Matching is more robust since it requires a weaker assumption regarding the unobserved decision of participation. Nevertheless, as we pointed before, since the samples considered for each estimator are different, we should be careful in the comparison between the estimators, because they identify the same treatment parameter under the suitable assumptions but possibly for different treatment groups.

5.3 - Marginal Treatment Effect

The Marginal Treatment Effect (MTE) is a measure of the treatment effect for individuals that are at the margin of participating in the treatment. That is, according to our definition, the MTE is the average effect for people who are just indifferent between participation or not at the given value of the propensity score. Thus, the MTE for values of p close to zero is the average effect for individuals with unobservable characteristics that make them more likely to participate, and the MTE for values of p close to one is the

average effect for individuals with unobservable characteristics that make them less likely to participate.

Our identification strategy for the MTE relies in the identity between the MTE and the Local Instrumental Variable (LIV) estimator over the support of $P(Z)$. That is,

$$\Delta^{\mathrm{MTE}}\big(\mathrm{x}, \mathrm{P(z)}\big) \equiv \frac{\partial \mathrm{E}\big(\mathrm{Y}|\mathrm{X}=\mathrm{x}, \mathrm{P(Z)}=\mathrm{P(z)}\big)}{\partial \mathrm{P(z)}}$$

for $P(z) \in supp(P(Z) \mid X)$.

In order to estimate the MTE parameter notice that

$$\mathrm{Y_i} = (\beta_1 - \beta_0)\mathrm{D_i X_i} + \beta_0 \mathrm{X_i} + (\mathrm{U_{1i}} - \mathrm{U_{0i}})\mathrm{D_i} + \mathrm{U_{0i}}$$

and

$$\mathrm{E}[\mathrm{Y_i} \mid \mathrm{X}, \mathrm{P(Z)} = \mathrm{P(z)}] = (\beta_1 - \beta_0)\mathrm{X_i P(z)} + \beta_0 \mathrm{X_i} + \mathrm{k}\big(\mathrm{P(z)}\big)$$

where $K(p) = E[(U_{1i} - U_{0i})D_i + U_{0i} \mid X, P(Z) = p]$. Using the previous equation it is easy to show that

$$\begin{aligned} \Delta^{\mathrm{MTE}}\big(\mathrm{x}, \mathrm{P(z)}\big) &\equiv \frac{\partial \mathrm{E}\big(\mathrm{Y}|\mathrm{X}=\mathrm{x}, \mathrm{P(Z)}=\mathrm{P(z)}\big)}{\partial \mathrm{P(z)}} \\ &= (\beta_1 - \beta_0)\mathrm{x_i} + \frac{\partial \mathrm{k}\big(\mathrm{P(z)}\big)}{\partial \mathrm{P(z)}} \end{aligned}$$

To estimate Δ^{MTE}, we consider an adapted version of the semiparametric algorithm proposed by Heckman, Urzua and Vytlacil (2006) and Carneiro, Heckman and Vytlacil (2010)[18]:

Step 1: Find the predicted values of $P(z)$ for each observation using the sector-choice model described in subsection 4.1.

Step 2: Estimate the coefficients β_0 and $(\beta_1 - \beta_0)$ using a nonparametric version of the double residual procedure proposed by Robinson (1988). In order to do that, we regress the outcome, each of the regressors (X_i) and $X_i\hat{P}(z)$, on $\hat{P}(z)$ using a local linear

[18] In our application and given the specificities of the outcomes analyzed we have to use a modified version of the procedure explained with more detail in section 6.

regression (LLR). If we have n_X regressors this implies the estimation of $2n_X + 1$ local linear regressions. Compute the residuals for each regression and denote them by $\hat{e}_Y$, $\hat{e}_{X_i}$ and $\hat{e}_{X_i \cdot \hat{P}(z)}$.

Step 3: Regress $\hat{e}_Y$ on $\hat{e}_{X_i}$ and $\hat{e}_{X_i \cdot \hat{P}(z)}$. This allows us to obtain consistent estimators for β_0 and $(\beta_1 - \beta_0)$. The intuition is the following. The equation estimated in this step is

$$\mathrm{Y_i} - \mathrm{E[Y_i \mid P(z)]} = \beta_0(\mathrm{X_i} - \mathrm{E[X_i \mid P(z)]}) + (\beta_1 - \beta_0)\mathrm{P(z)}(\mathrm{X_i} - \mathrm{E[X_i \mid P(z)]})$$

$$\Leftrightarrow \hat{\mathrm{e}}_{\mathrm{Y}} = \beta_0 \hat{\mathrm{e}}_{\mathrm{X_i}} + (\beta_1 - \beta_0)\hat{\mathrm{e}}_{\mathrm{X_i} \cdot \hat{\mathrm{P}}(\mathrm{z})}$$

This equation does not have endogeneity problems. Hence, the estimators obtained are consistent.

Step 4: Using the results found in step 3 compute $\hat{k}\left(\hat{P}(z)\right)$ as

$$\hat{\mathrm{k}}\left(\hat{\mathrm{P}}(\mathrm{z})\right) = \mathrm{Y} - \hat{\beta}\hat{\beta}_0 \mathrm{X_i} - \widehat{(\beta_1 - \beta_0)}\mathrm{X_i}\hat{\mathrm{P}}(\mathrm{z})$$

Step 5: Let $\vartheta_1(p)$ denote the nonparametric estimator $k'(p)$. This estimator is obtained in two steps. First, we run a five degree polynomial regression of $\hat{k}\left(\hat{P}(z)\right)$ on $\hat{P}(z)$. From this regression we obtain the effects of $\hat{P}(z)$ on $\hat{k}\left(\hat{P}(z)\right)$ which allows us to obtain $\vartheta_1(p)$.

6. Model for the outcomes

In this section we motivate a particular functional specification for each of the outcomes analyzed in the paper.

First of all, we should notice that only the MTE estimators require a functional specification of the outcomes in order to obtain identification. Nonetheless, a functional specification of the outcomes is useful to identify the groups that win and lose with the treatment.

In our paper the analyzed outcomes are wages, type of employment contract (i.e. choice between fixed-term and open-ended contract), median employment duration and hazard rates. The two latter outcomes deserve particular attention by two reasons. First,

duration is a censored variable, which creates several challenges in the estimation of the effects of ownership on median employment duration and on employment hazard rates. Second, we do not observe these two outcomes and thus in a first stage we need to estimate them. In subsection 6.1 we propose a strategy to deal with these problems.

6.1 - Theoretical framework and empirical strategy to estimate the effects on median employment duration and employment hazard rates

Let $\overline{T}_i$ and λ_i be, respectively, the median employment duration and the employment hazard rates of worker i. These outcomes are not observed and hence we need to estimate them. In order to estimate these outcomes we consider a parametric model of employment duration. We assume that employment duration (T_i) is a nonnegative random variable with a Weibull distribution. Thus,

$$\mathrm{F(t \mid v)} = 1 - \exp(-\gamma \mathrm{t}^{\alpha})\mathrm{g(v)}$$

where

$$\gamma = \exp(\mathrm{x}'\beta)$$

, t is a realization of T and x includes the explanatory variables. We consider as explanatory variables gender, age, level of education (the reference group is workers with less than four years of education), occupation (the reference group is less skilled workers) and a measure of firm size (number of employees).

In order to estimate $\overline{T}_i$ and λ_i, all inter-individual differences that are not measured by the regressors should be taken into account, that is, we have to take the unobserved individual heterogeneity (UIH) into account. UIH measures proportional variations in the hazard rates operating on a given individual relative to that on an average individual. We assume that UIH can be characterized by a multiplicative effect v on the hazard function. Therefore, the conditional hazard function is

$$\lambda(\mathrm{t \mid v}) = \mathrm{v}\gamma\alpha\mathrm{t}^{\alpha-1}$$

where v follows a gamma distribution.

These assumptions imply that duration can be characterized by a Weibull-Gamma mixture such that

$$F(t) = 1 - \left[1 + \frac{\exp(x'\beta)t^{a}}{\theta}\right]^{-\theta}$$

Thus, the median employment duration and the hazard function for each potential outcome are defined, respectively, by

$$\overline{T}^{k} = \left[\frac{\exp(x'\beta^{k})}{\theta^{k}}\right]^{-\frac{1}{\alpha^{k}}} \left(2^{\frac{1}{\theta^{k}}} - 1\right)^{\frac{1}{\alpha^{k}}}$$

$$\lambda^{k}(t) = \exp(x'\beta^{k})\alpha^{k}(t)^{a^{k}-1}\left[1 + \frac{\exp(x'\beta^{k})t^{a^{k}}}{\theta^{k}}\right]^{-1}$$

The parameter α is the shape parameter and, as pointed out by Abraham and Farber (1987), might be interpreted as representing some (unspecified) combination of true duration dependence and unmeasured heterogeneity. This parameter therefore relates the probability of the spell terminating with the length of the spell. The parameter θ is a measure of the characteristics of UIH.

The choice of the Weibull-gamma mixture model is adequate for the goal of accurately predicting completed job duration since it allows a flexible specification of completed job duration and accounts for duration dependence and unmeasured heterogeneity in the hazard rates. The model of potential outcomes also allows to consider unobserved heterogeneity between treated and untreated.

Using the usual notation on treatment literature, we can write

$$\ln\overline{T} = (1 - D)\ln E(T^{0}) + D\ln E(T^{1})$$

$$\ln\lambda(t) = (1 - D)\ln\lambda^{0}(t) + D\ln\lambda^{1}(t)$$

The coefficients are estimated by the following likelihood function

$$L(\beta, \delta) = [f^{0}(t \mid x)^{\gamma}S^{0}(t \mid x)^{1-\gamma}]^{1-D}[f^{1}(t \mid x)^{\gamma}S^{1}(t \mid x)^{1-\gamma}]^{D}$$

$$= \left[\left(\alpha^0 t^{\alpha^0-1}\exp(x'\beta^0)\left[1+\frac{\exp(x'\beta^0)t^{a^0}}{\theta^0}\right]^{-(\theta^0+1)}\right)^{\psi}\left(\left[1+\frac{\exp(x'\beta^0)t^{a^0}}{\theta^0}\right]^{-\theta^0}\right)^{1-\psi}\right]^{1-D} \times$$
$$\times\left[\left(\alpha^1 t^{\alpha^1-1}\exp(x'\beta^1)\left[1+\frac{\exp(x'\beta^1)t^{a^1}}{\theta^1}\right]^{-(\theta^1+1)}\right)^{\psi}\left(\left[1+\frac{\exp(x'\beta^1)t^{a^1}}{\theta^1}\right]^{-\theta^1}\right)^{1-\psi}\right]^{1-D}$$

where ψ is a dummy variable equal to 0 if the spell is right censored (the employment relation has not finished yet) and equal to 1 otherwise.

To estimate the coefficients and identify the median employment duration and the employment hazard rates, we use the data to obtain a flow sampling of employment spells for the period before and after the privatization process. The flow sampling after the end of the privatization process is constructed by considering all employment relations between 1996 and 2006 in firms created before 1996. The flow sampling before the privatization process considers all employment relations that started in the period between 1985 and 1988 in firms created before 1985. Table 32 and Table 33 each of these samples. For the period between 1996 and 2006, our data provides information for 31,909 employment relations that started during this period (24,463 in the private sector and 7,446 in the public sector). The mean of the spells associated with these relations is 2.821 and the median is 2. During this period the mean and the median of employment spells in the private sector are higher than in the public sector, suggesting that the employment relations in the private sector that started between 1996 and 2006 have a lower turnover and an higher duration than the employment relations in the public sector. 16,533 of these spells had not finished in 2006 and thus these observations are right censored. For the period between 1985 and 1988 we have information for 3,124 employment relations with a mean of 1.417 years and a median of 1 years. 1,494 of these employment relations had not finished in 1988.

Table 34 presents the results from the proportional hazard model for the post-privatization period (1996-2006). In the public and in the private sector the effect of age on the probability of termination of the employment relation is negative for younger workers and positive for older workers. That is, for younger workers, age decreases the probability of separation between workers and firms while for older workers age

increases that probability. One explanation for the increase of the hazard rate with age for older workers is the earlier retirement of workers in the banking industry. The legal retirement age during this period was 60 years old but many workers retired earlier. This earlier retirement was, in fact, incentivized by the government as a way of helping public firms dealing with the increasing competition and of helping the restructuration of privatized firms. The inversion in the effect of age on the hazard rate occurs earlier for workers in state-owned banks than in private banks (41 years against 45 years), however, excluding workers between 36 and 45 years old, the positive or negative effect of age on the hazard rate is higher for the public sector.[19]

The estimated coefficient of women is positive for public and private banks, but for the latter type of ownership the effect is not statistically significant. This implies that the employment spells for women terminate faster than the employment spells for men. In particular, since the coefficient for women in the public sector is 0.0844 and in the private sector is 0.0197, this implies that being women increases the hazard by nearly 8.8 percent over the baseline hazard in the public sector and increases the hazard by nearly 2 percent over the baseline hazard in the private sector sector. These results suggest that in private banks the incentives to terminate an employment relation with a female worker are only slightly higher than the incentives to terminate an employment relation with a male worker (in fact, the difference is not statistically significant). In contrast, in the state-owned banks this differential in the incentives is much larger. These results should be related with the fact that the proportion of women in private banks is lower than in public banks. Two possible explanations for the differences between the employment spells of female and male workers in private banks are that (i) women know that it is difficult to find another employment in the private sector and thus are less likely of quitting, and (ii) employer selection of the women accepted in the private sector is more strict and thus firms do not want to lose a valuable asset. Overall, our results suggest that it is more difficult for women, relative to men, to obtain an employment in a private bank but after obtaining it, the incentives to terminate that employment relation are smaller than in otherwise equivalent employment spells in a public bank.

[19] Notice that controling for education, age captures also the effect of labor market experience and so our interpretation might be extended to analyze the effects of labor market experience on the hazard rate.

Our results show that more education decreases the probability of separation in private and public banks. The magnitude of these effects is large. In public banks enrolment into high-school without enrolment in college implies a decrease in the hazard by nearly 73 percent over the baseline hazard and enrolment in college implies a decrease in the hazard by nearly 76 percent over the baseline hazard. In private banks enrolment into high-school without enrolment in college implies a decrease in the hazard by nearly 69 percent over the baseline hazard and enrolment in college implies a decrease in the hazard by nearly 81 percent over the baseline hazard. In public banks the effect of enrolment in college relative to enrolment only in high school is small. In contrast, the differences in private banks are higher. These results are in line with the predictions of job-matching and job-shopping theories that say that workers with more years of schooling are better at finding their most suited employment and thus they will have less turnover and higher job duration. Those results, however, contradict the findings in Farber (1994) and Mumford and Smith (2004) that workers with more education tend to have higher mobility.

We find that employment spells for managers and highly specialized workers, relative to employment spells of less skilled workers, terminate faster in private banks but terminate slower in public banks. The results suggest that managers and highly specialized workers are the occupation with the highest likelihood of separation in private banks and the occupation with the smallest likelihood of separation in public banks. Occupation is highly correlated with education. Therefore, in public banks the effects of occupation and education reinforce each other for managers and highly specialized workers, thus reducing the likelihood of separation. In contrast, for private banks, each effect has a different direction. Given the magnitude of each effect, the results suggest that the occupation effect attenuates the effect of education on reducing the probability of separation. The coefficients for foremen, supervision and administrative workers are not significant for public and private banks.

Finally, the firm size coefficient is negative for both sectors and thus separations are more likely in the smallest firms. One possible explanation is that exit rates decrease with size since in larger firms jobs are more valuable, promotion opportunities are higher, and the probability of failure is smaller.

For the two types of ownership structure the model exhibits positive state dependence (since α is greater than 1 in both cases); that is, the probability of spell termination increases as the spell lengthens. For the private sector the positive state dependence is very large, which implies that long spells have a high probability of termination in private banks.

The gamma coefficient, that provides information about the UIH, is small but significant for public banks. In contrast, for private banks the gamma coefficient is large and statistically significant. This suggests that UIH might not be very strong in state-owned banks but it is relevant for private banks.

Table 35 displays the results obtained for the pre-privatization period (1985-1988). The table reveals that for private and public banks' workers in the period before the privatization, the hazard rate decreases (but at a diminishing rate) with age for young workers and increases with age (at an increasing rate) for older workers. Furthermore, in both sectors, the coefficient for women is negative but not statistically significant.

As for the effects of education on the hazard rate, the results show that in both sectors the employment spell for more educated workers terminates faster. The effect of education on the hazard rates is stronger in the public sector. These results differ from the results for the period after the privatization. One possible explanation is that, before the privatization, workers with more education revealed higher availability to leave their employment to find a best one, while for workers with less education the percentage of voluntary turnover was small. Moreover, more educated workers might have faced a greater range of employment opportunities. Those facts are consistent with the findings in Farber (1994) and Mumford and Smith (2004) that workers with more education tend to have higher mobility, but they contradict job-matching and job-shopping theories.

The effect of occupation in the hazard rates is only significant for foremen, supervision and administrative workers in the public sector. For these workers, *ceteris paribus,* the employment spell terminates faster than the employment spell for any other occupation in the public sector.

During this period there was a high and significant positive state dependence for both types of ownership structure, since α greater than 2.9 for both types of banks. Furthermore, both types of ownership structure have a very small and not significant value of gamma, suggesting that UIH was not important during this period.

Using the coefficients obtained by maximum likelihood we can calculate the estimated median job duration and hazard rates. In particular,

$$\widehat{\overline{T}^{k}} = \left[\frac{\exp(x'\hat{\beta}^{k})}{\hat{\theta}^{k}}\right]^{-\frac{1}{\hat{\alpha}^{k}}} \left(2^{\frac{1}{\hat{\theta}^{k}}} - 1\right)^{\frac{1}{\hat{\alpha}^{k}}}$$

$$\widehat{\lambda^{k}(t)} = \exp(x'\hat{\beta}^{k})\hat{\alpha}^{k}(t)^{\hat{a}^{k}-1}\left[1 + \frac{\exp(x'\hat{\beta}^{k})t^{\hat{a}^{k}}}{\hat{\theta}^{k}}\right]^{-1}$$

It is possible to fit the specification of these outcomes with the model described in sections 4 and 5. In order to make this more clear notice that we can write the potential median employment duration and the hazard rate for an individual as

$$\begin{aligned} \overline{T}_{i}^{k}(x \mid v) &= \exp\left(x_i\beta^{k} + v_i^{k}\right)^{-\frac{1}{\alpha^{k}}}(\ln 2)^{\frac{1}{\alpha^{k}}} \\ \lambda^{k}(x, t \mid v) &= \exp\left(x_i\beta^{k} + v_i^{k}\right)\alpha^{k}t^{\alpha^{k}-1} \end{aligned}$$

and so

$$\begin{aligned} \ln\overline{T}_i &= \frac{1}{\alpha^0}\ln(\ln 2) - \frac{\beta^0}{\alpha^0}x + \left[\frac{1}{\alpha^1} - \frac{1}{\alpha^0}\right]D_i\ln(\ln 2) + \left(\frac{\beta^0}{\alpha^0} - \frac{\beta^1}{\alpha^1}\right)x_iD_i + \\ &\quad + \left(\frac{v^0}{\alpha^0} - \frac{v^1}{\alpha^1}\right)D_i - \frac{v^0}{\alpha^0} \end{aligned}$$

and

$$\begin{aligned} \ln\lambda(t) &= (\beta^1 - \beta^0)x_iD_i + D_i\ln\left(\frac{\alpha^1}{\alpha^0}\right) + (\alpha^1 - \alpha^0)D_i\ln t \\ &\quad + \beta^0x_i + \ln\alpha^0 + \alpha^0\ln t + (v^1 - v^0)D_i + v^0 \end{aligned}$$

Thus,

$$\begin{aligned} E\left[\ln\overline{T}_i \middle| X, P\right] &= \left(\frac{1}{\alpha^1} - \frac{1}{\alpha^0}\right)P(Z)\ln(\ln 2) + \left(\frac{\beta^0}{\alpha^0} - \frac{\beta^1}{\alpha^1}\right)x_iP(Z) \\ &\quad + \frac{1}{\alpha^0}\ln(\ln 2) - \frac{\beta^0}{\alpha^0}x + K_T(P) \\ K_T(P) &= E\left[\ln\overline{T}_i \middle| X, P\right] - \left(\frac{1}{\alpha^1} - \frac{1}{\alpha^0}\right)P(Z)\ln(\ln 2) - \left(\frac{\beta^0}{\alpha^0} - \frac{\beta^1}{\alpha^1}\right)x_iP(Z) \\ &\quad - \frac{1}{\alpha^0}\ln(\ln 2) + \frac{\beta^0}{\alpha^0}x \end{aligned}$$

and

$$E[\ln\lambda(t)|X,P] = (\beta^1-\beta^0)x_iP(Z)+P(Z)\ln\left(\frac{\alpha^1}{\alpha^0}\right)+(\alpha^1-\alpha^0)P(Z)\ln t + \beta^0x_i+\ln\alpha^0+\alpha^0\ln t+K_\lambda(P)$$

$$\mathrm{K_\lambda(P)} = \mathrm{E[\ln\lambda(t)|X,P]-(\beta^1-\beta^0)x_iP(Z)-P(Z)\ln\left(\frac{\alpha^1}{\alpha^0}\right)-(\alpha^1-\alpha^0)P(Z)\ln t -\beta^0x_i-\ln\alpha^0-\alpha^0\ln t}$$

Therefore, it is possible to obtain the MTE estimators of these outcomes by using the procedure described in subsection 5.3. However, given the assumptions made about the distribution of the potential outcomes of job duration and the specificities of these outcomes, the maximum likelihood estimators of the coefficients described above will be more efficient than estimators obtained from the step 3 of the procedure described in subsection 5.3 [20]. Hence, the MLE estimators will be used to obtain the estimated values of median job duration and hazard rates, and in the procedure to obtain the marginal treatment effect.

6.2 - Theoretical framework and empirical strategy to estimate the effects on wages

In our specification for wages we follow standard neoclassical models which predict that, in competitive markets, pay differences across individuals arise from differences in measured and unmeasured ability and characteristics. Our specification also takes into account that factors such as market power and social inequalities may explain differences between pay and productivity. Moreover, we assume that potential outcomes for wage have a linear (Mincerian) specification,

$$\mathrm{W^k = x'\beta^k + u^k}$$

where x includes the explanatory variable and u contains the unobserved factors. We consider as explanatory variables gender, age, the level of education, the tenure in the firm, and a measure of firm size (number of employees). Following Monteiro (2010), W is the logarithm of hourly wage and is constructed as the logarithm of the sum of monthly

[20] Nevertheless, the estimators obtained from that procedure continue being consistent.

base wage, plus the regular and irregular payments, payment indexed to tenure and overtime divided by normal and extra hours worked.[21]

6.3 - Theoretical framework and empirical strategy to estimate the effects on type of employment contract

Let O^k be the potential outcome that a contract is an open-ended contract. O^k is a binary variable equal to 1 if the worker has an open-ended contract and equal to 0 if the worker has a fixed-term contract. O^k depends on the factors that determine the worker's choice of whether to accept an open-ended contract and the factors that determine the firm's decision of offering an open-ended contract. Taking these factors into account, we consider the following generic specification for O^k

$$\mathrm{O^k} = \mathrm{g^k}\left(\mathrm{x}, \mathrm{u^k}\right)$$

where x includes the explanatory variable and u contains the unobserved factors. We consider as explanatory variables gender, education, occupation, education, and a measure of firm size.[22] In our estimation procedure to obtain the MTE we consider that

$$\mathrm{E}\left(\mathrm{O^k} \mid \mathrm{x}\right) = \mathrm{x'}\beta^{\mathrm{k}} + \mathrm{E}\left(\mathrm{u^k} \mid \mathrm{x}\right)$$

which allows usage of the algorithm proposed in subsection 5.3. This specification has the obvious deficiency of predicting probabilities that are negative or exceed one. Furthermore, since O^k is a binary variable, the standard errors have to be corrected for heteroskedasticity. Nonetheless, this specification is a useful exploratory tool and we believe the estimation procedure is robust enough to produce consistent estimators from this specification. This specification also has the advantage of reducing the number of assumptions, particularly, it avoids an assumption about the distribution of O^k and u^k

[21] As pointed by Monteiro (2010), hourly wage is preferable to monthly wage because workers from privatized and public firms experienced different length of hours of work after the reform.

[22] See Portugal and Varejao (2010) for a discussion about the importance of these variables to explain the choice of fixed-term versus open-ended contracts.

7. Data and Outcomes

We use the data of Quadros de Pessoal (henceforward QP), a survey conducted by the Portuguese Ministry of Employment and Social Security. This survey is done since 1985 and covers the workforce of all firms employing paid labour in Portugal. Its longitudinal nature, where a unique number identifies both firms and workers, makes it possible to follow them over time.

This data source is valuable to analyze differences between labor outcomes in the private versus the public sector because it enables to identify in which sector each firm is in each year and the respective labor outcomes. The access to raw data files allows us to compute labor outcome variables ourselves. The QP survey is mandatory for all firms, public and private, thereby the data should be immune to bias resulting from differences in survey questionnaires and from no compliance with the survey.

In the analysis of the ownership's effects on the labor outcomes of the banking industry we consider the year of 2005[23] and for the difference-in-differences approach we also consider the year of 1986. These years have some similar macroeconomic characteristics (Table 36), and most importantly, have relatively similar employment growth. Employment growth affects, for example, the participation rates, the number of vacancies and voluntary turnover. So, if we had chosen years with different macroeconomic characteristics, we could have obtained a spurious regression for the DID - propensity score matching estimators.

The Quadros de Pessoal contains information for 3,084,711 workers in 2005 and for 1897785 workers in 1986. To be on the safe side, we did some corrections to the data. We dropped observations with missing information for any of the variables described in Table 37 (except for type of contract) and in the worker identification variable. We excluded from our final sample observations where the age was smaller than 16 (minimum legal working age) and were the computed tenure was not in the interval from

[23] The choice of 2005 is justified by three main reasons. First, the privatization process that occurred during the nineties is already finished and consolidated since the last privatization occurred in 1996. Second, 2005 is one of the last years in our data. Third, for the last years in our data 2005 is the year that provides a better match with the macroeconomic environment in the years before the privatization process started.

0 to 65. Also, we excluded from our sample instances were the same worker hold multiple jobs in the banking sector in the same year, by keeping only the job with the larger number of declared monthly working hours.

We dropped from our sample temporary and part-time workers. Our sample was also restricted to the banking sector, that is, to commercial banks operating in the market in the considered time span. The final sample consists of 21,942 workers in 1986 and 33,753 workers in 2005. In order to obtain more accurate data about banks' ownership we also correct observations on social capital. More precisely, we assume that when social capital takes the value zero in only one year but a specific value in the remaining years the figure for the former year will be the same as in the later years. Finally, we deflated all nominal variables employed (sales, wage and social capital) to 2005 prices.

We define a private firm as a firm where fifty percent or more of the equity is owned by private investors and a public firm is defined as firm where more than fifty percent of the equity is owned by the Portuguese State.

Table 37 reports some summary statistics for the data. This table shows that, in 2005, employees in private banks were younger (approximately 38 years against 42 years in the public sector), had a lower tenure (11 years against 18 years in the public sector) and were more educated. In regard to the latter point, the proportion of workers that only enrolled in high school and the proportion of workers that enrolled in college were both higher in private banks. This explains why the proportion of workers with at least high school attendance is approximately 16 percent higher in private banks than in public banks.

In public banks the proportion of women and men is almost equal (49 percent of women) while in private banks the proportion of women is significantly lower (only 40 percent). The higher proportion of women and older workers in state-owned banks is in line with the predictions of the literature that argues that the public sector places greater weight on social welfare commitment and hence groups in a weaker position in the labor market tend to have a higher probability of being hired.

The proportion of low skilled workers in both sectors is very small (between 1 and 2 percent). Most of the employees are foremen, administrative or supervision workers. Nevertheless, the proportion of workers in these functions is higher in private than in public banks (87 percent against 81 percent). The lower proportion of workers in

these occupations in the public sector is almost exclusively explained by a higher proportion of managers and highly specialized workers.

The geographical distribution shows that most of the jobs are located in Lisbon. The most significant difference between the two forms of ownership structure is an higher representation of private banks in Porto.

Employees in state-owned banks have a higher wage per hour (15.62 euros against 13.99 euros in the private banks) and wage per month (2,185 euros against 2,026 euros in the private banks) than employees in private banks. Conversely, the number of hours worked per month is higher in private banks. These results are, again, consistent with the predictions of the theories that postulate the lack of profit pressure and the greater weight on social welfare commitment in public firms, since these two factors may translate in some wage advantages for workers. Nevertheless, we let a more extensive discussion of the differences on wages in the two sectors for the sections where we compare the wages in the two sectors taking the possible selection into account.

The median employment duration is higher for public banks (the median employment duration in public banks is 8.25 years while for private banks it is only 7.99 years). The hazard rates are also higher in state-owned banks (0.13 in public banks against 0.07 in private banks). For both outcomes the differences are statistically significant. One of the possible explanations for the latter results is the positive state dependence obtained for the estimated Weibull model in Table 34. Since the tenure in the public banks is higher, and thus the employment spells are longer, then the positive state dependence leads to a higher probability of the spell terminating for the public sector. Furthermore, the positive state dependence also helps to explain why the median employment duration is not very large and why the median employment duration is lower for private banks (remember that private banks have a stronger positive state dependence).

Both in public and in private banks the proportion of open-ended contracts is extremely high. Nevertheless, it is slightly higher in public banks where it achieves 96 percent against 93 percent in private banks.

8. Ownership Effects

8.1 - Simple Sector-Choice Model

Table 38 displays the results from the estimation of the simple sector-choice model described in subsection 4.1. The results show that being a women reduces the likelihood of employment in a private bank. Furthermore, the probability of choosing a private bank decreases, but at a diminishing rate, with age (the inversion only occurs for 71 years). These results are in line with the predictions of the theories that suggest that the public sector places greater weight on social welfare commitment, and thus, some groups that are in a weaker position in the labor market (such as women and older workers) receive both wage and non-wages advantages from public employment. In particular, they may have an increased probability of being hired in public banks. These advantages could explain why these groups are more likely to be employed in public banks rather than in private banks.

The lower likelihood of employment in the private sector by women is in line with the findings of Brainerd (2002) for Russia and of Lewis and Frank (2002)[24] and Blank (1985) for the US. However, for the latter case the results are not statistically significant.

Employees that at least enrolled in high school are more likely to have an employment in a private bank. Nevertheless, the probability of being employed in a private bank is slightly higher for workers that only enrolled in high school than for workers that enrolled in college. Again, a possible explanation for these results is the protection by public banks of workers in a weaker position (in this case workers with less education), which could imply that these workers have greater wage and non-wage compensations and higher probability of being hired in the public sector. These results are different from the results obtained by Blank (1985) for the US since in her case those with lower education prefer the private sector, while those with more education prefer the public sector.

[24] Lewis and Frank (2002) obtain a non-statistically significant effect of gender on the probability of holding a job in the public-sector when they exclude from the public sector teachers, bus service, U.S.Postal Service, water supply, irrigation and sanitary services.

Managers and highly specialized workers are the occupation group less likely to work in a private bank. Foremen, Supervision and Administrative workers are also less likely to work in a private bank than less qualified workers. We expect a positive correlation between education and the likelihood of being a manager or a highly specialized worker. Hence, the negative effect of being manager or highly specialized worker on the likelihood of working in a private bank is attenuated by the positive effect of education.

Figure 7 reports the distribution of the propensity scores, distinguishing between individuals in the treated and in the control group. As expected, the distribution for the treated is more left-skewed than the distribution of the control group and thus the distribution for treated has a larger mass in the right tail. This implies that the probability of working in a private bank is higher for workers that are already working in a private bank. These different distributions of the propensity score for treated and untreated provide some evidence that there is some selection in the choice of employment sector.

8.2 - Matching Estimators

Table 39 reports the propensity score matching estimators in 2005 for the outcomes analyzed. The results show that, on average, the wage per hour for a employee in a private bank is 0.08 euros lower than the wage she would receive if she worked in a public bank. However, this difference is not statistically significant and thus our results suggest no distinguishable differences on wages by working in a private bank rather than in a public bank.

In contrast, the estimators for the average treatment effect on treated for the median employment duration, the hazard rate and the likelihood of an open-ended contract are statistically significant at a five percent level. The median employment duration is more than half year lower by working in a private bank rather than in a public bank. Working in a private bank instead of a public bank also implies a 6 percentage points lower hazard rate. Finally, the likelihood of an open-ended contract is 2.1 percentage points higher in private banks.

The finding that there are not distinguishable differences in the wages per hour between private and public banks is consistent with the predictions of the literature that

argues that when firms are operating in competitive markets and are facing the same competitive environment, there should not be differences between private and public firms (Williamson, 1969, 1970, Caves and Christiansen, 1980, Vickers and Yarrow, 1991). According to that literature, when firms operate in competitive product markets, they will need to control their costs and thus, in these circumstances, it is expected industrial relations reform, greater constrains on pay growth, and greater emphasis on efficiency improvements. Since all the banks (including the public banks) in Portugal operate in a highly competitive environment, this helps to explain our results.

When we compare private and public banks' wages, we should take into account that private firms are more likely to provide more generous now-wage compensations (e.g. free car, pension plans) to reduce tax allowance. Indeed, there is some anecdotal evidence that this is true. So, our results may suggest that the overall compensation (wage and non-wage compensation) is higher in private banks. However, since we do not have data for non-wage compensation we cannot make any inference about that and thus we cannot make inferences about the overall compensation.

Our results for wages are in some way surprising due to some of the specificities of the Portuguese economy. After the 1974 Revolution, in order to reduce income inequalities, there was a lot of pressure to increase the wage compensation of workers in general, and in particular the wage compensation of workers in public firms. This legagy of the revolution remains present nowadays. Thus, one could expect that workers were better paid in state-owned banks rather than in private banks. Furthermore, there is some anecdotal evidence that in public banks there is lower profit pressure (nowadays talking about lack of profit pressure might be too strong) and they place a greater weight on social welfare commitment.[25] Finally, Bender (1998) and Gregory and Borland (1999), in their surveys of the literature on wage differentials between public and private firms, claim that most of the studies show that, on average, the public sector pays more than the private sector. By looking only at these factors, our predictions would be that the wages

[25] The lack of profit pressures and the greater weight placed on social welfare by public firms do not seem specific of Portugal. For example, these characteristics of public firms are also pointed for the US by Blank (1985) and for the UK by Haskel and Szymanski (1993) and Pendleton (1999). Katz and Krueger (1991) also found that in the US during the 1970's and 1980's women and less educated workers were better paid in the public sector.

by working in a public bank would be higher. However, our findings are not consistent with these predictions

The lower profit pressure and the greater weight placed on social welfare commitment, however, may help to explain the found results for the median employment duration. We find that by working in a private bank rather than in a public bank, private bank's employees have an 8 months lower median employment duration. This suggests more employment stability and job security in the public banks, as suggested in Blank (1985). As we pointed before, the explanation for an higher job security in the public banks might be the lower profit pressure and the greater weight placed on social welfare, assuming that workers prefer more employment stability.

During the nineties, Portugal was known for having low wages (by EU standards) but also low unemployment rates. This may suggest that Portuguese population places greater value in employment stability rather than in employment earnings. If this is true, it helps explaining why workers do not earn more by working in public banks but have an higher median employment duration in these banks. The intuition in that case is the following. Since state-owned banks know that workers give more value to stability than to earnings and public banks are constrained by competition in the banking industry, then the social concerns of public banks are only reflected on more employment stability and not on higher wage compensations. Nevertheless, since we do not know workers preferences, we cannot test this hypothesis.

Public banks' preference for creating differentials relative to private banks on job security rather than on wage compensation might also be related with the higher taxpayer scrutiny in the public sector. This taxpayer scrutiny normally is focused on wages and not on job security. That is, since information concerning job security is less clear than the information concerning wages, job security might be a preferred rent-yielding instrument to compensate employees in public banks.

Another explanation for our result is associated with the finding in subsection 6.1 that shows a stronger positive state dependence in private banks. This implies that in private banks it is more difficult to have very long spells because the probability of the spell terminating becomes very high as the spell lengthens.

In regard to the hazard rate, the results show a 6 percentage points lower value by working in a private bank rather than in a public bank. This means that the probability of

separation in the current year (in our case 2005) was lower if the worker was in the private sector. These results should take into account the higher median employment duration and tenure found for the public banks and the positive state dependence of employment spells found in the estimations performed in subsection 6.1. By working in a public bank, a worker in our treated group (private bank's employees) on average has an higher employment duration. Since there is a positive state dependence and thus the probability of the spell terminating increases as the spell lengthens, then this higher employment duration implies a higher hazard rate.

Let illustrate the aforementioned intuition with an example. For sake of simplicity ignore that the coefficients associated with the regressors are different in each sector and consider two identical individuals at the beginning of their working life. One is employed in a public bank and the other is employed in a private bank. After 10 years, the probability of remaining in the same job is higher for the worker who started working in the public bank. However, since she remains in the same bank and the probability of exit increases with the employment spell length, then her hazard rate is higher than the hazard rate of the other worker.

In public banks, we have workers with very high values of tenure. So, one way to interpret our results for the hazard rate is to relate them with the necessity to restructure public banks in order to reduce the overall employment duration. That is, the high hazard rate by working in a public bank might be a consequence of long employment spells that due to their long length should terminate soon.

Some literature[26] relates positive wage differentials in one sector with longer employment duration and lower separation rates. Since we do not find any difference between the wage in the two types of banks we cannot establish any relation of this type. Nevertheless, as we explain below, when we stratify the workers in different groups, for some of these groups a trade-off between wage and job stability seems to emerge.

Finally, our results imply that the likelihood of an open-ended contract is higher in private banks. However, despite significant, the difference between private and public banks in the likelihood of an open-ended contract is very small (2 percentage points),

[26] See Bellante and Long (1981), Ippolito (1987) and Moore and Newman (1991).

particularly if we take into account the large proportion of open-ended contracts in the banking industry (near 94 percent).

Table 40 to Table 42 display the results obtained from the propensity score matching estimator for the three outcomes analyzed for different groups stratified according to age, gender, education and occupation.

Table 40 and Table 41 show that, on average, the wage per hour and the median employment duration of women in private banks is lower than the wage and median employment duration that they would have if they were employed in a public bank. Indeed, on average, a private bank's female worker would earn more 0.75 euros and would have a nearly half year longer median employment duration if she was employed in a public bank. These results suggest that women have better employment conditions (higher wages and longer employment durations) in public banks which could help to explain why they are more likely to be employed in a public bank.

On the other hand, for men we find a trade-off between wage per hour and median job duration. In particular, on average, a private bank's male worker earns more 0.35 euros but has less one year of median employment duration than he would have if he worked in a public bank.

The differences on wages are not statistically significant for men. This gives some support to the hypothesis that potential advantages on wages in public banks are restricted to the groups in a weaker position in the labor markets.

Table 40 and Table 41 reveal that a private bank worker with college enrollment has a higher wage per hour but lower median employment duration for being employed in a private bank rather than in a public bank. Nevertheless, while for wages the difference is very large, the difference for median employment duration is very small (nearly 2 months). Conversely, private bank workers without college enrollment would have a higher wage per hour if they were employed in a public bank. Workers with high school enrolment but without college enrolment would have higher median employment duration if they were employed in a public bank. These results are in line with the literature that says that private banks provide higher returns to education. A possible explanation for this phenomenon is the lower discrimination on wages and on job stability in public banks, which essentially implies higher wages for less qualified workers and lower wages for more qualified workers. This lower discrimination in public

banks might be associated with the greater concern for social welfare and consequent protection of the groups in weaker position.

The choice of private banks instead of public banks by managers and highly specialized workers implies a trade-off between wage per hour and median employment duration. On one hand, their choice implies a wage per hour 3.84 euros higher. On the other hand, by working in a private bank rather than in a public bank their median employment duration is 2.7 years lower. The higher wages of managers and highly specialized workers in private firms is in line with the findings of some empirical and theoretical literature that points out as possible justifications: (i) the release of pay-scale constraints in private firms, (ii) the higher bargaining power of managers and highly specialized workers in private firms, and (iii) the higher investment of private firms in the managerial sector in order to restructure the firm and catch up with the organizational structures of the competitive market (Chong and Leon, 2007).

In contrast, foremen, supervision and administrative workers in private banks would have both higher wages per hour and higher median employment duration if they worked in a public bank.

In regard to age, we find that for workers with less than thirty years the choice of a private bank instead of a public bank implies a trade-off since they earn less but have an higher median employment duration than if they were employed in a public bank. In contrast, for workers with more than thirty years the choice of type of bank seems not to have a significant effect on wages. However, the choice of a private bank by workers between thirty and fifty years old implied lower median employment duration.

Overall, the stratification by different groups shows that there is some protection of younger workers and women in public banks, since private bank workers in these two groups, on average, would have higher wages and longer employment duration if they switched to a state-owned bank. On the other hand, for men and workers with more than 30 years of age we do not find differences on wages by working in a private bank rather than in a public bank. However, on average, these workers would have a longer employment duration if they worked in a public bank. Finally, our results also reveal that private banks provide higher returns of education.

Table 42 reveals that for all subgroups analyzed the hazard rates of workers in private banks would be higher if they were employed in public banks. The explanation is the same that we provided for the general case.

Table 43 presents the DID-Propensity Score Matching estimators. As we pointed out before, we should be careful when we compare these estimators with the usual Propensity Score Matching estimators in table 8, because the treated group in the DID-Propensity Score Matching estimators is a subgroup of the treated group in the usual Propensity Score Matching estimators. Now, the treated group are the workers that were in public banks in 1985 and who worked in a private bank in 2005.

Our results show that the treated group had a gain of 2.33 euros in the wage per hour by working in a private bank rather than in a public bank. Despite the large positive effect, the estimator is only significant at a 10 percent level. Nevertheless, our result suggests that the workers that switch from a public to a private bank (either because the bank where they worked was privatized or because they decided to quit from the public bank where they worked and moved to a private bank) had gains in their wage per hour because of that switch. These workers also had a gain on median employment duration since their median employment duration is more than 2 years higher than the employment duration they would have if they remained in a public bank.

Overall, these results suggest large gains from switching from public to private banks for workers employed in public banks in 1986.

8.3 - Marginal Treatment Effect

Table 44 and Table 45 display, respectively, the results from step 3 of the algorithm to find the Marginal Treatment Effect on wage per hour and on the likelihood of an open-ended contract. Since we believe these results *per se* have some interest, we briefly discuss them. The analogous to these results for the median employment duration and hazard are discussed in subsection 6.1 and reported in Table 34 and Table 35.

Table 44 shows that age increases (but at a diminishing rate) the log wage per hour of workers in the public sector until they achieve 50 years. For workers in the public sector with more than 50 years, age has a negative effect on wages per hour. The age variable in the wage equation may reflect both cohort and life cycles effects.

The effect of tenure on public banks' wage per hour is exactly the opposite because for workers with less than 18 years of tenure the effect is negative while for workers with more than 18 years of tenure the effect is positive.

Age always has a positive effect on private banks' wages per hour, however the effect is always very small. This helps to explain why for workers with less than 49 years the effect of age on wages per hour is higher in public banks than in private banks. In private banks, tenure has a positive effect on the wage per hour of workers with less than 15 years of tenure, otherwise the effect is negative.

Our results show that, *ceteris paribus,* on average, the wage per hour is lower for women in both sectors, but the difference relative to men's wages is higher in private banks. Indeed, in a private bank the wage of a female worker is nearly 11 percent lower than the wage of an otherwise equivalent male worker, while in a public bank the wage of a female worker is nearly 9 percent lower than the wage of an otherwise equivalent male worker. This result may help to understand why, as we found in subsection 8.1, women prefer to work in the public sector. This result should also be related with the aforementioned hypothesis that public banks have more social concerns and thus they protect groups in weaker position in the labor market (such as women). The finding of a lower penalization on wages for female workers in state-owned banks is similar to the findings in Van der Gaag and Vijverberg (1988), Moore and Raisian (1991), Belman and Heywood (1994) and Mueller (2000).

In regard to returns to education, our results suggest that in public banks the returns to education are not significant and, in fact, workers with only high school enrollment seem to have a lower wage than workers with less than 10 years of schooling. In contrast, in private banks there is evidence of significant returns to schooling since the wage per hour of workers with college enrollment is nearly 33 percent higher than the wage per hour of an otherwise equivalent worker with less than 10 years of schooling. Furthermore, the wage per hour of workers with high school enrollment is nearly 24 percent higher than the wage per hour of otherwise equivalent workers with less than 10 years of schooling.[27]

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[27] These results are in line with the findings of Ho et all (2002) who found that both returns to education and the gender wage discrimination increased after the privatization. However, we should notice

Finally, Table 44 shows that managers and highly specialized workers have the higher wages in both sectors, followed by foremen, supervision and administrative workers.

Table 45 reveals that for state-owned banks only age, gender and firm size have a significant effect on the likelihood of an open-ended contract. In particular, worker's age reduces the likelihood of an open-ended contract while firm size increases the likelihood of an open-ended contract in a public bank. In state-owned banks female workers have higher likelihood of an open-ended contract than otherwise equivalent male workers. This last result provides one more time evidence that public banks provide some protection to female workers. In contrast with state-owned banks, we find that age increases the likelihood of an open-ended contract and women have a lower likelihood than otherwise equivalent male workers. The coefficient on firm size for private banks also has the opposite sign than the one for public banks.

Figure 10 to Figure 13 display for each of the analyzed outcomes the plot of the MTE on different values of the propensity score for a male worker with 40 years old, 10 years of tenure, high school education and a foremen, supervision or administrative occupation, and who works in a firm with 5000 employees.

Figure 10 shows the graph of the MTE on log wage per hour. This graph has the expected shape. Workers that are more likely to work in the private sector have a positive and high marginal treatment effect by working in the private sector rather than in the public sector. This effect is decreasing with the likelihood of working in the public sector. Indeed, for workers that are less likely to work in the private sector the marginal treatment effect is negative.

Despite the expected shape, it is interesting to notice that workers with a high likelihood of working in the private sector have a high premium for working in the private sector. On the other hand, the workers with a low likelihood of working in the

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that our results are not relative to the effect of the privatization process but instead they evaluate the effect of ownership.

Adamchik and Bedi (2000) results are not so supportive of the higher returns to schooling in private sector. They found that for men the returns to schooling are higher in private sector, particularly for University educated workers, However, for women their results seem to suggest that public sector has higher returns to schooling.

private sector have a penalization by working in that sector but the magnitude of the penalization is much smaller than the premium received by workers with a high likelihood. For workers indifferent between working or not in the private sector for values of the propensity score between 0.4 and 0.6, the graph is almost flat, revealing that the effect is nearly equal for all these workers.

Figure 11 shows that the MTE on open-ended contracts is negative for all values of the propensity score. The effect is less negative for workers more likely of being employed in a private bank.

Figure 12 reveals that the MTE on log median employment duration increases with the propensity score for workers more likely to be working in a private bank and decreases with the propensity score for workers less likely to be working in a private bank. Furthermore, for a large range of values of the propensity score the MTE is almost flat. This suggests that for several workers the employment in a private bank may have the same effects on job stability despite the different likelihood of working in a given sector.

The MTE on employment duration is positive for values of the propensity score between 0.25 and 0.97. Thus, for workers indifferent between working in a private or public bank for these values of the propensity score, employment in a private bank implies higher employment duration. Conversely, for values of the propensity score below 0.25 or above 0.97, the employment in a private bank has a negative effect on the median employment duration.

The results for the workers that are more likely to be working in a private bank are in some way surprising. Not only the MTE on the log of median employment duration increases with the propensity score, but indeed the MTE is negative for these workers. So, our results suggest that for these workers employment in a private bank implies a trade-off between wages and job stability. In particular, for these workers, employment in a private bank allows higher wages but it has a negative effect on the median employment duration.

In the previous subsection we show that the average treatment effect on treated on median employment duration is negative. On the other hand, in this subsection we reveal that for a large range of values of the propensity score the MTE effect on log of median employment duration is positive. The explanation for these results, which at first glance

may look inconsistent, is that workers more likely of receiving the treatment (and thus more likely of being in the treated group) have a negative MTE. It is the negative effect for these workers that explains the negative average treatment effect on treated.

Finally, Figure 12 shows that the MTE on log hazard is always positive. This implies that for individuals indifferent between employment in a private bank or public bank, the choice of a private bank implies an higher hazard rate (at time 10). Since the treatment parameter identified by this method is different from the treatment parameters identified by the other methods, this result does not imply a contradiction with our previous results.

9. Evaluation of the privatization process

Figure 14 and Figure 15 display the evolution of some summary statistics for the pre- and post-privatization period.

After the privatization processes, as expected, there was a large increase in the number of workers in private banks. Indeed, in the pre-privatization (1986-1989) period, private bank workers were only 11 percent of the banking industry workforce while in the post-privatization period (1996-2006) they represented nearly two thirds of the employees in the banking industry. Furthermore, in the post-privatization period the number of workers in public banks slightly decreased and the number of workers in private banks increased.

In the pre-privatization period employees in public banks were older and had higher tenure than workers in private banks. These differences were considerably high. After the end of the privatization process these differences had a big reduction, which was expected because several of the public workers before the privatization become private workers when the firms where they worked switched from public to private. However, after 1998 this difference started to increase and thus in 2006 there was, again, a large difference between the age and tenure of employees in public and private banks.

The proportion of women working in the banking industry in the pre-privatization period was relatively small (lower than 30%) but almost equal in both types of banks. In the post-privatization period the proportion of women in the banking industry started to increase in both types of banks. However, this increase was higher in the public banks

and thus in 2006 the proportion of women was nearly 8% higher in public banks than in private banks.

In the pre-privatization period wages per hour were higher in private banks. In contrast, there were almost no differences in the median employment duration. After the end of the privatization processes this pattern changed. Median employment duration became consistently higher in public banks while wages per hour also became higher in public banks after 2001.

Figure 14 and Figure 15 display, respectively, the propensity-score matching estimators for wage per hour and median employment duration in the pre- and post-privatization period.

Figure 14 reveals that in the pre-privatization period workers in private banks received a higher wage per hour for being employed in a private bank rather than in a public bank. In the post-privatization period this situation changes because, with exception of 2000, the differences were always small and oscillated between positive and negative values.

Figure 15 shows that before the privatization, workers in private banks would have had the same median employment duration if they had worked in public banks. On the other hand, in the post-privatization period, particularly after 2001, workers in private banks have a lower median employment duration by working in a private bank rather than in a public bank.

10. Conclusion

In this paper we examine ownership effects on labor outcomes for the banking industry in Portugal. We find that if private bank workers were employed in public banks they would have the same wage but higher employment duration. This suggests that public banks may create differentials relative to private banks on job security and not on wages.

The wage gap between men and women is lower in public banks but the differential on employment duration is lower in private banks. However, women in private banks would have higher employment duration if they worked in public banks. This partially explains why women are more likely to be employed in public banks. The

greater differentiation on wages in private banks is also visible in the returns to education since private banks provide higher returns to education.

A second contribution of this paper is to evaluate the privatization process that occurred in Portugal between 1989 and 1996. According to our results privatization improved workers compensation, particularly in the banks that remained public. Furthermore, it increased the job stability on public banks relative to private banks.

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Tables and Figures

Table 31. Evolution of Banks

	1985-1989	1990-1996	1997-2000	2001-2005
Number of banks	214.6	223.5	182.8	165.5
	(15.81)	(26.29)	(9.106)	(7.141)
% of firms by ownership				
Public	0.053	0.034	0.016	0.012
Private	0.947	0.966	0.984	0.988
	(0.00572)	(0.0143)	(0.000823)	(0.00450)
Average Size (Number of workers)				
Public	3756.6	3010.1	4712.7	5910.4
	(2232.5)	(2634.6)	(4324.5)	(6313.0)
Private	24.54	103.2	159.7	154.2
	(109.8)	(575.2)	(656.1)	(590.4)
% of workers by ownership				
Public	0.892	0.518	0.329	0.320
	(0.0416)	(0.210)	(0.0358)	(0.0143)
Private	0.108	0.482	0.671	0.680
	(0.0416)	(0.210)	(0.0358)	(0.0143)

Table 32. Employment Relations Between 1996 and 2006

	Private	Public	Total
Number of employment relations	24463	7446	31909
Mean duration of each spell	2.9733	2.3227	2.8216
Median of each spell	2	1	2
Number of censored observations	13442	3091	16533

Table 33. Employment Relations Between 1985 and 1988

	Private	Public	Total
Number of employment relations	1669	1475	3124
Mean duration of each spell	1.3643	1.4569	1.4172
Median of each spell	1	1	1
Number of censored observations	1085	429	1494

Table 34. Proportional Hazard Model for the Period 1996-2006

	Public	Private
Age	-0.830***	-0.515***
	(-21.81)	(-20.43)
Age Square	0.0100***	0.00572***
	(19.34)	(16.21)
Women	0.0844*	0.0197
	(2.16)	(0.40)
Firm Size	-0.000154***	-0.0000701***
	(-17.57)	(-6.16)
Education (years of schooling)		
High School (between 10 and 12 years)	-1.318***	-1.181***
	(-14.60)	(-9.72)
College (More than 13 years)	-1.438***	-1.643***
	(-14.98)	(-13.10)
Occupation		
Managers and highly specialized workers	-1.049*	0.466*
	(-2.08)	(2.18)
Foremen, Supervision and Administrative workers	-0.8	-0.041
	(-1.60)	(-0.21)
Constant	15.31***	8.003***
	(16.96)	(17.10)
alpha	2.187***	3.199***
	(43.15)	(40.44)
gamma	0.592***	6.011***
	(7.03)	(23.35)
N	7446	24463

Note: The reference group is less qualified workers with less than 10 years of schooling.
We consider all employment relations in the period 1996-2006, that started in 1996 or after in firms created before 1996
t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 35. Proportional Hazard Model for the Period 1985-1988

	Public	Private
Age	-0.337***	-0.0646*
	(-8.42)	(-2.42)
Age Square	0.00417***	0.000758*
	(7.44)	(2.23)
Women	-0.0219	-0.135
	(-0.32)	(-1.47)
Firm Size	0.000132***	-0.00141***
	(5.30)	(-6.99)
Education (years of schooling)		
High School (between 10 and 12 years)	0.270**	0.0563
	(2.79)	(0.57)
College (More than 13 years	1.001***	0.272*
	(8.24)	(2.30)
Occupation		
Managers and highly specialized workers	0.328	-0.182
	(1.23)	(-1.04)
Foremen, Supervision and Administrative workers	0.468***	-0.156
	(4.67)	(-1.63)
Constant	0.894	-2.585***
	(1.36)	(-5.22)
alpha	3.158***	2.910***
	(23.85)	(29.69)
gamma	0.003	0,0000003
	(0.04)	0.00
N	1475	1669

Note: The reference group is less qualified workers with less than 10 years of schooling.

We consider all employment relations in the period 1985-1988, that started in 1985 or after in firms created before 1985

t statistics in parentheses

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 36. Macroeconomic Conditions

	1986	2005
Growth rate of GDP	1.18%	0.50%
Employment (thousands)	3900	5015.017
Growth rate of employment	-0.82%	0.00%
Government budget (% of GDP)	-5.90%	-6.00%
Unemployment rate	9.86%	7.57%

Table 37. Summary Statistics 2005

	Private	Public	Difference
Wage per hour	13.9936	15.6249	-1.6313
	(10.926)	(8.855)	(0.118)
Base Wage	2026.179	2185.079	-158.9005
	(1641.785)	(1241.384)	(17.415)
Hours worked per month	144.9873	139.8186	5.1687
	(8.722)	(4.579)	(0.087)
Median Employment Duration (years)	7.9909	8.2512	-0.2604
	(1.782)	(3.596)	(0.029)
Hazard rate	0.0671	0.1280	-0.0609
	(0.045)	(0.045)	(0.001)
Firm Size (Number of workers)	2440.163	11562	-9121.834
	(2433.001)	(107.708)	(22.679)
Age (years)	38.1152	42.4914	-4.3761
	(9.287)	(9.689)	(0.108)
Women	0.4055	0.4920	-0.0864
	(0.491)	(0.500)	(0.006)
Tenure (years)	11.4749	17.7784	-6.3035
	(8.412)	(9.158)	(0.100)
Education (years of schooling)			
Preparatory education (less than 9 years)	0.0967	0.2561	-0.1594
	(0.296)	(0.437)	(0.004)
High School (between 10 and 12 years)	0.5013	0.3869	0.1144
	(0.500)	(0.487)	(0.006)
College (More than 13 years)	0.402	0.357	0.045
	(0.490)	(0.479)	(0.006)
Region			
Lisbon	0.4237	0.4594	-0.0358
	(0.494)	(0.498)	(0.006)
Porto	0.1726	0.1015	0.07117
	(0.378)	(0.302)	(0.004)
Others	0.4037	0.4391	-0.0354
	(0.491)	(0.496)	(0.006)
Occupation			
Managers and highly specialized workers	0.1113	0.1700	-0.0587
	(0.314)	(0.376)	(0.004)
Foremen, Supervision and Administrative workers	0.8746	0.8116	0.0629
	(0.331)	(0.391)	(0.004)
Low skilled Personnel	0.0142	0.0184	-0.0042
	(0.118)	(0.134)	(0.001)
N	22232	11521	

Note: Standard deviation of the mean and standard error of the difference reported in parentheses.

Table 38. Logit Model for the Probability of Choosing the Private Sector

	Coef.	T-Statistic
Age	-0.0931***	-8.50
Age Square	0.00066***	5.11
Women	-0.566***	-22.59
Education (years of schooling)		
High School (between 10 and 12 years)	0.999***	26.49
College (more than 13 years)	0.848***	19.47
Region		
Lisbon	0.0996***	3.70
Porto	0.605***	15.37
Occupation		
Managers and Highly Specialized Workers	-1.258***	-12.07
Foremen, Supervision and Administrative workers	-0.724***	-7.44
Constant	3.416***	14.00
N	33753	

Notes: Reference group: Less qualified workers with less than 10 years of schooling, living outside Lisbon or Porto.
Log likelihood =-20059.531
*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 39. Propensity Score Matching

	Treated	Control	Δ^{TT}_{2005}	SE	T-Stat.
Wage per hour	13.9936	14.0697	-0.0760	0.1243	-0.61
Open-ended contract (1)	0.9315	0.9107	0.0209	0.0028	7.43
Median Employment Duration	7.9909	8.6858	-0.6949	0.0425	-16.36
Hazard Rate	0.0671	0.1314	-0.0643	0.0006	-108.07
N	22,232	11,521			

Note: The propensity score matching estimation is performed using a biweight kernel with replacement for the control group. For each estimator we present bootstrap standard errors based on 100 replications. The propensity score was defined as $P(D = 1|X)$ and it was derived from the probabilities obtained from the choice model.
(1) For Open-ended contract the number of treated observations is 22,152 and the number of untreated observation is 11,517.

Table 40. Propensity Score Matching - Wage per Hour

	Treated	N^T	Control	N^C	Δ^{TT}_{2005}	SE	T-Stat.
Age (years)							
Less than 30	8.8039	5250	9.6283	1482	-0.8244	0.0937	-8.70
Between 30 and 50	14.9476	14365	14.8722	7045	0.0755	0.1339	0.56
More than 50	19.1722	2617	18.5729	2994	0.5993	0.4373	1.37
Gender							
Female	11.9279	9016	12.6737	5668	-0.7458	0.1130	-6.60
Male	15.4029	13216	15.0506	5853	0.3523	0.2071	1.70
Education (years of schooling)							
Preparatory education (less than 9 years)	14.1446	2150	14.7228	2951	-0.5781	0.1873	-3.09
High School (between 10 and 12 years)	12.6881	11144	13.7443	4457	-1.0562	0.1246	-8.47
College (More than 13 years)	15.5915	8938	14.3513	4113	1.2401	0.2750	4.51
Occupation							
Managers and highly specialized workers	27.5043	2474	23.6590	1958	3.8452	0.5710	6.73
Foremen Supervision and Administrative workers	12.3653	19443	12.9476	9351	-0.5822	0.0813	-7.16
Low skilled Personnel	8.5815	315	11.1757	212	-2.5942	0.4064	-6.38

Table 41. Propensity Score Matching - Median Employment Duration

	Treated	N^T	Control	N^C	Δ^{TT}_{2005}	SE	T-Stat.
Age (years)							
Less than 30	6.1206	5250	5.4030	1482	0.7176	0.0457	15.71
Between 30 and 50	8.8056	14365	10.7857	7045	-1.9801	0.0375	-52.83
More than 50	7.2698	2617	5.0073	2994	2.2626	0.0574	39.45
Gender							
Female	8.0645	9016	8.5129	5668	-0.4484	0.0544	-8.24
Male	7.9406	13216	8.9611	5853	-1.0205	0.0636	-16.04
Education (years of schooling)							
Preparatory education (less than 9 years)	5.8252	2150	4.5374	2951	1.2879	0.0410	31.39
High School (between 10 and 12 years)	8.0778	11144	9.6344	4457	-1.5567	0.0519	-29.98
College (More than 13 years)	8.4049	8938	8.5870	4113	-0.1821	0.0628	-2.90
Occupation							
Managers and highly specialized workers	7.9619	2474	10.6655	1958	-2.7036	0.0915	-29.53
Foremen Supervision and Administrative	8.0285	19443	8.5208	9351	-0.4922	0.0440	-11.18
Low skilled Personnel	5.8983	315	3.4050	212	2.4933	0.1750	14.25

Table 42. Propensity Score Matching - Hazard Rate

	Treated	N^T	Control	N^C	Δ^{TT}_{2005}	SE	T-Stat.
Age (years)							
Less than 30	0.1176	5,250	0.1737	1,482	-0.0561	0.0024	-23.02
Between 30 and 50	0.0554	14,365	0.1153	7,045	-0.0599	0.0005	-131.97
More than 50	0.0295	2,617	0.1280	2,994	-0.0985	0.0009	-103.86
Gender							
Female	0.0686	9,016	0.1367	5,668	-0.0681	0.0009	-79.82
Male	0.0660	13,216	0.1260	5,853	-0.0601	0.0008	-74.40
Education (years of schooling)							
Preparatory education (less than 9 years)	0.0387	2,150	0.1472	2,951	-0.1085	0.0011	-102.14
High School (between 10 and 12 years)	0.0632	11,144	0.1287	4,457	-0.0655	0.0008	-82.05
College (More than 13 years)	0.0786	8,938	0.1310	4,113	-0.0523	0.0011	-48.49
Occupation							
Managers and highly specialized workers	0.0582	2,474	0.1078	1,958	-0.0497	0.0015	-33.61
Foremen, Supervision and Administrative	0.0685	19,443	0.1340	9,351	-0.0656	0.0006	-104.37
Low skilled Personnel	0.0418	315	0.1593	212	-0.1175	0.0041	-28.90

Table 43. DID - Propensity Score Matching

Wage per hour	15.335	13.005	2.330	1.271	1.830
Median Employment Duration	4.471	2.161	2.310	0.309	7.470
N	92	410			

Table 44. Auxiliary Regression for the MTE of Log(Wage per Hour)

	Coef.	T-Statistic
Age	0.2588***	20.62
Age Square	-0.0026***	-20.79
Tenure	-0.0742***	-17.54
Tenure Square	0.0021***	21.48
Women	-0.0975*	-2.43
Education (years of schooling)		
High School (between 10 and 12 years)	-0.2547**	-2.86
College (more than 13 years)	0.0373	0.45
Occupation		
Managers and Highly Specialized Workers	1.2555***	11.71
Foremen, Supervision and Administrative workers	0.6656***	8.66
Firm Size	0.000006**	3.07
Cross Terms		
Age × $P(X)$	-0.2372***	-14.04
Age Square × $P(X)$	0.0026***	14.32
Tenure × $P(X)$	0.1224***	19.50
Tenure Square × $P(X)$	-0.0037***	-22.79
Women × $P(X)$	-0.0247	-0.44
Education (years of schooling)		
High School (between 10 and 12 years) × $P(X)$	0.4664***	3.26
College (more than 13 years) × $P(X)$	0.2489	1.84
Occupation		
Managers and Highly Specialized Workers × $P(X)$	-0.6174***	-3.75
Foremen, Supervision and Administrative workers × $P(X)$	-0.4506***	-3.69
Firm Size × P (X)	-0.00000002	-0.01
Observations	33753	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

Table 45. Auxiliary Regression for the MTE of Open-Ended Contracts

	Coef.	T-Statistic
Age	-0.1315***	-16.17
Age Square	0.0015***	18.39
Women	0.0915***	3.46
Education (years of schooling)		
High School (between 10 and 12 years)	-0.0509	-0.87
College (more than 13 years)	0.0447	0.82
Occupation		
Managers and Highly Specialized Workers	-0.1252	-1.78
Foremen, Supervision and Administrative workers	-0.0736	-1.46
Firm Size	0.000005***	4.87
Cross Terms		
Age × $P(X)$	0.2969***	27.84
Age Square × $P(X)$	-0.0034***	-30.15
Women × $P(X)$	-0.1720***	-4.62
Education (years of schooling)		
High School (between 10 and 12 years) × $P(X)$	0.0737	0.78
College (more than 13 years) × $P(X)$	-0.0893	-1.00
Occupation		
Managers and Highly Specialized Workers × $P(X)$	0.2853**	2.64
Foremen, Supervision and Administrative workers × $P(X)$	0.1742*	2.17
Firm Size × P (X)	-0.000008	-4.82
Observations	33669	

*$p < 0.05$, **$p < 0.01$, ***$p < 0.001$

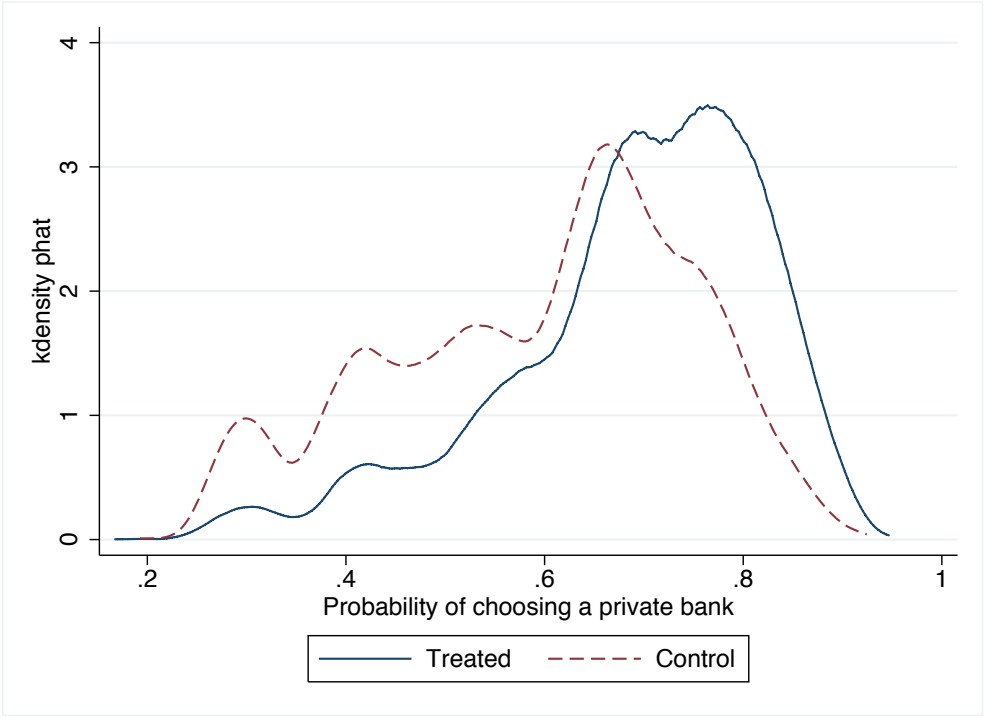

Figure 7. Propensity Scores Density

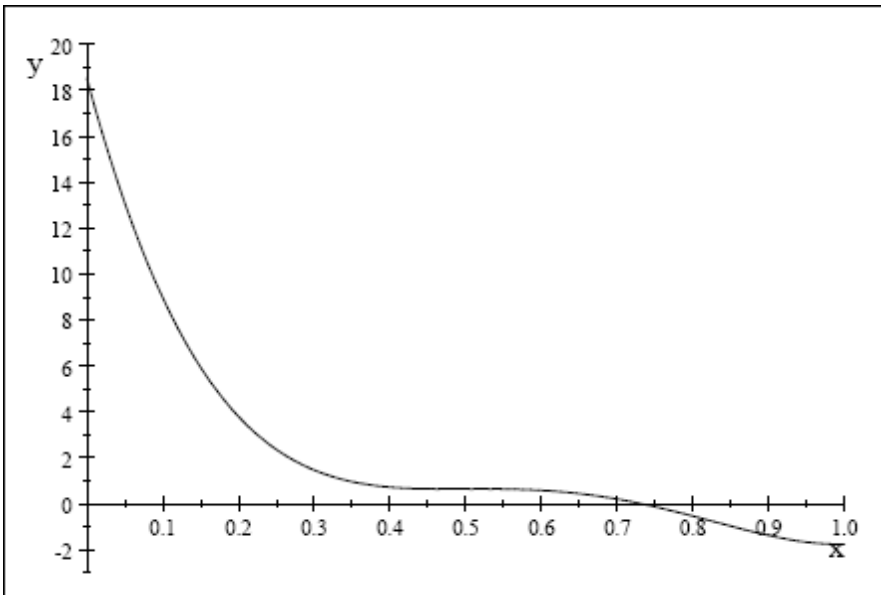

Figure 8. MTE - Log(Wage)

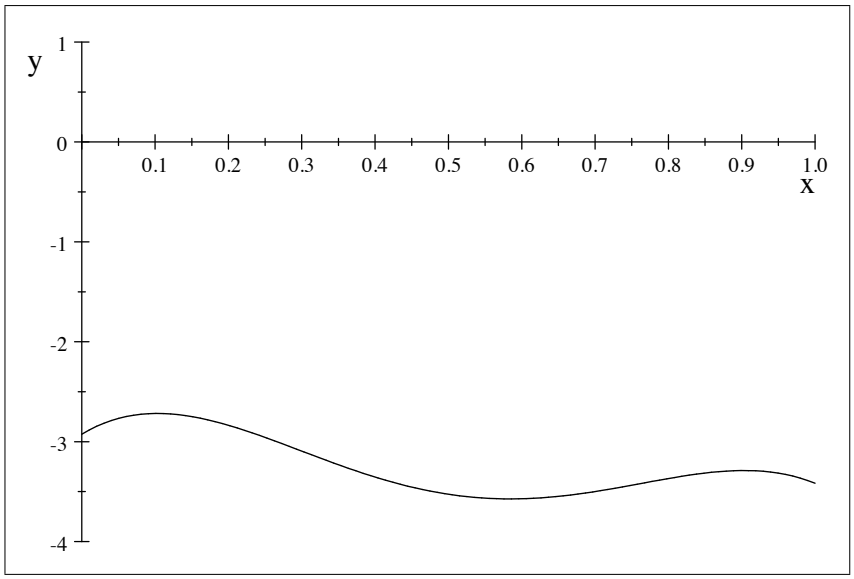

Figure 9. MTE - Open-ended Contracts

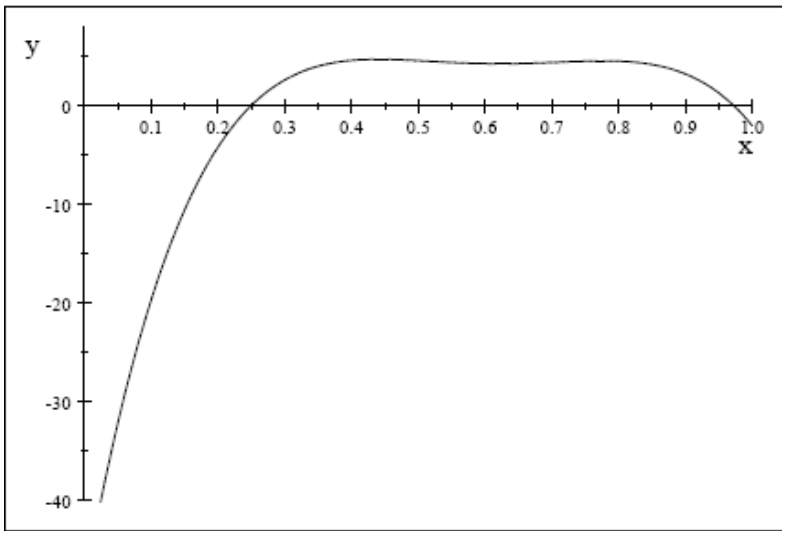

Figure 10. MTE - Log(Median Employment Duration)

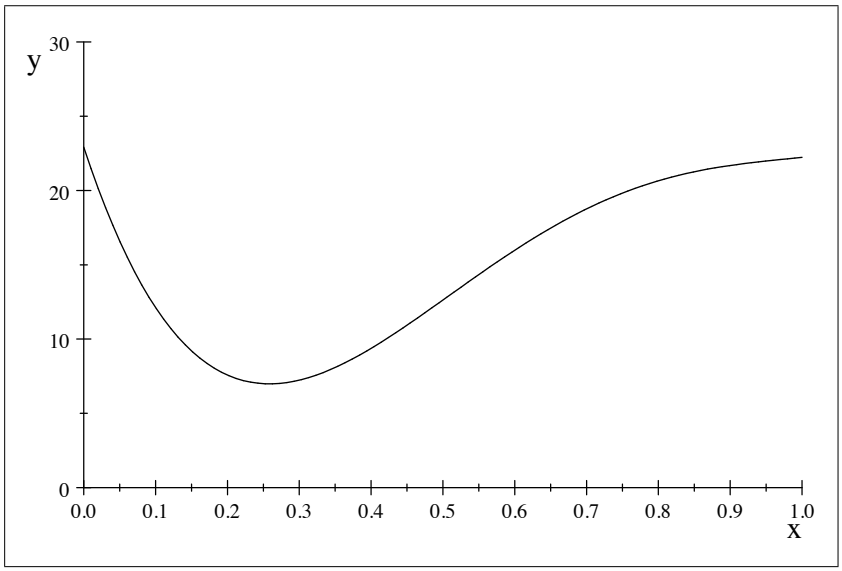

Figure 11. MTE - Log(Hazard Rate)

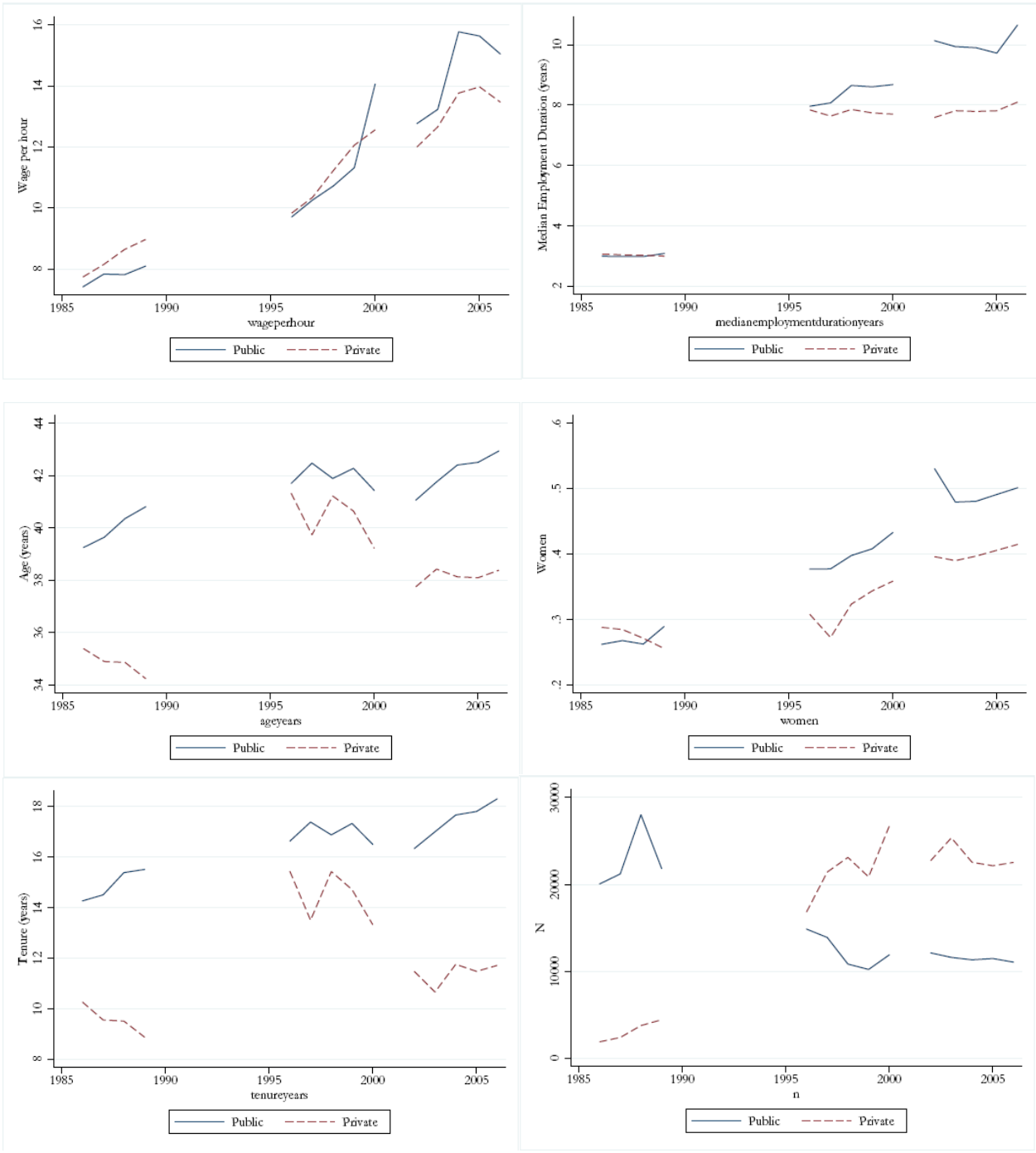

Figure 12. Summary Statistics

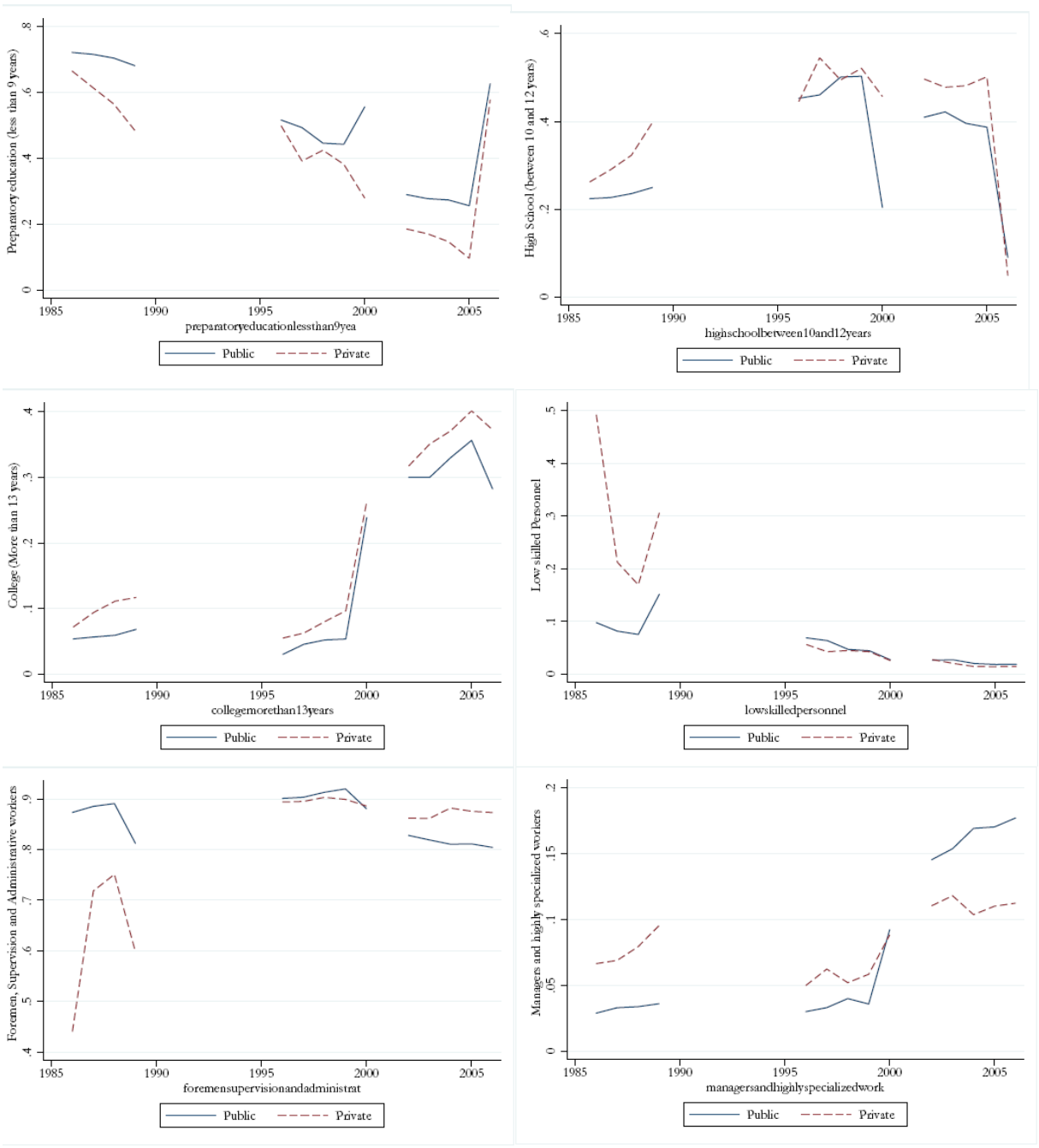

Figure 13. Summary Statistics (cont.)

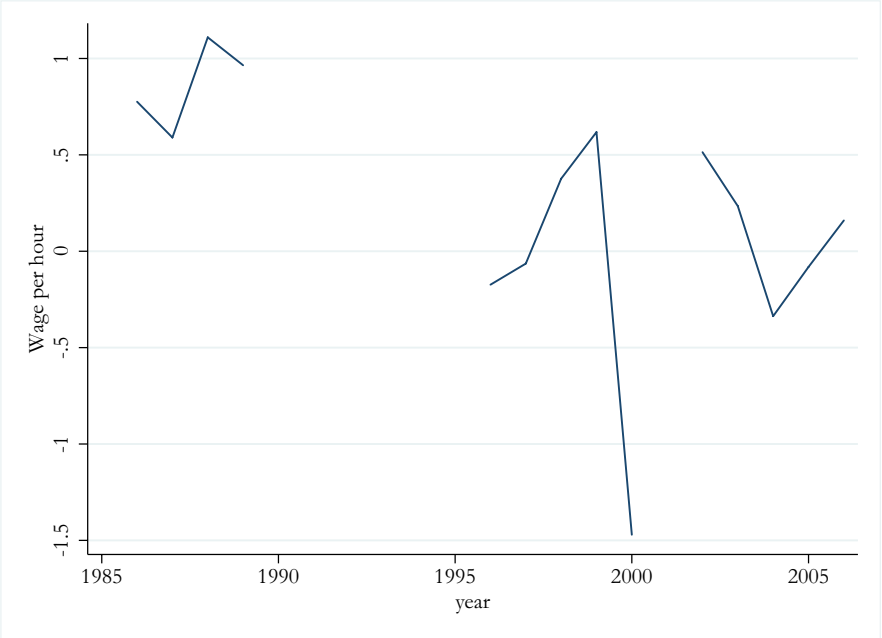

Figure 14. PSM - Wage per Hour

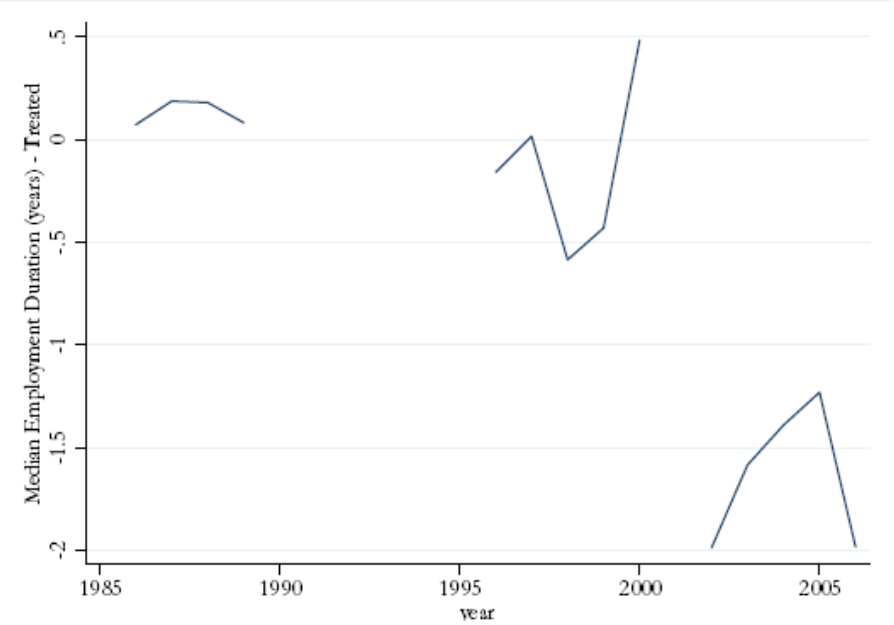

Figure 15. PSM - Median Employment Duration