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Multinationals as Stabilizers? Economic Crisis, Access to Finance, and Employment Growth*

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Abstract:
This paper examines the comparative response of multinationals and domestic firms to an economic crisis, using the empirical setting of a well defined case of economic slowdown in Chile. We find that employment in manufacturing plants has been drastically reduced during the economic crisis. Our findings reveal that multinationals are more likely to exit contributing to the employment contraction during the crisis, but surviving foreign firms experience lower employment reductions than domestic enterprises. These results are not fully consistent with idea that multinationals are less affected by an economic crisis and that they may be able to act as stabilizers.

Keywords: Multinationals, employment growth, plant survival, economic crisis.

JEL classification: F2, O1, J2

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1. Introduction

Increasing levels of foreign direct investment (FDI) in the world economy have spurred considerable policy and academic interest into the determinants and consequences of this phenomenon. Governments in both developed and developing countries generally seem to view inward FDI as highly desirable. There is plenty of evidence that many countries actively promote inward FDI through relaxations of investment regulations, or investment incentives (UN 2003). What is the impact of FDI on host countries? How well justified is promoting FDI for developing countries? These are very important questions from a policy point of view. Most of the research on development effects of inward FDI in the host country has focused so far on micro-level productivity and wage effects, and aggregate economic growth.[i]

In this paper we stress a different mechanism by which inward FDI, or more specifically the activities of foreign multinationals, may have an impact on the host country ability for recovering from an economic crisis. We investigate whether multinationals react differently to economic crises than domestic firms, in terms of employment adjustment at the firm level. Our main question is whether multinationals can be relied upon to provide stability in terms of employment during (temporary) recessions, or whether they are more "footloose" as they can relocate internationally quite easily This is a highly policy relevant question, especially (but not only) in the recent financial crisis 2008-2009. Still, little is known about the comparative reactions of foreign and domestic firms to economic crises[ii], especially in terms of employment. Empirical evidence on this regard may be crucial for understanding why some countries are more able to recover quickly from recessions.

Our paper investigates in detail the comparative response of multinationals and domestic firms in manufacturing industries to an economic crisis. To do so, we use the empirical setting of a well defined case of economic slowdown in Chile. After growing for more than a decade at 7 percent per year, the Chilean economy was hit by the international financial crisis in the late 1990s. In 1998, the economy expanded at a lower rate of 3.2 percent, and 1999 experienced its first recession in two decades (-0.8 percent of GDP growth). Unemployment grew from 5.3 percent in 1997 to 8.3 percent in 2000, reaching a peak of 8.9 per cent in 1999 (Cowan et. al. 2005).

We use this crisis as a natural experiment to examine the differences in employment growth between multinationals and domestic firms, and how this is affected by the economic crisis. We use firm level data for Chile and apply a difference-in-differences approach in which employment growth for multinationals is compared to domestic firms in two different time periods: one of rapid growth and one of growth slowdown. To the best of our knowledge, this is the first in-depth empirical study of this issue using micro-level data.[iii]

The Chilean case is not only of interest in its own right, but may also provide lessons for other countries. Firstly, Chile is a medium-sized country with a population of roughly 17 million. There are 44 countries in the world with populations of similar size, in the bracket between 10 and 30 million, including not only many developing countries in Latin America, Central Asia and Africa, but also some of the smaller European countries.[iv] As country size is an important factor for attracting foreign direct investment (e.g., Blonigen and Piger, 2011), and arguably also for the potential effects thereof on domestic development, the results of our study may be particularly pertinent for other medium sized countries.

Secondly, Chile has been successful at attracting foreign direct investment, helped by its outward looking policies which provide a liberal environment for foreign investors. As OECD (1997, p. 8) states, "Chilean policies generally conform to OECD standards concerning direct investment flows". Hence, the effects of FDI are likely to be driven by market forces, rather than particular government policies and may therefore be applicable to other countries as well.

Furthermore, while FDI activity in manufacturing is concentrated somewhat in the food and non-ferrous metal industries, other industries also attract sizeable activity. This is apparent from a look at the distribution of FDI activity across manufacturing sectors in Table A1 in the appendix.[v] This again suggests the applicability of our findings for countries with similar structures of FDI activity.

Why would we expect multinationals to react differently than domestic plants? One reason is that foreign firms may be less dependent on domestic capital markets in their operations given that they can obtain credit from their multinational parents. In fact, there is some evidence showing that access to global capital markets affects the relative performance of multinational and domestic firms. Desai et al. (2004) show that multinational affiliates substitute internal borrowing for costly external finance when facing adverse capital market conditions. In a more recent paper, Desai et. al. (2008) show that US multinationals located in emerging markets increase operations more than domestic firms in the presence of a currency crisis. Hence, rather than increasing instability they tend to impact positively on the host country during such a crisis. They argue that this is due to multinationals being less financially constrained than domestic firms, which allows them to expand economic activity

during currency crisis (Harrison and McMillan, 2003). If this advantage of multinational firms were true, we should observe that credit constraints in the domestic capital market - that accompany financial crises - may affect multinational firms less.

On the other hand, it has been argued that multinationals may introduce higher volatility in the host economy because they can move production facilities easily between different countries (Flamm, 1984). In an early paper, McAleese and Counahan (1979) performs a simple empirical analysis by looking at differences in aggregate employment growth rates for Ireland, and they do not find any differences in employment adjustment between the two types of firms during a recession. This similar performance between multinational and domestic firms can be explained for the substantial sunk costs involved in FDI. This implies that multinationals are unlikely to respond strongly to short term changes in host country conditions and behave more like domestic firms. Given these different theoretical priors, it appears worthwhile to turn to empirical evidence.

The literature also suggests that the impact of economic crisis may differ according to the industry-specific needs of financing[vi]. To detect such a difference, we use a measure of financial dependence for 3-digit ISIC industries, developed by Rajan and Zingales (1998), and analyze whether multinationals are less affected by the crisis in those industries where external financing is more important. To be clear, this measure of external financial dependence captures the idea that for some technological reasons, there are industries that are more dependent on resources external to the firm for financing investment and working capital. By contrast, there are other industries where firms finance their operations with internal resources.

In our empirical analysis we find that employment growth in manufacturing plants has been drastically reduced during the economic crisis. Compared to the previous years, plant employment growth was drastically reduced in the late 1990s. We find some evidence that multinationals employment growth reacts to the economic crisis differently than do domestic firms. Extending the baseline analysis, we use the alternative measures of financial dependence at the industry or firm level and analyze whether multinationals are less affected in industries where external financing is more important. We find little evidence in this regard. Moreover, in most of our estimations, we find that multinationals were less likely to survive during the crisis period. Our findings are, therefore, in contrast with the idea that multinational firms are less affected by economic crisis and may be able to act as stabilizers in developing countries.

The remainder of the paper is structured as follows. In section 2, we present our data and some preliminary evidence on employment growth for domestic and multinational plants. In section 3, we discuss our econometric strategy and present our main results. In section 4, we examine the role of external financing in explaining differences in plant performance. Finally, section 5 concludes.

2. Data and Preliminary Empirics

The analysis is based on the Annual National Industrial Survey (ENIA) carried out by the National Institute of Statistics of Chile (INE). This plant level survey is the universe of Chilean manufacturing plants with 10 or more workers. The dataset is available for the period 1979 to 2000, but we have information for exports and foreign ownership only since 1990. Given that we are interested in studying the relationship between plant growth and

multinationals, and that we also explore some differences between multinational exporters and non-exporters, we use information for the period 1990 through 2000.

The INE updates the survey annually by incorporating plants that started operating during the year and excluding those plants that stopped operating for any reason. Each plant has a unique identification number which allows us to identify entry and exit. For each plant and year, ENIA collects data on production, value added, sales, employment and wages (for production and non-production workers), exports, investment, depreciation, energy usage, foreign licenses, and other plant characteristics. Plant ownership is identified by the percentage of capital owned by foreigners. We define a foreign plant as one with any foreign ownership. Most plants, however, have majority foreign ownership[vii]. In addition, plants are classified according to the International Standard Industrial Classification (ISIC) rev 2. Using 3-digit industry level price deflators, all financial variables were converted to constant 1985 pesos. Plants do not report information on capital stock, thus it was necessary to construct this variable using the perpetual inventory method for each plant.

Table 1 presents a summary of the industrial structure in Chile, showing the importance of each 3-digit industry in the total number of plants and employment. The most important sector, both in terms of employment and plants, is food with a share of about percent 30 percent. Other important industries are metallic products and wood, with employment shares of about 7 and 6 percent respectively. This reveals basically that, according to its abundance of natural resources, the most important industries are those processing these resources. In contrast, the importance of capital intensive industries (such as machinery and transport equipment) is relatively low.

[Table 1 here]

In Table 2 we show the distribution of plants according to ownership and export orientation. We take export activity into account as the recent literature on firm level heterogeneity suggests that in a comparison of plants, domestic exporters may have characteristics that are somewhere between purely domestic firms and multinationals (e.g., Helpman et al., 2004). Furthermore, export oriented multinationals may behave differently to other multinationals in the presence of an economic crisis, as they are less reliant on the domestic output market.

Our data show that in 1990, foreign plants only represented 4.2 percent of total plants in the manufacturing industry. Their participation increased to 5.9 and 6.1 percent in 1995 and 2000, respectively. The majority of domestic plants are non-exporters, while more than 50 percent of multinationals export. Also, in general the importance of exporters has increased in domestic and multinational plants between 1990 and 2000. Although multinationals are relatively less important in terms of plant numbers they represent a large and growing share of employment, value-added, and exports as shown in Figure 1. Between 1990 and 2000, multinationals increased their importance in manufacturing employment from about 10 percent to more than 15 percent (Table 2). Over the same period, their participation in exports and value-added rose almost three times. In 2000, foreign firms accounted for more than 30 per cent of manufacturing exports and value-added.

[Table 2 and Figure 1 here]

The main issue of this paper is the question as to whether employment growth is different between domestic and foreign plants. In order to get a first impression of this, Table

3 compares employment growth for foreign and domestic plants. We are particularly interested in analyzing whether there are statistically significant differences in the (unconditional) employment growth for different types of plants and time periods. Panel A of Table 3 compares domestic and foreign-owned plants. For both groups of plants, there is a reduction in employment growth between 1990-1997 and 1998-2000. Also, previous to the crisis, we do not find that employment growth differs significantly for domestic and multinational plants. However, during the crisis there are lower employment contractions for multinationals firms, and this difference is statistically significant. This may suggest that the negative effects of the slowdown of the economy hit harder domestic firms.

Recall that the data in Table 2 showed that the majority of domestic plants are non-exporters, while for multinationals the distribution between exporters and non-exporters is almost even. As exporters are generally more efficient than non-exporters (see Alvarez and Lopez, 2005, for Chilean evidence) we also distinguish employment growth for plants by export orientation. As shown in panel B, there is also a reduction in employment growth for exporters in the crisis period, and we find evidence that employment growth contraction is significantly lower for multinational plants.

In sum, preliminary evidence in Table 3 suggests that there are significant differences in employment growth between multinational and domestic plants during the slowdown period. However, these are unconditional averages, which may merely reflect the effects of other plant or industry characteristics that are different for foreign and domestic plants. There are two main factors that could make a difference in employment response across plants. First, multinationals and exporters tend to be larger and more productive than

domestic plants (Lipsey, 2004; Bernard and Jensen, 1999; Alvarez and Lopez, 2005). Second, we are comparing employment growth only for surviving firms. In fact, Alvarez and Görg (2005) find for Chilean plant level data that, once controlling for size and other covariates, foreign multinationals are more likely to exit than comparable domestic plants, especially in the crisis period.[viii] In order to disentangle the effects of other covariates from the effect of ownership, we therefore turn to an econometric modeling of the determinants of employment growth. In this estimation we also correct for the potential sample selection problem introduced through exiting plants.

[Table 3 here]

3. Econometric Methodology and Results

Our identification strategy is to consider the economic crisis in the late 1990s as a natural experiment and investigate its effect on plant level employment growth. We allow the crisis to impact differently on multinationals and domestic plants' growth trajectories. To do so, we use a difference-in-differences approach by estimating the following employment growth equation:

$$\ln(L_{it}) - \ln(L_{it-1}) = \alpha + Z'_{t-1}\delta + \gamma_1 MNC_{it-1} + \gamma_2 Crisis + \gamma_3 MNC_{it-1} * Crisis + \varepsilon_{it} \qquad (1)$$

where the dependent variable is the log difference in employment in plant *i* between *t* and *t-1*.[ix] *Z* is a vector of plant's characteristics, *MNC* is a dummy variable for plants that are affiliates of foreign multinationals, and *Crisis* is a dummy for the period of economic crisis.

The potential differences in employment growth between multinationals and domestic plants are captured by γ_1. In the case that multinationals, independent of the period under

study, tend to grow faster than domestic plants, we expect γ_1 to be positive. The overall effect of the economic crisis on employment growth is given by γ_2, which is expected to be negative. If multinationals are more able to absorb negative shocks (e.g., because they are less likely to be financially constrained), employment growth in these plants should be higher than for domestic firms in the crisis period. In such a case, we expect γ_3 to be positive. On the other hand, γ_3 may turn out to be negative if multinationals are indeed more footloose than domestic firms and therefore more likely to contract employment in the crisis period. The third option is that γ_3 is equal to zero, indicating that there are no differences in the response between multinationals and domestic firms to the crisis.

The control variables in vector **Z** are those that have been found in the literature to affect plant employment growth.[x] In particular, we include the following plant characteristics: total factor productivity, age, size (measured in terms of employment), and a dummy variable indicating whether or not the plant is an exporter. Dunne and Hughes (1994), Dunne et al. (1989) and Evans (1987) show the importance of size and age of a plant for growth. In their results, younger and smaller plants grow more rapidly than older and larger plants. Total factor productivity and the export dummy are included as it is generally found that more productive firms, and exporters or multinationals, are larger and perform "better" than others (e.g, Lipsey, 2004, Alvarez and Lopez, 2005, Bernard and Jensen, 1999). These variables are also important for controlling for differences between domestic and multinationals firms. If foreign firms are larger or more productive, not controlling for these factors may bias the parameter associated with foreign ownership. In such a case, we may

attribute an impact to foreign ownership that could be actually capturing their superior characteristics in terms of size or productivity.

We define the economic crisis to have hit Chile at the end of the 1990's, specifically the variable *Crisis* takes on the value 1 for the years 1998 and 1999. It can be shown that during these two years the Chilean economy, and the manufacturing sector in particular, suffered significant adverse shocks[xi]. Figure 2 shows that manufacturing output contracted at 1.1 and 1.3 percent in these two years. As a result of this crisis, manufacturing employment was reduced significantly and more so than total employment. The share of manufacturing employment was reduced from about 16 percent before the crisis to 12 percent at the end of the 1990s.

In our estimation we face a sample selection problem due to the fact that employment growth is only observed for surviving firms between t-s and t. To deal with this problem, we use the common approach of estimating a Heckman selection model. We estimate jointly the outcome and selection equations using a maximum likelihood procedure. The selection equation includes the same covariates as the growth regression. Additionally, we add capital per worker measured at the plant level. This captures the idea that more capital-intensive plants face higher sunk costs. These, in turn, imply larger exit costs and hence such plants may be more reluctant to exit and more likely to survive.[xii] The inclusion of this variable only in the selection equation is useful as an exclusion restriction and follows the rationale that sunk costs only determine the extensive margin (i.e., exit decision) but do not affect the intensive margin (employment growth). Without the exclusion restriction, the model would be identified solely on distributional assumptions or based on the non-linearity of the model.

Table 4 presents these basic regression results[xiii]. Column (1) shows the estimates of a simple OLS regression to provide a baseline against which to compare the estimates obtained from other techniques. In column (2) we present results using plant fixed effects for controlling for potential plant-specific differences in employment growth. In column (3) and (4) we show the estimates for the sample selection model. Note from the last row that the null hypothesis of independence between both equations is rejected at 1 per cent for both specifications, which implies that sample selection is a relevant issue in our sample.

The regressions produce similar results in the different specifications. Plant age and initial size are negatively related to employment growth, a finding in line with the literature (e.g., Evans, 1987, Dunne et al., 1989). Plants with higher TFP and exporters, on the other hand, grow faster than others, again in line with our expectations.

The crisis dummy has a negative coefficient which indicates that employment growth slowed down during the years 1998 and 1999. The impact of the economic crisis is also economically significant. Compared to the rest of the period, plant employment growth is between 8.2 and 18.6 percent lower in the late 1990s. Note how the coefficient for the crisis period, in comparison with fixed-effect regressions, is reduced when we correct for the sample selection problem. This result jointly with the rejection of the assumption that both equations are independent reveals the importance of correcting for this selection problem.

In terms of ownership, we do not find any statistically significant coefficient on the multinational dummy. In other words, the employment growth trajectory of plants belonging to foreign multinationals is not different from that of domestic plants per se. Importantly, however, we also find that the coefficient on the interaction term for crisis and

multinationality, is positive and statistically significant in the OLS and sample selection models, indicating that the negative effect of crisis on employment growth would be lower for multinational plants.

The selection equation also shows some interesting results (Column 4). First, in line with previous literature, we find that older, larger and more productive plants are more likely to survive. Second, the negative coefficient of the crisis dummy shows that this is associated with a lower probability of survival. Second, the interaction between crisis and multinational status is negative, indicating that multinationals are more likely to exit than domestic plants during the crisis[xiv].

[Table 4 here]

4. Role of External Financing and Robustness Checks

One rationale for expecting differences in the reaction to the economic crisis between multinationals and domestic firms is that access to financing becomes more difficult for firms in a downturn. We show in figure 2 that this is the case during the crisis in Chile. The interest rate for commercial loans increased from 14.6 to 18.4 percent between 1997 and 1998. Then, the growth rate of the volume of commercial loans reduced to 1.9 and 3.4 percent in 1998 and 1999 after a period during which loans expanded at rates around 10 percent yearly.

If it is the case that multinationals are less dependent on domestic finance in their operations (Desai et al., 2004; Harrison and McMillan, 2003), they should be less affected by such a crisis. If this were indeed true, we would also expect to observe that the impact of an economic crisis differs across firms and industries according to their needs of financing. While we do not have any detailed information on the external financing requirements at the

level of the firm we try to take this point into account using industry-specific differences in financing dependence. We make use of an identification strategy pioneered by Rajan and Zingales (1998) to measure external finance dependence of industries. Specifically, we use their measures of external dependence for U.S. plants at 3-digit industries, and analyze whether multinationals are less affected in industries where external financing is more important.[xv]

Rajan and Zingales (1998) discuss at length the argument that this measure which is calculated using data for US firms can serve as a useful measure at the industry level for other countries as well. They assume that this indicator reflects some technological reasons why some industries depend more on external finance than others, and they argue that these technological differences persist across countries. In our context, we are assuming that the ranking of the industries does not differ too much between the U.S. and Chile. However, if this were not the case, these would be the differences that would prevail if Chile had financial markets with no significant restrictions as in the case of the U.S[xvi].

To test whether there are differences in employment growth trajectories across industries according to their degree of external financing dependence, we estimate a variant of equation (1) by including interactions of the crisis and multinational dummies with the variables for needs of external finance *(EXD)*.

$$\ln(L_{it}) - \ln(L_{it-1}) = \begin{array}{l} \alpha + Z'_{t-1}\delta + \gamma_1 MNC_{it-1} + \gamma_2 Crisis + \gamma_3 MNC_{it-1} * Crisis + \gamma_4 EXD_I * Crisis \\ + \gamma_5 MNC_{it-1} * EXD_I + \gamma_6 MNC_{it-1} * Crisis * EXD_I + \varepsilon_{it} \end{array} \quad (2)$$

In the case that firms grow less (more) during the crisis in industries with high dependence on financing, γ_4 is expected to be negative (positive). If multinationals,

independently of the period, grow faster than domestic plants in industries more dependent on financing we expect γ_5 to be positive. If multinationals were able to overcome the potential negative effects of the economic crisis by financing from abroad, the impact of a crisis should be lower for multinationals in those industries that are more dependent on external financing. In such a case, we expect γ_6 to be positive.

The results of these estimations are shown in Table 5 considering 1998 and 1999 as crisis years (columns 1 and 2), and for an alternative specification taking also the year 2000 as a crisis year (columns 3 and 4). In general, results are very similar in both estimations. Most of the previous results concerning the effect of plant characteristics on employment growth hold: older, younger, exporter and more productive plants tend to grow faster according to these three specifications. Regarding the effect of the crisis, as expected, we find that this is negative and statistically significant. We only find a differential effect of crisis on multinationals in the first specification, suggesting that the economic slowdown had lower negative effect on foreign firms during the first two years of the crisis. In the other specification, although the parameter for the interaction between crisis and multinationals is positive, this is not statistically significant. This suggests that being a multinational does not make any difference for employment contraction when the three years are defined as crisis.

Regarding financial variables, our results reveal no significant effects of crisis depending on industry financing dependence. Also the non significance of the triple interaction reveals that, in terms of employment, there are no differences in the effect of the crisis between domestic and multinational plants in more financing dependent industries.

[Table 5 here]

The results for the survival equation (columns 2 and 4) are consistent with previous evidence: larger, older and more productive firms are more likely to survive. By contrast, we find that multinationals have a lower probability of survival. Moreover, the negative parameter for the interaction between multinational and crisis indicates that foreign firms were less likely to survive during the financial crisis of the 1990s. This is consistent with a footloose effect that it is more pronounced during economic slowdowns. Regarding financial variables, we find that credit access does not seem to be important for explaining differences in the effect of the crisis across industries. For both specifications, the results show a positive parameter for the interaction between crisis and EXD, which suggests that the negative crisis effect on survival was lower in more financing dependent industries. Nevertheless, the positive coefficient for the triple interaction shows that multinationals were more likely to survive during the crisis in those industries where financing needs are more important. This suggests that, as expected, access to credit from multinational parents is important for survival during a financial crisis, but this is more relevant for multinationals in industries with more financing needs.

In sum, these results show a negative effect of the crisis on employment for multinational firms which is mostly explained by a lower survival probability. Once we correct for sample selection, the evidence is not so strong about a differential performance in terms of employment growth for foreign and domestic firms during the crisis.

We check the robustness of these results to several other changes in the specification. First, we acknowledge that there is a potential problem of using initial size as a regressor in the growth regression, as this may lead to "regression towards the mean". As an alternative

we use average size over the two periods instead (e.g., Konings et. al., 1996)[xvii]. Second, we use another alternative measure of size. Similar to Levinsohn (1993) we define four size categories and generate four dummy variables for size classes. Third, while our data do not provide us with detailed information on firm's financing requirements we have one piece of information that may be considered as a (less than perfect) proxy. This is the value of interest payments as a proportion of total sales. We consider this variable as a crude measure for access to capital markets and, hence, the role of external finance at the level of the firm to provide a comparison to the above results which measure financial dependence at the industry level. All of these results are similar to those presented above. They are not reported here to save space but are available upon request.

In one additional robustness check, we distinguished domestic and foreign firms into four categories: domestic exporters (the comparison category), domestic non-exporters, multinational exporters, multinational non-exporters. We include interactions of the crisis dummy with these three dummy variables separately for looking at differences in employment response of these firms to the crisis. Results, which are presented in Table 6, show evidence of some differences in the crisis effect on these four groups of firms. Considering 1998 and 1999 as crisis years, we find that the negative effect of the crisis on employment is lower only for multinational exporters. However, this is not robust to the inclusion of 2000 in our crisis dummy. Regarding survival, we find negative coefficients of the crisis interaction for the other three groups of firms in comparison with domestic firms oriented to the internal market. However, this result is only statistically significant for

multinational exporters and non-exporters in the first, and domestic exporters in the second specification, respectively.

[Table 6 here]

5. Conclusions

This paper investigates in detail the comparative response in terms of employment growth of multinationals and domestic firms to an economic crisis. To do so we use the economic slowdown in Chile in the late 1990s as a natural experiment. We use firm level data for Chile and apply a difference-in-difference approach in which employment growth in our treated group, multinationals, is compared to a control group, domestic firms.

In our empirical analysis we find that employment in manufacturing plants has been drastically reduced during the economic crisis. Compared to the previous years, we observe a large employment contraction during the late 1990s. More importantly, we find some evidence that employment contraction during the crisis is lower for foreign firms. However, we also find evidence that multinational were more likely to exit during the crisis.

Furthermore, we also investigate whether access to finance matters. In general, our results suggest that employment growth was not lower during the crisis in those industries with higher financing needs. However, our analysis shows differences in survival across industries. Moreover, it seems that financing needs are relevant for explaining differences in multinational survival depending on industry financing needs.

Our findings are, therefore, not fully consistent with the idea that employment in multinational firms is less affected by an economic crisis and that these firms can be able to act as stabilizers in developing countries. On the one hand, multinationals are more likely to

exit in a crisis and reduce aggregate employment. On the other hand, surviving foreign firms experience lower employment contraction than domestic enterprises during a crisis.

This evidence has important considerations for an evaluation of the potential benefits of attracting multinationals. Multinationals, while potentially bringing new technology and other benefits to the economy are likely to be different to domestic firms in terms of employment growth and survival when it comes to their potential reactions to negative shocks to the economy. This should also be kept in mind in any discussion of possible employment effects, and the role of multinationals, in the recent financial crisis 2008-2009, especially for developing countries.

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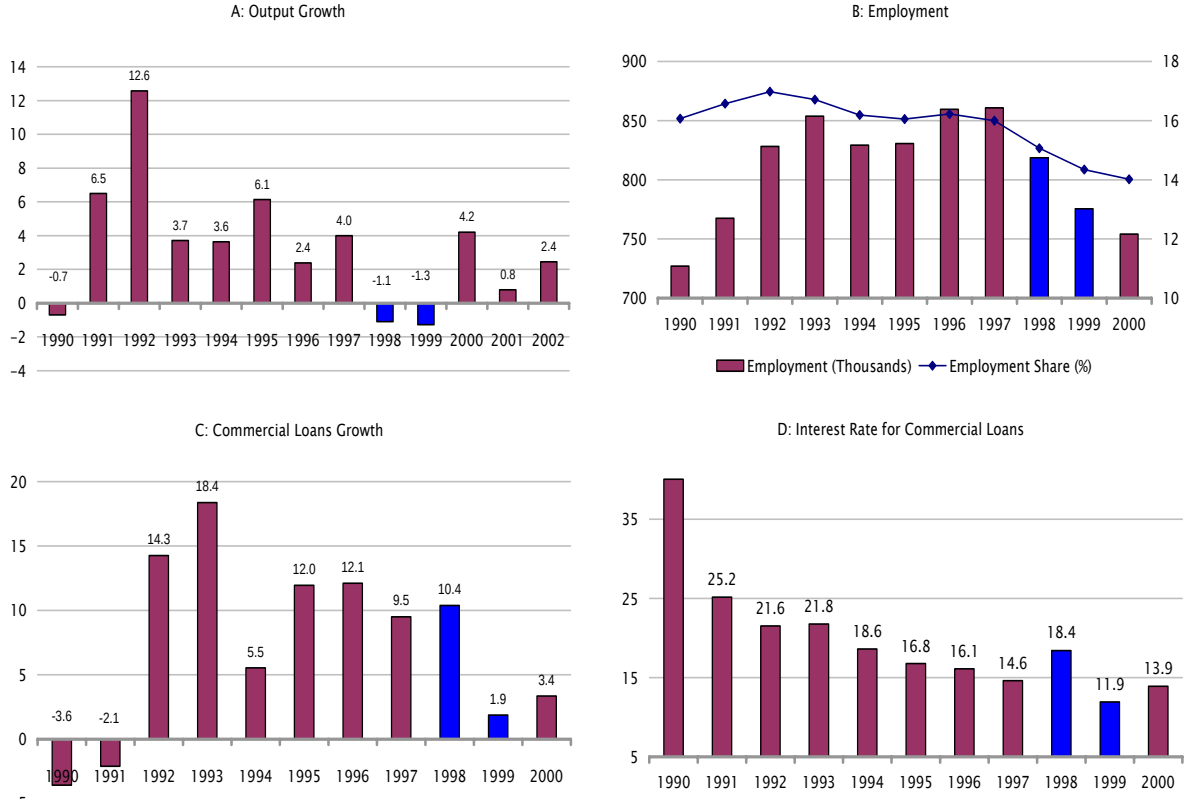
Figure 1: Importance of Multinationals in Manufacturing Industry
(Multinationals as percentage of total)

Source: Own elaboration based on Annual Survey of Manufactures

Figure 2: Manufacturing and Financial Indicators. 1990-2000



Source: Chilean National Institute of Statistics and Central Bank of Chile

Table 1: Manufacturing Industry

ISIC	Description	Plants Share		Employment Share	
		1990	2000	1990	2000
311	Food	30.7	28.7	26.5	31.5
313	Beverages	2.1	2.1	3.1	3.8
314	Tobacco	0.1	0.1	0.2	0.2
321	Textiles	7.9	6.3	8.7	5.4
322	Wearing	6.8	5.4	6.1	3.6
323	Leather	1.1	0.7	0.8	0.4
324	Footwear	3.4	2.1	3.7	2.1
331	Wood	7.2	6.5	7.1	6.3
332	Furniture	2.6	3.2	1.9	1.9
341	Paper	1.4	1.9	2.7	3.2
342	Printing & Pub.	4.1	4.8	3.1	3.7
351	Industrial chemicals	1.6	1.4	1.3	1.9
352	Other chemicals	3.7	4.0	5.0	5.0
353	Petroleum refineries	0.0	0.1	0.3	0.4
354	Petroleum & coal	0.4	0.4	0.5	0.3
355	Rubber	1.1	1.3	1.1	1.1
356	Plastic	4.3	5.0	3.7	4.4
361	Pottery	0.4	0.1	0.7	0.4
362	Glass	0.4	0.5	0.6	0.6
369	Other non-metallic	2.6	3.3	2.1	2.7
371	Iron & steel	0.7	0.7	2.2	1.8
372	Non-ferrous	0.8	1.3	2.4	4.1
381	Fabricated metal	7.7	10.8	7.2	7.3
382	Machinery	3.9	3.9	4.1	3.0
383	Machinery elec.	1.1	1.3	1.2	1.2
384	Transport equ.	2.4	2.2	2.8	3.0
385	Prof. & scientific eq	0.4	0.7	0.2	0.4
390	Other manuf.	1.2	1.2	0.7	0.5

Table 2: Plant and Employment Distribution by Nationality Types

	1990			*1995*			*2000*		
	Plants	%	% Employment	Plants	%	% Employment	Plants	%	% Employment
Domestic	4.395	95.9	91.4	4.812	94.1	90.0	4.262	94.0	84.1
Non-exporter	3.744	81.7	55.1	3.839	75.1	45.4	3.524	77.7	44.4
Exporter	651	14.2	36.3	973	19.0	44.6	738	16.3	39.7
Multinational	190	4.2	8.6	300	5.9	10.0	273	6.1	15.9
Non-exporter	81	1.8	3.1	139	2.7	2.8	111	2.5	4.3
Exporter	109	2.4	5.5	161	3.2	7.1	162	3.6	11.6
Total	4.585	100	100	5.112	100.0	100.0	4.535	100	100.0

Source: Authors' own calculations based on ENIA.

Table 3: Mean Tests for Employment Growth

(Percentage)

	A. Domestic versus Multinationals. all plants			
	Domestic	Multinationals	Difference	t-test
Pre-Crisis	-1.4	-2.2	0.8	1.03
Crisis	-6.5	-3.0	-3.5	-2.34
	A. Domestic versus Multinationals. only exporters			
	Domestic	Multinationals	Difference	t-test
Pre-Crisis	-1.2	-2.8	1.6	1.53
Crisis	-6.8	-0.7	-6.1	-2.69

Notes: Employment growth is defined as $\ln L_t - \ln L_{t-5}$. t-test is for the null hypotheses that difference in employment growth is equal to zero.

Table 4: Plant Employment Growth: Basic Regressions

	(1)	*(2)*	*(3)*	*(4)*
	Employment Growth	Employment Growth	Employment Growth	Survival
	Pooled OLS	Fixed Effects	Sample Selection Model	
Initial size	-0.035	-0.471	-0.037	0.145
	(18.62)**	(43.67)**	(17.56)**	(11.14)**
Age	-0.013	-0.006	-0.017	0.109
	(6.51)**	(0.74)	(7.49)**	(7.89)**
TFP	0.025	0.040	0.023	0.130
	(15.02)**	(9.75)**	(11.81)**	(12.95)**
Exporter	0.041	0.030	0.040	-0.010
	(8.51)**	(3.59)**	(8.25)**	(0.34)
Multinational (MNC)	-0.000	0.002	-0.001	-0.087
	(0.05)	(0.18)	(0.13)	(1.53)
Crisis	-0.082	-0.186	-0.098	-0.742
	(12.33)**	(17.58)**	(11.81)**	(14.68)**
Crisis*MNC	0.044	0.031	0.043	-0.206
	(2.50)*	(1.57)	(2.40)*	(2.04)*
Capital per worker	-	-	-	0.040
	-	-	-	(3.54)**
Constant	0.040	1.405	0.069	0.198
	(3.44)**	(15.09)**	(4.45)**	(2.30)*
Observations	37936	37936	38400	38400
Wald test independent equations: p-value	-	-	0.0004	

Notes: Robust absolute value of t-statistics and z-statistics in parentheses. * significant at 5%; ** significant at 1%. 3-digit industry dummies are included. but not reported.

Table 5: Plant Employment Growth and Financing Needs

	(1) Employment Growth	(2) Survival Equation	(3) Employment Growth	(4) Survival Equation
	Crisis=1998-1999		Crisis=1998-1999-2000	
Initial size	-0.036	0.146	-0.036	0.147
	(7.32)**	(6.30)**	(7.34)**	(6.35)**
Age	-0.017	0.106	-0.017	0.106
	(8.23)**	(5.05)**	(8.18)**	(5.04)**
TFP	0.023	0.128	0.023	0.129
	(3.66)**	(10.90)**	(3.65)**	(10.93)**
Exporter	0.040	-0.018	0.040	-0.018
	(7.45)**	(0.31)	(7.45)**	(0.32)
Multinational (MNC)	-0.014	-0.108	-0.012	-0.121
	(0.93)	(2.16)*	(0.80)	(3.21)**
Crisis	-0.097	-0.763	-0.075	-0.774
	(6.91)**	(19.50)**	(9.45)**	(13.88)**
Crisis*MNC	0.061	-0.377	0.032	-0.240
	(3.14)**	(2.53)*	(1.45)	(2.18)*
EXD*MNC	0.025	0.092	0.030	0.050
	(1.18)	(0.92)	(1.16)	(0.56)
Crisis*EXD	-0.007	0.152	0.010	0.144
	(0.46)	(2.45)*	(0.76)	(2.16)*
Crisis*MNC*EXD	-0.045	0.493	-0.045	0.458
	(1.50)	(2.38)*	(1.00)	(2.26)*
Capital per worker	--	0.038	--	0.038
	--	(2.58)**	--	(2.51)*
Constant	0.067	0.215	0.067	0.217
	(2.76)**	(1.49)	(2.70)**	(1.50)
Observations	37221	37221	37221	37221

Clustered standard errors at 3-digit industry level. * significant at 5%; ** significant at 1%.
Employment growth is defined as: $\log(L_{it}/L_{it-1})$ and initial size is $\log(L_{it-1})$. 3-digit industry dummies are included. but not reported.

Table 6: Plant Employment Growth: Multinationals and Exporters

	(1) Employment Growth	(2) Survival Equation	(3) Employment Growth	(4) Survival Equation
	Crisis=1998-1999		Crisis=1998-1999-2000	
Initial size	-0.037	0.146	-0.037	0.147
	(7.33)**	(6.37)**	(7.34)**	(6.45)**
Age	-0.017	0.106	-0.017	0.106
	(8.19)**	(5.03)**	(8.11)**	(5.00)**
TFP	0.023	0.128	0.023	0.129
	(3.67)**	(10.90)**	(3.65)**	(10.90)**
Crisis	-0.094	-0.746	-0.073	-0.757
	(6.48)**	(16.94)**	(8.80)**	(12.91)**
EXD*MNC	0.023	0.102	0.028	0.054
	(1.11)	(0.98)	(1.16)	(0.60)
Crisis*EXD	-0.006	0.156	0.010	0.147
	(0.41)	(2.56)*	(0.81)	(2.27)*
Crisis*MNC*EXD	-0.042	0.480	-0.045	0.459
	(1.38)	(2.28)*	(1.02)	(2.31)*
Domestic Exporter (DEXP)	0.044	0.000	0.044	0.015
	(6.44)**	(0.00)	(6.83)**	(0.20)
MNC Non Exporter (MNEXP)	-0.000	-0.201	-0.003	-0.187
	(0.01)	(2.46)*	(0.22)	(2.54)*
MNC Exporter (MEXP)	0.020	-0.052	0.026	-0.080
	(1.30)	(0.56)	(1.54)	(0.89)
DEXP*Crisis	-0.015	-0.101	-0.011	-0.108
	(1.05)	(1.91)	(0.98)	(2.29)*
MNEXP*Crisis	0.036	-0.310	0.033	-0.267
	(0.88)	(2.01)*	(0.82)	(1.79)
MEXP*Crisis	0.068	-0.460	0.029	-0.276
	(3.34)**	(2.17)*	(1.25)	(1.54)
Capital per worker	--	0.038	--	0.038
	--	(2.60)**	--	(2.53)*
Constant	0.066	0.213	0.067	0.211
	(2.74)**	(1.48)	(2.68)**	(1.47)
Observations	37221	37221	37221	37221

Clustered standard errors at 3-digit industry level. * significant at 5%; ** significant at 1%.
Employment growth is defined as: $\log(L_{it}/L_{it-1})$ and initial size is $\log(L_{it-1})$. 3-digit industry dummies are included. but not reported.

Appendix

Table A1: Sectoral distribution of value-added by foreign multinationals, percentages

ISIC Rev 2 Sector	Deescription	1990	2000
311	Food	23.9	23.2
313	Beverages	1.3	6.6
314	Tobacco	0.0	0.0
321	Textiles	0.4	0.1
322	Wearing	1.1	1.0
323	Leather	0.3	0.0
324	Footwear	1.3	0.0
331	Wood	1.3	0.8
332	Furniture	0.0	0.1
341	Paper	2.3	1.6
342	Printing & Pub.	2.8	1.3
351	Industrial chemicals	13.8	6.8
352	Other chemicals	16.4	8.5
353	Petroleum refineries	0.0	0.2
354	Petroleum & coal	3.8	0.8
355	Rubber	3.5	1.7
356	Plastic	2.7	0.4
361	Pottery	0.2	0.0
362	Glass	2.6	1.6
369	Other non-metallic	6.2	4.8
371	Iron & steel	0.8	0.0
372	Non-ferrous	8.6	36.2
381	Fabricated metal	2.4	1.1
382	Machinery	0.9	0.9
383	Machinery elec.	1.5	1.4
384	Transport equ.	1.3	0.5
385	Prof. & scientific eq	0.3	0.4
390	Other manuf.	0.2	0.0
Total manufacturing		100.0	100.0

Table A2: Variable Definitions

Variable	*Description*
Size	Total employment (in logs)
Age	1+year-first year a plant is observed (in logs)
TFP	Total factor productivity estimated using Levinsohn and Petrin (2003) methodology (in logs)
Exporter	Dummy for exporter plants
Capital per worker	Stock de capital over total employment (in logs)
External dependence	Industry external financial needs computed by Rajan and Zingales (1998)
Crisis	Dummy for years 1998 and 1999. In robustness analysis we also include 2000.

Table A3: Descriptive Statistics

Variable	Mean	St. Dev.	Minimum	Maximum
Employment growth	-0.028	0.290	-4.700	2.858
Log (Initial Employment)	3.748	1.059	1.099	8.270
Log (1+Age)	2.130	0.845	0.000	3.045
Log (TFP)	3.542	1.970	-7.601	17.818
Exporter	0.223	0.416	0.000	1.000
MNC	0.048	0.213	0.000	1.000
Crisis	0.183	0.387	0.000	1.000
Crisis*MNC	0.010	0.098	0.000	1.000
EXD*MNC	0.014	0.091	-0.150	1.140
EXD*Crisis	0.048	0.150	-0.450	1.140
EXD*Crisis*MNC	0.003	0.044	-0.150	1.140
Log(Capital per worker)	6.656	1.407	-2.300	12.754

Table A4 Correlation Table
Main Variables

	Initial size	Age	TFP	Exporter	MNC	Crisis (DC)	External Dependence EXD	DC*MNC	EXD*MNC	EXD*DC
Initial size	1									
Age	0.1835	1								
TFP	0.0694	0.0782	1							
Exporter	0.4922	0.0612	0.0749	1						
MNC	0.1839	0.0004	0.0312	0.2205	1					
Crisis (DC)	-0.026	0.0577	0.0247	0.0212	0.0148	1				
EXD.	-0.0077	-0.0445	-0.1093	0.0289	0.0391	0.0134	1			
DC*MNC	0.115	0.0187	0.0264	0.1364	0.553	0.196	0.0307	1		
EXD*MNC	0.1045	-0.0001	-0.0072	0.1472	0.7013	0.0173	0.2082	0.4134	1	
EXD*DC	-0.0182	0.0313	-0.0368	0.0345	0.0323	0.6472	0.42	0.1666	0.1167	1
EXD*MNC*DC	0.0627	0.0137	-0.0014	0.0965	0.3941	0.1397	0.1266	0.7126	0.5891	0.2667

[i] See Javorcik (2004), Girma and Görg (2007) and Alfaro et al. (2004) for recent examples.

[ii] An exception is Blalock et. al. (2008). They analyze the impact of the 1997 East Asian financial crisis on investment for domestic and foreign owned firms in Indonesia.

[iii] Levinsohn (1993) is an early paper examining the effect of trade liberalization in Chile on employment growth.

[iv] This information is based on the CIA World Factbook, accessed online at https://www.cia.gov/library/publications/the-world-factbook/rankorder/2119rank.html on 18 April 2011.

[v] The level of sectoral concentration appears somewhat similar to that for the Irish manufacturing sector, as shown by Barry and Kearney (2006).

[vi] At the aggregate level, Braun and Larrain (2005) show evidence that industries that are more dependent on external (to the firm) finance are hit harder during recessions. We focus here on the effects at the plant level.

[vii] The mean and median of foreign ownership are 77.7 and 100 percent, respectively.

[viii] Bernard and Sjöholm (2003) and Görg and Strobl (2003) find similar evidence for Indonesia and Ireland, respectively.

[ix] This definition of the dependent variable also wipes out any plant specific effects that determine employment levels.

[x] Tables with definitions of variables, descriptive statistics and correlation matrix are presented in Tables A2, A3 and A4 of the Appendix.

[xi] As we show later, not all of our results are robust when considering 2000 as a year crisis.

[xii] We also tried with other two variables that may proxy the effect of competition on plant survival: minimum efficient scale in the industry, and the Herfindahl index of industry concentration. These variables are commonly included in modeling plant survival (see, for example, Audretsch; 1991). Results are very similar with these two types of controls.

[xiii] We have estimated the same model using multinational as continuous variable (share of foreign capital). The results are very similar and available upon request.

[xiv] This has been also documented in the Chilean case by Alvarez and Görg (2009).

[xv] This variable is defined as the fraction of capital expenditures not financed with cash flow operations, and it is computed for the median of US firms at 3-digit ISIC industries (some at 4-digit). To be consistent, we only use information at 3-digit level.

[xvi] Even if it is difficult to argue that financing restrictions are similar in Chile than the U.S., it can be argued that differences have been falling over time due to structural reforms in Chile. Moreover, in one of the financial development indicators – stock market capitalization to GDP - shown by Becker and Greenberg (2005), Chile displays a better performance than the U.S.. In the other two indicators, however, Chile ranks no better than the world average.

[xvii] With the exception of a positive parameter for average size, the results which are available upon request are very similar to those presented in the previous regressions.