DESTRUCTION, CREATION AND SURVIVAL: EVIDENCE FROM THE EVOLUTION OF FIRMS IN AN EMERGING MARKET, IN A POST-CRISIS CONTEXT.

TESIS PARA OPTAR AL GRADO DE
MAGÍSTER EN ECONOMÍA

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Santiago, Enero 2012

Destruction, Creation and Survival: Evidence from the evolution of firms in an Emerging Market, in a post-crisis context.*

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Abstract

We use a panel database of the universe of firms constructed from Chilean IRS, to study the evolution of firms, in a sense of destruction, creation and survival. As expected, larger and more productive firms are less likely to be destroyed; and (also as expected) they are less likely to be created than smaller and less productive firms. However, when we analyze young firms, the most succeded are those who made an important investment in his first year of life, and the productivity will be relevant depending of the sector. So there's some evidence about the entrepreneurship and the stock of capital they make and how is that related with his relevance in an emerging market. We have shown that "financial dependence" has different meaning for smaller firms, as reflected in a significant difference in sign of the corresponding parameter. For them it is an indicator of "financial constraint" and acts in our regressions as a predictor of firm destruction, also a stronger predictor of firm creation smaller firms, acting like a "financial access". but does not affect the chances of survive.

Keywords:
Firms, Entrepreneurship, Growth, Survival, Succeed.
JEL Classification:
D22, C33, M13, M21, L25, L26

*Comments and advice of the following persons are gratefully acknowledged: Sergio Urzúa, Rodrigo Wagner, Mathieu Pedemonte, Federico Huneeus, Gabriel Villarroel, Sofía Correa, Diego Vera, Matías Morales, Alonso Bucarey, Nicolás Libuy. The usual disclaimer applies.

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1 Introduction

Currently, the literature shows that part of the success of emerging economies to achieve development is the ability they have to create new firms, which is directly related to the ability to create jobs, and therefore greater good for society. However, the literature has not considered the question from an evolutionary standpoint, that is, not facing the problem before the firm is born, develops in the market, with the possibility of destroying or survive. Thus the main purpose of this paper is to make a contribution to this discussion, to characterize the dynamics of the entrepreneurs who manage to enter the market as well as those that once inside, succeed or otherwise fail in a post-crisis context.

In this sense, account for the evolution of firms in an unfavorable period, allows to implement policies to create an environment conducive to entrepreneurship. Emerging economies are an attractive case for research, as they have greater restrictions after being hit by a crisis. In particular, Chile, was established as an ideal country to provide empirical evidence about it. Notably, it was one of the countries that most grew during the first part 90'; of the most beaten by the Asian crisis, and remained in a recession after this for about 4 years, unable to regain the dynamic.

As we know, reliable information on the results of the firms is crucial, since much of the success of the evidence provided is based on how best to characterize the evolution of firms. Thus, the databases generated from tax reports have become the most reliable. Thus, this research counts with the universe of firms after the Asian crisis, taking the information from the reports of the Chile IRS, for a period from 1999-2004. This would be a feature of most relevance in this document. In turn, the information is exploited in the economy, taking charge of the heterogeneity, this by identifying the different impacts that have these characteristics from economic sectors. The above, then allows to isolate specific effects of certain sectors in recessionary periods.

In summary, this paper aims to contribute to discussion, to characterize those entrepreneurs who saw their company bankrupt after the crisis and those who decided to go after it. In particular, this case presents a censorship which has only been treated by Paulson and Townsend (2004) and Paulson and Townsend (2005). Finally, we characterize those entrepreneurs who decide to enter the market after the crisis and survive over time, i.e successful one. The article is divided in section 2 for the review of literature, description of the base and the stylized facts, section 3 implements the empirical estimation and results, and finally 4 concludes.

2 The Firm Flow Facts

2.1 Review of Literature

From the theoretical point of view it is possible to account for the first approaches to the analysis of evolutionary firms. On the one hand, Jovanovic (1982), who through a model argues that only companies that adapt to the environment and grow, will survive. On the other hand,

Cabral and Mata (2003) assumes a model in which the initial size and financial constraints are the minimum desired, thus the evolution of the company depends on the initial restrictions.

There seems to be agreement in the literature regarding the environment in which firms develop is directly related to the evolution of these. Consider, for example, an Allen and Gale (2005) economy where there is a pool of financial liquidity that can quickly become rationed after an aggregate shock [1]. On the other hand, a Caballero and Krishnamurthy (2001) emerging economy[2] where there is a pool of internationally pledgable collateral that becomes rationed when the country is hit by an international shock. In such economy one would expect firms with different access to international finance, to react differently to the same shock.

Thus, once the literature identifies the environment as a relevant variable for a firm, we have on the other hand the characteristics of the firm, Gertler and Gilchrist (1994) show us evidence that investment among smaller firms is much more sensitive to monetary policy than among larger firms. Moreover, Oliner and Rudebusch (1996b) show that the shifting of bank credit away from small firms is a salient feature of monetary contractions in the US. But this differential behavior of firms of different sizes can be found in many places. For instance, Forbes (2007) shows that the implementation of the Chilean capital flow reserve requirement mechanism had a significantly larger (although transitory) adverse effect on smaller firm's access to credit, but is biased towards larger firms. Harris et al. (1994), find evidence that Indonesian financial liberalization increased borrowing costs more for smaller firms. Gelos and Werner (2002) find evidence that the Mexican financial liberalization resulted in an easing of financial constraints that was concentrated among smaller firms, and so forth.

There seems to be, in fact, a consensus that the size of a firm does seem to, at the very least, correlate with the reaction to a crisis or a policy innovation. However, there is less agreement on what characteristics of the firms are delivering this differential sensitivity and on what is being proxied by size in papers that use it as an independent variable. Gertler and Gilchrist (1994) explicitly argue that size is a good proxy for capital market access, but other papers do not necessarily clarify what it is that we are talking about. And there are alternatives: for example Hu (1999) shows that it is highly leveraged firms which are more affected by a contraction in credit, and Kashyap et al. (1994) show that firms without access to bond markets that are the ones that react to shocks with most intensity. All three empirical findings are compatible and it is entirely possible that illiquidity, excessive leverage and imperfect access to capital markets are theoretically and empirically related.

It is pertinent to note that the evolutionary approach is evidenced first by Audretsch and Mahmood (1991), Audretsch (1991), who made an attempt to characterize the behavior of the company, by survival analysis, however, again there is bias towards large companies. Benavente and Ferrada (2004), carried out a study similar to the above, but focuses on Chile, using them also the data-

[1] In such an economy it is likely that firms with less liquid assets or thinner cash flows such as those referred to by Oliner and Rudebusch (1996a) and Carpenter and Petersen (2002) will be relatively more affected by aggregate shocks

[2] consider the family of papers that follows.

base of the manufacturing sector, known as ENIA [3] using non-parametric methods of survival analysis, however the database only contains firms of manufacturing sector, therefore, again is skewed towards only for larger firms in economy.

2.2 The Data Set

The FUNDES-SII data set compiles information for the universe of firms that have made their tax statement in Chile for the years 1999-2004. It contains information on the economic sector of the firm, it's sales, value of assets, total debt, profits and geopolitical region. The database contains observations for roughly 650-700 thousand firms per year with fictitious identities. The complete database as an unbalanced panel contains 4.1 million observations, being a census for the Chilean economy.

It is important to note that this database contains the universe of the firms of the economy, Forbes (2007) uses a database of publicly listed companies in Chile, so she is estimating the effects of size among already relatively large companies, that have sufficient financial access to be admitted into the Santiago Stock Exchange. Hu (1999) uses the Manufacturing Sector Master File which is composed of large, durable manufacturing companies. Gallego and Hernández (2003) use a database of publicly traded firms for the chilean economy, they show that relatively smaller firms increased their reliance on short term debt as a result of the reserve requirement.

This is how it is possible to deduce a common feature of all the documents mentioned so far, namely the existence of a natural bias towards large companies. However, there is another bias due to the difficulty of obtaining financial data between companies financially fragile firms. Most of these papers are interested in the transmission mechanism of monetary policy tightenings, exchange rate shocks or capital account policies, so this is probably not a problem for their conclusions. But, from the need to identify the different distributive effects of crises across different types of entrepreneurs, are probably underestimated the adverse effects of shocks. Therefore, for our purposes, the evidence of these documents is motivated but not decisive.

There are several problems that the database presents that make the interpretation of its results complicated. First, these are legal rather than economic definitions of firms. There are plenty of firms in Chile that have several identities for accounting and tax purposes. We have no way of accounting for these "hidden" larger firms. Second, as we said before we are using a database constructed from reports to the Chilean Internal Revenue Service. The rule at the Chilean IRS is that the firms RUT identification number (Unique Tax Registry or Registro Único Tributario) is dropped from the database when it does not file tax forms for a third consecutive year. It is possible that firms do not have activities for a year (for example due to restructuring) and cease to produce. It is also possible that they have simply disappeared and actually been destroyed as firms. Since our panel is quite short it is not possible for us to determine which is the case. All we can say is that it has not filed a report so that a particular year's project has been destroyed, not the actual firm. We will use this concept

[3] Survey of plants for manufacturing in the Chilean economy

of project creation and destruction as an empirical approximation to entrepreneurial creation, destruction and survival in Chile.

2.3 The Stylized Facts

The firs thing we should do is define our key variables that charaterize our firms, we will have three types of heterogeneity: First, our measure of k (the proportion of their capital that is financed internally) will be the logarithm of the ratio of equity over assets, so that we will call $1-k$ "financial dependency" and measure it by the ratio of credit to assets , productivity π (the capability they have of extracting value added from the economy) will be the arctangent of the ratio of profits to total assets.[4], and scale or size ϕ that will be the logarithm of the amount of sales. All firm flows presented in this next section section are normalized with respect to the average performance of the sector they belong to.[5]

One of the first clues that the sample of firms in this dataset is different comes from the panel of Figure 1. Here we show the percentage of firms destroyed and created every year in this panel of firms. Annual churning of firms seems to be in the 2%-4% range, and an interesting feature of this period is that it is one of post Asian Crisis net firm destruction. The exception is 2001 (indicating flows from 2000 to 2001, hence it is pre 9/11) when creation was higher. This coincides with a period of relatively high growth (unfortunately we do not have data for the relatively rapid growing year of 2005). The spike in firm destruction in 2003 it could be the impact of post 9/11 or some changes in registry of firms. As we will see in the sections that follow, this will not change our results and, in fact, the econometric results for 2003 are robustly in line with those for the rest of the sample. The second panel of Figure 1 counts the number of firms that having survived, either improved, worsened or maintained their sales levels during a given year. interestingly enough, with the exception of 2000, most surviving firms are improving their sales levels (in real terms).

Before running any regressions that control for sector specific effects, we attempt to characterize our data by size, our financial dependency measure (1-k) and cash flows. Figure 2 shows firms performance by firm size. We can see that, with the exception of the 2003 destruction spike, there is a clear difference in the firm churning rates of micro firms and the rest. Around 4% of micro firms are destroyed and crated, while only around 1% are destroyed and created among the other categories. It is also more likely for larger firms to improve their sales, although this result is less robust and is not observed in 2003 and 2004. On the other hand it is very unlikely for micro firms that survive to worsen their sales level. This could be a very strong indicator of the fragility of these firms: either they improve and maintain their sales levels or they fall into bankruptcy or informality. As an interesting feature, from the "small" category onwards, the probability of worsening falls with size for 2000-2002.

[4] Arctangent is defined for $(-\infty, +\infty)$ but is bounded so it helps to limit the effect of outliers on the regression

[5] Specifically, we calculate a flows and performances by characteristic, sector and year. Then we aggregate deviations from sector averages and finally weight them according to the importance of different sectors. on average in the FUNDES IRS database, 10% of firms are from the agricultural sector, 0.6% are from forestry, 0.5% are from fishing, 0.2% are mining (but they are very large), 6% are manufacturing, 0.3% are utilities (also large), 5% are construction, 37% are commerce and 41% are services.

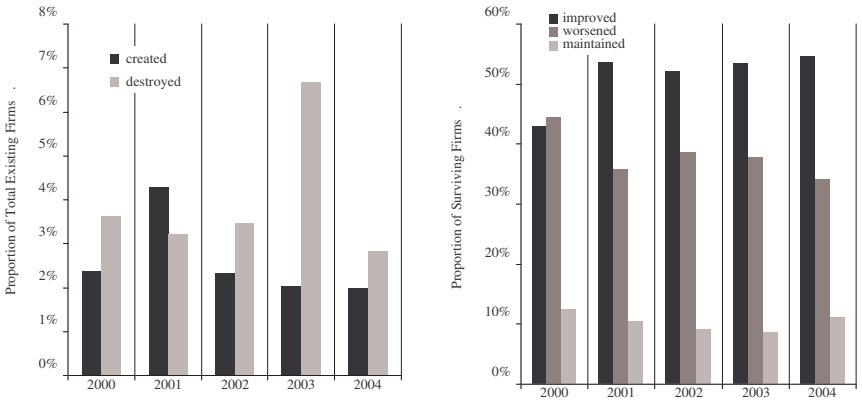


Figure 1: Firm Performance in Chile

For Figure 3 we have divided the databases according to "financial dependency" defined as equity over total assets. That is, the extent to which the entrepreneur is actually working with someone else's capital to financie his enterprise that we named $1-k$. However, it is important to consider that, k must include all the assets and financial resources of the entrepreneur's household. Whilst in this database we only see the assets and debt of the firm. Even if the household's assets are not formally associated or mortgaged, a bank will obviously feel more reassured if the entrepreneur has other sources of liquidity that can sustain a business through rough times. Hence, there is a chance that we may confuse financial dependency with access to credit markets, and, as we shall see in the next sections this is in fact a crucial distinction. In any case, in this section we divide the database into four quartiles, where the first quartile is composed of firms with the least financial dependency. [6]

The evidence is that firm churning is higher among more financially dependent firms. We find particularly interesting, the concentration of firm destruction among micro firms. Among the fourth quartile firm destruction is roughly 9% per year, while it fluctuates around 3% for firms in the first quartile. This partition of the database is less meaningful when analyzing sales performance among surviving firms. There is no clear pattern for sales improvement, but there is a seemingly paradoxical trend towards a lower proportion of financially dependent firms to worsen their sales. Again, this is probably a sign that, among surviving firms, our measure of financial dependence is really capturing credit market access to some extent.

Finally, we divide the database into quartiles according to the most common productivity indicator in this literature, which is cash flow sales over asset value.[7] Figure 4 displays the

[6] One interesting feature of the FUNDES IFS database is the enormous number of firms with negative equity when comparing assets and debt. Tax accountants will explain that the value of assets that is recorded for many firms is constrained by legal definitions and book values, while the value of debts is priced in the market. It is frequent, hence, for the firms in this database to have large debt to asset ratios.

[7] See previous footnote. Again cash flow is valued at market prices and is a crucial input for the IRS to

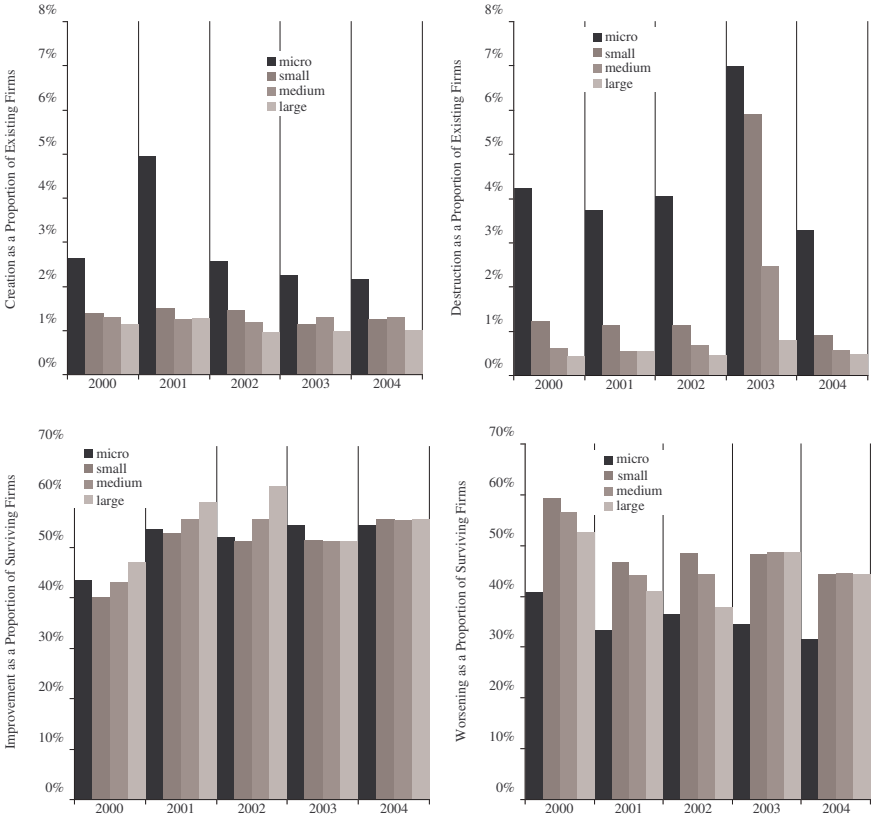


Figure 2: Firm Performance and Size

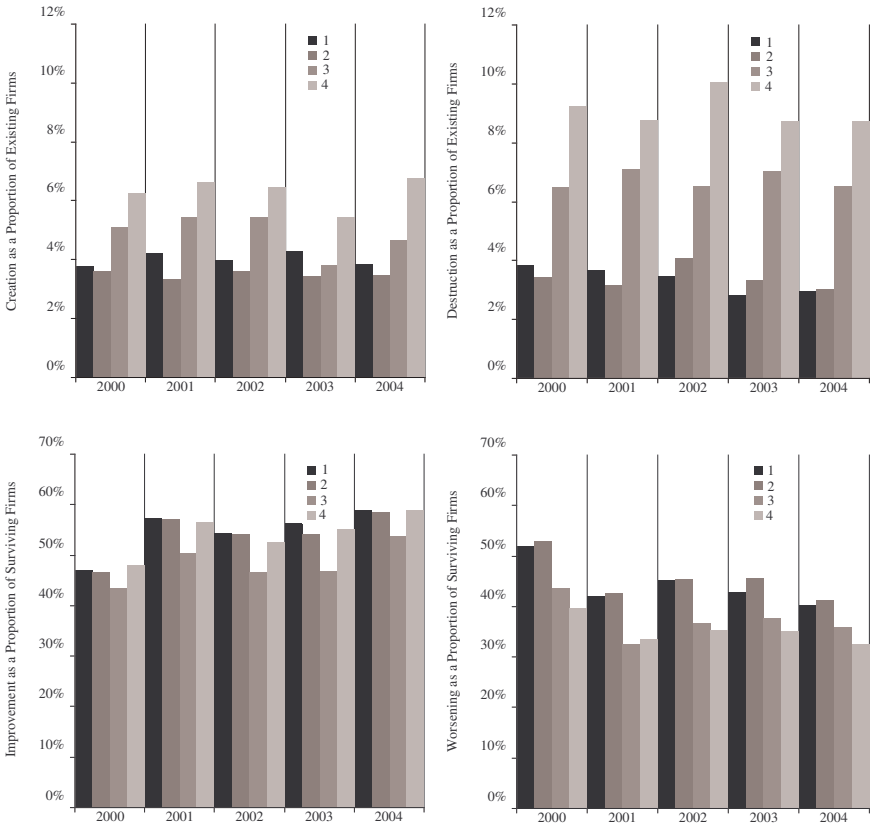


Figure 3: Firm Performance and Financial Dependency

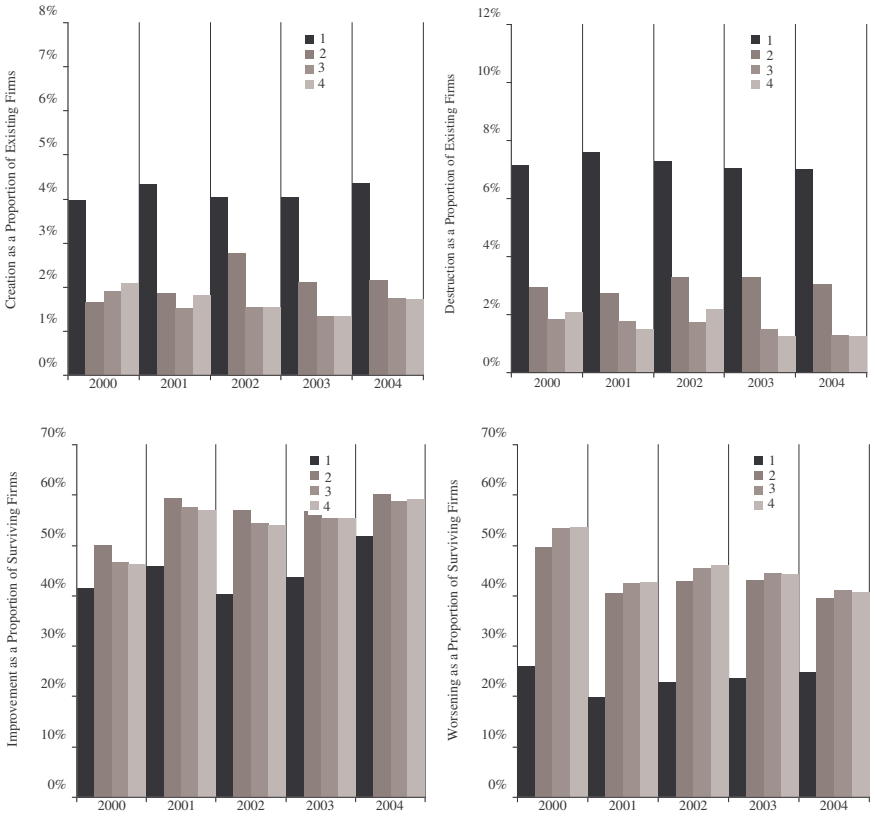


Figure 4: Firm Performance and Cash Flows

results. In this case, quartile 1 is comprised by firms with the lowest cash flows and quartile 4 by firms with the highest cash flows. The evidence is that destruction and creation is particularly high among first quartile firms. Destruction is exceptionally low among third and fourth quartile firms. Among surviving firms, on the other hand, there seems to be some evidence of a high percentage of firms that maintain their sales level (one minus the percentages in the two lower panels of figure 4), but particularly strong evidence of very little firms that worsen. Again, these fragile firms seem to have much more dramatic outcomes.

calculate the firms tax liabilities. Assets, on the other hand, have book values, giving us some pretty wild cash flow indicators. Since all we do is in this section is rank them, this should not be a major problem.

3 Heterogeneity, Environment and Small Firms

3.1 Destruction

Call $x_{i,t} = \{\pi_{i,t}, k_{i,t}, \phi_{i,t}\}$ the vector that characterizes the firms as we define before. It will be critical for our estimation to assume that this vector of characteristics evolves dynamically in a way that can be approximated by some unknown process:

$$x_{i,t} = \gamma x_{i,t-1} + e_{i,t} \quad (1)$$
$$e_{i,t} = \epsilon_{i,t} + \alpha_i \quad (2)$$

that is shocked through time by an i.i.d. vector of shocks that are particular to the firm ($\alpha_i \sim N(0, \sigma_\mu^2)$), and particular to the firm at a moment in time ($\epsilon_{i,t} \sim N(0, \sigma_\epsilon^2)$).

Since we are interested in destruction, we will be interested in observing firms that disappear from the database. That is, we will be interested in understanding the determinants of those firms that exists in $t-1$ and disappear at t.

$$y_{i,t} = \left\{ \begin{array}{ll} 1 & \text{if } x_{i,t} < 0 | x_{i,t-1} \geq 0 \\ 0 & \text{if } x_{i,t} > 0 | x_{i,t-1} \geq 0 \end{array} \right\} \quad (3)$$

So we need an outcome function $F(.)$ that summarizes our probabilities by reporting who is chosen and who is not chosen to maintain their project, conditional on his survive. So in this article we shall attempt to estimate destruction by adjusting F to a function Φ, in this case we will use a Probit model. Our strategy to deal with the legal problems of the database, is to implement cross-section regression of entrepreneurial projects, so in that way we assume that we see a firm only in two periods, and we use a definition of destruction only if a firm is not selling in the past year, this means that we have 5 consecutive years that we append and run a probit regression for the cross-section database.[8].

The equation of our probit regression is:

$$P(Destruction)_{t,i} = F\left(\alpha_0 + \alpha_1 \pi_{t-1,i} + \alpha_2 (1 - k_{t-1,i}) + \alpha_3 \phi_{t-1,i} + \alpha_4 Imacec_{t-1,i} + \beta_1 DSc_i + \beta_2 DSyr_i\right) \quad (4)$$

Where π, our measure of productivity of the firm, k will be the ratio of equity over assets, so that we will call $1-k$ "financial dependency", at last we have a measure of size, ϕ that will be the amount of sales. It is important to note that we try to use the most of the definition in the econometric model, so we control using a set of dummy years, $DSyr_i$, to capture the shocks that the firms have in a particular moment in time, also we include a set of sector dummies DSc and the sectorial IMACEC[9] to isolate the specific effect of the growth of the sector, this

[8] One first strategy was use a panel probit regression to consider the heterogeneity in the time, in this case we assume that a firms destroyed when gets out of the panel, in our case we have an unbalanced panel by construction, but due to computer restrictions, we only present the results for the full panel and each year

[9] Growth Index

is constructed by the percent change of this index annually.

Table 1: Probit Regression

VARIABLES	(1) full panel	(2) 1999-2000	(3) 2000-2001	(4) 2001-2002	(5) 2002-2003	(6) 2003-2004
π_{t-1}	-0.027***	-0.030***	-0.030***	-0.030***	-0.027***	-0.026***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
$1-k_{t-1}$	-0.002***	-0.001	-0.002***	-0.002***	-0.003***	-0.002***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
ϕ_{t-1}	-0.008***	-0.009***	-0.008***	-0.009***	-0.008***	-0.007***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
$Imacecs_{t-1}$	-0.050***	-0.217***	0.309***	0.368***	-0.391***	-0.527***
	(0.008)	(0.017)	(0.017)	(0.014)	(0.014)	(0.018)
Sector Controls	yes	yes	yes	yes	yes	yes
Years Controls	yes	-	-	-	-	-
Observations	2,059,563	394,431	406,792	409,244	423,781	425,315
LogLike	-269108	-53879	-53912	-56929	-53715	-52523
Pseudo R-Squared	0.130	0.132	0.128	0.134	0.112	0.109

Note 1: Marginal effects on the probability of destruction, standard errors in parenthesis.
Note 2: * is 90% significance, ** is 95% significance,*** is 99% significance.
Note 5: Dummy for Agriculture has been dropped.

The table 3.1 shows the probit regression for the cross-section of entrepreneurial projects and also for five sets of consecutive years. A few things are worth noticing, the first is that the marginal effect of the panel probit regression are very similar with the cross-section regression of entrepreneurial projects when we use the entire database[10], in that sense we have that productivity π is always negative (better quality firms have a lower probability of disappearing) and statistically relevant at the highest significance level. Second, the effect of financial dependency $1-k$ is very significative, and show us that if the proportional of capital external is higher, that means with more possibilities of external financial has lower probability of disappear, this is robust across the time span. Third, the size of the firm intuitively is always negative, and robust for every specification, establish some well known conclusion about the relationship of the size and the probability of destruction.

However, and this is the main finding of this section, we know from the stylized facts of the previous section that the regressions of Table 3.1 hide a some meaningful heterogeneity among sectors and financial dependency. To illustrate this instead of artificially dividing the sample into the size categories we have used up to this point, we decide to divide the sample according to a criteria that imposes less structure on the regression and attributes less meaning to the particular thresholds that are used in Chilean development policies. We rank the cross-section database and order the observations according to size measured as the log of sales in real terms and then run probit regressions for a rolling sample of centiles starting from the smallest firms

[10]See Appendix, table A

and moving to the largest.

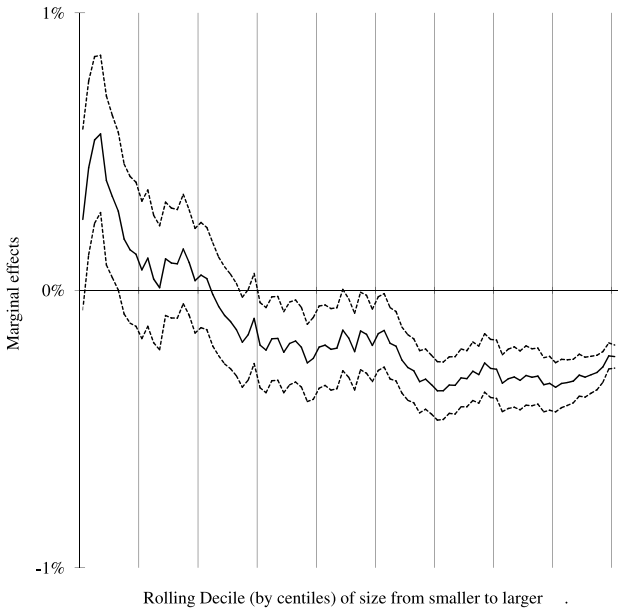
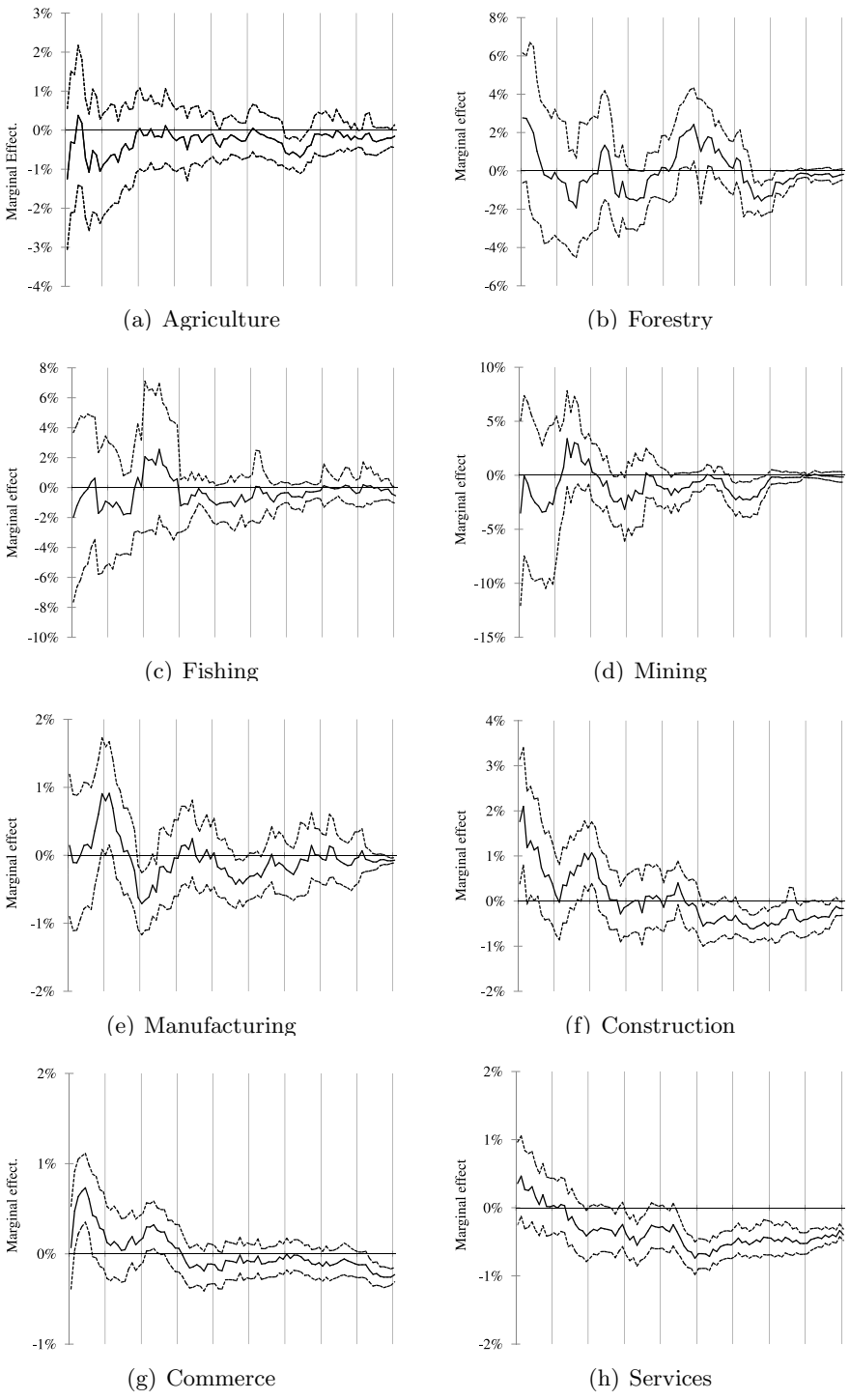


Figure 5: Marginal Effect of $1-k$ on the probability of default

Figure 5 reports the estimated marginal effect of $1-k$ for deciles of different sizes. As we can see, for smaller firms, the effect is positive and significant while for larger firms it becomes negative and significant. This means that for smaller firms $1-k$ acts as an indicator of "financial fragility" or "financial constraint" while for larger firms it is more of an indicator of own financial capacity, and then with the financial access. This, in our view, means that the scale of entrepreneurial projects helps relax the incentive constrained margin composed of very productive and poor entrepreneurs: scale helps with the asymmetric information problem.

Furthermore, Figure 6 shows this result by running the same program but separated by sectors[11]. We see that we lost significance in most of the sectors, but is important to watch some heterogeneity among non-tradeable sectors, sub-figure 6(f), 6(g), 6(h), are very similar to the general conclusion about the full panel, this may happen because this sectors represent an important part of the database, and are composed with much more microfirms than others. So we can conclude that non-tradeable sectors represent most of the behave of the economy after a crises.

[11] Utilities was dropped because it has to few observations.



(a) Agriculture (b) Forestry

(c) Fishing (d) Mining

(e) Manufacturing (f) Construction

(g) Commerce (h) Services

Figure 6: Rolling Decile (by centiles) of size from smaller to larger, Marginal Effect of $1-k$ on the probability of default by sector

3.2 Creation

Studying creation of firms in this database does not allow for a lot of well specified econometrics since we do not have a control group. We do not have data on what would have been the size, the financial dependency and the productivity of entrepreneurial projects that were not implemented either because of strategic decisions by the entrepreneurs or did not accede to financing due to adverse evaluations in the banking sector. Hence we are, by nature, restricted to a statistical description of the firms that are created. Our solution is to calculate "propensities" to create among different types of firms and then try to predict with econometrics these propensities. In a sense, this methodology is very similar to the construction of pseudo panels that is frequent in labor and public finance econometrics. What this literature does is to construct "fictitious" representative individuals that can be observed through the population that they represent, even if actual individuals cannot. Usually, these individuals are constructed by grouping the observed samples according to some subset of demographic or socio-economic characteristics. The assumption is that the characteristics and collapsed data of this constructed representative individual would have been the data if we had been able to actually find that individual, survey, and follow him or her through time. Then these "fictitious" representative individuals are used in panel regressions to address whatever question this literature wants to ask.

Our methodology is very similar, what we do is expand on the three dimensional decile grid that we have used in the previous section. In generic terms, lets call the three dimensions $\{x, y, z\}$, and assume we rank in deciles along each. To do this properly we must rank z decile within each y decile and each x decile. The result is a homogenous grid of 1,000 partition cells $(10 \times 10 \times 10)$ with an identical amount of firms on each partition. It is important to note that here we are generating a tri-cube[12] with the characteristics of the firm that we thought are crucial for our estimation of creation, in that sense following the literature the cube is created conditional first on the size, then productivity and at last our financial dependency measure, our explanation for this conditional joint distribution that we created is, first because it's well documented that size acts like a proxy for financial dependency, so it must be the variable that condition the others, then our productivity measure allows to believe that firms conditional on it's size and his productivity will determinate his possibility to access to the credit market, and try to avoid the asymmetry information problem that exists in the market.

So, we then collapse the data in each partition to obtain stylized characteristics of the representative firm of each partition cell. In particular, we count the number of firms created in each cell, this means that we use consecutive years of the base and we see if the firm doesn't exist in $t-1$ and exist in t, it means that we have a new firm between two consecutive years, so we want to know the determinants on $t-1$ that made posible this new firm in t this is possible due to the homogeneous grid we have created for the base. So we count the years and sectors that predominate in each cell of the full panel, estimate the average $\{\pi,\ 1-k,\ \phi\}$ that we assume to be the characteristics of the representative firm and execute the following OLS regression:

[12] See Appendix, figure 9

$$Creation_t = \alpha_1 \pi_{t-1,d} + \alpha_2 (1 - k_{t-1,d}) + \alpha_3 \phi_{t-1,d} + \beta_1 VSc + \beta_2 VYr \quad (5)$$

Where $Creation$ is the amount of firms created of each cell, π_d is the productivity decile of the cell, $1 - k_d$ is the financial dependency decile and ϕ_d is the size decile, VSc is a vector that counts the number of firms of each sector within each partition cell and VYr is a vector that counts the relative importance of observations of each year from the sample in the partition cell.

Table 2: Preferred Regressions: Amount of Creation

VARIABLES	(1) full panel	(1) 1999-2000	(2) 2000-2001	(3) 2001-2002	(4) 2002-2003	(5) 2003-2004
π_{t-1}	-43.53***	-11.56***	-7.18**	-12.24***	-12.13***	-14.19***
	(9.11)	(2.39)	(2.84)	(2.32)	(2.26)	(1.46)
$1 - k_{t-1}$	32.14***	1.97	5.83***	3.55*	2.54	1.44
	(7.15)	(1.79)	(2.19)	(1.81)	(1.81)	(0.92)
ϕ_{t-1}	-24.92***	-3.88***	-4.90***	-4.48***	-4.61***	-4.26***
	(1.55)	(0.34)	(0.39)	(0.30)	(0.35)	(0.38)
Sector Controls	yes	yes	yes	yes	yes	yes
Years Controls	yes	-	-	-	-	-
Observations	1,000	1,000	1,000	1,000	1,000	1,000
Adjusted R-squared	0.80	0.66	0.68	0.71	0.71	0.66
LogLike	-4243	-2891	-2949	-2888	-2883	-2934

Note 1: Effect of increasing a decile on amount of creation, conditional on the joint distribution of the tri-cube, it means that the parameter capture the incidence of any variable conditional first in the size, then productivity and at last financial dependency; standard errors in parenthesis.
Note 2: * is 90% significance, ** is 95% significance,*** is 99% significance.
Note 3: full panel regression use years and dummy sector weight for controls, regression for periods include sectorial growth weighted following the relative weight of the sectors in the cell.

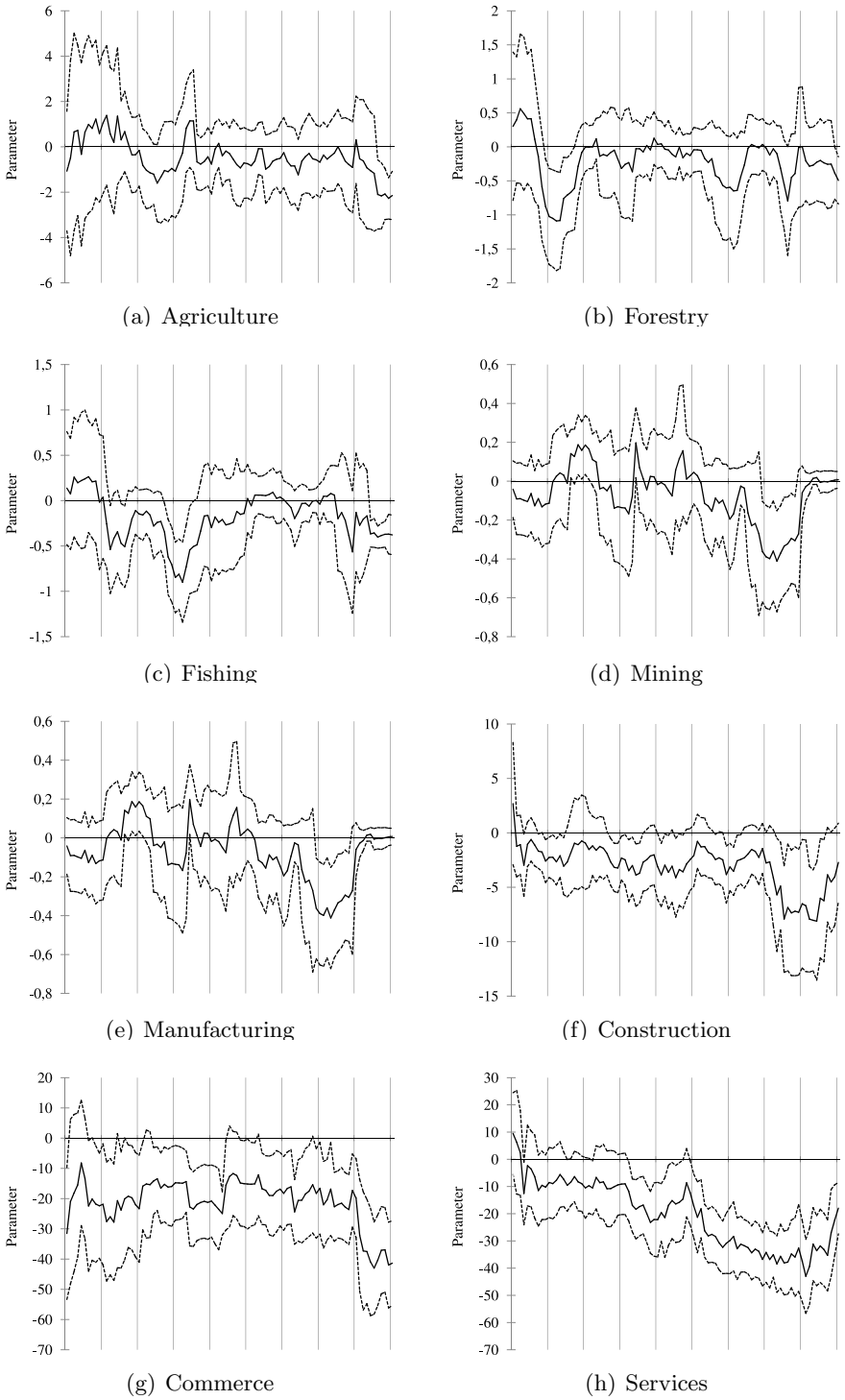
Table 3.2 shows the results, they means that in average the characteristics of the representative firm in the different deciles of each cell made the creation more or less posible depending of the parameter we have, in the case of the full panel, we see the amount of firms created have a negative relationship with the size (ϕ) of the firms, this indicate that, conditional on the joint distribution, of the tri-cube generated, on average, creation of firms is more likely among smaller, less productive firms that could obtain external financial for their entrepreneurial project. We realize that this is not completely surprising, but it is important to remember, that most of the empirical literature treats size as a good proxy for restricted access to capital markets or even the quality of firm projects. This regression shows us that, at the very least, size and financial access are operating through different channels, and, hence, have their own significative effects. Moreover, even in our regression, and following the sense of our discussion in subsection 3.1 the direct interpretation of $1-k$ is not clear. We could argue that is a measure of financial dependency and hence fragility or a measure of financial access. In this case, in our view, the variable is indicating financial access, that as we could see it has a positive impact

in the creation. Also, the results are extremely robust across different time spans, parameters continue to be very significant but in the case of financial dependency we have a loss of significance, but the sign does not change, then it means there is still existing some kind of low correlation between the financial dependency of the firms and the creation of them.

Figure 7: Parameter of $1-k$ on creation

A crucial difference between the results in Table 3.2 and Table 3.1, in the case of creation, it seems, $1-k$ indicates financial access and not financial dependency, like it did for smaller firms in Figure 5. So, in this case, the most reasonable interpretation is that the parameter indicates that controlling for everything else, it is most likely that new firms rely on internal finance. This exactly the opposing characteristics for the destruction, where we have a positive relation with the smaller firms on the financial dependency, this due to the level of leverage the fell.

In any case, motivated by the evidence of economically significant heterogeneity that we found in section 3.1 we do same in this section. The result can be seen in Figure 7. As we can see the parameter is positive and then negative but then is close to zero, (without statistical significance). And in again we do the same among sectors. First we have sectors that behave as the full panel, and again we do not have any clear significative rolling. Then, as we can see, we do not found the same heterogeneity for creation.



(a) Agriculture (b) Forestry

(c) Fishing (d) Mining

(e) Manufacturing (f) Construction

(g) Commerce (h) Services

Figure 8: Rolling Decile (by centiles) of size from smaller to larger, capturing parameter of $1-k$ on creation by sector

3.3 Survival

At this time we have been addressed the determinants of destruction and creation, but now, we want to explore those entrepreneurs that were able to implement their project in a crisis context, and how are related the characteristics that we have used with the succeed of the firm. So we want to relate time as a dependent variable with the initial conditions of the young firms, when the credit was restricted and the economy depress. The strategy for this section will be a duration model, due to the bias and inconsistency of OLS, Probit and Logit in the use of time as dependent variable, more over when we know that exist a censorship present in our database.

Now, to relate the characteristics of the firms to our survival probability we use a semi-parametric specification, we prefer the well known proportional-hazards proposed by Cox (1972). The effect of time it is being capture by a common component for every firm, that he called baseline hazard, and note it as $h_0(t)$. Then, a firm i faces the same risk for everyone but modify by the characteristics X_i.

$$h_i(t) = h_0(t) \exp(\alpha_1 \pi_i + \alpha_2(1 - k_i) + \alpha_3 \phi_i + \alpha_4 \omega + \beta_1 DSc)$$

The models is semi-parametric because while the baseline hazard could take any functional form, the explanatory variables enters linearly in the model. Moreover the model is proportional in the sense that the risk that faces every firm is multiply proportionally for the baseline hazard factor.[13].

However, although $h_0(t)$ is not estimated, the parameters are, because we implement a partial likelihood, besides that estimation is less efficient than a parametric model that use full information, avoid the possibility to use an incorrect specification, which lead us to estimate less reliably and inestable parameters Heckman and Singer (1984), so do not specificate a functional form for $h_0(t)$ is one of the virtues of the method propose by Cox. It is important to note that we have a truncation from the left, and censorship from the right, to dealt with the left case we use only firms that enter at 2000, and with the right we just incorporate this censorship at the moment of estimate our specification. Before running our regression we pretend to show some flows for the firms.

Table 3: Firm Survive by Age

Age	Begin	Deaths	Survival Rate (%)
1	73638	12752	82.68
2	60886	8640	70.95
3	52246	8341	59.62
4	43905	8294	48.36
5+	35611	35611	-

Note: Firm flows of surviving by 2000 entry.

We can see in the table 3 that there is a clearly relation with the age of the firm, and the likelihood of die, in the first years of life, 12752 disappear, and this maintain in the time at 8000

[13] $\exp(\beta' X)$ is arbitrary to avoid negative number for the probability.

firms destroyed per year. This probably happens because some of the important conclusions that we get in destruction section, but again is important to understand which kind of firms they are, so we disaggregate the same life table by economic sector.

In the case of table 4, we have that non-tradeable sectors are the least "successful", it means that much of young firms do not survive, what is in the line of the destruction section, where we found that small firms in non-tradeable sectors are the most fragile. However, you should keep in mind that in turn is where most firms were created in 2000, being basically commerce and services which carry most, with 7000 firms that disappear at the age of 1 year, for instance, commerce represent about 50% of all firms that survive the first year.

Now we have made some interpretations from the firm flows by sectors, we are able to run our specification, in this case we decide to incorporate an assets variable (ω), that we will use as a proxy of investment, basically we believe, that the capital that the firm has, is more important than the capital from outside, when this has entered to the economy. This was because we assume that the firm already exceeds the existing restrictions on market entry, i.e the creation is done, being more relevant in this case the level of investment to succeed.

Table 4: Life Table by Economic Sector

	Tradeable			Non Tradeable		
Age	Begin	Deaths	Survival Rate (%)	Begin	Deaths	Survival Rate (%)
	Agriculture			*Manufacturing*		
1	1812	251	86,1	5187	867	83,2
2	1561	148	77,9	4320	584	72,0
3	1413	171	68,5	3736	603	60,4
4	1242	206	57,1	3133	596	48,9
5+	1036	1036	-	2537	2537	-
	Forestry			*Utilities*		
1	421	69	83,6	139	14	89,9
2	352	47	72,4	125	12	81,2
3	305	42	62,4	113	10	74,1
4	263	48	51,0	103	22	58,2
5+	215	215	-	81	81	-
	Fishing			*Construction*		
1	252	24	90,4	5556	1009	81,8
2	228	27	79,7	4547	641	70,3
3	201	22	71,0	3906	663	58,3
4	179	27	60,3	3243	694	45,8
5+	152	152	-	2549	2549	-
	Mining			*Commerce*		
1	146	26	82,1	37600	7111	81,0
2	120	18	69,8	30489	4898	68,0
3	102	20	56,1	25591	4615	55,7
4	82	14	46,58	20976	4242	44,5
5+	68	68	-	16734	16734	-
				Services		
				22531	3380	85,0
				19151	2267	74,9
				16884	2195	65,1
				14689	2445	54,3
				12244	12244	-

Table 5: Cox - Proportional Hazard Regressions

Independent Variables	(1) All Sectors	(2) Agriculture	(3) Forestry	(4) Fishing	(5) Mining	(6) Manufacturing	(7) Utilities	(8) Construction	(9) Commerce	(10) Services
π	0.805***	0.760**	0.845	0.965	1.064	0.737***	1.019	0.933	0.789***	0.878***
	(0.0151)	(0.0934)	(0.144)	(0.327)	(0.353)	(0.0567)	(0.388)	(0.0510)	(0.0208)	(0.0329)
$1-k$	0.980*	0.937	0.911	0.942	1.184	0.948	1.070	0.937***	1.043**	0.969
	(0.0108)	(0.0608)	(0.0671)	(0.185)	(0.206)	(0.0414)	(0.201)	(0.0235)	(0.0182)	(0.0197)
ϕ	0.960***	0.993	1.027	1.029	1.003	0.986	0.872***	0.979*	0.938***	0.968***
	(0.00286)	(0.0172)	(0.0385)	(0.0621)	(0.0482)	(0.0115)	(0.0368)	(0.0110)	(0.00395)	(0.00539)
ω	0.875***	0.845***	0.764***	0.865**	0.901*	0.865***	0.981	0.869***	0.910***	0.846***
	(0.00319)	(0.0186)	(0.0354)	(0.0629)	(0.0535)	(0.0129)	(0.0361)	(0.0116)	(0.00496)	(0.00525)
Observations	65,821	1,518	367	205	106	4,662	121	4,885	35,204	18,753
Pseudo R-squared	0.00517	0.00906	0.0181	0.00585	0.0108	0.00558	0.0182	0.00415	0.00422	0.00803
Pseudo Log-Like	-364330	-4524	-962.8	-424.9	-253.3	-19088	-236.0	-21562	-196090	-81062

Note 1: Parameters are the Hazard Ratios, means that one firm has more or less chances to die than another firm, centered at one for the hazard rate.
Note 1a: e.g, 0,8, means that if the dependent variable raises, one firm has 20% less chances to die than another firm.
Note 2: Robust standard errors in parentheses
Note 3: *** p<0.01, ** p<0.05, * p<0.1
Note 4: All Sector regression includes sectorial dummy for controls.

As we expected, there exists an strong negative relation with our productivity measure π, this variable captures the importance of the productivity in the first year of existence and the probability of the survival in the next five years, in concrete, we have that for all the firms and sectors that enter in the 2000 year, there is a 20% less chances of die, if their productivity is higher. For the rest of our variables, in the case of $1-k$ is not very significative, we believe that this happens as we said before, because the binding before the entry has been passed away, and now this variable does not have any clear channel to act with the chances of surviving of the firm. In the case of our sales variables it has a negative relation too, about 10% less chances of die if his sales were larger in his first year. Finally the investment variable is very related with the chances to survive, so we believe that here is the channel where the financial variable is acting, this represente about 12% less chances of die and statistically significative. This means that firms that are capable to overcome the barriers at entry are those who have made strong investment.

However, we believe again that exists a hidden heterogeneity among sectors, we have made the same regression for each sector and if we look more closer. First, for the productivity variable we have 4 sectors that does not have any relation between the productivity and their chances to survive in the time and it is important only for two sectors that are non-tradeable. We believe that this happen because those sectors, in particular fishing, forestry and mining, are again tradable, and acts like rentier sectors, this means that for them is not crucial their productivity (utilities over assets), because their business are in the long run, so in the short term we can not conclude anything with this variables against their chances to survive. Second, our financial measure (1-k), in most of the sectors is not significative, so our explanation it has the same intuition as before, in fact, our investment variable is significative, and it has a negative relationship in every sector. Finally, as we can see, our size variable does not have to much relation among sectors, except for the non-tradeable, so in those cases we believe that depends more of the size of the project since we were using sales as a proxy for it, so their project it needs more impact in the short term than in the long run, as we watch, sectors as commerce and services are more closer to the retail, then, if they do not sell they will not survive, that in these sectors is very related with our productivity measure, being about 6% less chances of dying if his sales are larger, and 12%-15% less if his productivity is higher.

4 Conclusions

Using FUNDES-SII panel database to characterize firm destruction, creation and survival in Chile. We have shown that, as expected, larger and more productive firms are less likely to be destroyed; and (also as expected) they are less likely to be created than smaller and less productive firms. However, when we analyze young firms, the most succeeded are those who made an important investment in his first year of life, and the productivity will be relevant depending of the sector. We have shown that "financial dependence" has different meaning for smaller firms, as reflected in a significant difference in sign of the corresponding parameter. For them it is an indicator of "financial fragility" or "financial constraint" and acts in our regressions as a predictor of firm destruction, also a stronger predictor of creation for smaller firms, acting

like "financial access" but does not affect the chances of survive, perhaps due to the relevance of the investment variable. All of this evidence seems to lend support to the general notion (and practice) in the literature that size can be used as a proxy of financial constraints, but only, it seems, for the smallest of firms. We show that these differences in sensitivity effects are amplified for smaller scale projects and that it does seem reasonable to use size as a proxy for fragility in a model such as the one presented in this article.

We also illustrate that the high degree of heterogeneity that lies behind our general regression results for the whole of the Chilean economy, is basically due to the different reactions among economic sector in a post-crisis context. First, we found that the crises acts through the non-tradable sectors, behaving exactly like the hole economy, this means that exists some "financial fragility" among the small firms of these sectors. Second, creation does not have any clear result for this heterogeneity, perhaps due to the empirical strategy that impose an arbitrary structure. Third successful entrepreneurs, are those who invest an important sum in his first year of life, and as we could expect are the more productive firms, and our financial dependence variable does not act here through any clear channel, we strong believe that this tightness was relaxed once the firm passed the credit market restrictions.

In summary we believe that the poorer but productive entrepreneur will be more benefited by institutional improvements to contracting, financial opening, financial development and the provision of technical support by the government. This can help explain why in emerging markets, such as Chile, small firms and financially dependent firms tend to be more volatile and generally sensitive to shocks.

A Appendix

Database

The database has the firms grouped by sector, as declared by the owner. Three things must be pointed out. The first is that it is conceivable that a firm has activities in several sectors of the economy. We reasonably asume, although it is not formally established anywhere, that the entrepreneur will report the "predominant" sector localization of the firm. Second, some firms change their sector from year to year (very few). We assume that this is just another expression of the previous problem. Firms do several things, and, as the evolve and learn, they may change the "predominant" activity that they do. Third, the original database reports 14 mayor sectors and disaggregated commerce into 13 varieties of wholesale and 48 varieties of retail. In order to control by the sector shock we aggregate into 9 sectors in the following way:

Table 6: Aggregation of Sectors for Control and Stylized Descriptors

From	To	Firms	Sales	Value Added
		average proportion		
Agriculture Production Agriculture Services	Agriculture	9.8%	3.6%	3.2%
Forestry	Forestry	0.6%	0.9%	1.1%
Fishing	Fishing	0.4%	0.8%	1.5%
Mining, Oiling and Stonemasonry	Mining	0.2%	5.2%	8.1%
Foods, drinks and tobacco Textiles and Leather Woodworks and Paper Chemicals, Oil Derivatives, Rubber Metal Manufactures Machinery and Instruments Other Manufactures	Manufacturing	6.7%	16.0%	18.7%
Electricity, Gas and Water	Utilities	0.1%	0.2%	3.1%
Construction	Construction	5.0%	5.8%	8.6%
13 varieties of wholesale 48 varieties of retail	Commerce	37.9%	28.4%	10.6%
Restaurants and Hotels Transportation Financial Services Technical and Professional Services State and Social Services Leisure and Free Time Personal and Homestead Services Other Services	Services	38.8%	36.2%	45.2%

The aggregation of sectors we have chosen reflects those made in the official Chilean National Accounts (CNA) with two mayor exceptions. First, in the CNA Agriculture and Forestry are aggregated, so, for the sake of this table, we have separated them according to their participation in sales in our database. Second, in the CNA commerce is usually aggregated with restaurants and hotels. We have separated them, again for the sake of this table, using as weights sales from our database, and reaggregation them by adding restaurants and hotels to services and leaving commerce alone.

Table 6 shows the differences that arise from counting firms or quantifying sales, as well as the differences when counting value added. Agriculture and Commerce seems to be a sector of more firms than sales or value. Mining, Manufacturing, Utilities, Construction and Services are clearly the other way around: few firms, lot's of sales and a large value (particularly in mining).

The FUNDES-SII database provides us with seven categories that we aggregate into four

familiar categories: micro, small, medium and large. The "official" definition of sizes in Chile (relevant for policy indicators mostly) is the following: micro firms have annual sales up to 2,400 Unidades de Fomento (UF, the Chilean official inflation index) which is just bellow US$ 80,000; small firms are those in the 2,400-25,000 UF range which is up to just over US$ 800,000; medium firms are those with annual sales in the 25,000-100,000 UF range which is just over US$ 3 million; and over this benchmark a firm is considered large. According to this database, the Chilean economy has around 550,000 micro firms, 100,000 small firms, 15,000 medium firms and 7,000 large firms.

Results

Destruction

$$P(Destruction)_{t,i} = F\left(\alpha_0 + \alpha_1 \pi_{t-1,i} + \alpha_2(1 - k_{t-1,i}) + \alpha_3 \phi_{t-1,i} + \alpha_4 Imacecs_{t-1,i} + \beta_{\mathbb{1}} DSc_{t,i}\right) \tag{6}$$

Table 7: Panel Probit Regression

VARIABLES	(1) full panel
π_{t-1}	-0,035***
	(0.000)
$1 - k_{t-1}$	-0.0015***
	(0.000)
ϕ_{t-1}	-0.0082***
	(0.000)
$Imacecs_{t-1}$	0,14***
	(0.000)
Forestry	0,026***
	(0.000)
Fishing	0.009**
	(0.004)
Mining	-0.003
	(0.004)
Manufacturing	0,039***
	(0.000)
Utilities	0.002
	(0.005)
Construction	0,058***
	(0.000)
Commerce	0,043***
	(0.000)
Service	0.005***
	(0.000)
Observations	1,609,695
Number of groups	559,733
LogLike	-525278

Note 1: Marginal effects on the probability of destruction, standard errors in parenthesis.
Note 2: * is 90% significance, ** is 95% significance,*** is 99% significance.
Note 5: Dummy for Agriculture has been dropped.

Creation

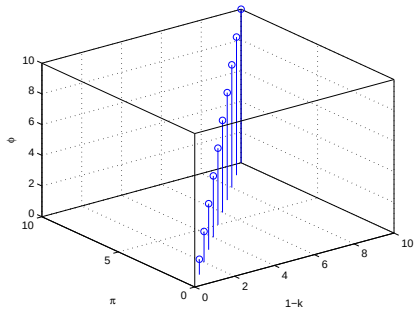


Figure 9: Tri-Cube Creation

Survival

Table 8: Life Table by Firm Size

Interval	Beginning	Deaths	Lost	Survival	Std.Error	[95% Conf. Int.]
Micro						
1-2	66958	12159	0	0.8184	0.0015	0.8154 0.8213
2-3	54799	8183	0	0.6962	0.0018	0.6927 0.6997
3-4	46616	7793	0	0.5798	0.0019	0.5760 0.5835
4-5	38823	7627	0	0.4659	0.0019	0.4621 0.4697
5	31196	31196	0	0.0000	.	. .
Small						
1-2	4873	444	0	0.9090	0.0041	0.9006 0.9167
2-3	4425	356	0	0.8361	0.0053	0.8254 0.8462
3-4	4070	421	0	0.7498	0.0062	0.7374 0.7617
4-5	3650	524	0	0.6417	0.0069	0.6281 0.6550
5	3124	3128	0	0.0000	.	. .
Medium						
1-2	1664	141	0	0.9152	0.0068	0.9007 0.9276
2-3	1523	96	0	0.8574	0.0086	0.8397 0.8733
3-4	1427	120	0	0.7852	0.0101	0.7647 0.8042
4-5	1307	140	0	0.7010	0.0112	0.6783 0.7223
5	1167	1167	0	0.0000	.	. .
Large						
1-2	149	7	0	0.9568	0.0172	0.9064 0.9804
2-3	142	7	0	0.9065	0.0247	0.8444 0.9446
3-4	135	7	0	0.8561	0.0298	0.7859 0.9047
4-5	128	3	0	0.8345	0.0315	0.7616 0.8868
5	125	125	0	0.0000	.	. .

Note 1: Consider only firms entry at 2000

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