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CREATION AND DESTRUCTION: EVIDENCE FROM AN EMERGING MARKET

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Creation and Destruction: Evidence from an Emerging Market

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Resumen

Usamos una base de datos de panel construida a partir de datos del Servicio de Impuestos Internos de Chile para estudiar la creación y destrucción de firmas. Como sería de esperar, firmas mayores y de mayor productividad tienen una menor probabilidad de ser destruidas; y tienen menos probabilidad de ser creadas que firmas de menor tamaño y menor productividad. Es más probable que estas firmas reflejen los shocks de la economía en la ejecución de proyectos dentro de la firma. En el caso de las firmas más pequeñas y de menor productividad, los shocks y cambios ambientales se reflejan más en la probabilidad de sobrevivencia, destrucción o creación. Hemos mostrado que "dependencia financiera" tiene un significado diferente para firmas más pequeñas, tal como se refleja en un signo diferente del parámetro respectivo. Para ellas es un predictor de destrucción de firma, de mal desempeño de ventas y también como un mayor predictor de creación de firmas que el caso de firmas de mayor tamaño.

Palabras Clave: Firmas, productividad, sobrevivencia.

Abstract

We use a panel database constructed from Chilean IRS data to study firm creation and destruction. 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. They are more likely to reflect the shocks of the economy on sales performance, or in the execution of individual entrepreneurial projects within the firm. For smaller and less productive firms shocks and changes are reflected in survival, destruction or creation. 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, of bad sales performance and a also as a stronger predictor of firm creation than for larger firms.

Keywords: Firms, productivity, survival.

Creation and Destruction: Evidence from an Emerging Market*

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We use a panel database constructed from Chilean IRS data to study firm creation and destruction. 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. They are more likely to reflect the shocks of the economy on sales performance, or in the execution of individual entrepreneurial projects within the firm. For smaller and less productive firms shocks and changes are reflected in survival, destruction or creation. 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, of bad sales performance and a also as a stronger predictor of firm creation than for larger firms.

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1 Introduction

(Gertler & Gilchrist 1994) show us evidence that investment among smaller firms is much more sensitive to monetary policy than among larger firms.[1] Moreover, (Oliner & Rudebusch 1996*a*) and (Oliner & Rudebusch 1996*b*) 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 example, (Forbes 2003) 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.[2] (Harris & Siregar 1994), find evidence that Indonesian financial liberalization increased borrowing costs more for smaller firms. (Gelos & 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 & 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 & Stein 1994) show that it is 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.

Moreover, it is possible that different characteristics of the firms can compound to make things even more difficult. For example (Carpenter & Petersen 2002) show that the classical cash flow effect on investment seems to be a particularly important restriction for the growth of smaller firms.[3] In their case, they implicitly interpret "small" to be a proxy for "new" in the (Jovanovic 1982) sense and/or "owned by financially constrained entrepreneurs" in the (Gertler & Gilchrist 1994) sense.[4] It is

[1]For example, they show that in a monetary contraction, large firms tend to borrow and invest in inventories in preparation for the recovery of demand. Small firms, on the other hand, tend to rapidly lower their inventories during the contraction.

[2](Gallego & Hernandez 2003) use a database of publicly traded firms to show that relatively smaller firms increased their reliance on short term debt as a result of the reserve requirement.

[3]There is a somewhat paradoxical result available in (Devereux & Schiantarelli 1989), consisting on the find that cash flows are more important for large rather than small firms among publicly traded UK companies. This result has not been replicated elsewhere to our knowledge.

[4]Small firms are firms that are starting to discover their growth opportunities, cash flow would be, it seems, a particularly important restriction on them. Hence, cash flows would be a good predictor

most likely that different financial characteristics of the firms become more or less important depending on the financial environment that surrounds them. Consider, for example, an Allen and Gale economy[5] where there is a pool of financial liquidity that can quickly become rationed after an aggregate shock. In such an economy it is likely that firms with less liquid assets or thinner cash flows such as those referred to by (Oliner & Rudebusch 1996*a*) and (Carpenter & Petersen 2002) will be relatively more affected by aggregate shocks. Consider, on the other hand, a Caballero and Krishnamurthy emerging economy[6] where there is a pool of internationally pledgable collateral that becomes rationed when the country is hit by an international shock. In such an economy one would expect firms with different access to international finance, to react differently to the same shock [7]. Hence, it is very likely that the type of heterogeneity that will be relevant in predicting the reaction of different firms will change from country to country and sector to sector.

The empirical literature that documents heterogenous effects is usually based on databases of relatively large and well established firms.[8] This is true of all the papers referred to in this section up to this point and is a natural bias due to the difficulty of surveying financial data among 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, as far as statements on the distributive effects of shocks across different types of entrepreneurs goes, they probably underestimate the adverse effects. Hence, for our purposes, the evidence from these papers is motivating but not decisive, since most of the databases used in these studies are biased towards relatively large firms.

of their growth opportunities or productivity potential.

[5]See (Allen & Gale 2004*b*) for a surveylike view of their work on the effect of liquidity scarcity on asset prices (what they call Cash-in-the-Market Pricing) that can be found in a family of papers that they have produced.

[6]See (Caballero & Krishnamurthy 2001) and the family of papers that follows.

[7](Bleakley & Cowan 1995) find evidence of different effects of devaluations on large Latin American firms conditional to the exchange rate composition of their debt and the elasticity of their income to the exchange rate. (Benavente & Morand 2003) find that no such effects for Chilean firms after the 1998 Asian Crisis. The jury is basically out in this type of literature.

[8](Gertler & Gilchrist 1994) use the Quarterly Financial Report for Manufacturing Corporations, so they inherit all the biases that this particular sector can bring. This can be particularly relevant when extrapolating conclusions towards small agricultural commercial or service enterprises. Also due to the nature of their database the "cutoff" for separating small from large firms is somewhere in the US$ 100 to 250 million range for annual sales. This is clearly not what pepople have in mind when they talk of small businesses that create development and social mobility opportunities for poor households. (Forbes 2003) 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 acess to be admited into the Santiago Stock Exchange. (Hu 1999) uses the Manufacturing Sector Master File which is composed of large, durable manufacturing companies. (Kashyap & Stein 1994) use a subset of this database, the Compustat companies of the Compustat dataset.

We are interested in the fate of high quality entrepreneurs with low financial resources in emerging markets, and we are interested in the effect that this has on workers. Moreover, we are not only interested in the fate of existing small entrepreneurs that either default or survive shocks and regulatory changes. We are also interested in the effect of these shocks on potential entrepreneurs and their decisions to enter or not into the economy. This presents a difficult censorship problem that we have only seen dealt with by (Paulson & Townsend 2004) and (Paulson & Townsend 2005).

We will show evidence of this heterogeneity from the Chilean economy, from the viewpoint of entrepreneurs (counting firms) and attempt to characterize further the characteristics of firms that predict these different events.

2 The Firm Flow Facts

2.1 The Data Set

The FUNDES-SII data set compiles information for all the 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 and profits. 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, making it by far the most representative database for the Chilean economy. We use this database to construct propensities for creation and destruction among different types of firms, as well as improvement or worsening of sales performance among surviving firms. All firm flows presented in this section are normalized with respect to the average performance of the sector they belong to.[9] In the next sections of this section we run regressions where we properly identify sector effects.

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, we do not know that firms that fall out or step into the panel are actually being created or destroyed. We only know that they are not declaring taxes, hence, they could be stepping in and out of informality. Hence, its very likely that we are forced to ignore a large section of micro and informal firms that could end up accounting for a large proportion of entrepreneurial fragility in Chile.

[9]Specifically, we calculate a flows and performances by characteristic, sector and year. Then we aggregate deviations from sector averages and finally weigh them according to the importance o 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.

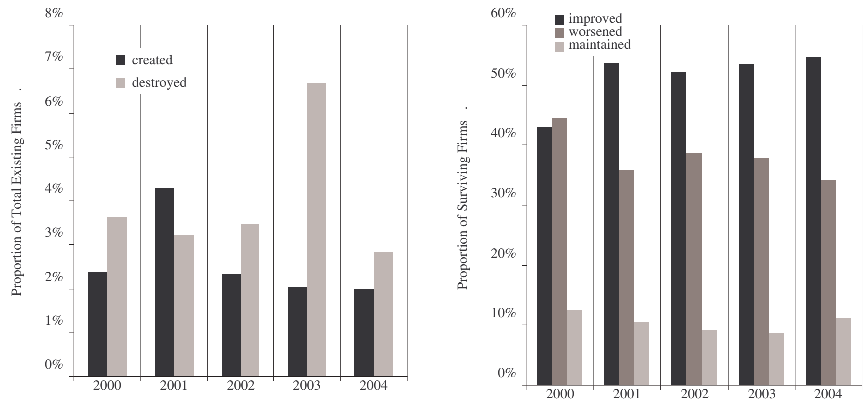

Figure 1: Firm Performance in Chile

2.2 The Stylized Facts

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. The numbers are much smaller than what can be inferred from job churning data. Annual churning of firms seems to be in the 2%-4% range, as we have mentioned above it is entirely possible that the more fragile firms are, in fact, labor intensive and hence the result of high job churning due to bankruptcy that we found in the previous section. A second 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 is somewhat suspicious in the sense that it could indicate 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 calculate firm performance by size, only this time size is defined according to sales levels. The FUNDES-SII database provides us with seven categories that we aggregate into four familiar categories: micro, small, medium and large.[10] Figure 2 shows firms

[10]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

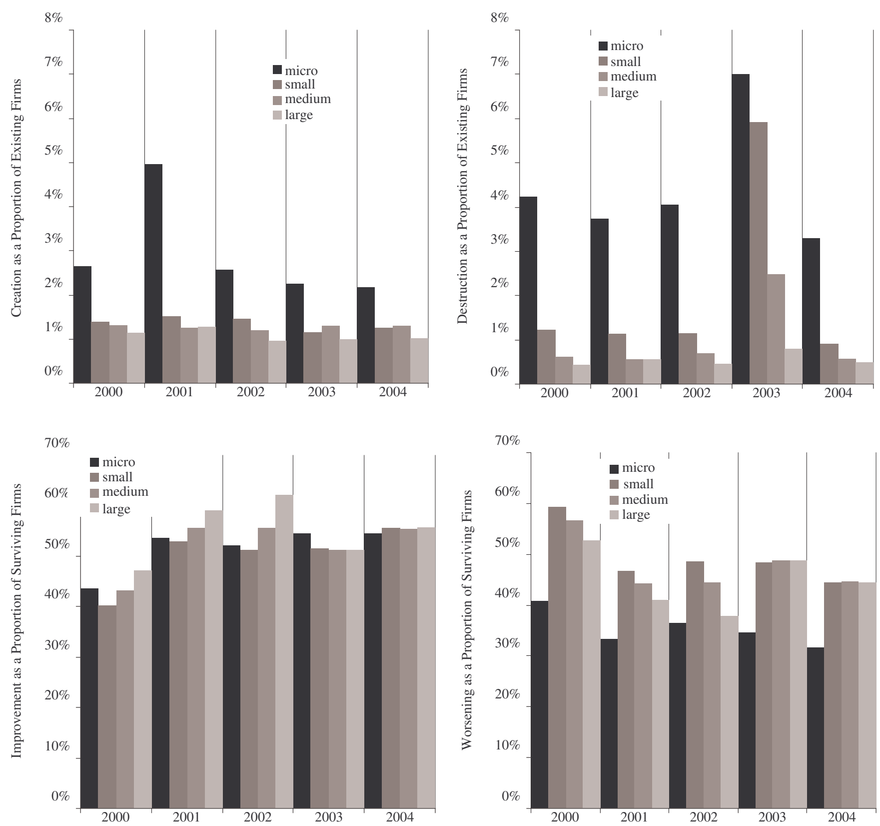

Figure 2: Firm Performance and Size

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.

For Figure 3 we have divided the databases according to "financial dependency" defined as total debt over total assets. That is, the extent to which the entrepreneur is actually working with someone else's capital to financie his enterprise or $1 - k$ in the notation of section **??**. However, it is important to consider that, in the model below k includes 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 of this section 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. [11]

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.

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. Accordin to this database, the Chilean economy has arround 550,000 micro firms, 100,000 small firms, 15,000 medium firms and 7,000 large firms.

[11] 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.

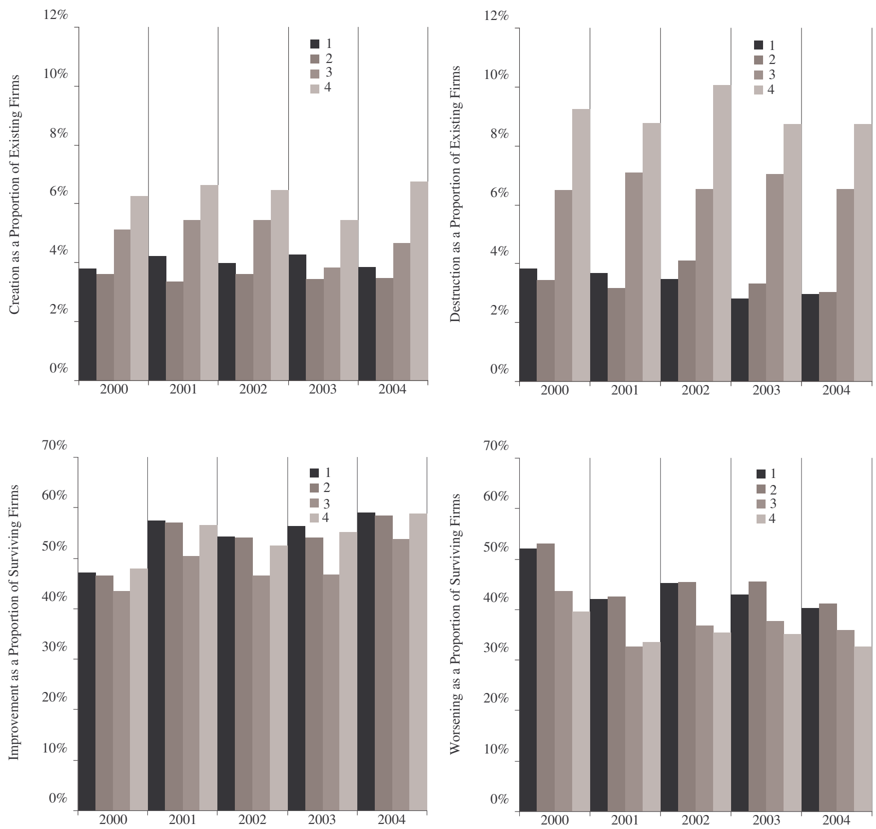

Figure 3: Firm Performance and Financial Dependency

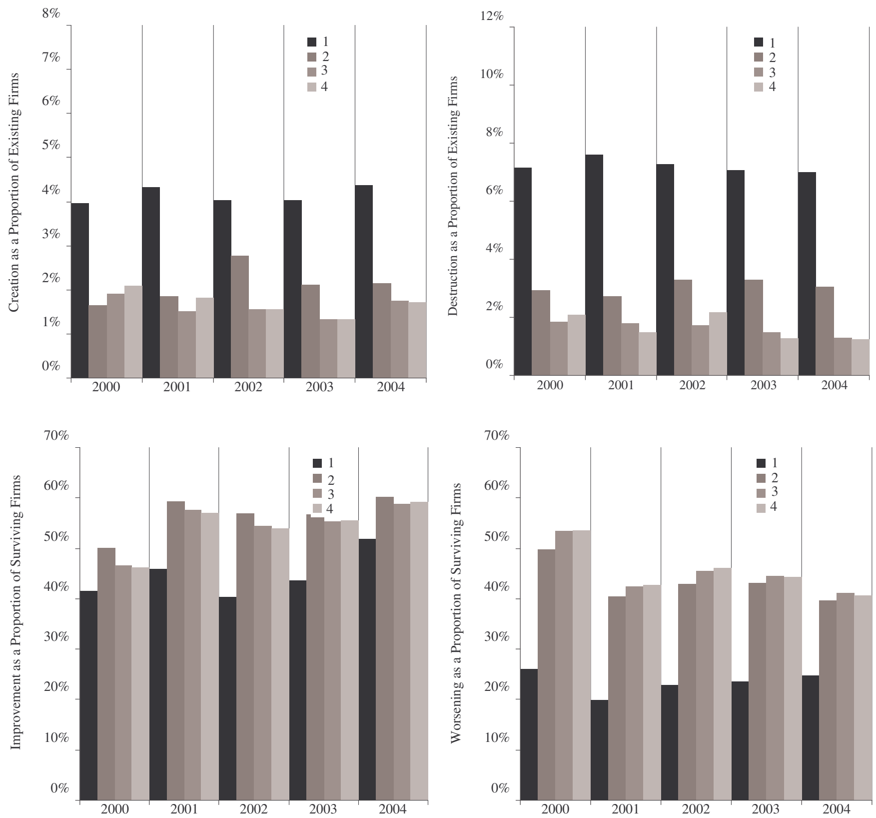

Figure 4: Firm Performance and Cash Flows

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.[12] Figure 4 displays the 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.

3 Heterogeneity and Small Firms

In this section we will attempt to estimate the determinants of destruction, creation and performance of entrepreneurial projects using the FUNDES-SII database for Chile. The model we are estimating is a reduced form of the model presented in the first section of this paper, but there are some additional assumptions that we must make in order to take the model literally and proceed towards estimations.

The main result of the model of section **??** is summarized in Figure 5 where we represent a country or sector constituted by firms that have three types of heterogeneity: financial dependency $0 \leq k \leq 1$ (the proportion of their capital that is financed externally), productivity $0 \leq \pi \leq 1$ (the capability they have of extracting value added from the economy), and scale or size $0 \leq \phi \leq 1$. The economy has a continuum of entrepreneurial projects that are distributed on this space in some way (in the model of Chapter 1 we have assumed a homogeneous distribution), and occupies the area comprised by space $B = [0, 1] \times [0, 1] \times [0, 1]$. A hidden information problem makes it possible only for a subset of firms to sign contracts were they credibly promise to exert unobservable effort. Generally, this partitions B into an area of entrepreneurial projects that are financed and another that is not.[13]

Panel (b) of Figure 5 shows the margin of such an economy constituted by the upper envelope of two types of constraints: a participation constraint that will be active for relatively less productive firms that use mainly internal finance, and an

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

[13] In the complete model there is also the possibility that some firms are profitable even if they do not promise high effort. In this case these firms are financed but are charged higher interest rates. In the database we use in this section there is no information on the interest rates being payed by the firms so we will simply ignore this possibility and stick to the dual margin model with only one Tier of firms being financed.

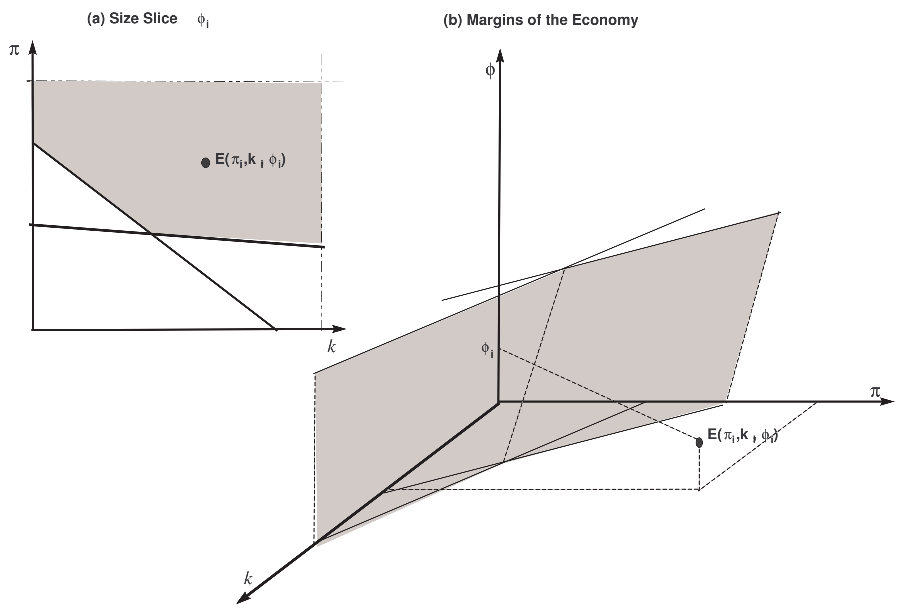

Figure 5: Partition of Space B

incentive compatibility constraint that will be active for relatively more productive firms that use external finance intensely. All firms above the envelope will be financed, all firms bellow the envelope will not. In panel (a) of figure 5 we show a slice of space B at a certain size. In section **??** of this dissertation we prove that, as size increases, the constraints are relaxed, particularly the incentive constrained margin, hence the slant in the margin as size ϕ increases.

In this section we will assume that it is feasible to represent the whole of the model of section **??** in an instrumental function $E(\pi, k, \phi)$ that we will call *eligibility*. We will assume that $E(1,1,1) = +\infty$, $E(0,0,0) = -\infty$ and $E(\pi^*, k^*, \phi^*) = 0$ such that firm $\{\pi^*, k^*, \phi^*\}$ is a firm on the margin. Function $E(.)$ will be some measure of distance from the margin that we do not know, although we know the arguments of the function, and the model where it comes from. Critically for our estimation we cannot observe $E(.)$ only it's arguments and wether it is greater or smaller than zero at any moment in time. In Figure 5 we illustrate a position for a sample firm. Function $E(.)$ will be some measure of distance from the margins that properly represents the model of section **??**.

The second relevant result that we must rescue from section **??** is the fact that the incentive constrained margin will be more sensitive to a variety of shocks. Figure 6 illustrates a generic adverse shock to this economy. The effect is to make non viable a set of firms that is close to the margins. However, the model shows that this shock will have larger effects on smaller firms (lower ϕ), less productive firms

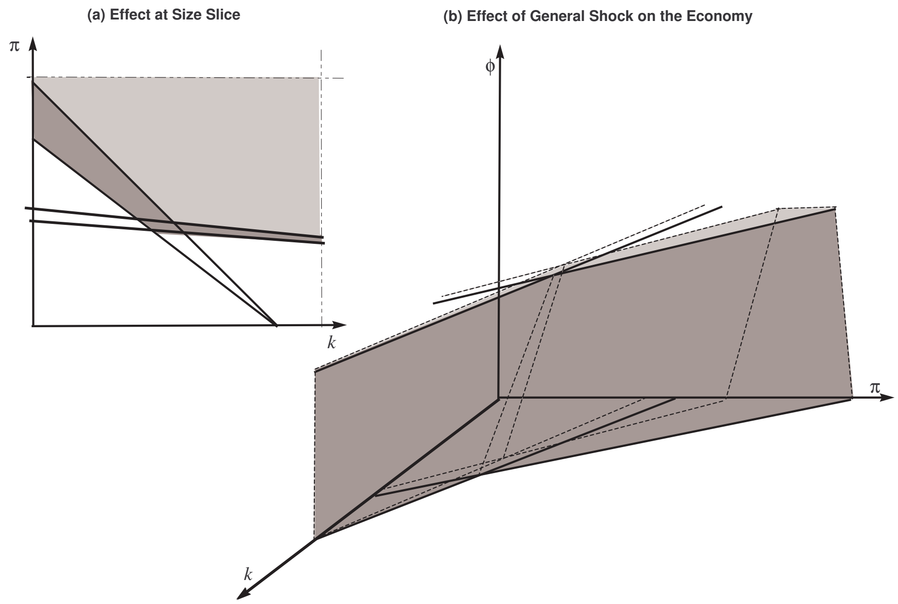

Figure 6: Effect of a Generalized Shock on the Partition of Space B

(lower π) and more financially dependent firms (larger k), although most of the destruction will be concentrated among relatively productive firms owned by financially dependent entrepreneurs. In the following sections of this section we will attempt to estimate which characteristics of these firms increase the sensitivity of eligibility $E(.)$ to external conditions.

One of the many insufficiencies of the model in section **??** is that it is a static model. Entrepreneurs have a single project that is either financed or not. The concept of fragility that we use in that section is particular to the characteristics of the model. We say that entrepreneurs are fragile if it is very likely that a shock can devoid them from external finance that they would have otherwise secured. To be more realistic, firms in this model should really be a succession of static entrepreneurial projects. A shock may interrupt the operation of a fragile firm for a period driving it back in it's process of accumulation of capital or driving it into bankruptcy. In this sense, the model is really one of creation and destruction of static projects, rather than firms.

It turns out that this fits rather well with the nature of the database we are using since it is 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 nico 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 of project creation and destruction as an empirical approximation to entrepreneurial creation and destruction in Chile.

3.0.1 Destruction

Call $x_{i,t} = \{\pi_i, k_i, \phi_i\}$ the vector that characterizes the firms in this model. 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:

$$\begin{aligned} x_{i,t} &= \gamma x_{i,t-1} + e_{i,t-1} \\ e_{i,t-1} &= \epsilon_{i,t-1} + \eta_{t-1} + \mu_i \end{aligned} \tag{1}$$

that is shocked through time by an i.i.d. vector of shocks that are particular to the firm (μ_{i-1}), to the economy but particular to a moment in time (η_{t-1}), and particular to the firm at a moment in time ($\epsilon_{i,t-1}$).

We must assume that vector x is measured with error in our database. In particular, we will observe a vector $\tilde{x}$ such that

$$\tilde{x}_{i,t} = x_{i,t} + \nu_i \tag{2}$$

where ν is a a vector of i.i.d. noises. 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

$$P(Destruction) = P\left(E(x_{i,t}) < 0/E(x_{i,t-1}) \geq 0\right) \tag{3}$$

and although we will not be able to observe $x_{i,t}$ directly we know from 1 and 2 that

$$x_{i,t} = \gamma \tilde{x}_{i,t-1} + (\epsilon_{i,t-1} + \eta_{t-1} + \mu_i - \gamma \nu_i) \tag{4}$$

so that, theoretically we can use an estimation $\hat{x}_{i,t} = \gamma \tilde{x}_{i,t-1}$ to estimate the probability of destruction of equation (3) if we knew γ and the form and parameters of the eligibility function $E(.)$. However, we do not know the parameter. We do observe the outcome function $F(.)$ that summarizes $E(.)$ by reporting who is chosen and who is not chosen to execute their project, given by

$$F_{i,t} = \left\{ \begin{array}{ll} 1 & \text{if } E(x_{i,t}) \geq 0 \\ 0 & \text{if } E(x_{i,t}) < 0 \end{array} \right\} \tag{5}$$

which we can see compared to $E(.)$ in Figure 7. In this paper we shall attempt to estimate E(.) by adjusting a function Φ. The usual choice is to use the cumulative

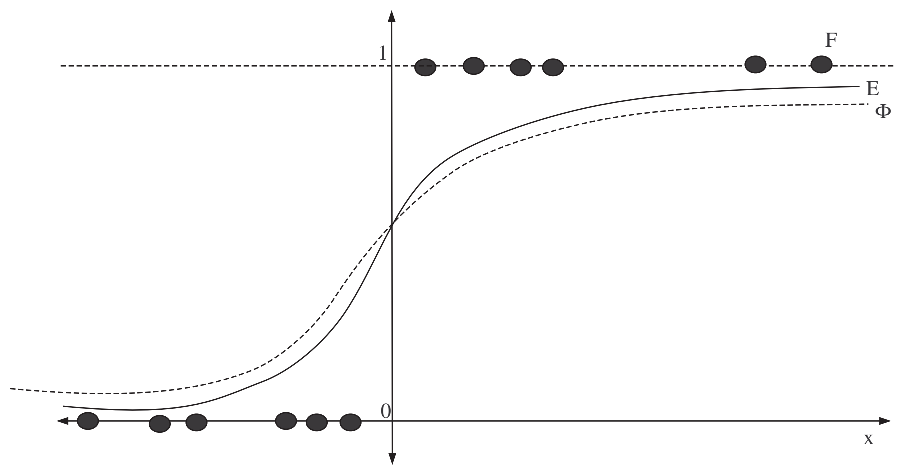

Figure 7: Eligibility Function, Chosen Function and Approximation

distribution function of the standard normal density for Φ which yields the probit model or the lognormal distribution yielding the logit model.

The equation of our preferred probit regression is:

$$P(Destruction)_{t,i} = F\left(\beta_0 T + \alpha_1 \pi_{t,i} + \alpha_2 (1 - k_{t,i}) + \beta_3 DSc_i + \beta_4 DSz_i\right) \qquad (6)$$

Where π, our measure of productivity of the firm, will be the cotangent of the ratio of profits to total assets.[14] Our measure of k will be 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. Finally we include a set of time dummies T, a set of sector dummies DSc and a set of size dummies Dsz.[15] The results are presented in Table 1. The Table presents the marginal effects of π and $1 - k$, and the marginal effects of each of the size dummies Dsz. The table with the complete results (sector dummy marginal effects and year dummy marginal effect for the full panel regression) is available in Appendix A-4.

The table shows the probit regression for the full panel and also for five sets of consecutive years. A few things are worth noticing The first is that the marginal effect of productivity π is always negative (better quality firms have a lower probability of disappearing) and statistically relevant at the highest significance level. Second, the estimated marginal effect of productivity is very robust, with the exception of the

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

[15] Where we have classified sizes in the way that is customary in Chilean public policies and is used in subsection 2.

Table 1: Preferred Probit Regressions: Probability of Destruction

	full panel	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
π	-6.13%	-5.53%	-7.09%	-6.56%	-5.65%	-6.07%
	(0.08%)***	(0.18%)***	(0.20%)***	(0.21%)***	(0.18%)***	(0.18%)***
$1-k$	-0.00%	0.29%	-0.28%	0.10%	0.13%	-0.12%
	(0.06%)	(0.12%)**	(0.13%)**	(0.15%)	(0.13%)	(0.12%)
ϕ	-2.23%	-2.02%	-2.67%	-2.33%	-2.02%	-2.20%
	(0.01%)***	(0.02%)***	(0.02%)***	(0.02%)***	(0.02%)***	(0.02%)***
Obs.	938,561	206,727	174,049	189,510	191,384	176,895
LogPLike	-199066.85	-41440.224	-37193.162	-42660.072	-39368.965	-38050.662
Pseudo R2	0.2095	0.2099	0.2464	0.2026	0.2018	0.1910

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 3: Dummy for micro firms, $Dsz(micro)$ has been dropped.

first couple of years when profitability seems to have taken a back seat. Secondly, the size dummies are always significant at the highest level, and indicate that there is always a smaller chance of survival for firms that are larger than what we classify as micro firms (excluded dummy). And finally, it is interesting to see that the marginal effect of financial dependency $1-k$ is not very significative, if anything it shows a 10% significance level for the 2000-2001 pair. Given this result we should reject that financial dependency or leverage, at least in the way we are measuring it is an important variable in our model and *prima facie* we should cast doubt on the model of section **??**.

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 1 hide a some meaningful heterogeneity. 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 full panel 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 and moving to the largest.

Figure 8 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 financial access. This, in our view, is consistent with the prediction of section **??** 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 A-4.2 in Appendix A-4 sows the robustness of this result by running the same program but separated by years in the same way that we used to checked for robustness in Table 1. Of course, as samples are reduced, the significance of the result is also hurt (so the

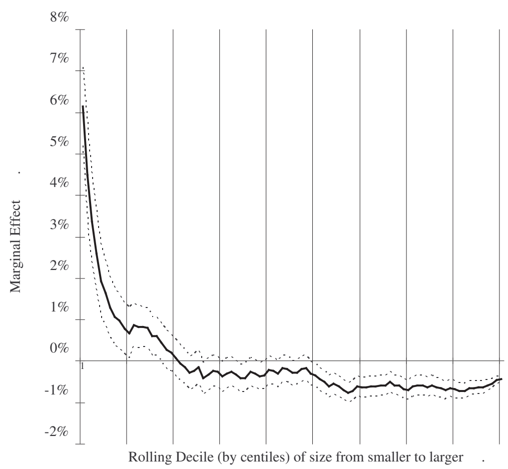

Figure 8: Marginal Effect of $1 - k$ on the probability of default

confidence intervals are thicker) but the form of the curve and the general conclusion is sustained.

3.0.2 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. 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, count the years and sectors that predominate in each cell, estimate the average $\{\pi, k, \phi\}$ that we assume to be the characteristics of the representative firm and execute the following OLS regression:

$$Creation = \alpha_1 \pi_d + \alpha_2 (1 - k_d) + \alpha_3 \phi_d + \beta_1 VSc + \beta_2 VYr \tag{7}$$

Where $Creation$ is the amount of firms created, 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. Since each cell has the same number of firms we interpret the parameter as incidences of different characteristics of the "representative" firm of the partition cell.

Table 2 shows the results for the preferred regression as well as the results for the same regression for each subsample of creation during two consecutive years. The results indicate that, on average, creation of firms is more likely among smaller, less productive firms that tend to borrow a small proportion of their initial capital. 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 3.0.1 the direct interpretation of $1 - k$ is not clear. We could argue that is 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. Finally the extended version of table 2 with the estimated parameters for all the dummies can be found in Table A-4.4 of Appendix A-4. Also, the results are extremely robust across different time spans, parameters continue to be very significant but approach in level towards cero indicating some loss of significance in the subsamples.

A crucial difference between the results in Table 2 and Table 1 is the robust significance of the $1 - k$ parameter across all time span subsamples. In the case of creation, it seems, $1 - k$ indicates financial access and not financial dependency, like it did for smaller firms in Figure 8. So, in this case, the most reasonable interpretation

Table 2: Preferred Regressions: Amount of Creation

	full panel	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
π	-6.14	-1.05	-1.11	-1.10	-1.25	-1.21
	(0.27)***	(0.06)***	(0.07)***	(0.06)***	(0.06)***	(0.06)***
$1-k$	-1.49	-0.41	-0.24	-0.46	-0.43	-0.49
	(0.24)***	(0.05)***	(0.07)***	(0.05)***	(0.05)***	(0.05)***
ϕ	-12.80	-2.24	-2.48	-2.12	-2.33	-1.94
	(0.60)***	(0.15)***	(0.15)***	(0.12)***	(0.13)***	(0.12)***
Obs.	1,000	1,000	1,000	1,000	1,000	1,000
LogLike	-4305.75	-2987.63	-3070.15	-2976.80	-3000.91	-3005.87
R2	0.7739	0.5972	0.6092	0.6657	0.6479	0.6318

Note 1: Effect of increasing a decile on amount of creation, standard error in parenthesis.
Note 2: * is 90% significance, ** is 95% significance,*** is 99% significance.
Note 3: Dummy for micro firms, $Dsz(micro)$ has been dropped.

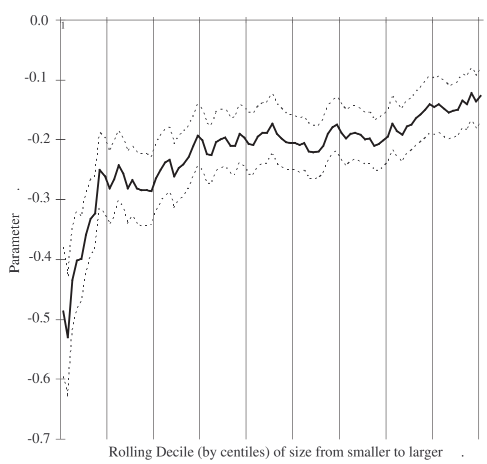

Figure 9: Parameter of $1-k$ on creation

Table 3: Preferred Regressions: Sales Performance

	full panel	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
π	3.38%	3.35%	3.38%	3.08%	3.34%	3.40%
	(0.41%)***	(0.09%)***	(0.10%)***	(0.09%)***	(0.09%)***	(0.08%)***
$1-k$	0.30%	0.26%	0.31%	0.29%	0.33%	0.38%
	(0.22%)***	(0.04%)***	(0.05%)***	(0.05%)***	(0.05%)***	(0.04%)***
ϕ	0.71%	0.76%	0.80%	0.71%	0.48%	0.86%
	(0.00%)***	(0.01%)***	(0.01%)***	(0.01%)***	(0.01%)***	(0.01)***
Obs.	862,798	192,249	159,782	174,075	174,119	162,573
LogLike	969933.25	219258.79	179237.31	196236.78	193210.28	182696.50
R2	0.0589	0.0667	0.0652	0.0585	0.0409	0.0786

Note 1: Effect of variable on sales growth, standard error in parenthesis.
Note 2: * is 90% significance, ** is 95% significance,*** is 99% significance.
Note 3: Dummy for micro firms, $Dsz(micro)$ has been dropped.

is that the parameter indicates that controlling for everything else, it is most likely that new firms rely on internal finance. In any case, motivated by the evidence of economically significant heterogeneity that we found in section 3.0.1 we do a similar exploration into heterogeneity in this section. We rank all firms according to size centile, and we then run preferred regression 6 and store the $1-k$ parameter and significance band for each rolling decile. The result can be seen in Figure 9. As we can see the parameter is negative (with statistical significance) across all size sub samples just as it was for every year. It is interesting to note, though, that the absolute magnitude of the parameter falls with size. For smaller firms, it seems, financial restrictions are much more important determinants of the possibility if implementing a project. Finally, it is interesting to note the geometric symmetry between figures 8 and 9. The marginal effect of financial dependency on default probability is convex in the same way that the parameter on creation propensity is concave. This means that the smallest sizes of firms in our data base that turn out to be those for which a large $1-k$ is not helpful in surviving crisis, are the same for which financial access is especially stringent for creation.

3.0.3 Performance

In the two previous subsections we have addressed the determinants of creation and destruction of firms. In this subsection we will study the determinants of performance measured as growth of the sales/assets ratio. Since the model presented in section **??** of this dissertation is not a model of entrepreneurial performance but rather of entrepreneurial creation and destruction, it is important that we justify the relevance of this subsection for the questions that we are asking in this dissertation.

One way to interpret the model in section **??** is that it is a model of entrepreneurial projects rather than a model of actual firms, with the exception, of course, of smaller single project firms, among which both interpretations are equivalent. Firms, under this interpretation, are intermediaries for entrepreneurs that work as staff inside them or units that have some level of administrative independence. Hence, the entrepreneurial unit inside the firm could face a similar information asymmetry and contracting problem as the entrepreneur of our model. In this case, the performance of firms could serve as an indicator of the success or failure of entrepreneurial projects within existing firms. Hence, wWe will estimate the following OLS regression:

$$Performance_{t,i} = \beta_0 T + \alpha_1 \pi_{t,i} + \alpha_2(1 - k_{t,i}) + \alpha_3 \phi_{t,i} + \beta_1 DSc_i \tag{8}$$

Where $Performance$ is the percentage increase in the sales/assets ratio for firm i in the year t, π is productivity, $1 - k$ is financial dependency and ϕ is size, DSc is the sector dummy vector, and T is the year dummy vector.

The results of the preferred performance regressions can be seen in Table 3. The results are very robust across time and indicate that higher productivity, higher financial dependence, and size are predictors of sales performance. The extended regression with the estimated parameters for all the dummies can be found in Appendix A-4. In this case, it seems that $1 - k$ is indicating financial access, and that firms with more external financing seem more likely to implement successfully their entrepreneurial projects and have good sales performances. Figure 10 shows the same heterogeneity exercise of Figures 8 and 9. Interestingly, for very small firms, the sign of the $1 - k$ parameter is negative and very significative. It is very clear that the signs in Table 3 are a result of the weigh of 8 deciles worth of firms for which $1 - k$ is an indicator of financial access. However, it seems very clear, just like it was for the destruction regressions of subsection 3.0.1 that for smaller firms it is really an indicator of financial dependency and constraints.

3.1 Heterogeneity and Sensitivity to Shocks

One clear cut conclusion that one can extract from section 3 is that there is economically meaningful heterogeneity in the sensitivity of firm performance, survival and creation to different parameters. In particular, it seems that among the smallest firms, $1 - k$ is an indicator of financial constraint rather than financial access. It seems, that among larger firms it is a good thing to be working with "other people's money" while it is a bad thing among smaller firms (although it could be inevitable). In this section we do two things. We explore heterogeneity in a more multidimensional way and we do so while testing for sensitivity to shocks.

Up to this point all that we have done is to predict financial behavior through firm characteristics. The estimated parameters that accompany $1 - k$, π and ϕ in the regressions are reduced form parameters that describe the probability of different types of firms in general. It is important to note that the regressions of tables 1, 2 and 3 have sector and year dummies that, presumably, are capturing the incidence of macroeconomic and sector shocks faced by the firms of the Chilean economy. Hence,

Figure 10: Parameter of $1-k$ on performance

most of the information on the importance of shocks for different firms is contained in the levels and statistical significance of the estimated vector of dummy parameters.

One way of using these parameter vectors to estimate the importance of macroeconomic and sectoral shocks on different types of firms is to execute a Log Likelihood Ratio test on their statistical significance and to interpret the size of the statistic as an indicator of the relative importance of these shocks to different types of firms. Generically we estimate:

$$X_{t,i} = \beta_0 T + \alpha_1 \pi_{t,i} + \alpha_2(1-k_{t,i}) + \alpha_3 \phi_{t,i} + \beta_1 DSc_i \tag{9}$$

and extract the log likelihood statistic for the complete regression, which we call ll_c; then we estimate the restricted regression:

$$X_{t,i} = \alpha_1 \pi_{t,i} + \alpha_2(1-k_{t,i}) + \alpha_3 \phi_{t,i} \tag{10}$$

which is the same regression as 9 but without the year dummies (which we hypothesize are capturing the macroeconomic shocks of this economy) and the sector dummies (which capture the sector shocks). Again we extract the the log likelihood statistic, which we call ll_r. Finally we calculate:

$$LRT = -2(ll_r - ll_c) \sim X(n) \tag{11}$$

where n is the total number of restrictions imposed in regression 10, which in this case is 14 (9 sectors and 5 year pairs). We estimate this statistic for subsets of the firms, and generically find that the dummy vectors are always statistically significant for all types of regressions (probits for destruction and OLS regressions for creation and performance).

Constructing the grid for the Creation regressions was slightly more convoluted, since, as we can recall from subsection 3.0.2 the methodology was already based on collapsing the database into a $10 \times 10 \times 10$ grid of the whole space of variables we are using. What we do is to restrict our attention to the two dimensional space that we want to graph (for example the $\{k,\pi\}$ space for the main result of this section). In each square of the grid we rank the firms into thousandiles and run the regression ignoring the parameter of the variable that we have used to rank and collapse the database of the square we are working on (in this case size ϕ). Of course the problem is that when we wish to repeat the exercise for a different space (as we do in Appendix A-4), we need to recalculate completely the database on which we run the regression. However, results are very robust, as we will illustrate in Section 3.2 and Appendix A-4.

Figure 11 shows the LR test of equation 10 for a 10×10 grid on the $\{k,\pi\}$ space. Each row has a pair of graphs constituted by a three dimensional surface and a contour graph with identical coloring. The first row shows the tests for the destruction probits of equation 6, the second row shows the test for the creation regressions of equation 7, and the third row shows the test for the performance regressions of equation 8.

The first thing to note is the heterogeneity in the levels of the LR tests for different types of firms. Destruction seems to peak in sensitivity along a diagonal that runs from high k low π firms to low k high π firms. This is also true in the performance regressions although the slope of the line of peaks is lower and the line runs at much higher productivity levels than for the destruction probits. It is interesting to note that this diagonal of peak sensitivity is exactly what is predicted by the model of section **??**, that is, the existence of sensitive margin of highly productive entrepreneurs that are mostly financed with external resources. The second row, however, shows that peak sensitivity in creation is clearly among high k, low π projects, that is, low productivity projects that have most of the resources to be implemented but require some finance. There is some insinuation of a diagonal in the creation contour, showing that there is a margin of increasingly productive firm creation projects with lower internal resources that is relatively sensitive to shocks, but it is less clear than among the destruction and performance regressions.

The same types of graphs for 10×10 grids on the $\{\phi,\pi\}$ and $\{\phi,k\}$ spaces can be found in Figures A-4.5 and A-4.6 of Appendix A-4 respectively. In them we find sensitivity peaks for small and low productivity firms in creation (which is not surprising), but for mid productivity small firms in destruction. interestingly we find a diagonal in the performance regressions constituted by two peaks: a high productivity - small firm peak and a middle productivity - large firm peak. We find that smaller firms are more sensitive in destruction, larger firms are more sensitive in creation and

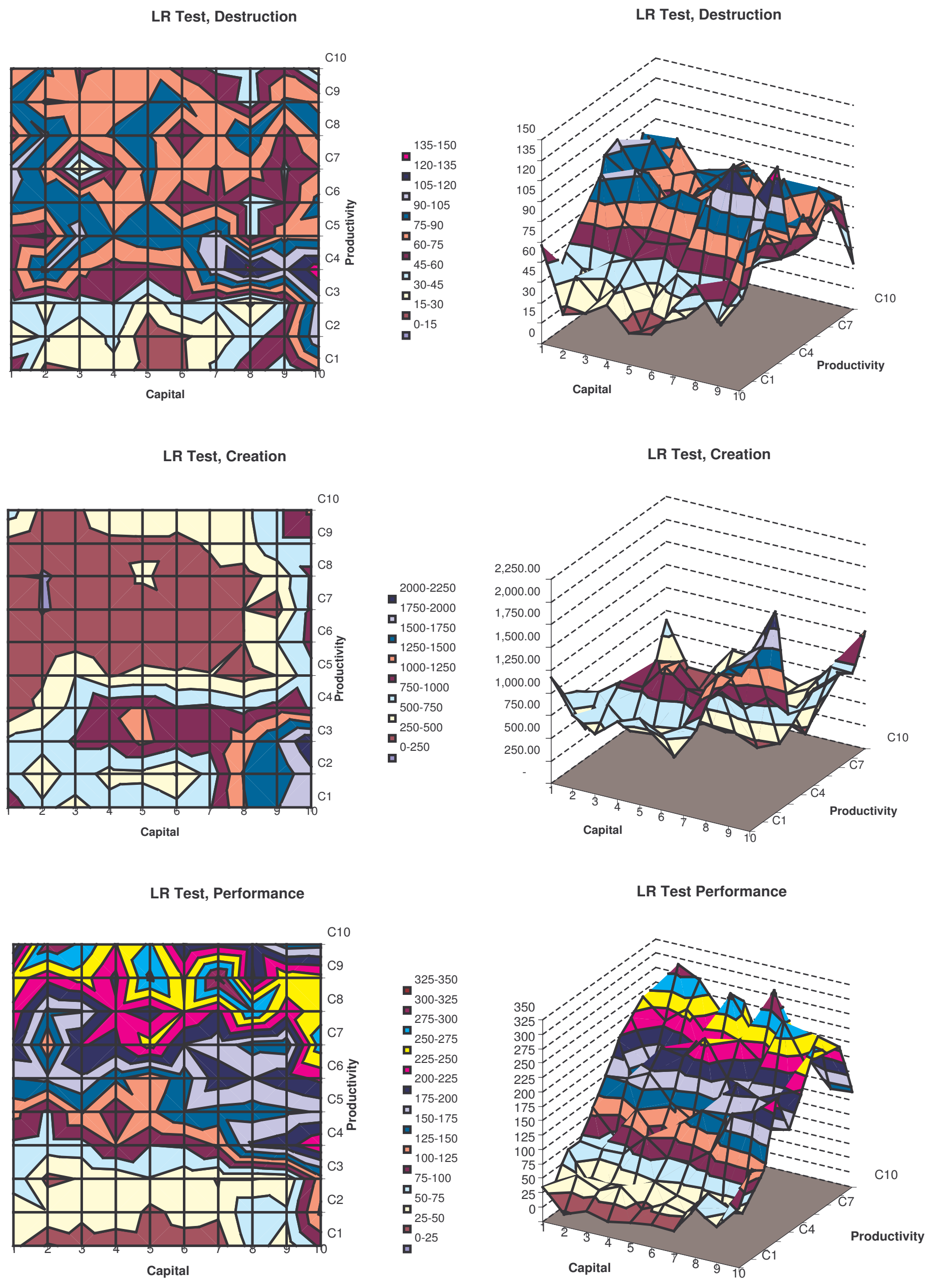

Figure 11: LR Tests for 10×10 grid on the $\{k,\pi\}$ space

large firms with middle productivity are more sensitive in performance. [16]

As an additional demonstration of the importance of heterogeneity we show in Figures A-4.7 to A-4.15 of Appendix A-4 the parameters for the 10×10 grids on the three spaces. For the financial parameter $1-k$ we can see in Figures A-4.8 and A-4.9 the same fact that we have documented in figures 8 to 10, that is that there is a sign change in the parameter for smaller firms in the case of the destruction probit and the performance regression, that the sign remains in the creation regression, but the parameter is stronger for smaller firms. However, we also find some new things. For example in figure A-4.8 we can see that there is an area of middle productivity firms with relatively small capital that have very high absolute $1-k$ parameters both for destruction and performance. In the case of destruction, parameters are positive, while they are negative in the case of performance. It would seem that these firms are very financially constrained, and it is interesting that they are in the lower middle squares of our grid. Another interesting heterogeneity can be found in the surfaces and contours of Figure A-4.14 where we display the ϕ size parameter. Again, destruction and performance show a symmetry. Size enters as a negative parameter in destruction probits and as a positive parameter in performance regressions. However, the peak parameters, in both cases can be found in the low capital low productivity areas of the grid. On the other hand the size parameter peaks in the creation regression among high capital low productivity firms. Hence, it seems that size can be used as an attribute to substitute for deficits in other characteristics of a project. It is basically substituting productivity in all three types of regressions. However, for existing firms (to be destroyed or not) it is more important among financially dependent firms, and for potential firms (to be created or not) it is more important among high capital firms.

3.2 Who and Where are the Fragile Firms?

In this section we characterize the anonymous dummies that we have been using in sections 3 and 3.1, and try to illustrate the sectors and geographic distribution of our results on sensitivity to shocks. To do this, again, we estimate the LR tests on the dummy vectors from equation 11, only this time instead of sorting the data base on grids we sort them according to regions of the country and sectors. When we sort by sectors, of course, both the complete and restricted models of each type of regression lack sector dummies, so we only remove the year dummies as an indicator of macroeconomic shocks. The nine sectors we have used are described in Table A-3.2 of Appendix A-3. The regions of Chile, on the other hand are fairly easy to understand.

[16] The creation regressions for Figures A-4.5, A-4.8 and A-4.11 are different from those used in Figures 11, A-4.7 and A-4.10. The first are run constructing thousandiles along k while the former are run constructing thousandiles along ϕ. Creation regressions of Figures A-4.6, A-4.9 and A-4.12 are run constructing thousandiles along π.

They are numbered from I to XII in order from the arid northernmost region (I) to the southern patagonian region (XII). The exception is the capital Santiago which is usually called *Regin Metropolitana* (Metropolitan Region) and is in the middle of the country between Region V and VI. Region V (Valparaiso and Via del Mar) and VIII (Concepcin and Talcahuano) contain the other two major urban concentrations of the country.

The first panel of Figure 12 shows the LR test for the different regions of Chile. To facilitate graphical presentation we have normalized the LR tests of the different regressions. Figure 12 presents is the ratio of the test of a given region to the average test for the country.[17] We present tests for the destruction probit, performance regression and creation regressions on the three dimensions (as explained in footnote 16) As we can see, by far, the most sensitive region to macroeconomic shocks is Santiago. It is followed by Regions V and VIII, and then Region X that also follows in urbanization. The second panel shows us four characteristics of the regions: their participation in value added, their participation in national population, their participation in the number of firms in our database and finally, the average of the relative LR tests of the first panel. As we can see sensitivity seems to be clearly correlated with urbanization. Moreover, the only exception is Region II where most of the largest capital intensive copper mines are. There, per capital value added is much higher, but still relative LR tests are at the level predicted by population and firm concentration.[18]

The natural question is then: what is going on in urban areas that makes them more sensitive? Section 3.1 insinuates part of the answer. Urban regions must contain most of this sensitive margin that is shown in the diagonal of Figure 11. In other words urban areas must contain most low productivity high capital firms, most high productivity low capital firms and most small firms. What sectors do these firms belong to? Figure 13 shows that it is mostly commerce and services that show large sensitivity to shocks. These sectors are clearly urban. Moreover, they are followed by construction and manufacturing which are also urban. Rural sectors like agriculture and forestry are relatively stable. Interestingly, the construction sector shows larger relative sensitivity in performance among existing firms while services shows very little sensitivity in performance but very high sensitivity in creation and destruction. In a nutshell: service sector firms churn rapidly, construction firms improve or worsen but survive, commerce does both. Also, although manufacturing (which is the sector used in most of the literature due to data availability) is the fourth most volatile sector in Chile.

As we explain in Appendix A-3, the nine sectors we use in the regressions are

[17] For example on average Region V shows slightly higher tests than the average of the country, Region RM shows tests that are 5 to 7 times the average of the country, and so forth.

[18] One of the reasons we show the LR tests for creation regressions in the different dimensions is to illustrate the robustness of the results across these different regressions.

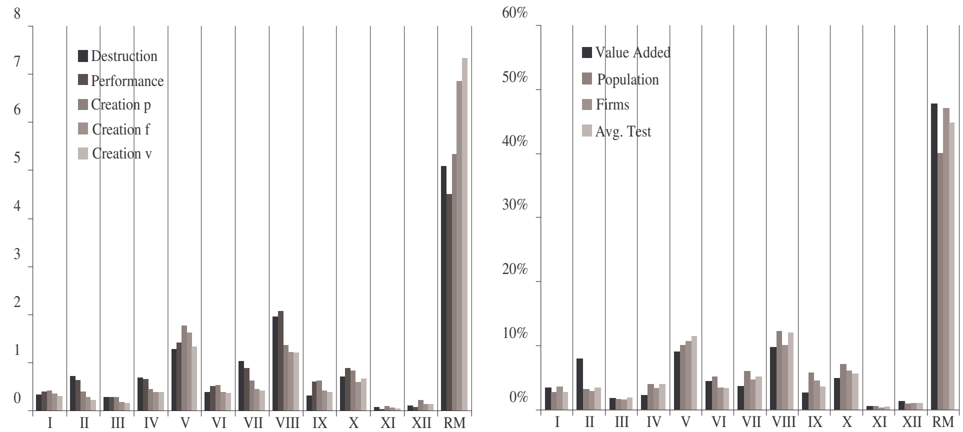

Figure 12: Relative LR Test for Shocks in Different Chilean Regions

really aggregations of the available sector descriptions in the database. The reason we aggregate is to not consume the regressions in dummies and to be able to graph effectively. However, one last exercise we do is to unfold the 9 sectors into 42 subsectors and then run the LR sensitivity test for all of them. In Table 4 we show the most sensitive and the less sensitive subsectors for the destruction probit, the performance regression and the creation regression on the $10 \times 10 \times 10$ grid. We find that construction is one of the most sensitive sectors, but also retail clothing, foods and home improvement. On the other hand, among the less sensitive are some wholesale sectors, utilities, and less sumptuary retail like jewelry and furniture. What the table seems to show is that sectors that depend more on consumption demand are more sensitive to shocks, while sectors that depend more on investment demand or inventories are less sensitive. This is curious since investment demand is the more volatile component of aggregate demand. It must be that, by nature, these suppliers are larger, more productive and less financially dependent.

4 Conclusions

We have studied a model of an economy with heterogeneous entrepreneurs in productivity, wealth and also size. We have shown that in such an economy, with contracting originating from a hidden action problem, there will be at least a dual margin with high productivity firms owned by poor entrepreneurs being incentive constrained and low productivity firms owned by richer entrepreneurs being participation constrained. The constraint will be tighter for poorer and more productive entrepreneurs. We have shown that this setup can also lead to an economy with multiple margins and differ-

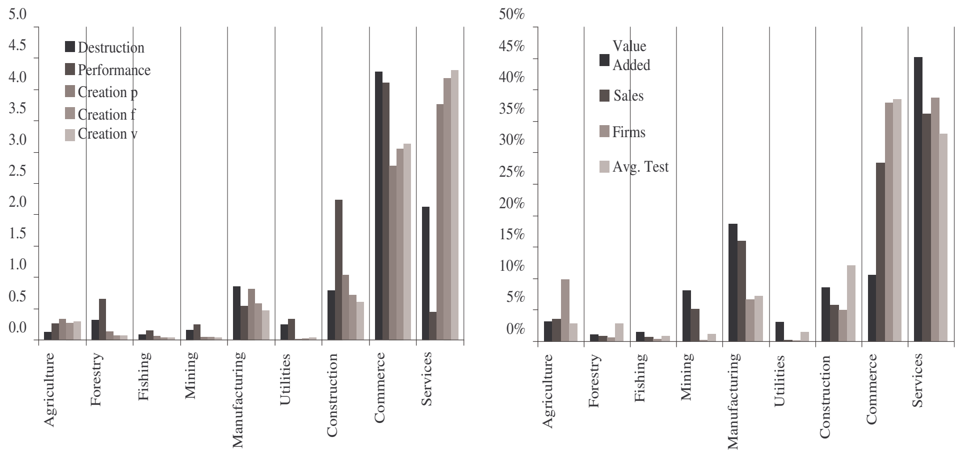

Figure 13: Relative LR Test for Shocks in Different Sectors of the Chilean Economy

Table 4: Subsector Sensitivity to Shock, Ranking of LR Tests

Most Volatile		**Less Volatile**	
Destruction			
1	Construction	**42**	Other Manufactures
2	Retail, clothing	**41**	Retail, office and school supplies
3	State and Social Services	**40**	Wholesale, textiles, clothing and leather
4	Retail, home improvement	**39**	Retail, jewelry, watches and apparel
5	Other Activities	**38**	Fishing
6	Restaurants and hotels	**37**	Retail, furniture
7	Technical and Professional Services	**36**	Mining, Quarrying, Gas and Petroleum Extraction
8	Agricultural Production	**35**	Transport
9	Retail, foods	**34**	Electricity, Gas and Water
10	Financial Services	**33**	Retail, garden products
Creation			
1	Retail, clothing	**42**	Wholesale, textiles, clothing and leather
2	Construction	**41**	Wholesale, agriculture, hunting, fishing and forestry
3	Retail, home improvement	**40**	Retail, jewelry, watches and apparel
4	Forestry	**39**	Other Manufactures
5	Retail, hunting and fishing apparel	**38**	Retail, machinery, motors and equipments
6	Retail, foods	**37**	Retail, leasing and renting goods
7	Financial Services	**36**	Agricultural Services
8	Retail, artifacts related to food services	**35**	State and Social Services
9	Retail, furniture	**34**	Retail, artifacts related to health services
10	Retail, bicycles	**33**	Retail, garden products
Performance			
1	Retail, clothing	**42**	Other Manufactures
2	Construction	**41**	Mining, Quarrying, Gas and Petroleum Extraction
3	Retail, home improvement	**40**	Electricity, Gas and Water
4	Technical and Professional Services	**39**	Retail, office and school supplies
5	State and Social Services	**38**	Wholesale commerce, textiles, clothing and leather
6	Restaurants and hotels	**37**	Fishing
7	Retail, gas stations	**36**	Retail, jewelry, watches and apparel
8	Other Activities	**35**	Wholesale, metallic, machines, equipment and motors
9	Retail, artifacts related to food services	**34**	Retail, garden products
10	Wood Manufactures and Paper	**33**	Agricultural Services

ential interest rates in contracts. Again, poorer entrepreneurs will be the ones to face the higher interest rates.

We show that this participation constrained margin composed of poorer but productive entrepreneurs will be more sensitive to shocks in this economy, 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 a developed country such as Chile, small firms and financially dependent firms tend to be more volatile and generally sensitive to shocks.

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 paper. Finally, we show that risk generally affects more the participation constrained margin composed of wealthier entrepreneurs that will flee. We also show that in riskier economies interest rates will be higher among poor entrepreneurs with relatively high productivity.

In the second part of the paper we used FUNDES-SII panel database to characterize firm creation, destruction and performance 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, they are more likely to perform better in sales. So, it seems they reflect the shocks of the economy on sales performance, or, as we interpret in this paper, in the execution of individual entrepreneurial projects within the firm. For smaller and less productive firms shocks and changes are reflected in survival, destruction or creation. 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, of bad sales performance and a also as a stronger predictor of firm creation than for larger firms. 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 also show in this paper that there is some evidence to support the theoretical predictions of section **??**. In particular, there does seem to be a margin of high productivity low capital firms that are very sensitive to shocks. We also illustrate, in this Chapter, the high degree of heterogeneity that lies behind our general regression results for the whole of the Chilean economy. Finally we characterize sensitivity of firm flows as a largely urban phenomenon that is mostly seen in the commerce and services sectors, in a distant second place we find construction and the sector that is most used by the literature: manufacturing.

References

Acemoglu, D. & Newman, A. (2002), 'The labor market and corporate structure', *European Economic Review* **46**, 1733–1756.

Aghion, P., Banerjee, A. & Piketty, T. (2002), 'Tdualism and macroeconomic volatility', *Quarterly Journal of Economics* **114**(4), 1359–97.

Allen, F. & Gale, D. (2004*a*), 'Financial fragility. liquidity and asset prices', *Journal of the European Economic Association* **2**(6), 015–1048.

Allen, F. & Gale, D. (2004*b*), 'From cash-in-the-market pricing to financial fragility', *Journal of the European Economic Association* **3**(2-3), 535–546. 5

Anderson, P., Meyer, B., Pencavel, J. & Roberts, M. (1994), 'The extent and consequences of job turnover', *Brookings Papers on Economic Activity* **0**(1), 177–248.

Ashcraft, A. & Campello, M. (2002), Borrowerss financial constraints and the transmission of monetary policy: Evidence from financial conglomerates.

Benavente, J.M., C. J. & Morand, F. (2003), 'Debt composition and balance sheet effects of exchange rate depreciations: A firm-level analysis for chile', *Emerging Markets Review* **4**(4), 397–416. 7

Berkowitz, J. & White, M. (2004), 'Bankruptcy and small firms' access to credit', *RAND Journal of Economics* **35**(1), 69–84.

Bernanke, B. & Gertler, M. (1995), 'Inside the black box: The credit channel of monetary policy transmission', *Journal of Economic Perspectives* **9**(4), 27–48.

Blanchard, O. & Diamond, P. (1990), 'The cyclical behavior of the gross flows of u.s. workers', *Brookings Papers on Economic Activity* **0**(2), 85–143.

Bleakley, H. & Cowan, K. (1995), 'Corporate dollar debt and depreciations: Much ado about nothing?', *Federal Reserve Bank of Boston Working Papers* **02**(5), 27–48. 7

Bosworth, B., Dornbusch, R. & Laban, R., eds (1994), *The Chilean Economy: Policy Lessons and Challenges*, Brookings, Washington, DC.

Bravo, D. (2005), *Segunda Encuesta de Proteccion Social: Analisis y Principales Resultados*, Centro Microdatos, Santiago, CL.

Bravo, D., Ferrada, C. & Landerretche, O. (2005), The labor market and economic cycles in chile. University of Chile.

Caballero, R. & Hammour, M. (1996), 'The fundamental transformation in macroeconomics', *American Economic Review* **86**(2), 181–186.

Caballero, R. & Hammour, M. (1998), 'The macroeconomics of specificity', *Journal of Political Economy* **106**(4), 724–767.

Caballero, R. & Krishnamurthy, A. (2001), 'International and domestic collateral constraints in a model of emerging market crises', *Journal of Monetary Economics* **48**(3), 513–548. 6

Caballero, R. & Krishnamurthy, A. (2002), 'A dual liquidity model for emerging markets', *American Economic Review* **92**(2), 33–37.

Carpenter, R. & Petersen, B. (2002), 'Is the growth of small firms constrained by internal finance', *Review of Economics and Statistics* **84**(2), 298–30. 1

Cowan, K. & Micco, A. (2005), 'El seguro de desempleo en chile: Reformas pendientes', *Documento en Foco de Expansiva* .

Crespi, G. (2003), *PyME en Chile: Nace, Crece y....Muere. Analisis de su desarrollo en los ultimos siete aos*, Fundes, Santiago, CL.

Devereux, M. & Schiantarelli, F. (1989), 'Investment, financial factors and cash flow: Evidence from uk panel data', *NBER Working Paper* . 3

Edwards, S. & Cox, A. (1991), *Monetarism and Liberalization: The Chilean Experiment*, University of Chicago Press, Chicago, IL.

Ferrada, C. & Reinecke, G. (2005), Creacin y destruccin de empleos en chile: Analisis de datos longitudinales de la achs. University of Chile and International Labor Organization.

Ffrench-Davis, R. (2005), *Entre el Neoliberalismo y el Crecimiento con Equidad: Tres Decadas de Politica Econmica en Chile*, Siglo XXI, Santiago, CL.

Forbes, K. (2003), 'One cost of the chilean capital controls: Increased financial constraints for smaller trade firms', *NBER Working Paper* . 1, 8

Galindo, A., F. & Weiss, A. (2005), Does financial liberalization improve the allocation of investment. Boston College.

Gallego, F. & Hernandez, F. (2003), 'Microeconomic effects of capital controls: The chilean experience during the 1990s', *International Journal of Finance and Economics* **8**(3), 225–253. 2

Gelos, R. & Werner, A. (2002), 'Financial liberalization, credit constraints, and collateral: Investment in the mexican manufacturing sector', *Journal of Development Economics* **67**(1), 1–27. 1

Gertler, M. & Gilchrist, S. (1994), 'Monetary policy, business cycles, and the behavior of small manufacturing firms', *Quarterly Journal of Economics* **109**(2), 309–40. 1, 8

Greenwald, B., J. S. & Weiss, A. (1984), 'Information imperfections in the capital market and macroeconomic fluctuations', *American Economic Review* **74**(2), 194–199.

Hall, R. (2005), 'Employment efficiency and sticky wages: Evidence from flows in the labor market', *NBER Working Paper* .

Harris, J.R., S. F. & Siregar, M. (1994), 'The effect of financial liberalization on the capital structure and investment decisions of indonesian manufacturing establishments', *World Bank Economic Review* **8**(1), 17–47. 1

Holmstrom, B. & Tirole, J. (1997), 'Financial intermediation, loanable funds, and the real sector', *Quarterly Journal of Economics* **113**(3), 663–691.

Hu, C. (1999), 'Leverage, monetary policy, and firm investment', *Federal Reserve Bank of San Francisco Economic Review* (2), 32–38. 1, 8

Jovanovic, B. (1982), 'Selection and the evolution of industry', *Econometrica* **50**(3), 649–670. 1

Kashyap, A.K., O. L. & Stein, J. (1994), 'Credit conditions and the cyclical behavior of inventories', *Quarterly Journal of Economics* **109**(3), 565–592. 1, 8

Meller, P. (1996), *Cien Anos de Economia Politica Chilena: 1890-1990*, Andres Bello, Santiago, CL.

Meller, P., ed. (2005), *La Paradoja Aparente*, Taurus, Santiago, CL.

Oliner, S. & Rudebusch, G. (1996*a*), 'Is there a broad credit channel for monetary policy?', *Federal Reserve Bank of San Francisco Economic Review* (1), 3–13. 1

Oliner, S. & Rudebusch, G. (1996*b*), 'Monetary policy and credit conditions: Evidence from the composition of external finance: Comment', *American Economic Review* **86**(1), 300–309. 1

Paulson, A. & Townsend, R. (2004), 'Entrepreneurship and financial constraints in thailand', *Journal of Corporate Finance* **10**(2), 229–262. 1

Paulson, A. & Townsend, R. (2005), 'Financial constraints and entrepreneurship: Evidence from the thai financial crisis', *Federal Reserve Bank of Chicago Economic Perspectives* **29**(3), 34–48. 1

Schumpeter, J. (1942), *Capitalism, Socialism and Democracy*, Harper, New York, NY.

Stiglitz, J. & Weiss, A. (1981), 'Credit rationing in markets with imperfect information', *American Economic Review* **71**(1), 224–227.

Stiglitz, J. & Weiss, A. (1992), 'Asymmetric information in credit markets and its implications for macroeconomics', *Oxford Economic Papers* **44**(4), 694–724.

Appendix

A-1 Proofs for Heterogenous Productivity Model

A-1.1 Derivation of Equations (??)-(??)

First notice that the cost of effort in the high effort incentive compatibility constraint is $c - fq$ which is the technological cost of effort minus the expected fine from shirking. In both the high effort participation constraints and in the low effort incentive compatibility constraint the cost of effort is only c, since in those constraints we are not considering the possibility of cheating.

Incentive compatibility to exert effort is satisfied if the firm is willing to expend effort at const $c - fq$ to increase the probability of success from p_l to p_h, given that the firm has signed a contract on the zero profit rate for high effort rp_h^{-1}, hence:

$$\left(\pi W - (1-k)\, rp_h^{-1}\right) p_l \leq \left(\pi W - (1-k)\, rp_h^{-1}\right) p_h - (c - fq) \tag{12}$$

another way to see this condition is to say that R_{ich}, the maximum interest rate at which a hypothetical bank would be willing to lend to project $\{k, \pi\}$, believing that the incentives of the entrepreneur are aligned with high effort is:

$$R_{ich} = \frac{\pi W - (c - fq)(p_h - p_l)^{-1}}{1-k} \tag{13}$$

or that, at zero profit interest rate rp_h^{-1} for high effort, the minimum productivity at which the bank will believe effort is expended is:

$$\pi_{ich} = \frac{(1-k)rp_h^{-1} + (c - fq)(p_h - p_l)^{-1}}{W} \tag{14}$$

which is our equation (**??**).

Participation compatibility within a high effort contract is satisfied if the net result of expending effort and reaping the higher expected value is larger than the outside option of depositing in the riskless interest rate, hence:

$$rk \leq \left(\pi W - (1-k)\, rp_h^{-1}\right) p_h - c \tag{15}$$

another way to see this condition is to say that R_{pch}, the maximum interest rate at which a hypothetical entrepreneur owning project $\{k, \pi\}$, would be willing to engage in a high effort contract is:

$$R_{pch} = \frac{\pi W - (\delta k + c)p_h^{-1}}{1-k} \tag{16}$$

or that, at zero profit interest rate rp_h^{-1} for high effort, the minimum productivity at which the bank will believe effort is expended is:

$$\pi_{pch} = \frac{(r+c)p_h^{-1}}{W} \tag{17}$$

which is our equation (**??**).

Participation compatibility within a low effort contract is satisfied if the result of executing the project with no effort is larger than the outside option of depositing in the riskless interest rate, hence:

$$rk \leq \left(\pi W - (1-k)\, rp_l^{-1}\right) p_l \tag{18}$$

another way to see this condition is to say that R_{pcl}, the maximum interest rate at which a hypothetical entrepreneur owning project $\{k, \pi\}$, would be willing to engage in a low effort contract is:

$$R_{pcl} = \frac{\pi W - rkp_l^{-1}}{1-k} \tag{19}$$

or that, at zero profit interest rate rp_h^{-1} for low effort, the minimum productivity at which the bank will believe effort is expended is:

$$\pi_{pcl} = \frac{rp_h^{-1}}{W} \tag{20}$$

which is our equation (**??**).

Incentive compatibility within a low effort contract is satisfied if the result of executing a low effort project is greater than executing a high effort project:

$$\left(\pi W - (1-k)\, rp_h^{-1}\right) p_h - c \leq \left(\pi W - (1-k)\, rp_l^{-1}\right) p_l \tag{21}$$

another way to see this condition is to say that R_{bl}, the minimum interest rate at which a hypothetical entrepreneur owning project $\{k, \pi\}$, would be willing to prefer a low effort contract to a high effort contract is:

$$R_{bl} = \frac{\pi W - c(p_h - p_l)^{-1}}{1-k} \tag{22}$$

or that, at zero profit interest rates for high and low effort, the maximum productivity at which an entrepreneur will prefer a low effort contract to a high effort contract is:

$$\pi_{bl} = \frac{c(p_h - p_l)^{-1}}{W} \tag{23}$$

which is our equation (**??**).

A-1.2 Derivation of $\bar{k}$ and $\bar{\bar{k}}$ with related proofs.

First, from equations (**??**) and (**??**) we can see that a sufficient condition for low effort contracts to never be preferred over high effort contracts is:

$$c(p_h - p_l)^{-1} \leq (r + c)p_h^{-1} \tag{24}$$

which ends up implying

$$\frac{c}{r} \leq \frac{p_h - pl}{p_l} \tag{25}$$

or that the financial cost of effort is lower than the financial gain from effort.

Second, from equations (**??**) and (**??**) we can see that a sufficient condition for there to never be a two tier economy in the absence of information asymmetry is that:

$$rp_l^{-1} \leq (r + c)p_h^{-1} \tag{26}$$

which ends up implying (25).

Third, from equations (**??**) and (**??**) we derive equation (**??**) retyped here:

$$\bar{k} = \left(\frac{c}{r}\right)\left(\frac{p_l}{p_h - p_l}\right) - \left(\frac{fq}{r}\right)\left(\frac{p_h}{p_h - p_l}\right)$$

so that for there to be a dual margin economy condition (25) must be satisfied.

Fourth, although it is redundant given our three previous steps, it is interesting to note that from equations (**??**) and (**??**) we can see that a sufficient condition for the BL roof to be lower than the PCL floor is:

$$c(p_h - p_l)^{-1} \leq rp_l^{-1} \tag{27}$$

which implies condition (25).

So summarizing, either $\pi_{pch} \geq \pi_{pcl} \geq \pi_{bl}$ and $\bar{k} \geq 1$, and/or $\pi_{bl} \geq \pi_{pch} \geq \pi_{pcl}$ and $\bar{k} \leq 1$. Hence if condition (25) is satisfied we will have an economy such as panel (a) in Figure A-1.1, with the possibilities of a dual and tripe margin economies and tiers of firms. If not, we will have an economy such as panel (c) in Figure A-1.1, with a unique participation constrained low effort margin, two tiers, and the potential for a dual tier margin. Finally, panel (b) shows the case where the financial cost of effort is exactly equal to the financial effect of effort. In this case there is no dual margin, but rather a tier margin with a slope where it becomes easier for richer entrepreneurs to qualify for low interest rates.

In panels (a) and (b), the kink in the tier margin $\bar{\bar{k}}$ is the intersection of (**??**) and (**??**) and is

$$\bar{\bar{k}} = 1 + \frac{cp_h}{r(p_h - p_l)} - \frac{p_h}{p_l} \tag{28}$$

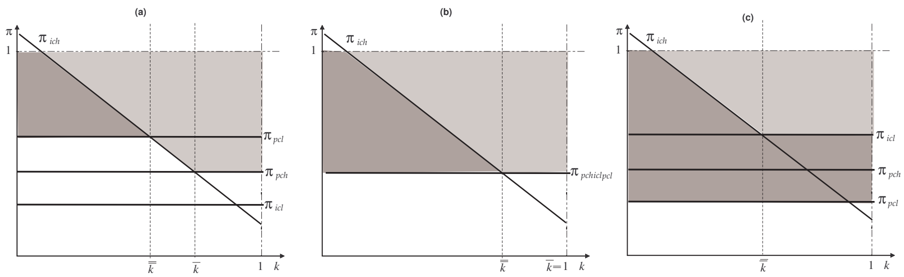

Figure A-1.1: Alternative Levels of Relative Financial Relevance of Effort

and in panels (b) and (c) the tier margin $\bar{\bar{k}}$ is the intersection of (**??**) and (**??**) and is

$$\bar{\bar{k}} = 1 - \frac{fqp_h}{r(p_h - p_l)} \tag{29}$$

so that as $fq \to 0$, and condition (25) is satisfied as an equality, $\bar{\bar{k}}$ in both (28) and (29) converges to 1.

A-1.3 Derivation of effect of taxes and controls on capital flows.

Consider an ad-valorem tax on capital outflows for residents of t_{out} and an ad-valorem tax on capital inflows of t_{in} for non-residents. The ICH equation of (12) is recast as

$$\left(\pi W - (1-k)\left(1+t_{in}\right) r p_h^{-1}\right) p_l \leq \left(\pi W - (1-k)\left(1+t_{in}\right) r p_h^{-1}\right) p_h - (c - fq) \tag{30}$$

which means that (**??**) is now

$$\pi_{ich} = \frac{(1-k)(1+t_{in}) r p_h^{-1} + (c - fq)(p_h - p_l)^{-1}}{W} \tag{31}$$

and is not affected by the outflow tax, since the ICH constraint compares two options that are realized inside the economy. At $k = 0$ equation (31) is identical to equation (**??**), but not at $k = 1$, hence the pivoting movement shown in Figure **??**. The slope of (31) is $-(1 + t_{in}) r (p_h W)^{-1}$.

The PCH equation of (17) is recast as

$$(1 - t_{out}) r k \leq \left(\pi W - (1-k)\left(1+t_{in}\right) r p_h^{-1}\right) p_h - c \tag{32}$$

which means that (**??**) is now

$$\pi_{pch} = \frac{((1 - t_{out}) r + c - rk(t_{out} + t_{in})) p_h^{-1}}{W} \tag{33}$$

and is affected by both taxes since it compares options inside and outside of the economy. The slope of (33) is $-(t_{out}+t_{in})r(p_h W)^{-1}$. Hence, both ad-valorem taxes affect the slope of the constraint in the same way, what changes is the point on which the constraint pivots. In the case of the outflow tax it pivots on $k=1$, in the case of the inflow tax it pivots on $k=0$.

The PCL equation of (21) is recast as

$$(1-t_{out})rk \le \left(\pi W - (1-k)\,(1+t_{in})rp_l^{-1}\right) p_l \tag{34}$$

which means that (**??**) is now

$$\pi_{pcl} = \frac{((1-t_{out})r - rk(t_{out}+t_{in}))p_l^{-1}}{W} \tag{35}$$

and is also affected by both taxes since it compares options inside and outside of the economy. The slope of (35) is $-(t_{out}+t_{in})r(p_l W)^{-1}$. The PCL constraint is affected in the same way that the PCH constraint only amplified by the fact that $p_l^{-1} > p_h^{-1}$.

A-1.4 Derivation of effect of microfinance policy α.

Consider an economy with a tax on capital inflows t. The ICH constraint with a microfinance policy consisting of a gift of $\alpha(1-k)$ to every entrepreneur of capital k is

$$(c - fq) \le \left(\pi W - (1-k)\,(1+t)(1-\alpha)rp_h^{-1}\right)(p_h - p_l) \tag{36}$$

which means that (**??**) is now

$$\pi_{ich} = \frac{(1-k)(1+t)(1-\alpha)rp_h^{-1} + (c-fq)(p_h-p_l)^{-1}}{W} \tag{37}$$

and a marginal increase in α relaxes the constraint in

$$\frac{\partial \pi}{\partial \alpha} = -\frac{(1-k)(1+t)rp_h^{-1}}{W} \tag{38}$$

so, the effect is larger for lower k.

The PCH constraint in this economy is now

$$rk \le \left(\pi W - (1-k)\,(1+t)(1-\alpha)rp_h^{-1}\right) p_h - c \tag{39}$$

if the development agency is capable of verifying that the entrepreneur will use the subsidy to complement his own funds in implementing the project. Otherwise, the PCH constraint will be

$$r(k + k(1-\alpha)) \le \left(\pi W - (1-k)\,(1+t)(1-\alpha)rp_h^{-1}\right) p_h - c \tag{40}$$

and the PCL will be either

$$rk \leq \left(\pi W - (1-k)\,(1+t)(1-\alpha) r p_l^{-1}\right) p_l \tag{41}$$

or

$$r(k + k(1-\alpha)) \leq \left(\pi W - (1-k)\,(1+t)(1-\alpha) r p_l^{-1}\right) p_l \tag{42}$$

which means that the effect of a marginal increase in α on the PCS $S \in \{H, L\}$ constraint is now either

$$\frac{\partial \pi}{\partial \alpha} = -\frac{(1-k)(1+t) r p_s^{-1}}{W} \tag{43}$$

if investment is verifiable to the development agency, or

$$\frac{\partial \pi}{\partial \alpha} = -\frac{(1-k) t r p_s^{-1}}{W} \tag{44}$$

if it is not. Hence, the effect is lower and the development agency will have to either expend resources verifying investment or make gifts to fewer entrepreneurs if it cannot verify the investment. Moreover, if there are no taxes or distorted access to international banking markets there is no effect on the PC constraints in the nonverifiable case, and the only effects on this economy are those created by the relaxation of the ICH constraint. Note that in this case (t=0) both participation constraints acquire positive slope when $\alpha > 0$.

A-1.5 Proofs and derivations of effects of international shocks.

Notice that all constraints have the following general form

$$\pi_x = \frac{\theta_x}{W}; \forall x \in \{ich, pch, pcl, icl\} \tag{45}$$

which implies that

$$\frac{\partial \pi_x}{\partial W} = -\frac{\pi_x}{W} \tag{46}$$

since all firms in this economy share W, any shock to W will have a larger effect on the margin composed by firms of higher productivity π. Since, in the three margin two tier economy PCL is higher than PCH, we show in panel (a) of Figure (**??**) a larger contraction (upward shift) of PCL. Moreover, ICH will contract more than constraint PCX whenever it is above and less when it below. We know then, that ICH will shift upward in the same distance than PCH at $\bar{k}$ and in the same distance as PCL at $\bar{\bar{k}}$. These two points indicate the new position of ICH.

From equations (??), (??) and (??) we can derive the comparative static effects of the interest rate hike as

$$\begin{aligned}\frac{\partial \pi_{ich}}{\partial r} &= \frac{(1-k)p_h^{-1}}{W} \\ \frac{\partial \pi_{pch}}{\partial r} &= \frac{p_h^{-1}}{W} \\ \frac{\partial \pi_{pcl}}{\partial r} &= \frac{p_l^{-1}}{W}\end{aligned} \tag{47}$$

so that both PC constraints will move up in parallel to their original positions, the PCL constraint will move more than the PCH constraint and the ICH constraint will move the same as the PCH constraint at $k = 0$ and will pivot on $k = 1$.

A-2 Proofs for Extensions and Generalizations

A-2.1 Effect on ICH, PCH and PCL of amplifications of risk.

We can rewrite equation (??), by grouping the deterministic and random terms in the following way:

$$EU(s,z) = EU\begin{pmatrix} p_s\left(\pi(W-(1-k)rp_z^{-1}) - kr - qf(z,s)\right) \\ -c_s + p_s\pi\nu_w - (p_s(1-k)p_z^{-1}+k)\nu_r \end{pmatrix} \tag{48}$$

Notice that when $s = z$ this reduces to:

$$EU(s,s) = EU\begin{pmatrix} p_s\left(\pi(W-(1-k)rp_z^{-1}) - kr\right) \\ -c_s + p_s\pi\nu_w - \nu_r \end{pmatrix} \tag{49}$$

, so we can see that the effect of international credit risk ν_r is the same on both PC constraints, no matter what the choice of effort s is, and the same for marginal firms of any productivity level π that are the property of entrepreneurs of any wealth k. Now, an identical amplification of risk will have a lower effect if it is applied on a higher initial level of expected utility. So, it is important to remember that the base expected utility levels on the PCL and PCH curves are the same, that is, zero. For this reason, the effect on both constraints of the amplification of international credit risk will be the same. In the case of domestic institutional risk ν_c, only the PCH tightens since, since $c_l = 0$. The effect of domestic productivity risk will be larger on the PCH constraint since it is amplified by p_h rather than p_l. In the case we study in section 3.1, there is no slope on the PC constraints, so all marginal firms will have the same productivity π, and the constraints will shift in a parallel way and remain horizontal.

Now consider the case where $s \neq z$, which only makes sense when the entrepreneurs promises more effort than he is willing to deliver, hence $s = l$ and $z = h$. In this case, the term that accompanies the international credit risk random variable ν_r is $(p_l p_h^{-1}(1-k)+k)$ which is smaller than 1. Hence the effect of interest rate risk on EU(h,l) is smaller than the effect either on EU(h,h) or EU(l,l) (remember, they are the same). The difference between these amplifications will increase as the technological importance of effort increases. The implication is that the ICH constraint tightens (since EU(h,h) falls more than EU(h,l)), but less than the PCH or PCL constraints.

Another difference is that these constraints are not amplified by the level of k while the effect on EU(h,l) is. This means that for higher k, EU(h,l) falls more relative to EU(h,h) and hence the PCH constraint will tighten less. Since $\lim_{k\to 1}(p_l p_h^{-1}(1-k)+k)=1$ the ICH constraint will, in fact, pivot on $k=1$ as the interest rate risk amplifies, while the PCH and PCL constraints will tighten in a parallel way.

Consider now the effect of the amplification of the domestic productivity shock ν_w. The amplified risk will be larger if high effort is chosen, also if productivity of the firms is higher. Hence, all three constraints will increase their slope, the PCH constraint will tighten more than the PCL, and the ICH constraint will tighten less than the PCH constraint since the fall in EU(h,h) is, in this case, ameliorated by the fall in EU(l,h).

A-2.2 Effect of Size on ICH with non proportional effort and fines.

Consider the ICH constraint of equation array (**??**). The effect on π_{ich} of an increase in size ϕ is:

$$\frac{\partial \pi_{ich}}{\partial \phi} = \frac{r p_h^{-1} k - (c - fq)(p_h - p_l)^{-1}}{W\phi^2} \tag{50}$$

it is only positive if $k \geq \left(\frac{c-fq}{r}\right)\left(\frac{p_h}{p_h - p_l}\right)$, a point that we have labeled $\breve{k}$ and does not change with ϕ. Hence, above $\breve{k}$ the constraint will tighten, and below it will loosen. Now compare $\breve{k}$ to $\bar{k}$ of equation (**??**) retyped here:

$$\bar{k} = \left(\frac{c}{r}\right)\left(\frac{p_l}{p_h - p_l}\right) - \left(\frac{fq}{r}\right)\left(\frac{p_h}{p_h - p_l}\right)$$

hence, the ICH constraint will only tighten with size for entrepreneurs that are participation constrained.

A-3 Firm Flow Data Set

The data set of section 1.3 is composed of all firms that have filed in tax forms between the years 1999 through 2004. The Internal Revenue Service (IRS) has doted them with fictitious identities that are consistent through time. Firms that do not fill in tax forms are assumed to have ceased to exist. Legally, the IRS keeps them active for three years in case their legal identities have been traded and are to be reused in

Table A-3.2: 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%

other context. We count as a dead firm a firm that either reports no sales or does not report at all. According to this criterium, the general flows of the database are represented in the following table:

Table A-3.1: Firm Flows by Year

From	To	Created	Survived	Destroyed
1999	2000	51,565	629,877	42,170
2000	2001	38,905	639,451	64,356
2001	2002	39,711	653,977	46,172
2002	2003	80,946	630,875	43,520
2003	2004	43,297	630,933	60,539

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 disaggregates 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: 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 A.2.2 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).

A-4 Complete Tables and Figures for Probits and Tests

Table A-4.3: Preferred Probit Regressions Over Existing Firms: Probability of Destruction, Extended Table

	full panel	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
π	-6.13%	-5.53%	-7.09%	-6.56%	-5.65%	-6.07%
	(0.08%)***	(0.18%)***	(0.20%)***	(0.21%)***	(0.18%)***	(0.18%)***
$1-k$	-0.00%	0.29%	-0.28%	0.10%	0.13%	-0.12%
	(0.06%)	(0.12%)**	(0.13%)**	(0.15%)	(0.13%)	(0.12%)
ϕ	-2.23%	-2.02%	-2.67%	-2.33%	-2.02%	-2.20%
	(0.01%)***	(0.02%)***	(0.02%)***	(0.02%)***	(0.02%)***	(0.02%)***
Dsc	2.40%	2.39%	3.45%	2.71%	1.28%	2.32%
$(forestry)$	(0.36%)***	(0.74%)***	(0.93%)***	(0.87%)***	(0.69%)**	(0.83%)***
Dsc	2.73%	1.26%	2.99%	2.97%	3.48%	2.98%
$(fishing)$	(0.53%)***	(1.05%)	(1.29%)*	(1.26%)*	(1.14%)***	(1.15%)**
Dsc	4.29%	3.29%	6.34%	3.81%	5.06%	3.79%
$(mining)$	(0.72%)***	(1.37%)**	(1.91%)***	(1.70%)*	(1.60%)***	(1.56%)**
Dsc	-0.05%	-0.10%	-0.37%	-0.16%	-0.31%	-0.14%
$(manufacturing)$	(0.14%)	(0.32%)	(0.38%)	(0.35%)	(0.28%)	(0.31%)
Dsc	1.84%	1.21%	5.45%	0.48%	1.41%	1.52%
$(utilities)$	(0.63%)***	(1.34%)	(2.15%)***	(1.33%)	(1.17%)	(1.27%)
Dsc	3.82%	3.15%	4.42%	4.06%	3.65%	4.01%
$(construction)$	(0.22%)***	(0.48%)***	(0.58%)***	(0.54%)***	(0.45%)***	(0.49%)***
Dsc	-1.06%	-1.44%	-1.94%	-2.01%	-1.98%	-1.93%
$(commerce)$	(0.13%)***	(0.29%)***	(0.33%)***	(0.32%)***	(0.26%)***	(0.28%)***
Dsc	1.93%	1.63%	2.17%	1.88%	1.87%	2.23%
$(services)$	(0.15%)***	(0.33%)***	(0.38%)***	(0.36%)***	(0.30%)**	(0.33%)***
t_{2000}	0.68%	.	.	.	.	.
	(0.06%)***	.	.	.	.	.
t_{2001}	0.31%	.	.	.	.	.
	(0.06%)***	.	.	.	.	.
t_{2002}	-0.04%	.	.	.	.	.
	(0.06%)	.	.	.	.	.
t_{2003}	-2.23%	.	.	.	.	.
	(0.01%)***	.	.	.	.	.
Obs.	938,561	206,727	174,049	189,510	191,384	176,895
LogPLike	-199066.85	-41440.224	-37193.162	-42660.072	-39368.965	-38050.662
Pseudo R2	0.2095	0.2099	0.2464	0.2026	0.2018	0.1910

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 3: Dummy for micro firms, $Dsz(micro)$ has been dropped.

Table A-4.4: Preferred Least Squares Regressions Over Collapsed Panels: Amount of Creation, Extended Table

	full panel	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
π	-6.14	-1.05	-1.11	-1.10	-1.25	-1.21
	(0.27)***	(0.06)***	(0.07)***	(0.06)***	(0.06)***	(0.06)***
$1-k$	-1.49	-0.41	-0.24	-0.46	-0.43	-0.49
	(0.24)***	(0.05)***	(0.07)***	(0.05)***	(0.05)***	(0.05)***
ϕ	-12.80	-2.24	-2.48	-2.12	-2.33	-1.94
	(0.60)***	(0.15)***	(0.15)***	(0.12)***	(0.13)***	(0.12)***
Dsc	-3.40	-0.06	-0.18	-0.15	-0.27	-0.07
$(agriculture)$	(2.03)*	(0.04)	(0.05)***	(0.05)**	(0.05)***	(0.05)
Dsc	-2.54	0.17	0.43	0.22	0.18	0.15
$(forestry)$	(2.07)	(0.11)	(0.16)*	(0.11)*	(0.11)	(0.13)
Dsc	-0.94	0.73	0.81	0.73	0.36	0.42
$(fishing)$	(2.04)	(0.19)***	(0.22)***	(0.16)***	(0.17)**	(0.15)*
Dsc	-2.59	0.07	0.35	0.20	0.20	0.10
$(mining)$	(2.00)	(0.21)	(0.24)	(0.22)	(0.21)	(0.29)
Dsc	-2.82	0.11	-0.02	0.05	0.03	0.05
$(manufacturing)$	(2.03)	(0.02)***	(0.03)	(0.03)*	(0.02)	(0.03)
Dsc	-2.79	0.48	0.31	0.25	-0.55	-0.21
$(utilities)$	(2.08)	(0.25)	(0.27)	(0.23)	(0.21)*	(0.30)
Dsc	-2.74	0.13	0.16	0.26	0.27	0.24
$(construction)$	(2.02)	(0.02)***	(0.03)***	(0.03)***	(0.03)***	(0.02)***
Dsc	-3.00	-0.04	-0.12	-0.03	-0.05	-0.03
$(commerce)$	(2.02)	(0.00)***	(0.01)***	(0.01)**	(0.01)***	(0.01)***
Dsc	-2.80	0.13	0.05	0.15	0.11	0.11
$(services)$	(2.02)	(0.01)***	(0.01)***	(0.01)***	(0.01)***	(0.01)***
t_{2000}	-0.24	.	.	.	.	.
	(0.04)***	.	.	.	.	.
t_{2001}	0.04	.	.	.	.	.
	(0.04)	.	.	.	.	.
t_{2002}	-0.05	.	.	.	.	.
	(0.02)*	.	.	.	.	.
t_{2003}	-0.03	.	.	.	.	.
	(0.02)	.	.	.	.	.
Obs.	1,000	1,000	1,000	1,000	1,000	1,000
LogLike	-4305.75	-2987.63	-3070.15	-2976.80	-3000.91	-3005.87
R2	0.7739	0.5972	0.6092	0.6657	0.6479	0.6318

Note 1: Effect of increasing a decile on amount of creation, standard error in parenthesis.
Note 2: * is 90% significance, ** is 95% significance,*** is 99% significance.
Note 3: Dummy for micro firms, $Dsz(micro)$ has been dropped.

Table A-4.5: Preferred Least Squares Regressions Over Existing Firms: Sales Performance, Extended Table

	full panel	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004
π	3.38%	3.35%	3.38%	3.08%	3.34%	3.40%
	(0.41%)***	(0.09%)***	(0.10%)***	(0.09%)***	(0.09%)***	(0.08%)***
$1-k$	0.30%	0.26%	0.31%	0.29%	0.33%	0.38%
	(0.22%)***	(0.04%)***	(0.05%)***	(0.05%)***	(0.05%)***	(0.04%)***
ϕ	0.71%	0.76%	0.80%	0.71%	0.48%	0.86%
	(0.00%)***	(0.01%)***	(0.01%)***	(0.01%)***	(0.01%)***	(0.01)***
Dsc	-1.48%	-2.06%	-1.17%	-0.87%	-1.48%	-1.65%
$(fishing)$	(0.12%)***	(0.27%)***	(0.27%)***	(0.24%)***	(0.26%)***	(0.28%)***
Dsc	-1.30%	-0.93%	-1.37%	-1.24%	-1.46%	-1.49%
$(mining)$	(0.15%)***	(0.34%)***	(0.36%)***	(0.33%)***	(0.35%)***	(0.29%)***
Dsc	-2.12%	-2.45%	-2.71%	-1.66%	-2.49%	-1.19%
$(manufacturing)$	(0.21%)***	(0.41%)***	(0.58%)***	(0.45%)***	(0.50%)***	(0.46%)**
Dsc	0.31%	0.17%	1.42%	0.43%	0.51%	0.25%
$(fishing)$	(0.05%)***	(0.11%)	(0.13%)	(0.12%)***	(0.13%)***	(0.12%)**
Dsc	-0.00%	0.66%	-0.91%	0.30%	-0.40%	0.41%
$(utilities)$	(0.18%)	(0.34%)*	(0.45%)**	(0.41%)	(0.40%)	(0.37%)
Dsc	-2.27%	-2.82%	-2.43%	-2.16%	-1.83%	-2.12%
$(construction)$	(0.06%)***	(0.13%)***	(0.14%)***	(0.13%)***	(0.14%)***	(0.13%)***
Dsc	1.19%	1.03%	1.08%	1.26%	1.32%	1.20%
$(commerce)$	(0.05%)***	(0.10%)***	(0.11%)***	(0.11%)***	(0.11%)***	(0.10%)***
Dsc	0.25%	-0.29%	-0.47%	-0.25%	-0.08%	-0.19%
$(services)$	(0.05%)***	(0.11%)***	(0.12%)***	(0.11%)**	(0.12%)	(0.11%)*
t_{2000}	0.15%	.	.	.	.	.
	(0.02%)***	.	.	.	.	.
t_{2001}	0.28%	.	.	.	.	.
	(0.02%)***	.	.	.	.	.
t_{2002}	0.18%	.	.	.	.	.
	(0.02%)***	.	.	.	.	.
t_{2003}	0.18%	.	.	.	.	.
	(0.02%)***	.	.	.	.	.
Obs.	862,798	192,249	159,782	174,075	174,119	162,573
LogLike	969933.25	219258.79	179237.31	196236.78	193210.28	182696.50
R2	0.0589	0.0667	0.0652	0.0585	0.0409	0.0786

Note 1: Effect of variable on sales growth, standard error in parenthesis.
Note 2: * is 90% significance, ** is 95% significance,*** is 99% significance.
Note 3: Dummy for micro firms, $Dsz(micro)$ has been dropped.

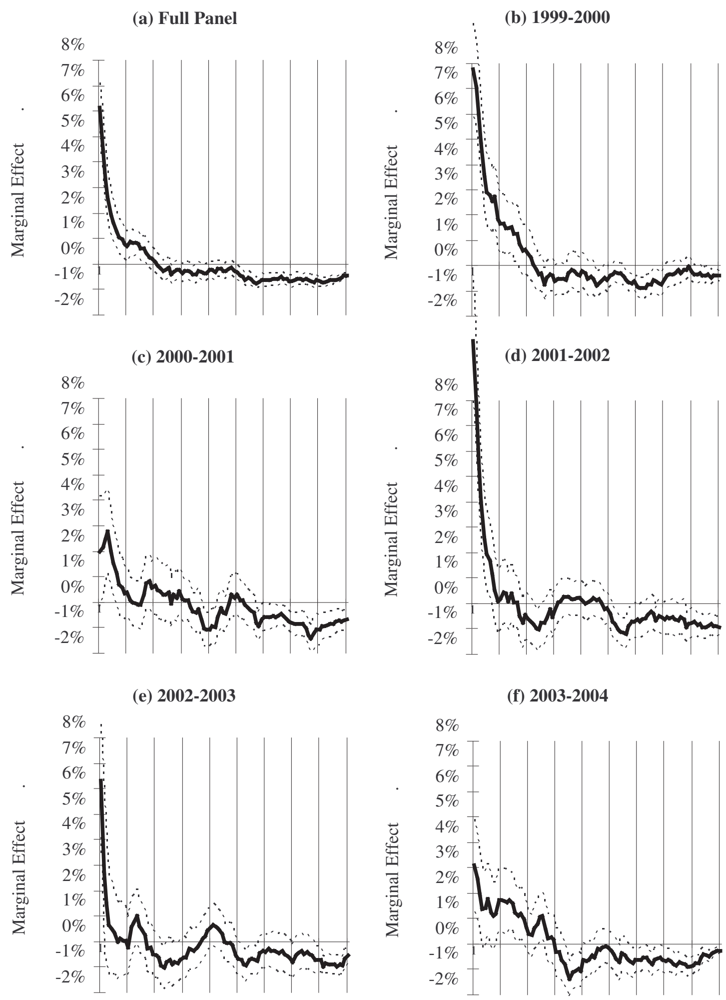

Figure A-4.2: Marginal Effect of $1 - k$ on the probability of default

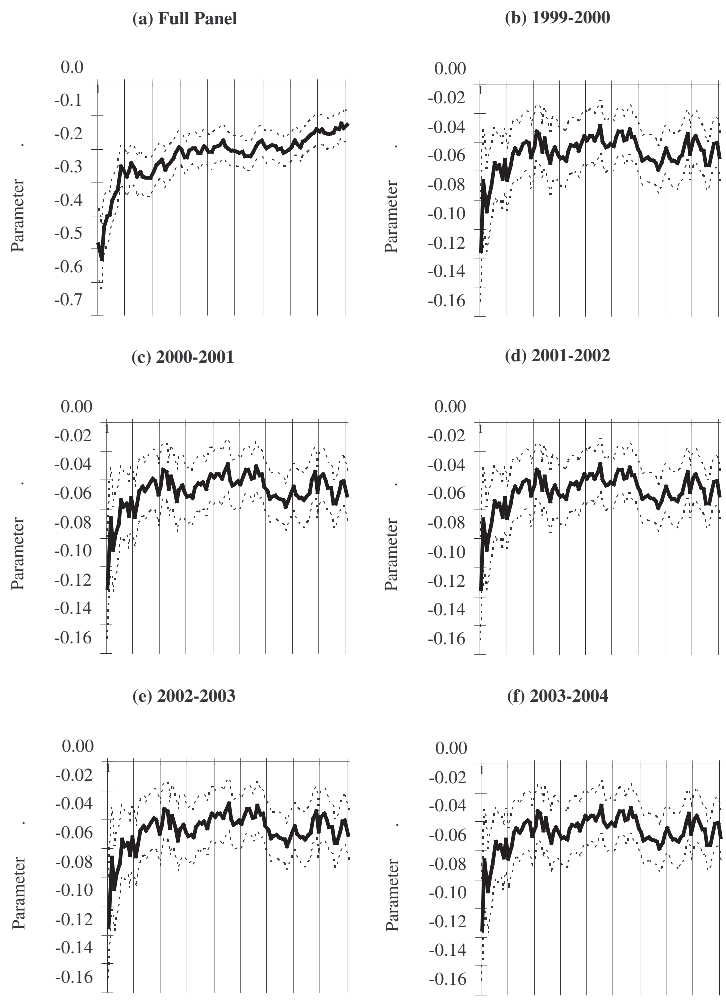

Figure A-4.3: Marginal Effect of $1-k$ on creation

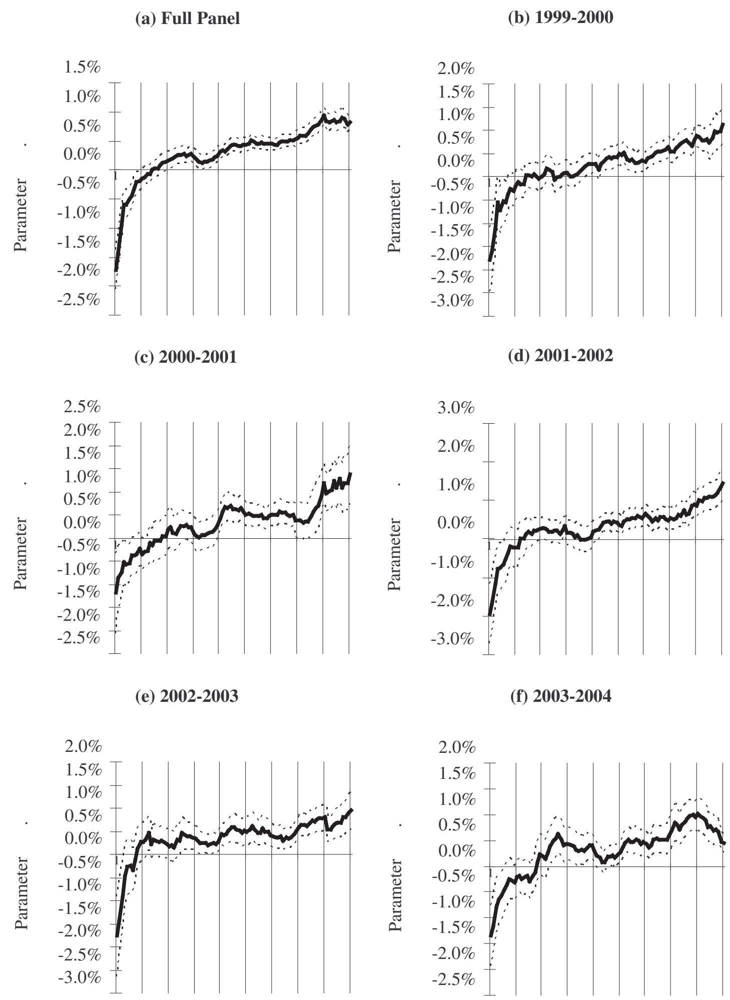

Figure A-4.4: Marginal Effect of $1 - k$ on performance

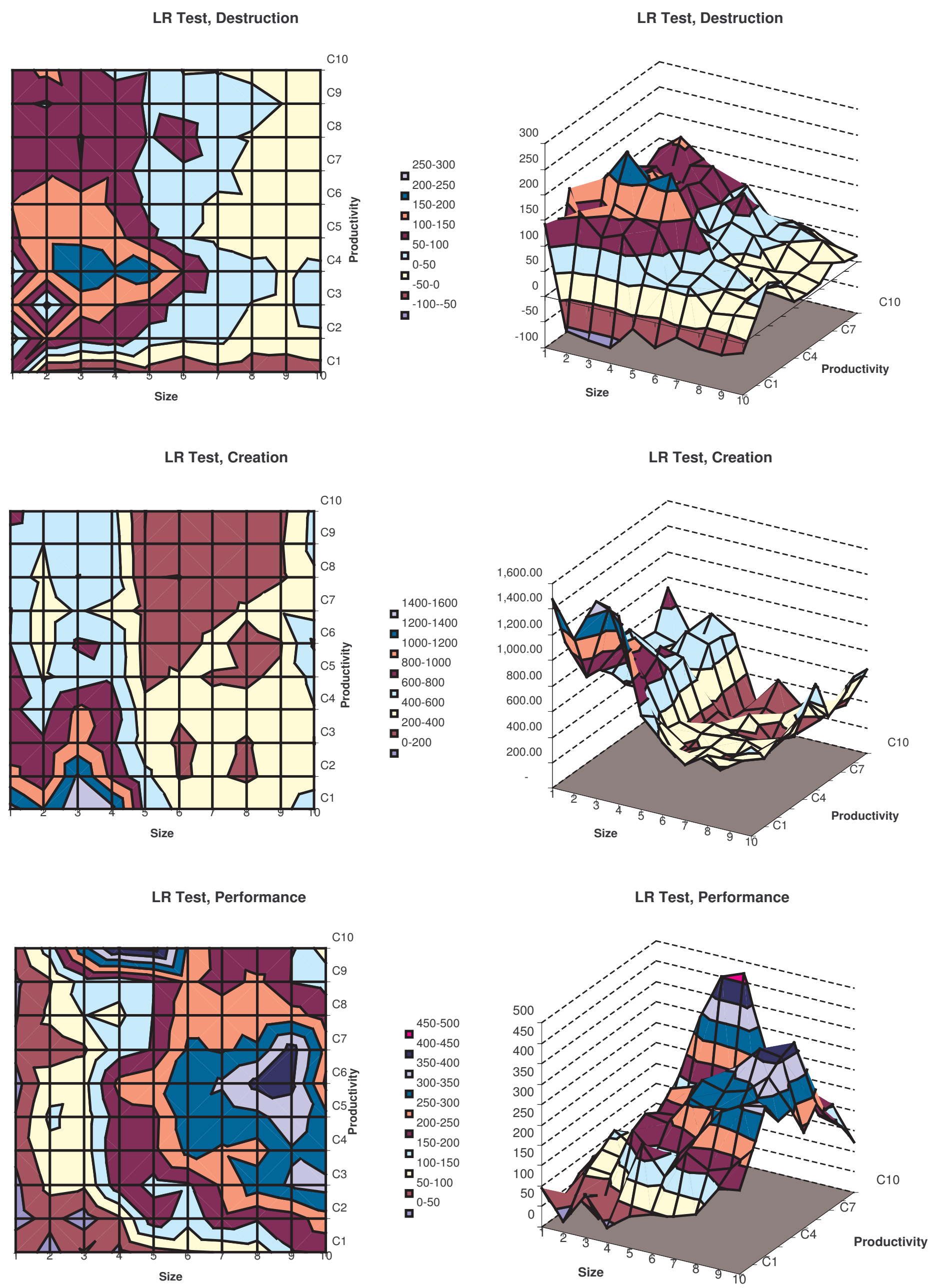

Figure A-4.5: LR Tests for 10×10 grid on the $\{\phi,\pi\}$ space

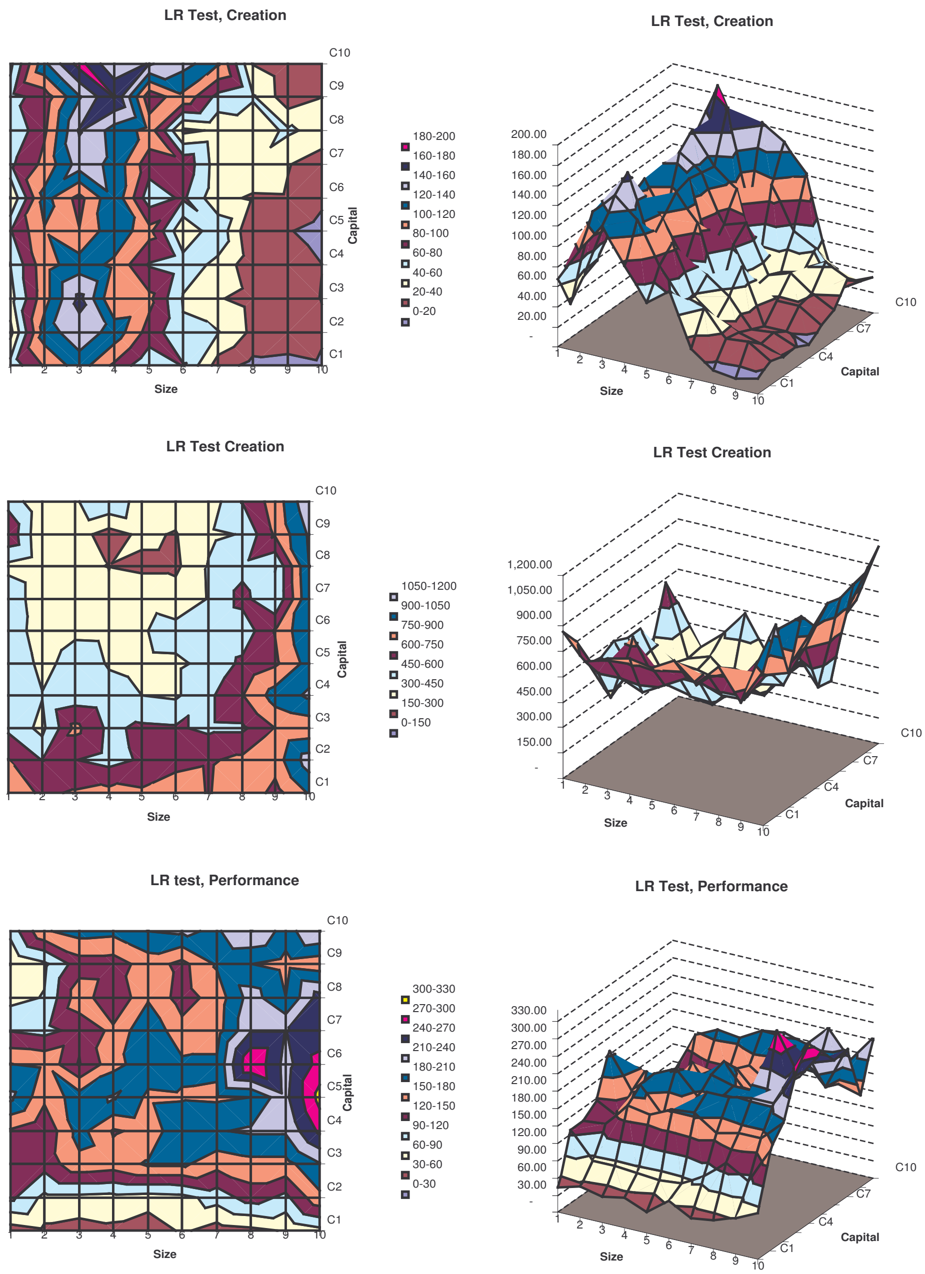

Figure A-4.6: LR Tests for 10×10 grid on the $\{\phi,k\}$ space

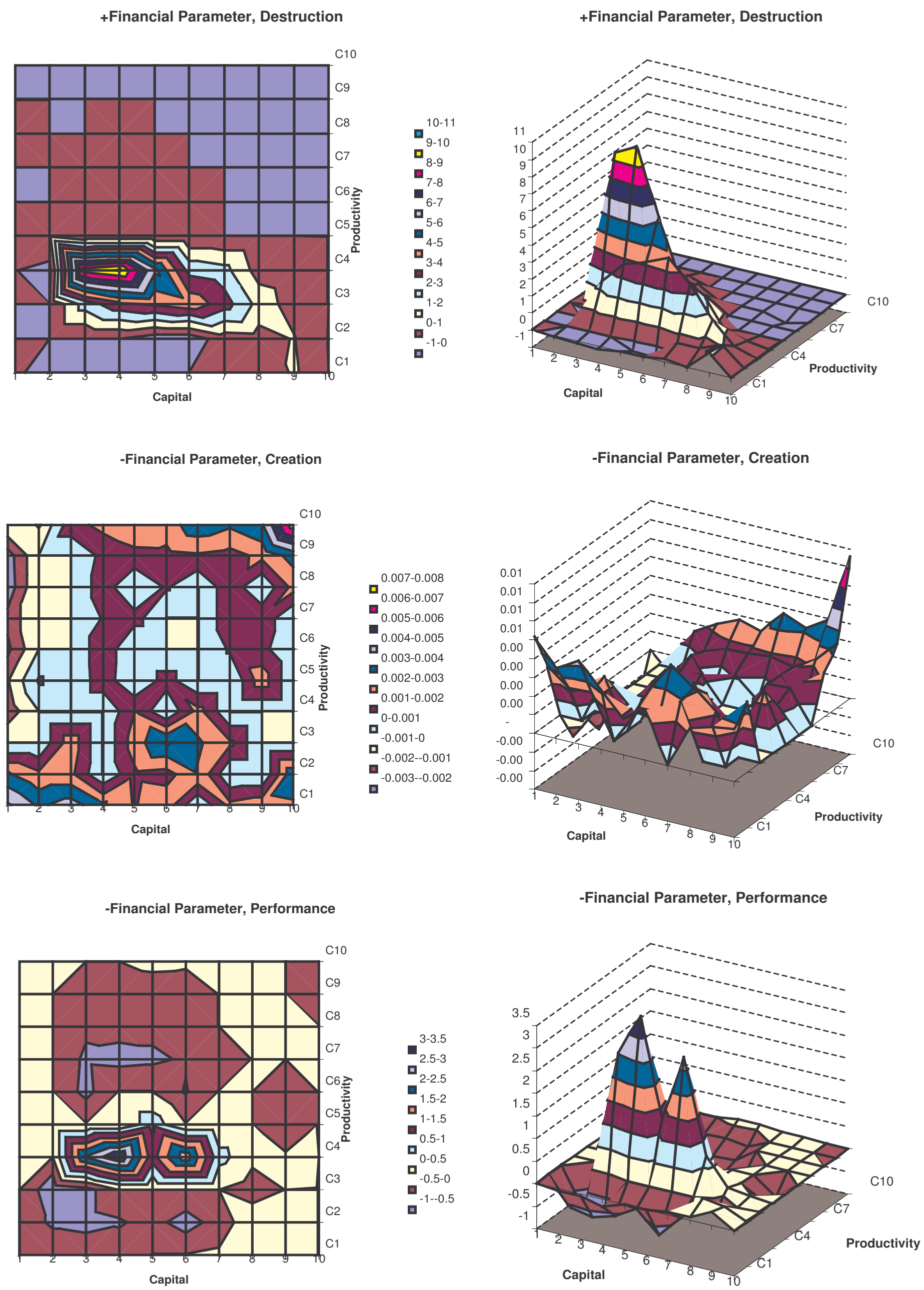

Figure A-4.7: $1-k$ parameter for 10×10 grid on the $\{k,\pi\}$ space

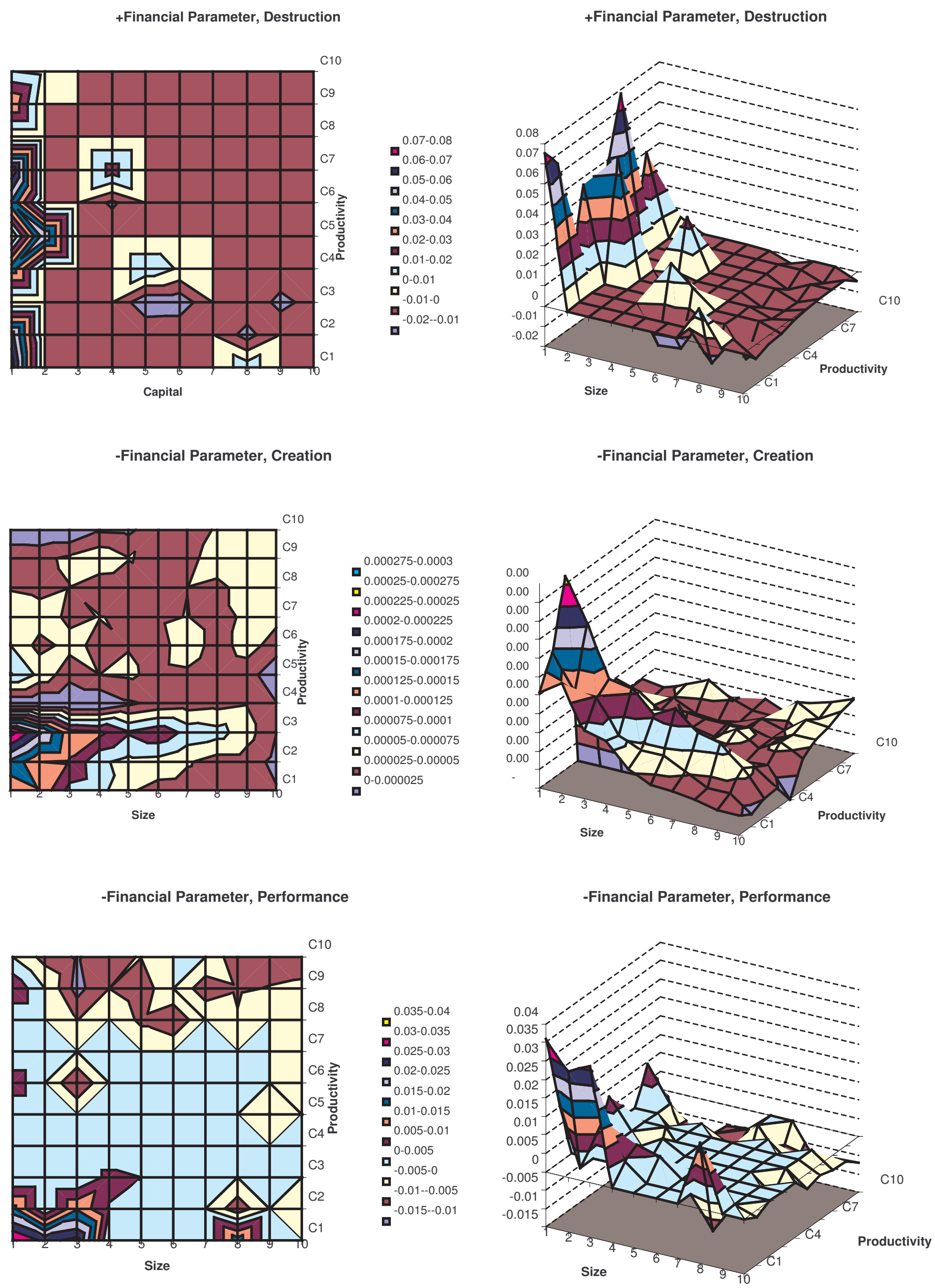

Figure A-4.8: $1-k$ parameter for 10×10 grid on the $\{\phi,\pi\}$ space

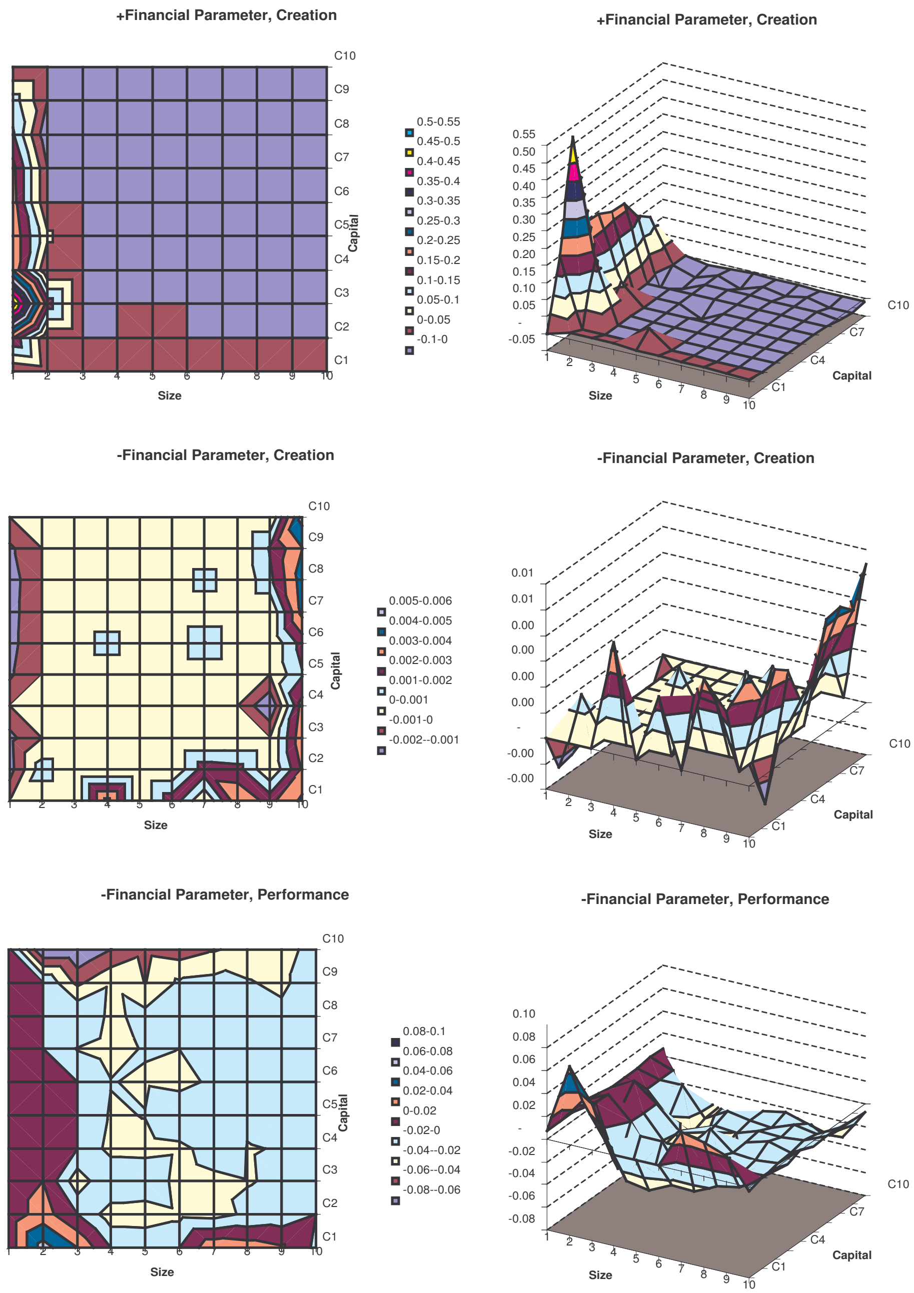

Figure A-4.9: $1-k$ parameter for 10×10 grid on the $\{\phi, k\}$ space

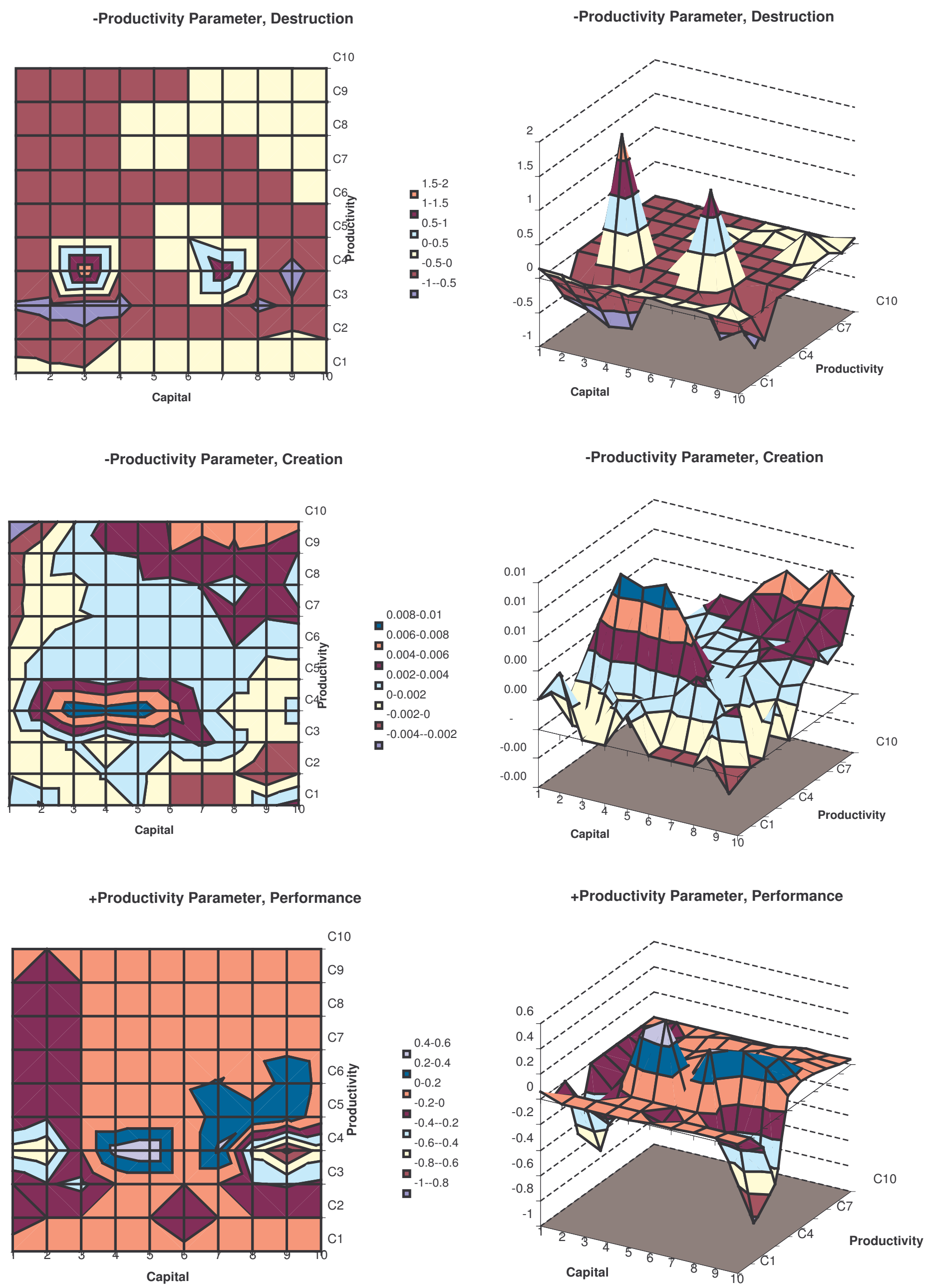

Figure A-4.10: π parameter for 10×10 grid on the $\{k,\pi\}$ space

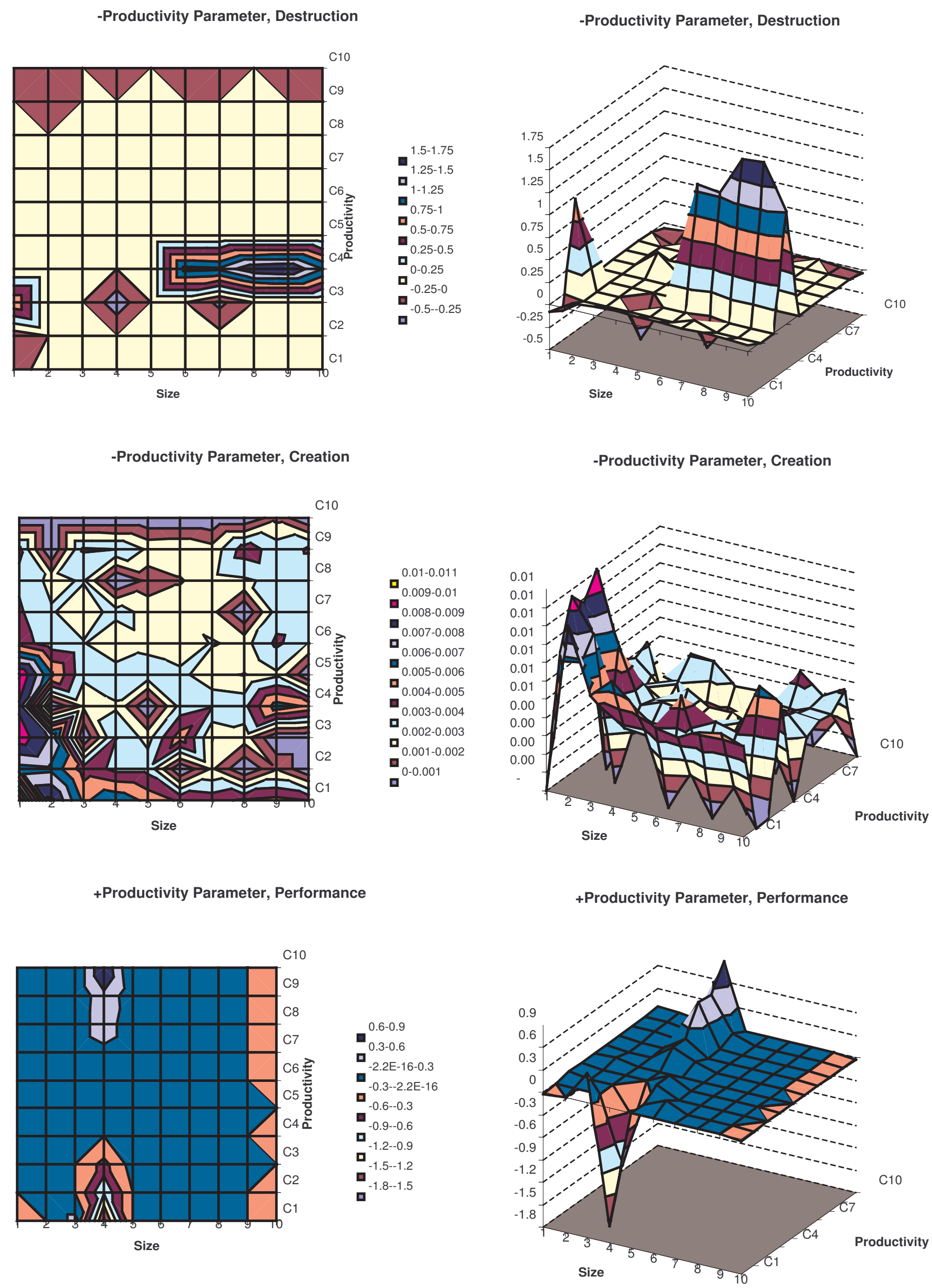

Figure A-4.11: π parameter for 10×10 grid on the $\{\phi,\pi\}$ space

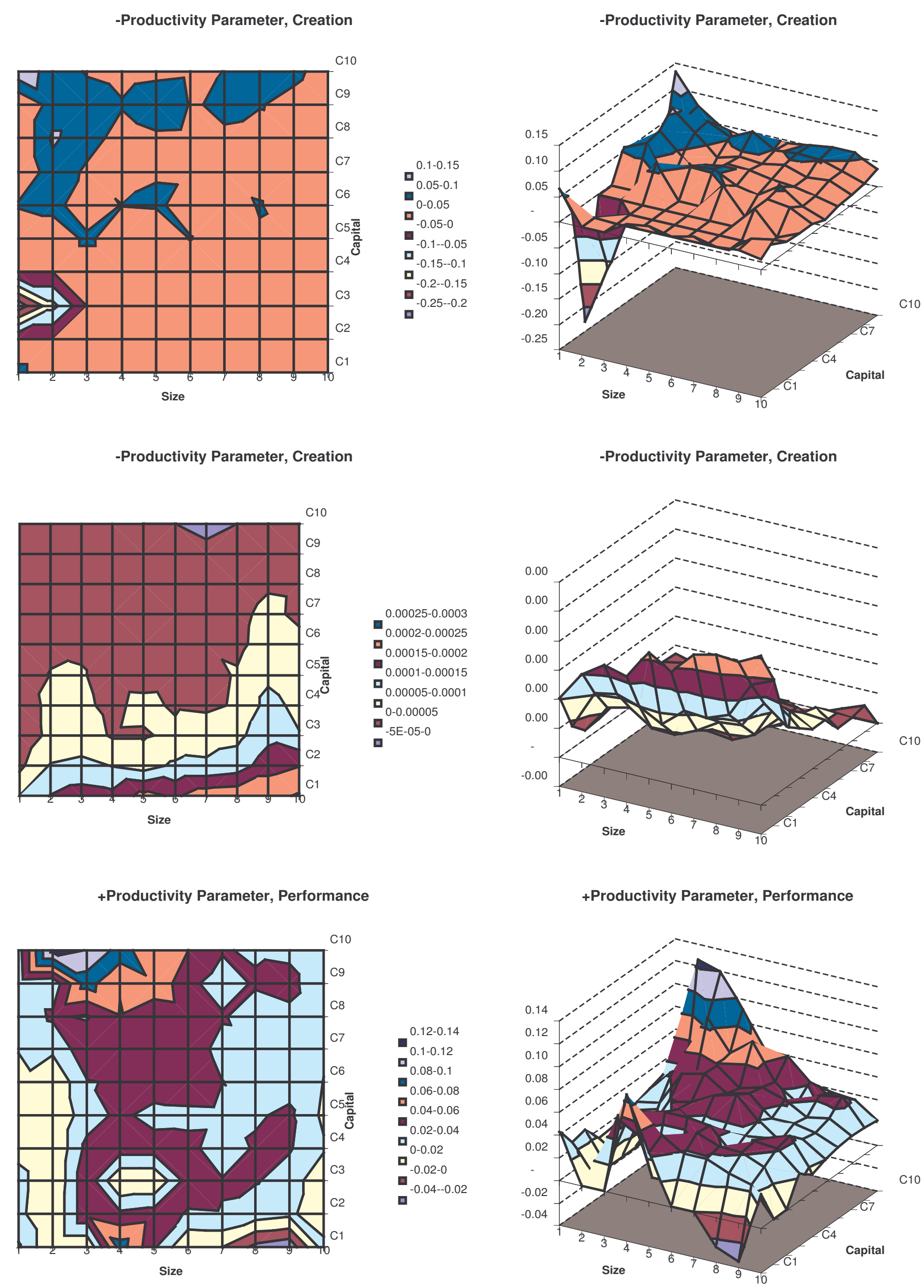

Figure A-4.12: π parameter for 10×10 grid on the $\{\phi,k\}$ space

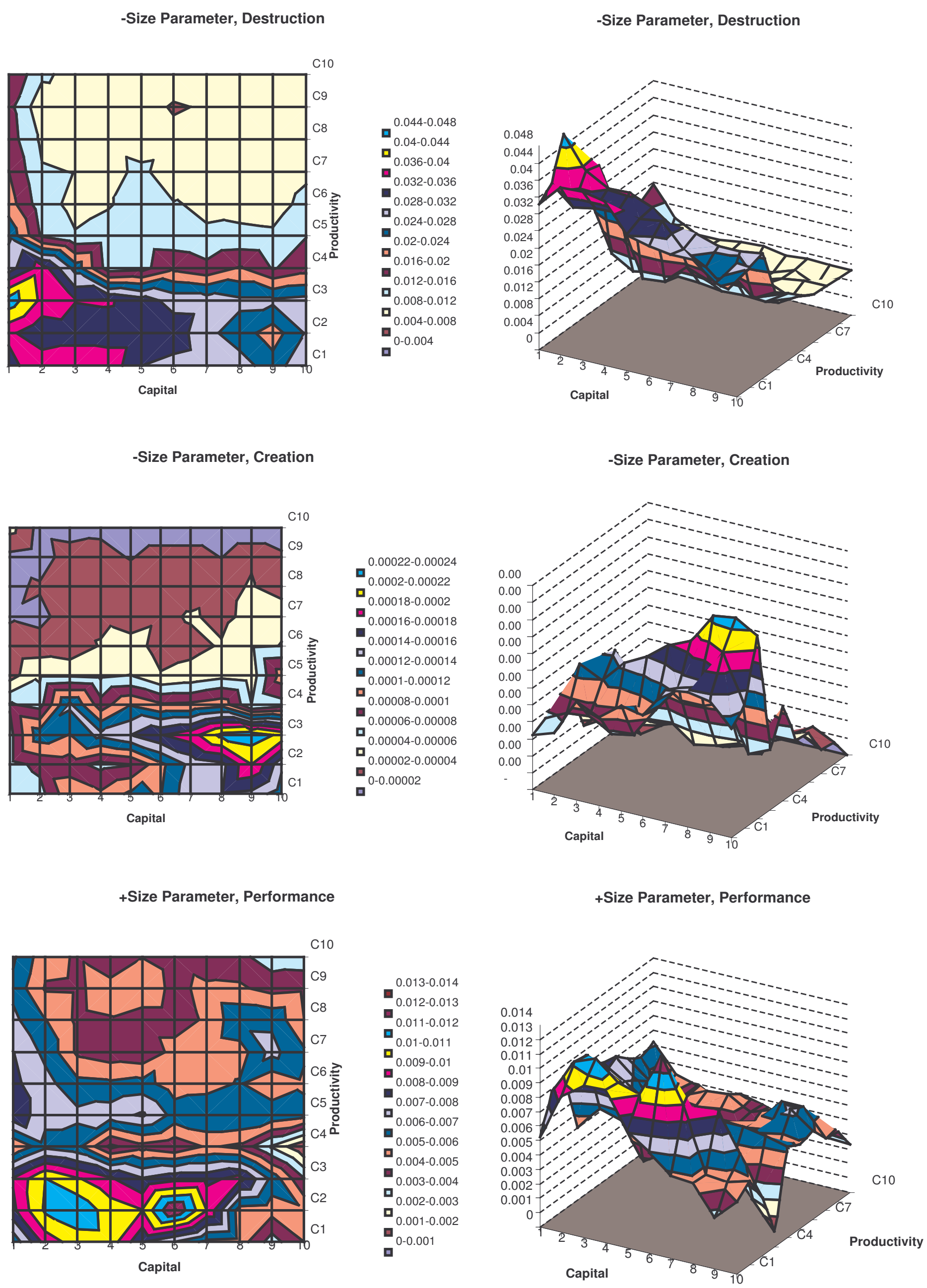

Figure A-4.13: ϕ parameter for 10×10 grid on the $\{k,\pi\}$ space

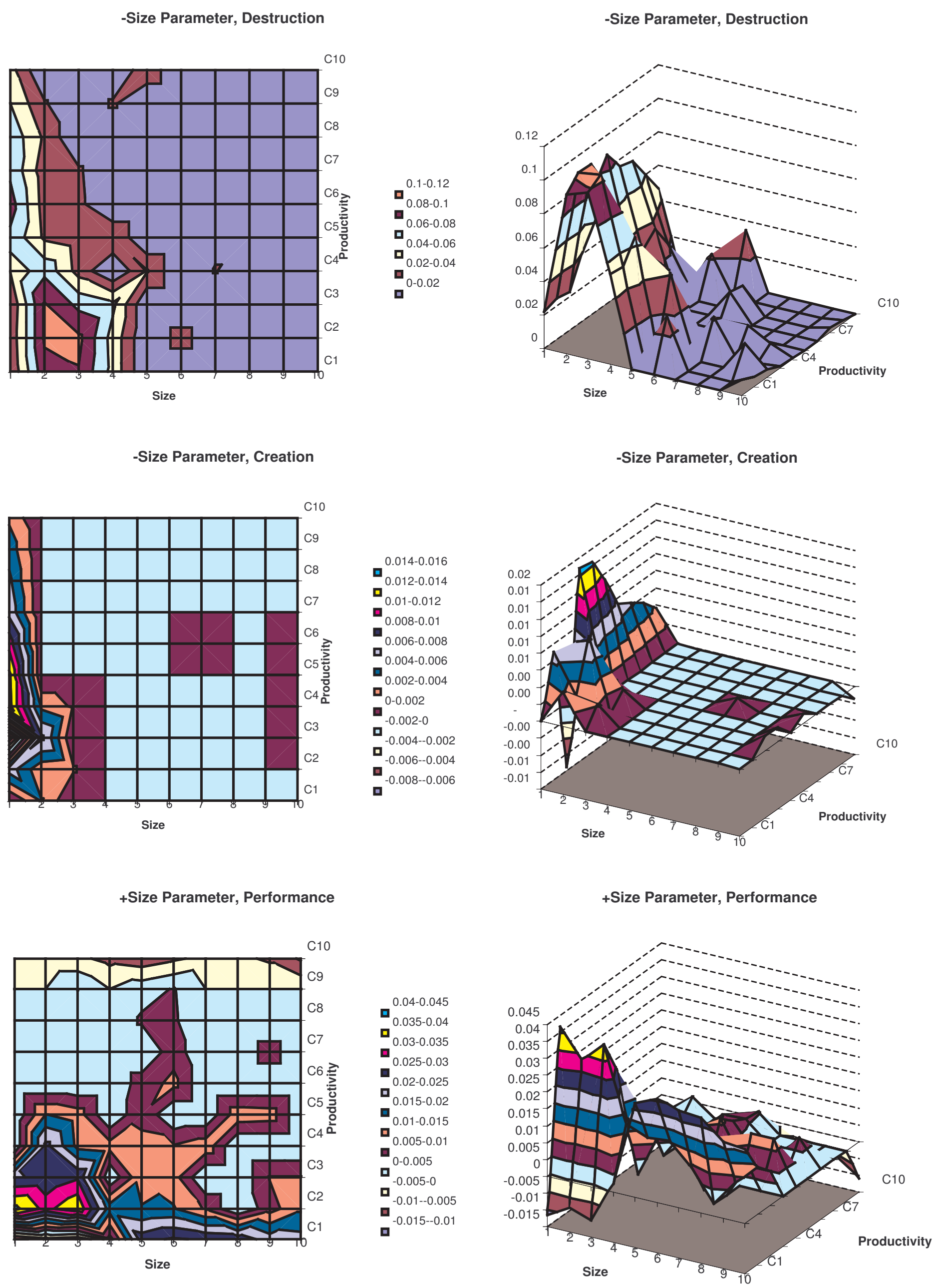

Figure A-4.14: ϕ parameter for 10×10 grid on the $\{\phi,\pi\}$ space

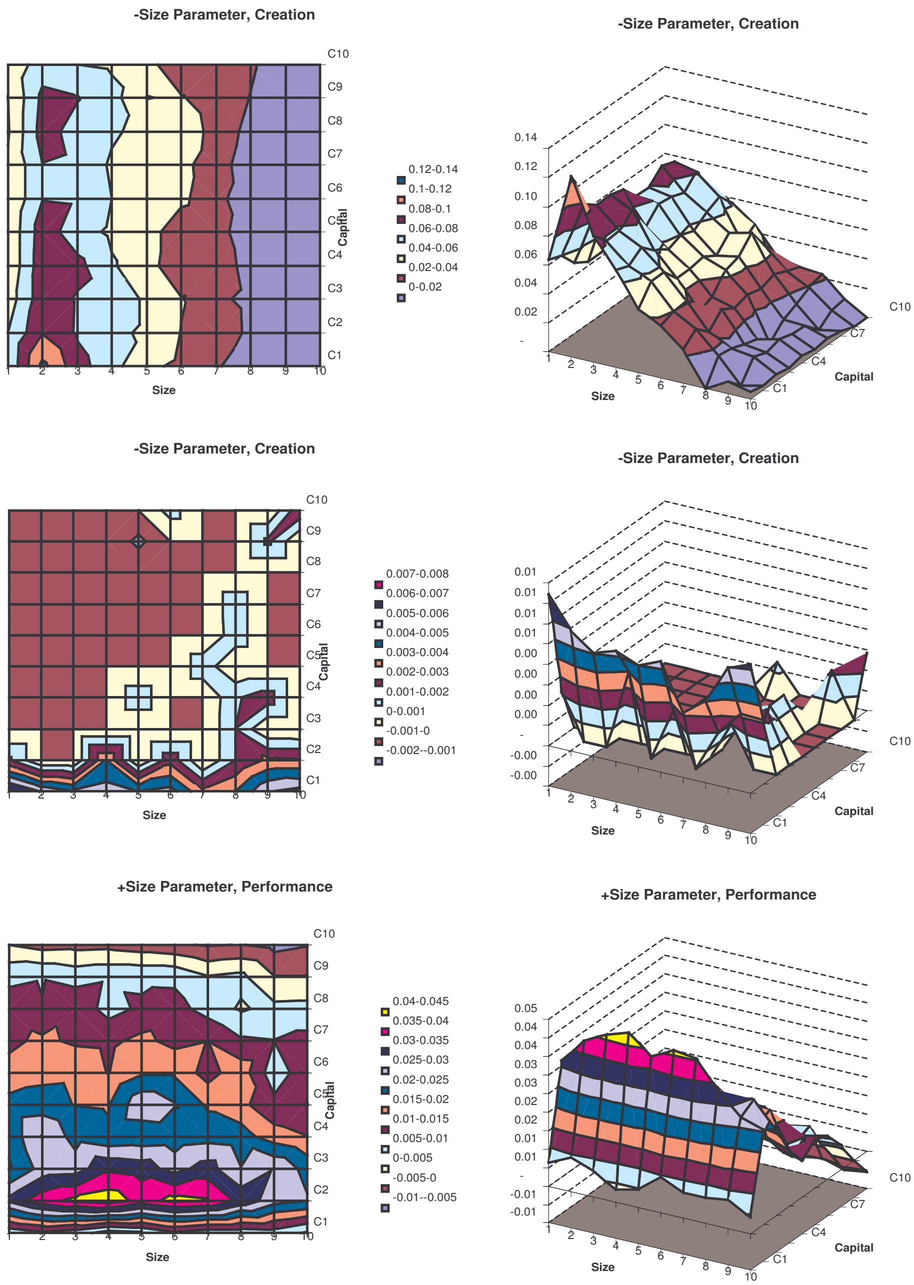

Figure A-4.15: ϕ parameter for 10×10 grid on the $\{k,\pi\}$ space