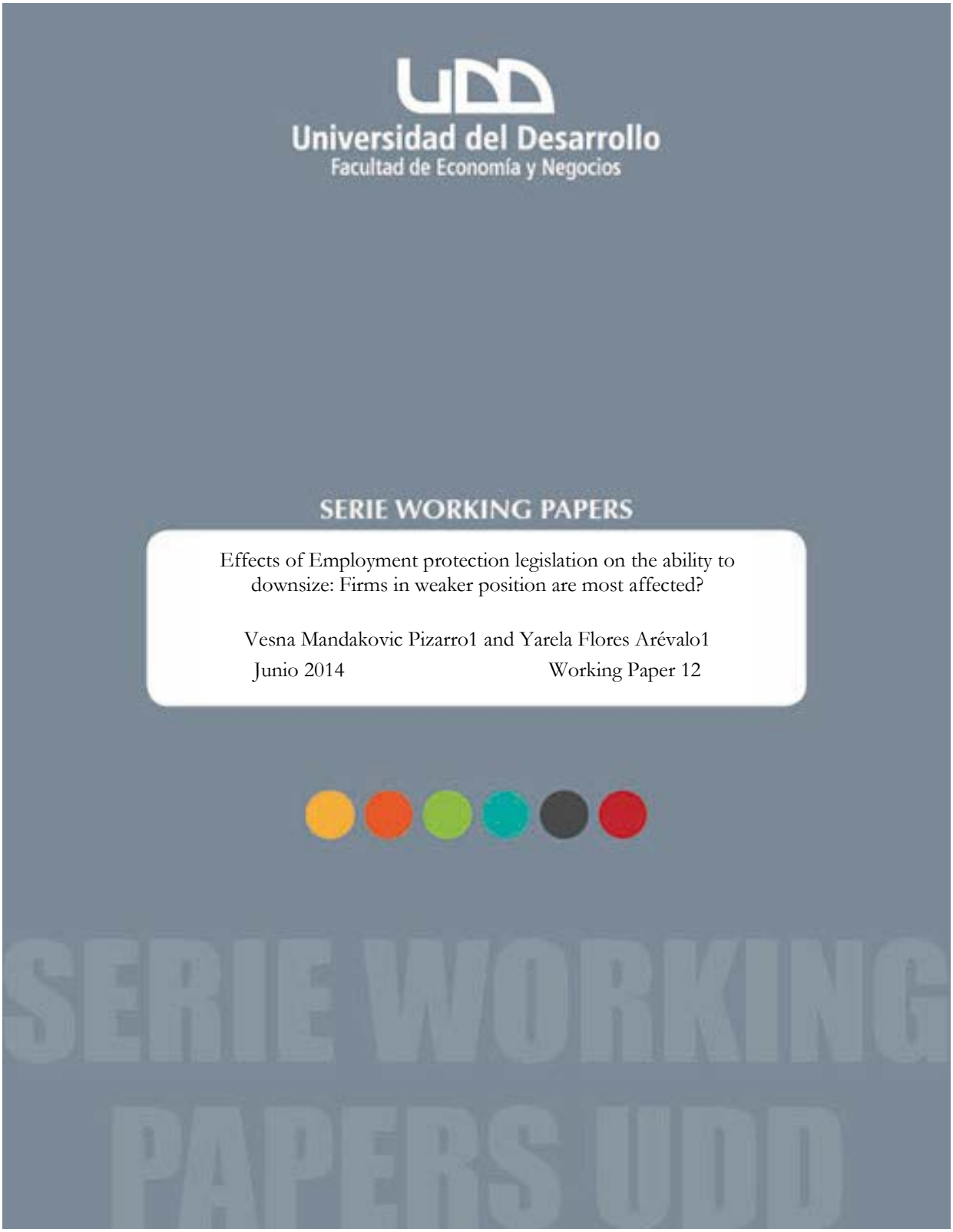
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Effects of Employment protection legislation on the ability to downsize: Firms in weaker position are most affected?
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Abstract

The research on downsizing has focused either on the causes or on the effects of downsizing on firms' performance. This paper empirically investigates how the interaction between increasing employment protection legislation (EPL) and firms' attributes affects downsizing decisions, our hypothesis are founded in the fact that the negative effect of EPL in downsizing can be attenuated or enhanced in the presence of heterogeneous attributes of firms. We estimate the likelihood of labor downsizing at firm level using a panel data of manufacturing firms in Chile between 1980 and 1994. We find evidence that on average, an increase in the EPL index of one point, as in the Chilean economy the year 1984, reduces as expected the probability of downsizing by 0.202 percentage points. But this effect is not homogenous among firms; we also found that firms with weaker positions (less TFP, higher labor wedges, less skilled intensive and facing negative demand conditions) will have a lower cut off level of "resistance" of doing downsizing even though the firing costs increase. This implies that the more vulnerable firms are downsizing anyway, which means that less efficient firms or firms that have higher wedges, undertake downsizing to improve firm performance through reduction in employees. In other words this firms tend to be more inelastic to changes in EPL, and therefore pay most part of this "labor tax". These findings expand the current understanding of EPL and its effects on firm practices, such as downsizing in an emerging economy.

Keywords: Employment protection legislation, Labor, Downsizing, Firm heterogeneity, Developing economies

JEL: M21; M5; J88; J63; J24

1. Introduction

In the 20th century, employment protection legislation (EPL) was put in place to protect the interests of workers worldwide. During the early 1980s, successive reforms extended EPL, and the subsequent debt crisis led to more pro-liberalization economic policies that relaxed employment protection. As a result, less developed economies have more stringent labor protection laws than industrialized countries. In fact, Latin American economies are among the most protected, surpassed only by Eastern Europe and Central Asia (Heckman *et al*. 2000; Pagés 2004).

From an empirical and theoretical point of view, employment protection legislation unambiguously reduces job destruction and job creation (Mortensen *et al*. 1994, Bertola, 1992, Kugler *et al*. 2003, Bentolila *et al*. 1990). The effects of higher firing costs on firms' management strategies are less studied, in particular firms with downsizing decisions.

Formally, downsizing is defined as "an intentional event involving a range of organizational policies and actions undertaken to improve firm performance through reduction in employees" (Datta *et al*. 2010).[1] The main purpose of this practice is to reduce costs associated with employment and improving productivity (Cameron *et al*. 1993).

One of the restrictions firms face when attempting to downsize is EPL. The essence of this regulation is to increase the stability of employment, generating firing costs to firms in the form of severance payments. Autor *et al.* (2007) argue that "dismissal protections altered short-run production choices and caused employers to retain unproductive workers, leading to a reduction in technical efficiency." Therefore, due to the presence of EPL, firms face a trade-off between productivity gains from workforce reorganization and firing costs. The firm will downsize if the productivity gains associated with this practice make up for the firing costs.

The research on downsizing has focused either on the causes or on the effects of downsizing on firms' performance. This paper belongs to the former branch of the literature, specifically to the one that emphasizes environmental factors, such as demands in stability and growth, industry concentration, technological and capital intensity, and organizational factors (e.g., firm's governance, reputation, and managerial strategies).

The main contribution of this work is the analysis of how the interaction between increasing EPL and firms' attributes affects downsizing decisions, our hypothesis being based on the fact that the negative effect of EPL in downsizing can be attenuated or enhanced in the presence of heterogeneous attributes of firms (an issue that to the best of our knowledge has not been addressed by the literature so far). By doing so, this work expands the current understanding of EPL and its effects on firm practices, such as downsizing in an emerging economy.

Chile as an emerging economy is an interesting case to study. Job security legislation has experienced discrete changes over time, which makes easier to identify the effect of EPL on downsizing. Between 1981 and 1994 this economy experienced changes in job security legislation that tended to increase the cost of adjustment to all sectors of the economy, which helps in the identification of the firms' reaction towards stricter labor market regulation. Chilean EPL is high if compared across countries. Heckman *et al.* (2000), construct an index of job security at the end of the 90s, classifying Chile as number 29 in a ranking of 36 countries.

We will use panel data of manufacturing plants in Chile.[2] The dataset covers a 14-year

[1]This definition was presented by Datta *et al*. (2010), who review studies associated with downsizing in all disciplines (e.g., economics, finance, organizational behaviour, organization theory, human resources, and sociology)

[2] This database has been used by Cerda *et al*. (2010), Álvarez *et al.* (2003), Petrin *et al*. (2013), and Pavnick (2002), among other authors.

time period from 1980 to 1994, and includes 20 sectors at the three-digit level of the International Standard Industrial Classification (ISIC) code. We use this data because the empirical literature on downsizing, such as Coucke *et al.* (2007) for Belgian firms and Budros (2002) for U.S. firms, suggest that downsizing is more prevalent in manufacturing firms than in firms in other sectors.

Our preliminary findings are consistent with the idea that downsizing is a practice that differs from regular dismissals. Regular dismissals are basically driven by external market conditions, while downsizing depends on firms' particular long term characteristics, linked to productivity and efficiency.

We also find evidence for Chile that on average, an increase in the EPL index of one point, as in the Chilean economy in 1984, reduces as expected the probability of downsizing by 0.202 percentage points.[3] But this effect is not homogenous among firms. We also found that firms with weaker positions (less TFP, higher labor wedges, less skilled labor intensive, and facing negative demand conditions) will have a lower cutoff level of "resistance" to downsizing even though the firing costs increase. The level of competition in a given sector did not appear to attenuate or enhance the negative impact of EPL over the probability of downsizing.

The study is structured as follows. Section 2 examines the previous literature findings and the hypothesis. Section 3 presents the empirical analysis that discusses the institutional background, data, downsizing analyses, and the empirical model. In Section 4, we discuss our empirical findings; and Section 5 draws conclusions and implications.

2. Literature review and hypothesis

This paper studies the effects of EPL on the propensity of employee downsizing, which brings together two concepts traditionally analyzed separately in the literature: *downsizing* that is commonly analyzed in the field of management and the effect of *employment protection legislation (EPL)* at firm level decisions, analyzed in the field of economics. It is relatively natural to analyze these concepts together, higher firing costs will make the downsizing practice more expensive, and therefore could become a factor that reduces the propensity of downsizing.

Comprehensive surveys of the downsizing literature such as Datta *et al.* (2010) and Gandolfi *et al.* (2012) show that downsizing studies focus either on the causes (Item I Figure 1) or the consequences of downsizing on firms' performance (Item II, Figure 1). Our study belongs to the first branch of the literature: the factors that *cause* downsizing; EPL can be categorized as an environmental factor (Point 1 Figure 1) more precisely in the category "Changes in Legislation and Regulatory Frameworks."

[3] Employment protection measure, as elaborated by Pagés *et al.* (2007). Further explanation of the index is presented in Appendix 1.

Our main contribution is to analyze how EPL might affect heterogeneously the downsizing decision according to firms' characteristics. Therefore, as in Figure 1, we are constructing a bridge between environmental factors and firm level characteristics to explain downsizing causes. This focus, to the best of our knowledge, has not been addressed by the literature so far. By doing so, this work expands the current understanding of EPL and its effects on firm practices, such as downsizing in an emerging economy.

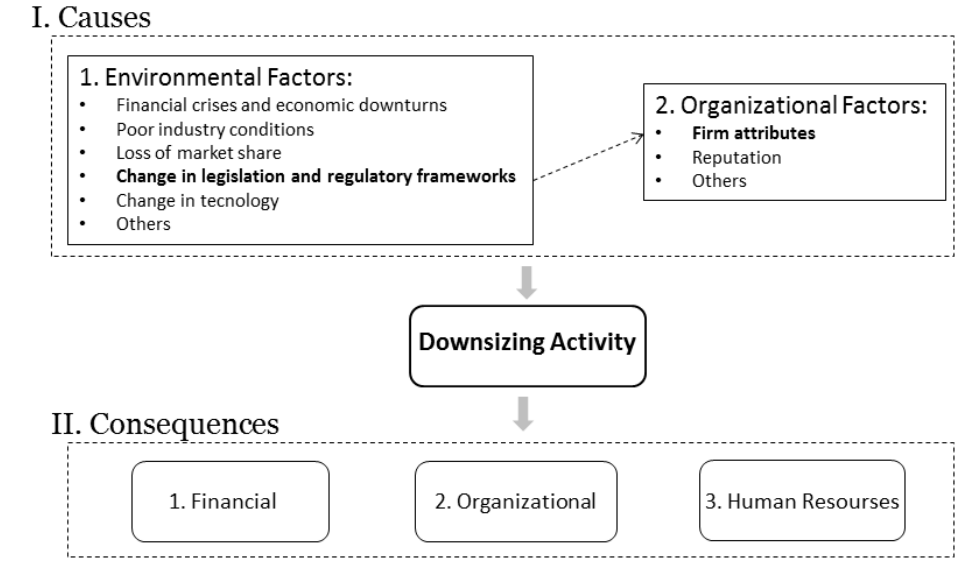

Figure 1. Causes and consequences of downsizing

The effects of firing costs on a firm's hiring and firing decisions in response to shocks was studied in the early 90's by Bentolila *et al.* (1990). The authors predict in a partial equilibrium context that firing costs reduce job turnover and volatility of employment, but EPL has ambiguous effects on employment. Hopenhayn *et al.* (1993), using a general equilibrium model, show that a tax on job destruction reduces the speed of workforce adjustment.

Empirical studies, with a cross country scope, proof that EPL reduces the ability of firms to adjust labor in response to shocks (Lafontaine *et al.* 2008; Caballero *et al.* 2010). Even more, Micco *et al.* (2006) show that EPL reduces not only job flows, but also value added and employment.

In the same spirit, other empirical studies are carried along using data at firm level. They analyze diverse firm level decisions or outcomes such as: productivity, firms' decision of operating in formal or informal sector, labor turnover, investment or labor adjustment (Besley *et al.* 2004; Autor *et al.* 2007; Álvarez *et al.* 2011; Kugler, 1999; Caballero *et al.* 1997).

The negative impact of employment protection on job destruction is also accounted by Messina *et al*. (2007) for European firms': Their contribution is that the incidence of dismissal restrictions depends on the sector of operation and the phase of the business cycle. Therefore, depending on the sector the firm belongs to, the impact of firing costs on firms' hiring and firing decisions is attenuated.

We also evaluate the heterogeneous response of firms to an increase in EPL, but we focus mainly on firm attributes within a sector, in line with the factors proposed by the downsizing literature (Point 2, Figure 1). Our hypothesis is based on the fact that the negative effect of EPL on downsizing can be attenuated or enhanced in the presence of heterogeneous attributes of firms. The following hypothesis will be tested:

H1: The negative impact of stringent firing costs in the likelihood of downsizing will be attenuated as the sector's relative price faces a negative trend.

Employee downsizing has been linked to demand declines, with firms seeking to reduce labor costs (Cameron *et al*. 1993; Budros, 2002; Datta *et al.* 2010). In other words, firms exposed to negative demand shocks are more likely to adjust through labor. Although higher firing costs make the downsizing decision less profitable, we expect that the negative effect of increasing firing costs on firms' downsizing decision will be smoothened when prices in the sector are declining.

H2: The negative impact of stringent firing costs in the likelihood of downsizing will be enhanced as the firm has higher previous productivity.

It is expected that firms engage in downsizing strategies when they have low productivity (Marques *et al.* 2011; Abowd *et al.* 2009; Ahmadjian *et al*. 2001; Love *et al*. 2005). They downsize to increase efficiency, eliminate redundancies, and therefore increase productivity. Due to the presence of higher EPL, if the firms have high productivity levels, the effect on the likelihood of downsizing will be even lower.

H3: The negative impact of stringent firing costs in the likelihood of downsizing will be enhanced as the labor skill dependence increases.

It is likely that firms distinguished by the skills of their workers, in the presence of higher firing costs, will see even a bigger rise in the average cost of adjusting than the low skilled dependent firms. This is due to the high wages these workers receive and extended tenures.

"The average cost of adjustment rises very rapidly with the skill of the worker. Thus, while external costs may be very low in jobs filled by high turnover, low skilled workers, they are very large for high-skilled jobs that are usually occupied by long-tenure workers" (Hamermesh *et al.* 1996: p. 1268).

Therefore, a rise in the firing costs will make firms that are intensive in high skilled workers, reduce the probability of downsizing.

H4: The negative impact of stringent firing costs on the likelihood of downsizing will be attenuated as the firm has higher wedge between the desired and the effective labor.

The labor wedge is defined as the difference between the marginal revenue product of labor and its marginal cost (see Petrin *et al*. 2013). The incorporation of this variable follows the "wedge" concept developed by Caballero *et al.* (2010), which shows the flexibility of a firm to adjust. A firm that has a big wedge has been accumulating more labor than the optimal; we believe that as the firm has higher wedge increases in firing costs, it will have an attenuated effect over the probability of downsizing. The benefits from closing the wedge in terms of productivity are higher than the costs associated to firing the excess of labor.

H5: The negative impact of stringent firing costs in the likelihood of downsizing will be enhanced as the firm has higher market power (big firm in a highly concentrated market).

Firms in competitive markets are exposed to higher levels of market pressure; therefore, even if firing costs are high, the probability of downsizing will be unaltered. "One of the prime attributes of competition is that it does not tolerate inefficiency." (Baumol *et al.* 2003: p. 81) If firing costs rise, small firms in concentrated markets face great efficiency pressures (they will do downsizing anyway), while large firms in concentrated markets have less competitive pressure (less benefits from downsizing) .

3. Empirical analysis

3.1 Institutional Background

The Chilean Labor Code was enacted in 1931 and regulates the labor market, with the exception of jobs in state-run entities (Statute Administrative Law 18.834). Title V of the Labor Code is the chapter addressing the termination of job contracts and labor stability. In general terms, EPL imposes two kinds of firing costs: severance payments, which are transfers made from the firm to the worker, and administrative costs with no monetary transfers (e.g., the advanced notification period).

There were three different regimes imposed by the legislation to govern EPL between 1981 and 1994. Table 1 summarizes all these amendments to the law.

Year	Law N°	Prior Notice Period	Change	Compensation for dismissal in case of just cause	Limit	Min Compensation	Max Compensation
1981	18,618	1 month	Maximum limit introduced	non	5 months	1 month per year	1 month per year
1984	18,372	1 month	Economic needs not considered just cause	non	5 months	1 month per year	1 month per year
1990	19,010	1 month	Economic needs where considered just cause	Economic reasons: 1 month per year	11 months	1 month per year	1.5 month per year

Source: Information taken from Chilean labor code.

Table 1. Summary of the chances in the legislation, that took place between 1981 and 1994

Changes in the law affected firing costs through the compensation that workers receive per years of service. Before 1981, in order to fire an employee who had been with a company for 15 years, the compensation for years of service corresponded to a 15-month salary. Between 1981 and 1990, this same employee would have received a five-month salary. Lastly, if this person had been fired in 1991, he would have received an 11-month salary. The second is related to the definition of justified firing and the position of the court as a mediator between the employee and the firm. Before 1990, firms did not pay compensation if the firing was unjustified, but after 1990, firms' economic reasons for firing employees were considered justifiable; however, the firm still needed to pay one month for each year worked up to 11 years.

In this paper we were interested in the evolution of EPL in Chile between 1981 and 1994. Therefore, to visualize the evolution of EPL we construct a job security protection index, based on the methodology of Pagés *et al*. (2007) and using the legal modifications of the law summarized in Table 1. Figure 2 show that the changes in the EPL legislation increased the job security index from an initial period of 0.88 month wage to 3.05 month wage after 1991. In a 14-year period, the job security index in Chile raised almost three times its initial value, for all the firms in the economy.

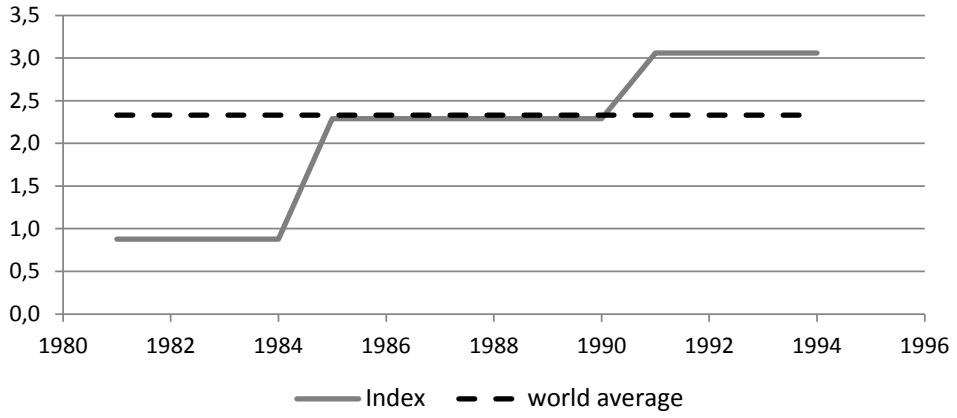

Figure 2. Chilean job security index evolution, constructed using that of Pagés et al. (2007)

Chilean EPL is high if compared across countries. Heckman *et al*. 2000 construct an index of job security at the end of the 90s, and classify Chile N° 29 in a ranking of 36 countries. In the first position the United States has the lower job security index (0 in monthly wages). Among Latin American countries Chile has the 12th position from a total of 16 countries (see Figure 3 extracted Table 1 Heckman *et al*. 2000). In general, lower dismissal costs are concentrated in developed countries, with the exception of Spain and Portugal with higher EPL than Latin American countries.

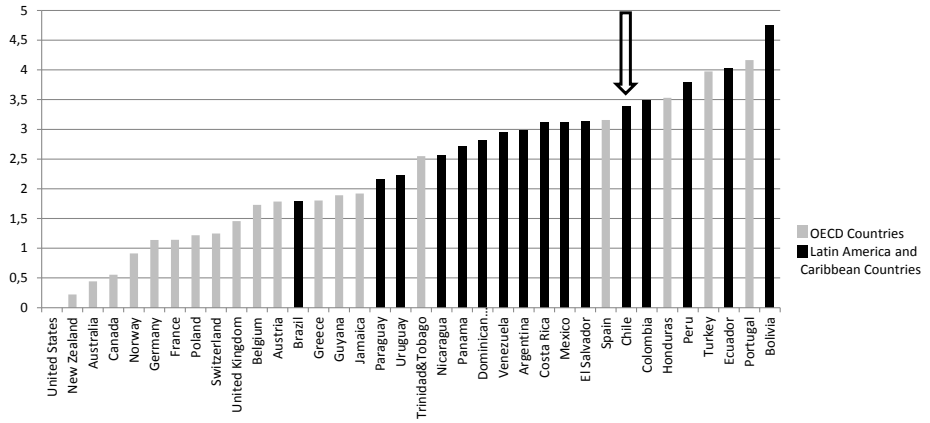

Figure 3. Job Security Index across Latin America, the Caribbean and OECD countries (monthly wages). End of the nineties. Heckman et. al. (2000)

3.2 Data

The empirical analysis is based on statistical information from the National Annual Industrial Survey (ENIA) implemented by the National Institute of Statistics (INE according to its Spanish acronym). The goal of the ENIA is to gather information on an annual basis from all manufacturing establishments in Chile that have 10 or more employees. These surveys include companies that come into the sample and then also leave the sample during the period studied, so it is an unbalanced panel of companies.

In this paper, the relevant period of study is between 1980 and 1994, mainly due to data availability. The ENIA was conducted between 1979 and 2007, but the INE changed plants' identification numbers. We have been working on matching plant identification number to construct the entire time series from 1979 to 2007, but the results have been unsatisfactory in terms of plant coverage. There are a significant number of plants for which the matching is imperfect. We decided to use the first period since during these years three changes were made to EPL, and in between 1995 and 2007, only one change was made that affected firing costs (in 2001).

The size of the panel is 53,274 observations. We eliminated those firms that entered

and left the sample more than one time since they correspond to errors in the measurement or they are below the threshold of 10 employees. After eliminating these, there were a total of 43,838 observations. We restricted the analysis to 12 three-digit sectors in order to concentrate the analysis on sectors characterized by competition and representation in terms of the number of observations. Table 2 describes the selected sectors, which represent 82% of the total sample. The sectors that are not considered have a small number of firms. The final database has 35,326 observations.

Sector	Sector Code	Number of Firms	Number of Employees	Ratio of skilled over unskilled workers	Concentration Index GRS(1)	Concentration Index HHI (2)	TFP (3)	Number of Obs
Food	311	645	84	0,51	0,04	0,01	5,97	11796
Beverages	313	53	135	0,82	0,18	0,07	7,25	1146
Textiles	321	178	119	0,57	0,07	0,03	6,33	3347
Wearing Apparel	322	149	84	0,53	0,21	0,06	6,21	2979
Footwear	324	70	115	0,51	0,24	0,09	6,13	1429
Wood	331	153	91	0,47	0,11	0,04	6,20	3203
Printing and Publishing	342	84	98	0,72	0,34	0,14	6,50	1675
Chemical Products	352	108	123	0,97	0,19	0,05	7,14	1861
Plastic	356	101	73	0,64	0,09	0,03	6,36	1908
Non-metallic mineral products	369	65	89	0,60	0,27	0,14	6,47	1083
Metal	381	198	80	0,61	0,09	0,02	6,39	3798
Machinery	382	85	103	0,68	0,19	0,07	6,26	1635

Average for the entire period for all variables
(1) Ginevičius *et al.* (2009) equation 21 p. 197.
(2) Herfindahl Index
(3) Olley and Pakes Methodology

Table 2. Statistical summary of the relevant variables across manufacturing firms

Downsizing decisions are not the same as the death of a firm. Downsizing practices are not regular layoffs made by firms before exiting the market, but they represent a practice that firms do to improve their efficiency. Therefore, the main empirical analysis will only consider firms that do not exit the sample, which represents more than 62% of the observations. The firms that exit the sample are smaller than the continuing firms (31 vs. 40 employees) and also have a median TFP that is 5.7% smaller than the continuing firms.[4]

3.3 Analyzing Downsizing

A distinctive feature that characterizes downsizing is that it is an intentional practice driven by firms to improve efficiency or productivity. The main difference between regular layoffs and downsizing is that downsizing is a large voluntary reduction in the number of permanent workers that does not end in the firm's death but in productivity improvements. Baily *et al.* (1996) tried to determine the effects of downsizing on

[4] The information provided by the ENIA enables the estimation of TFP for firm-level data using the methodology developed by Olley *et al*. (1996) and extended by Levinsohn *et al*. (2003). This estimation was done previously for the Chilean manufacturing industry by Bergoeing *et al*. (2006) and Álvarez *et al*. (2011)

firms' productivity growth using plant-level data for the United States and found that downsizing firms had only a slight improvement in productivity. However, the authors defined downsizing firms as those that reduced their employment (giving the same importance to firms that cut one worker or 100 workers), which included regular job reductions and is not the concept of downsizing used in the literature.[5]

The precise way to measure downsizing is not a clear issue in the literature. Most researchers use a numerical cutoff of employment reduction (θ). Guthrie *et al*. (2008) referenced the existing literature, concluding that the most common value for θ is a 5% reduction, which represents a significant event and likely an intentional reduction in employment. However, these researchers used employment data from the Compustat database, which includes firms that are relatively large, compared to Chilean manufacturing firms. An employment reduction of 10% in a firm with 12 employees is not the same as the same reduction in a firm with 5,000 employees. Therefore, we will use higher θ values in order to ensure that the phenomenon captured is downsizing and not a regular layoff. The downsizing of a firm *i* at time *t* is calculated as follows:

$$\text{Down}(\theta)_{i,t} = 1 \quad \text{if} \quad \left[\frac{\left|\text{empl}_{i,t} - \text{empl}_{i,t-1}\right|}{\text{empl}_{i,t-1}} \geq \theta\right] \text{and} \quad \left(\text{empl}_{i,t} - \text{empl}_{i,t-1}\right) < 0,$$

where empl_{it} is the employment level of a firm *i* at time *t* and *θ* is the cutoff value.

Table 3 shows the frequency with which firms downsize. The first column presents the percentage of firms that reduce their workforce. The lowest level occurs in 1987, and the highest level is present in 1982. The average percentage of firms reporting some job elimination is 34%, which is lower than the 44% reported by the American Management Association (AMA) for the same period of study in the United States.[6] The second and third columns show the percentage of firms that downsize using θ = 0.1 and θ = 0.2 (from the total number of firms that reduce their workforce during that period), respectively. It can be seen from comparing these two columns that assuming a higher cutoff level, the proportion of firms that downsize is reduced. The last column presents the measure of downsizing used by Abowd *et al.* (2009), which is a stricter measure of downsizing that depends on the maximum size the firm achieves during the sample period. The way Abowd *et al*. (2009) define downsizing is in the equation below:

$$Down\_abw_{it} = 1 \;\; if \;\; \left[\left(\frac{\left|empl_{i,t} - empl_{i,t-1}\right|}{\max(empl)_i} \geq 0.2\right) \cap \left(empl_{i,t} - empl_{i,t-1}\right) < 0\right]$$

[5] Baily *et al.* (1996) describe downsizing as the reduction of the number of workers over a 10-year period. Muñoz *et al.* (2008) define downsizing in the same way but during a year span.
[6] Source from table 2.2 Baumol *et al*. (2003)

year	(1) % of firms that reduce it´s workforce in t	(2) % of firms in (1) that reduce more than 10% of it´s workforce	(3) % of firms in (1) that reduce more than 20% of it´s workforce	(4) % of firms in (1) that reduce more than 20% of it´s max size
1981	39%	57%	28%	13%
1982	59%	69%	44%	20%
1983	43%	58%	30%	9%
1984	26%	52%	23%	11%
1985	27%	49%	26%	11%
1986	25%	50%	24%	11%
1987	23%	54%	29%	16%
1988	27%	49%	22%	14%
1989	30%	53%	29%	19%
1990	36%	51%	27%	17%
1991	34%	53%	29%	20%
1992	33%	47%	24%	16%
1993	36%	52%	27%	20%
1994	39%	54%	27%	18%
Average	34%	53%	28%	15%

Table 3. Percentage of firms doing downsizing, considering only the firms that do not exit the sample

Taking into consideration that firms are present in the sample for seven years on average, job destruction is a relatively frequent practice: half the firms reduced the number of workers at least five times. However, downsizing is a less frequent practice. As shown in Figure 4, the stricter the definition of downsizing, the lower the average number of times a firm downsizes when analyzing the continuing firms.

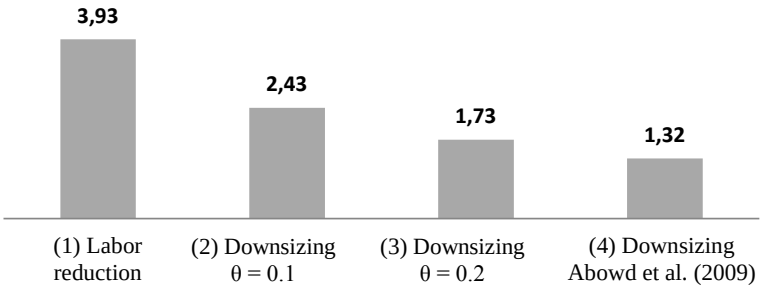

Figure 4. How many times does a downsizer firm downsize? (Average number of events in the simple)

Before downsizing, downsizing firms had, on average, 48 employees and with a productivity level almost 10% lower than non-downsizing firms. Table 4 shows the average change in firms' employment between the two periods before downsizing and

the two periods immediately after downsizing. The same is done with the variables for real value added and firm-level productivity, which shows an 8% increase.

Variable	Downsizing $\theta = 0.1$	Downsizing $\theta = 0.2$	Downsizing Abowd *et al* . 2009
Employment	-19,5%	-27,0%	-37,1%
Real value added	-6,0%	-9,5%	-18,5%
TFP	7,0%	8,0%	8,0%

Table 4. Average percentage change before and after firms do downsizing, using different definitions

Firms present in the data show that for the same level of productivity, they have different employment levels. In analyzing firms that belong to a same sector, this continues happening. Therefore, some firms are being less efficient. After firms downsize, they increase their TFP level on average.[7]

3.4 Empirical Model

The probability of downsizing is modeled as a function of two sets of variables (prior to downsizing): firm-level characteristics ($\text{Firm}_{i,t-1}$) and environmental factors (Environ_{t-1}), which are based on Figure 1 and described in Table 5.

Our basic empirical strategy is based on a reduced form specification (equation 1), that is estimated using a traditional fixed-effect logit regression, for which the dependent variable is the downsizing event (down), that takes a value 1 if done by firm *i* at time t.

$$\text{Pr}_{it}(\text{down} = 1) = \Phi\left[\alpha\,'\text{Firm}_{i,t-1} + \beta\,'\text{Environ}_{s,t-1} + \gamma\ \text{Index}_t + \delta(\text{Index}_t)\left(Z_{s,i,t-1}\right) + \rho D + \varepsilon_{ist}\right] \qquad \text{(equation 1)}$$

where the subindex t stands for time, j for sector and i firm, $Index_t$ stands for employment protection legislation index, $Z_{s,i,t-1}$is a set of firm and sectoral attributes (formed by the variables explained in Table 5) that are linked to the five hypotheses presented in the previous section, and D is a set of sectoral and time dummies.

[7] In an exercise done for firms from the food sector (311), which has the highest number of firms, it can be seen that firms that downsized in 1988 increased their TFP the next couple of years (this period was chosen because it was macroeconomically stable).

Set of Variables	Variable	Variable construction
$Firms_{i,t-1}$	TFP	Total factor productivity for firm i at a time t-1, calculated using Olley-Pakes methodology (1) based in the estimation of a Cobb Douglas production function, the estimation takes care of potential simultaneity issues.
	Skilled dependence	Skilled dependence of firm i at time t-1, calculated as the ratio between the skilled workers and the total number of workers of the firm in the period t-1.
	Labor wedge	Calculated using Petrin *et al.* (2013) methodology. It is the absolute difference between the marginal revenue of product (VPM) and the marginal input price (w) of firm i at time t-1.
	Firm relative size	Firm relative size for firm i in sector s, calculated as the ratio between the average firm level number of employees and the average sectoral number of employees.
$Environ_{t-1}$	GRS	Measures the sectors concentration where the firm belongs to, calculations made using the methodology created by Ginevičius *et al.* 2009
	Negative Demand Shock	Negative growth rate of the ratio between the sectors prices (sectors deflators) and the industrial price index.
EPL_t	Index	Employment protection index(2) in period t, based in Pagés *et al.* 2007

(1) This methodology is also implemented by other studies that work with ENIA like Pavnick (2002), Álvarez *et al.* (2011) and Bergoeing *et al.* (2006)

(2) Further details of the methodology and data used for the construction of this index in Appendix1

Table 5. Construction of the variables included in the reduced form specification

We are mostly interested in the coefficients δ that correspond to the interaction effect between the EPL index and the firm and sector attributes. We expect from the previous literature the effect of the Index in the probability of downsizing to be negative ($\gamma < 0$), but it could be attenuated or enhanced by the variables in Z. Derivating equation 1with respect to the index, we will obtain:

$$\frac{\partial Prob(down=1)}{\partial Index} = \gamma + \delta Z \qquad \text{(equation 2)}$$

If $\delta < 0$, the negative effect of higher employment protection in the probability of downsizing would be enhanced; and if $\delta > 0$, it would be attenuated. At the same time, if $\delta = 0$, it would not change as the variable Z increases. We resume all the five

hypothesis in Table 6.

Hypothesis	Variable that represents Z	Expected sign of	Effect on $\frac{\partial Prob(down=1)}{\partial Index}$
H1	Negative demand shocks	Positive	Attenuated
H2	Firm total factor productivity	Negative	Enhanced
H3	Firm skilled dependence	Negative	Enhanced
H4	Wedge between desired and effective employment	Positive	Attenuated
H5	Firms market power	Negative	Enhanced

Table 6. Summary of Hypothesis

4. Empirical findings

In Table 7, the first column presents the estimates of the probability of a job reduction in firm *i* at time *t*, regardless of the number of workers that have been laid off (JD); the second column estimates the probability of downsizing defined as the reduction of 10% of the workers (down_10) in firm *i* at time *t*, and the third column estimates the probability of downsizing defined as the reduction of 20% of the workers (down_20) in firm *i* at time *t*.

It can be seen that if the sector's prices grow, the probability of reducing jobs decreases. This is associated to better demand conditions; nevertheless, they do not explain changes in the probability of downsizing. The firms' TFP level is a more relevant variable in the downsizing decision rather than in regular dismissal. Something similar happens in the case of the wedge between desired and real labor. As the wedge increases, the probability of regular dismissals and downsizing also increase.

These preliminary findings are consistent with the idea that downsizing is a practice that differs from regular dismissals. Regular dismissals are basically driven by external market conditions, while downsizing depends on firms' particular long-term characteristics, linked to productivity and efficiency.

Regarding the EPL index, which measures how stringent the legislation is in terms of firing costs, it can be seen that if the EPL index increases by one point, as in the Chilean economy in 1984, the impact on the downsizing decision is bigger than in a regular job reduction, and it increases with the strictness of downsizing definition.

Our results show that there is a decrease in the likelihood of downsizing of 0.202 for down_20, 0.164 for down_10, and not a significant one in the case of regular

dismissals.[8] This is not a surprising result, because a firms' total firing cost expenditure increases with the number of workers being fired.

	(1)		(2)		(3)	
Dependent variable	JD		Down_10		Down_20	
Index	-0,0225		-0,164	***	-0,202	***
	(0,0219)		(0,0264)		(0,0347)	
Negative Demand Shock	-0,448	**	-0,508	*	-0,368	
	(0,215)		(0,269)		(0,359)	
TFP	-0,15	***	-0,233	***	-0,324	***
	(0,0199)		(0,0244)		(0,0315)	
Skilled dependence	0,165	**	0,0336		0,149	
	(0,0717)		(0,0935)		(0,128)	
Labor wedge	0,107	***	0,149	***	0,208	***
	(0,0122)		(0,0159)		(0,0218)	
Firm relative size	-0,0397	***	-0,0302	*	-0,113	***
	(0,0130)		(0,0168)		(0,0234)	
GRS	2,765	**	2,133		4,556	***
	(1,105)		(1,349)		(1,722)	
GRS*Firm relative size	0,461	**	0,973	***	1,357	***
	(0,205)		(0,262)		(0,358)	
Index*Negative Demand Shock	-0,224		-0,877	***	-1,673	***
	(0,281)		(0,340)		(0,451)	
Index*TFP	-0,112	***	-0,132	***	-0,145	***
	(0,0250)		(0,0296)		(0,0374)	
Index*Skilled dependence	-0,15	*	-0,141		-0,22	*
	(0,0806)		(0,0971)		(0,126)	
Index*Labor wedge	-0,0039		0,0314		0,0517	**
	(0,0154)		(0,0191)		(0,0255)	
Index*(GRS*Firm relative size)	-0,0607		0,0363		-0,0087	
	(0,124)		(0,145)		(0,190)	
Observations	21902		21902		21902	
Number of padron	2366		2366		2366	

Model 1 estimates the probability of job destruction (JD), Model 2 estimates the probability of downsizing defined as the reduction of more than 10% of the firms workforce and Model 3 estimates the probability of doing downsizing defined as the reduction of more than 20% of the firms

Table 7. Comparing EPL effects for different downsizing definitions

[8] The effect of an increase by one point in the EPL index is evaluated considering all the interaction variables (Z) in their means.

Table 8 shows the estimated model presented in section 3.3. As expected, the EPL index has a negative impact in the probability of downsizing; an increase by one point in the index makes the probability of downsizing decrease by 0.202 percentage points. This result is assuming that all the significant interacting variables are replaced by their mean values ($\bar{Z}$):

$$\frac{\partial Prob(down = 1)}{\partial Index} = \hat{\gamma} + \hat{\delta}\bar{Z} = -0.202$$

In order to test our hypothesis, the interaction terms were included. As we can see, all the coefficients turned out to be significant, except the measure of firm market power. This gives as insights that the effect of EPL on the probability of downsizing is not homogenous among firms, and the final impact will depend on firms and sectoral attributes as we have suggested in our hypothesis.

Figure 5 shows how the effect of EPL index changes as we move a specific attribute. Therefore, five subfigures are shown, each of them representing a specific attribute associated to our five specific hypothesis.

It can be observed that as firms face deeper negative demand shocks, the effect of EPL in the probability of downsizing is attenuated (H1). In fact, when the negative demand shock is in the 10th percentile, the effect of EPL is -0.34 and when it moves to the 90th percentile the effect of EPL is -0.06. This attenuation effect is also present as the wedge between the desired and the effective labor grows (H4), where variations of the wedge from the 10th to the 90th percentile makes the EPL effect decrease from -0.26 to -0.1.

On the other hand, an enhancement effect of EPL on the probability of downsizing is seen in firms with growing levels of productivity (H2). When moving TFP from the 10th to the 90th percentile, it makes the EPL effect increase from -0.03 to -0.39, also increasing skilled dependence (H3) from -0.1 to -0.25 when skilled dependence moves from the 10th to the 90th.

So far, we have identified important heterogeneities of the EPL effects on the probability of downsizing, depending on firm and sectoral characteristics. This mechanism behind these findings is that firms will accomplish downsizing as an intentional event, where the decision is taken comparing the benefits in terms of efficiency of doing downsizing versus the costs associated to this practice. Higher firing costs do increase the costs associated to downsizing, but the final effect depends on how profitable downsizing will be for the firm. We found that firms with weaker positions (less TFP, higher labor wedges, less skilled labor intensive and facing negative demand conditions) will have a lower cutoff level of “resistance” to downsizing even though the firing costs increase.

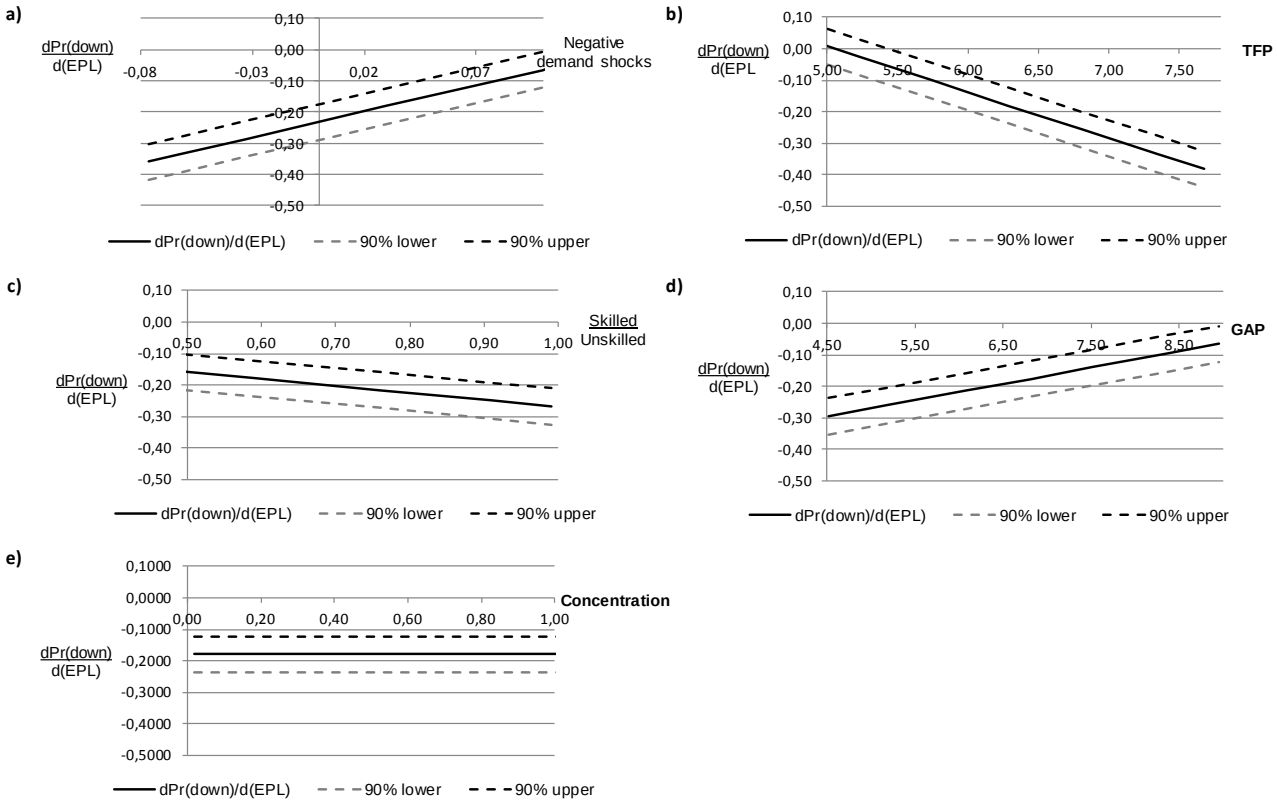

Figure 5. EPL effects in the probability of downsizing, for changes in firms 'attributes.

	(1)	(2)
Dependent variable	**Down_20**	**Down_20**
Index	-0,151 ***	-0,202 ***
	(0,033)	(0,035)
Negative Demand Shock	0,128	-0,368
	(0,325)	(0,359)
TFP	-0,312 ***	-0,324 ***
	(0,031)	(0,032)
Skilled dependence	0,152	0,149
	(0,126)	(0,128)
Labor wedge	0,204 ***	0,208 ***
	(0,022)	(0,022)
Firm relative size	-0,110 ***	-0,113 ***
	(0,023)	(0,023)
GRS	4,630 ***	4,556 ***
	(1,685)	(1,722)
Firm relative size	-1,251 ***	-1,357 ***
	(0,334)	(0,358)
Index*Negative Demand Shock		-1,673 ***
		(0,451)
Index*TFP		-0,145 ***
		(0,037)
Index*Skilled dependence		-0,22 *
		(0,126)
Index*Labor wedge		0,052 **
		(0,026)
Index*Firm relative size		-0,009
		(0,190)
Observations	21902	21902
Number of padron	2366	2366

Probability of downsizing (Down_20) , logit estimation marginal effects reported. All the explanatory variables used are from t-1 and are deviations from their means.

Table 8. Comparing EPL effects for different downsizing definitions

5. Conclusions

This paper studies the effects of EPL on the propensity of employee downsizing in an emerging economy using manufacturing firm level panel data, which brings together two concepts traditionally analyzed separately in the literature: *downsizing* and the effect of *employment protection legislation (EPL)* at firm level decisions.

We test empirically five primary hypothesis : H1) The negative impact of stringent firing costs in the likelihood of doing downsizing will be attenuated as the sector relative price faces a negative trend. H2) The negative impact of stringent firing costs in the likelihood of doing downsizing will be enhanced as the firm has higher previous productivity. H3) The negative impact of stringent firing costs in the likelihood of doing downsizing will be enhanced as the labor skill dependence increases. H4) The negative impact of stringent firing costs in the likelihood of downsizing will be attenuated as the firm has higher wedge between the desired and the effective labor. H5) The negative impact of stringent firing costs in the likelihood of downsizing will be enhanced as the firm has higher market power (a big firm in a highly concentrated market).

We find evidence for Chile that, on average, an increase in the EPL index by one point, as in the Chilean economy in 1984, reduces as expected the probability of downsizing by 0.202 percentage points. But this effect is not homogenous among firms. We also found in line with our hypothesis that firms with weaker positions (less TFP (H2), higher labor wedges (H4), less skilled labor intensive (H3), and facing negative demand conditions (H1) will have a lower cutoff level of "resistance" to downsizing even though the firing costs increase. The level of competition in a given sector, measured by the concentration of the sector and the firm relative size, did not appear to attenuate or enhance the negative impact of EPL over the probability of downsizing (H5).

As previous literature has shown, we find that stringent firing costs make employment more stable for workers; firing costs have a negative effect on a firm's job reduction and downsizing.

Nevertheless, the heterogeneity of this negative impact is relevant for labor protection policies. This implies that the more vulnerable firms are downsizing anyway, which means that less efficient firms or firms that have higher wedges, undertake downsizing to improve firm performance through reduction in employees. In other words this firms tend to be more inelastic to changes in EPL, and therefore pay most part of this "labor tax".

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Appendix 1: Employment Protection Index

Pagés *et al*. (2007) constructed a measure of job security cost, which is an index used in the estimations presented in this paper. Their goal was to elaborate a synthetic index that measures the relative rigidity of Chilean codes over the years. The authors approach was to compute an index combining information on notice periods, compensation for dismissal, the likelihood that a firm's economic difficulties argument is considered as justified cause of dismissal, and the severance payment that is due in that event. The equation to compute the cost of job security in period t is as follows:

$$\text{Index}_t = \sum_{i=1}^{T} \beta^i \left(\delta^{i-1}\right)(1-\delta)\left[b + aSP_{t+i}^{jc} + (1-a)SP_{t+i}^{uc}\right]$$

where δ is the probability of remaining in a job, $\left(\delta^{i-1}\right)(1-\delta)$ is the probability of dismissal after i periods at the firm and β is the annual discount factor. In addition, b denotes the cost of advance notice, a is the probability that the economic difficulties of a firm are considered a justified cause of dismissal, SP_{t+i}^{jc} is the mandated severance payment in the event the dismissal is justified and the worker has a tenure of i years at the firm, and finally, SP_{t+i}^{uc} denotes the payment to be awarded to a worker with tenure i in case of unjustified dismissal. [9]

The constructed index measures the expected cost (in monthly wages) at the time of hiring, and of dismissing a worker in the future. The advantage of this measure is that it captures the whole profile of severance payment. The assumption is that firms evaluate future costs based on current labor regulations. Higher values of the index indicate periods of relatively high EPL, whereas lower values characterize periods in which dismissals were less expensive.

The parameters used by the authors to fill in the equation are summarized in Table A1. The parameter δ is the probability of remaining in a job and is assumed to be a constant. It takes the value generated by Davis *et al.* (1992) who estimated that U.S. job destruction rates average 12% a year. This assumption of considering an exogenous probability restricts the heterogeneous behavior of firms from different sectors in the manufacturing industry. Finally, Pages *et al*. (2007) compute the discount rate based on the fact that Chilean real interest rates averaged 8.4% during the 1960-1998 period.

Firing costs, according to the index, were low and lost up to 0.8 months of wages before 1984. After that year, job security increased significantly and then again after

[9] The parameter *a* was constructed with two pieces of information: (1) whether a firm's economic difficulties are considered a justified cause for dismissal according to the labor codes and (2) information on the stand of labor courts in each period

the 1991 law. At the end of the period studied, the average firing costs raised to approximately 3-month wages.

Period	Index	β	δ	b	a	SP^{jc}	SP^{uc}
1981-1984	0,88	0,92	0,88	1	0,8	0	(1)
1985-1990	2,29	0,92	0,88	1	0	0	(1)
1991-1999	3,06	0,92	0,88	1	0,9	(2)	(3)

The maximum tenure is of 25 years (1) is a payment of one month per year with an upper limit of 5 months per year (2) one month per year with an upper limit of 11 months (3)1.2 -1.5 months per year worked with an upper 11 months

Table A1. Parameters of EPL index equation, Pagés et al. (2007)