Firing Cost and Firm Size: A Study of Sri Lanka's Severance Pay System

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Abstract

Sri Lanka's Termination of Employment of Workmen Act (TEWA) requires that firms with 15 or more employees justify layoffs and provide generous severance pay to displaced workers. Smaller firms are exempt from the TEWA. In addition, although formally subject to the law, firms in Export Processing Zones (EPZs) may also have been exempt from the law due to allegedly lax enforcement in EPZs. We construct a theoretical model showing that firms subject to TEWA will tend to mass at the threshold of 14 workers while awaiting an atypically large productivity shock that will enable them to cross the threshold. We test these predictions using 1995-2003 panel data on employment of all private formal sector firms collected by the Employees Provident Fund of Sri Lanka. We find that nonEPZ firms below the threshold are less likely to grow than are firms with 14 workers. Once crossing the threshold, however, nonEPZ firms grow faster, consistent with the existence of a large productivity shock needed to induce growth beyond 14 workers. In contrast, EPZ firm growth above and below the threshold does not differ significantly from firm growth at the threshold. Both below and above the threshold, EPZ firms grow significantly more rapidly than non-EPZ firms.

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1. Introduction

Consistent with its focus on social policies, Sri Lanka has devoted significant attention to worker protection. One of the main pillars of its worker protection policy is the 1971 Termination of Employment of Workman Act (TEWA). The act requires that each layoff of a covered worker, whether individual or as a part of a mass layoff, must be approved by the government. The government also decides on the severance pay the firm must pay to the laid off workers.

Since its introduction, critics have argued that the TEWA's non-transparent, discretionary, and costly regulations discourage employment growth, hinder reallocation of labor from inefficient firms to more profitable sectors, slow the introduction of new technologies, and harm vulnerable groups by increasing unemployment. Defenders including trade unions and the government argue that on the contrary, severance pay may enhance efficiency by promoting longer-lasting employment relationships that improves incentives for training and enhance cooperation and trust between employers and workers.

Recent microeconometric analyses have shown that labor market regulations can produce important efficiency losses. For example, Heckman and Pages (2000) show that in Latin America, more stringent job security laws are associated with lower employment and higher unemployment, particularly among young workers. Similarly, Besley and Burgess (2004) find that labor regulations in India had important adverse effects on output and employment. Ahsan and Pages (2007) report that regulations concerned with labor disputes and job security hurt covered workers. Bassanini and Duval (2006) find that changes in tax and labor policies explain about half of the 1982-2003 changes in unemployment among OECD countries. Other studies using macroeconomic data have also found negative efficiency effects of severance pay including Nickell and Layard (1999), Haffner et al (2001), and the OECD (1999). Nevertheless, these negative findings from labor market regulations are not universal, particularly those based on cross-section analysis (see Baker et al, 2005).[1]

This paper adds to this literature by identifying the impact of the TEWA on firm employment growth in Sri Lanka. We exploit two sources of variation in the way firms are treated. First, the law only applies to firms with more than 14 workers, and so smaller firms need not comply. Second, firms in Export Processing Zones (EPZ) are said to face lax policy enforcement which should lower their firing costs compared to non-EPZ firms. We construct a theoretical model showing that firms subject to the TEWA tend to mass at the threshold of 14 workers and that firms must experience an atypically large productivity shock to cross the threshold. We test these predictions using 1995-2003 panel data set collected by the Employees' Provident Fund composed of the employment histories of every private formal sector firm in Sri Lanka. We employ a difference-in-differences method to identify the effects, using firms at or above the threshold as the treatment group, and those with fewer than 14 workers and those in EPZs as control groups.

We find that non-EPZ firms below the 14 employee threshold are less likely to grow and that non-EPZ firms that manage to cross the threshold are more likely to grow, compared to firms with 14 workers. Moreover, at the threshold employment size, the growth pattern of EPZ firms does not differ significantly from the one of non-EPZ firms. This suggests that TEWA has been enforced equally for EPZ and non-EPZ firms below and above the threshold. However, EPZ firms grow significantly more rapidly than non-EPZ firms.

The article is organized as follows. The next section gives a background of the institution. Theoretical framework is presented in section 3. In section 4, the data and model used to analyze it is described. In section 5, the results from the model estimation is used to explain firm labor demand decision with firing cost. Section 6 is an extension of the model to study differences in law enforcement. Section 7 concludes.

2. Institution Background on the TEWA

The TEWA was intended to prevent or discourage mass retrenchment situations in the industrial sector. All terminations of private sector workers for any reason other than discipline are covered under the TEWA, including redundancies arising from organizational restructuring and financial or economic constraints, temporary lay-off, termination as a result of the closure of the business, and even incompetence.[2] TEWA applies to all firms that employed 15 or more workers in the 6 month period preceding the termination. A worker qualifies as long as he worked at least 180 days in the 12 month period preceding the termination. Although all workers in the private sector, subject to eligibility criteria, are legally covered by the TEWA, its provisions are difficult to enforce in the informal sector.

The TEWA requires that employers with 15 or more workers must seek the consent of the Commissioner General of Labor (CGL) before they are allowed to dismiss a worker, even if it concerns a single worker. The CGL may refuse to sanction the layoff or, if permission is granted, the employer will be required to pay severance in an amount determined by the CGL. Over the sample period, the procedure by which the severance is determined was not specified in law but was subject to a lengthy and seemingly arbitrary deliberation.[3]

In dealing with termination applications by employers or complaints by workers, the CGL has the power of a District Court to conduct inquiries, such as summoning and compelling the attendance of witnesses, production of records, and recording testimony. The employer must therefore justify to an officer – who is essentially a bureaucrat with little experience in the private sector or in managerial decision making – that terminating the identified group of workers is in the best interest of the employer. During the TEWA process, the workers continue to be paid wages and other benefits until the CGL makes a decision, even where there is no work to be done. Box 1 in the appendix contains an example of the retrenchment at the Shell Gas Lanka. The final order of the CGL does not take into consideration the wages paid by the employer during the inquiry period. Data for 2003 confirm that the TEWA procedure is a very lengthy one - the average processing time of employers' applications was

9.8 months, and it exceeded one year in more than 25 percent of cases (World Bank 2007).

Severance pay was quite generous. During 2002-03, the severance averaged nearly 2 times the monthly salary per year of service, and the multiple could rise as high as 6 times the monthly salary. (Figure 1). Judged by international standards, this level of TEWA severance is extremely high. Using 2002 data, a year for which we have some data on individual compensation, we can infer the relationship between generosity of payments and years of service with the firm. As shown in Figure 2, a Sri Lankan worker with 20 years of service received an average severance package equal to 29 months of wages. In contrast the average severance was 16 months of wages in other Asian countries, 12 months in Latin American, 7 months in African, 6 months in the OECD countries, and 4 months in transition countries. At shorter levels of prior service, the Sri Lankan laid off workers still received unusually generous severance pay. Sri Lankan workers with shorter duration of prior service were also awarded much more generous level of severance pay than workers in other countries. Nevertheless, when the system switched to a fixed formula for computing the severance package in December 2003, the program became even more generous.

The high turnover costs imposed by the TEWA have led to a relatively small number of applications for separations by employers. Between 2000 and 2003, the number of employer applications ranged from 71 to 105 per year (World Bank 2007). Less than half of these cases were concluded by the order of the commissioner because they were settled "voluntarily", whether because the firm withdrew the application or allowed the worker to retire. Moreover, according to a survey of the Employers' Federation of Ceylon (2004), 27 of a total of about 400 of its private sector members entered voluntary retirement agreements with 3263 workers during 2001-03 without having first applied for separations through the TEWA. Nevertheless, the expected cost of the compensation package that would result from a TEWA proceeding heavily influences the terms of these retirement packages. These voluntary retirement packages ranged from 6 to 45 months of wages.

A small number of processed applications for separations do not necessarily mean that the TEWA has curtailed separations. Firms may also try to sidestep TEWA obligations by contriving disciplinary grounds that would justify firing a worker or else by harassing workers to make them quit. Alternatively, they could outsource work to avoid having to take on more employees. While it is difficult to assess how frequently these options are used, there are reasons to believe that firms have only limited ability to avoid the costs of the TEWA. Inflexible labor regulations were one of the five most commonly cited business challenges reported by urban firms in Sri Lanka.[4]

It is often alleged that TEWA system has not been enforced for firms in Export Promotion Zones (EPZs) so that they could fire workers without prior approval of the CGL. If true, then the patterns of employment growth and decline would differ between EPZ and non-EPZ firms, a possibility we will test empirically below.

3. Theoretical Framework

We frame our analysis with a model that captures how firms select employment under the TEWA policy. The firm pays an exogenously set wage w_t to it's workers. The firm also faces a proportional markup over the wage, $\delta_t \geq 0$, so that the total per worker cost is $w_t(1+\delta_t)$. Each period, the firm pays $w_t\delta_t$ per worker. Under the TEWA, firms face a mandatory severance pay prepayment to ensure against potential future layoff costs. For simplicity, assume $\delta_t = \delta$ for all $L_t > 14$ and 0 otherwise. For firms that are not covered by the TEWA system, $\delta_t = 0$.

The firm produces output using a short-run decreasing returns to scale Cobb-Douglas technology. L_t represents number of workers and A represent other fixed inputs that are used to produce output Q_t. The production function takes the form

$$Q_t = A(\tau_t L_t^{\alpha}). \tag{1}$$

The variable τ_t is a permanent exogenous technology shock to labor productivity that is a function of past shocks and a random variable, so that

$$\tau_t = \tau_{t-1}\exp(\eta_t) \tag{2}$$

The η_t is assumed to have mean zero and variance σ_η^2 and is an unforeseeable firm-specific innovation to total factor productivity. The specification for τ is chosen such that the growth of technology shocks to labor is a random process that the firm cannot control. In every period, the firm's profit-maximization problem is to select employment so that

$$Max : \Pi_t = A\tau_t L_t^{\alpha} - w_t(1+\delta_t)L_t \tag{3}$$

with first order condition:

$$\frac{\partial \Pi_t}{\partial L_t} \equiv A\alpha\tau_t L_t^{\alpha-1} - w_t(1+\delta_t) \gtreqless 0 \tag{4}$$

The optimal number of workers at time t for a given productivity level is defined when the condition in (4) holds with equality

$$L_t^* = \left(\frac{A\alpha\tau_t}{w_t(1+\delta_t)}\right)^{\frac{1}{1-\alpha}} \tag{5}$$

The optimum number of workers increases in the cumulative productivity shock τ_t and decreases in the wage and the severance costs. Firms will adjust their employment by comparing their previous employment level to the new optimum

$$\text{if } L_{t-1} \begin{cases} > \left(\frac{A\alpha\tau_t}{w_t(1+\delta_t)}\right)^{\frac{1}{1-\alpha}}, & \text{the firm will want to reduce employment below } L_{t-1} \\ = \left(\frac{A\alpha\tau_t}{w_t(1+\delta_t)}\right)^{\frac{1}{1-\alpha}}, & \text{the firm will want to stay at } L_{t-1} \\ < \left(\frac{A\alpha\tau_t}{w_t(1+\delta_t)}\right)^{\frac{1}{1-\alpha}}, & \text{the firm will want to expand employment beyond } L_{t-1} \end{cases}$$

Thus, the condition for the firm to expand employment from period $t-1$ to t is:

$$\ln\left(\frac{L_t}{L_{t-1}}\right) \geq \frac{1}{1-\alpha}\eta_t - \frac{1}{1-\alpha}\ln\left(\frac{w_t(1+\delta_t)}{w_{t-1}(1+\delta_{t-1})}\right) \tag{6}$$

Expression (6) leads to interesting insights about the conditions that would lead us to observe an increase in firm employment. The decision to raise employment will depend on a random shock η_t and an expression that captures the change in the cost of hiring labor. We will examine three cases.

Case 1: $L_{t-1} = 14$. Consider a firm whose optimal employment in $t-1$ is at the threshold point of $L^*_{t-1} = 14$.The firm would decide to expand in period t if:

$$\frac{1}{1-\alpha}\eta_t - \frac{1}{1-\alpha}\ln\left(\frac{w_t(1+15\delta)}{w_{t-1}}\right) \geq 0 \tag{7}$$
$$\Rightarrow \eta_t \geq \ln\left(\frac{w_t(1+15\delta)}{w_{t-1}}\right)$$

So firms that expand past 14 workers require an unusually large unobserved persistent technology shock for them to decide to employ the additional worker. This is because the marginal cost of adding the 15th worker is atypically large. Because the firm has to make severance payment for all 15 employees in case of mass retrenchment or firm dissolution, the marginal cost of adding the 15th worker includes the TEWA tax of $\delta_t = 15\delta$. At $L_{t-1} = 14$, the TEWA tax was $\delta_{t-1} = 0$.

The TEWA severance cost is illustrated in Figure 3. The first graph shows the total annual cost of the severance package as a function of firm employment in period t, $S_t = L_t \delta w_t$. The severance cost in period t is zero for firms with less than 15 workers. At 15 workers, the firm becomes responsible for turnover costs, and so S_t jumps to $15\delta w_t$. Beyond 15 employees, the severance cost rises at δw_t per worker. The second graph shows the marginal change in the severance cost as the number of workers changes. Below 15 workers, the cost is zero. At the 15th worker, the marginal cost spikes to $15\delta w_t$, and then falls to a constant δw_t thereafter.

Note that many firms will be caught by the inequality in (7) because $\eta_t < \ln\left(\frac{w_t(1+15\delta)}{w_{t-1}}\right)$. They will remain at 14 workers until some future period t^* at which they have accumulated enough positive productivity innovations to cross the threshold, that is:

$$(\ln \tau_{t^*} - \ln \tau_{t-1}) \equiv \sum_{i=t}^{t^*} \eta_i > \ln(\frac{w_{t^*}(1+\delta_{t^*})}{w_{t-1}}) \tag{8}$$

This will not be true in the EPZ regions where firms may not pay the severance tax. Therefore, firms in the nonEPZ regions that pass the hurdle beyond the 14th worker will be more productive on average than will be firms passing the 14th worker in the EPZ region because of the productivity hurdle imposed by equation (8).

Case 2: $L_{t-1} < 14$. For a firm with less than 14 employees, The firm would decide to expand in period t if

$$\eta_t > \ln\left(\frac{w_t}{w_{t-1}}\right)$$

This is the usual value of marginal productivity condition where the firm will decide to hire if the value of the marginal product of the extra worker is higher than the cost to the firm. The same condition holds for all firms.

Case 3: $L_{t-1} > 15$. The condition for firm size expansion is similar to that of case 2. With constant severance tax $\delta_t = \delta_{t-1} = \delta$, the productivity shock needed to hire an extra worker is

$$\eta_t > \ln\left(\frac{w_t(1+\delta_t)}{w_{t-1}(1+\delta_{t-1})}\right) \equiv \ln\left(\frac{w_t}{w_{t-1}}\right)$$

Therefore the probability that a given firm will increase employment is the same under cases 2 and 3. This is true even for firms in the EPZ region. The reason is that EPZ firms have a lower average level of productivity in period $t-1$ than do equally sized nonEPZ firms according to equation (8). The same magnitude multiplicative productivity shock is required for employment growth in EPZ and nonEPZ regions.

Note that if the technology shock is not random but depends positively on the magnitude of past shocks (*i.e.* $cov(\eta_t, \tau_{t-1}) > 0$), we would have faster growth in the nonEPZ regions. The reason is that nonEPZ firms have had to pass a greater hurdle to reach 15 or more employees, and so they will have higher average levels of τ than nonEPZ firms.

4. Estimating the threshold effect

4.1. ***Data Description:***

In our empirical analysis, we make use of a unique panel data set that includes annual employment data for 80,560 firms in Sri Lanka over the 1995-2003 period. The data are compiled by the Sri Lanka Employees' Provident Fund (EPF) on all private sector firms and workers paying contributions to the fund. The data are maintained by the Central Bank of Sri Lanka. All registered firms regardless of size are required to pay contributions for their workers. The data are quite limited, however. Apart from the number of workers employed during the year, the only other information contained in the database is the firm's name and region: each firm is designated as having a base in one of 24 regions. The name allows us to identify which firms belong to an export processing zone. The Sri Lankan Board of Investment provided us a list of names for firms that operate in EPZs. We matched these names with 1,124 firms in the EPF list, and these firms comprise our EPZ group.

The EPF data are not free of problems. The data set only contains workers for whom the firm paid contributions during the year. If for whatever reason such contributions are not paid, the true number of workers in the firm will deviate from the number reported to the EPF. The most frequent reason for such discrepancies is financial difficulties of firms that prevent firms from paying contributions in the current year. Even delayed payments are not used to correct the data retrospectively. Therefore, these employment numbers will only reflect the contemporaneously reported number of workers for whom the firm is making an EPF contribution. The frequency or magnitude of this measurement error is not known.

In our empirical work, we will focus on the direction of change in employment (i.e. falling, staying the same, or rising) rather than the reported change in the number employed. We expect that the direction of change will be subject to less error than the number, although we have no way of validating that presumption. In addition, as will be made apparent, the dichotomous or trichotomous indicators of employment change will fit the theoretical model more closely than would the change in employment because of the role of the marginal cost of adding workers. The threshold matters for whether the firm adds workers at all, but less so for additional workers beyond the threshold.

Table 1 provides summary information on the size distribution of firms in EPZ and nonEPZ regions. The differences are striking. Only 22.5% of EPZ firms have fewer than 14 employees compared to 75.6% of nonEPZ firms! In contrast, the EPZ firms are over 3 times more likely than nonEPZ firms to have grown beyond the threshold employment level. It certainly appears that the incentives to grow must differ between the two groups of firms.

There are also apparent differences in the probability that firms will add to or reduce their workforces. NonEPZ firms are much more likely than EPZ firms to reduce or maintain their current employment level, regardless of size. EPZ firms are much more likely to add to their employment base. The largest contrast in probability of growth is below the threshold: the smallest EPZ firms are twice as likely to increase employment compared to nonEPZ firms.

Comparing the distribution of employment by firm size in Sri Lanka with that in other developing countries (Table 2) also shows evidence consistent with atypically large barriers to employment or firm growth in nonEPZ regions. Of 15 countries for which we can find comparable data, Sri Lanka has the fifth highest proportion of workers in firms with fewer than ten workers and the second lowest fraction of workers in firms with over 49 workers. The reason for the relatively large employment share for Sri Lanka's small firms lies entirely in the nonEPZ regions. In fact, the distribution of employment across Sri Lanka's EPZ firms is in marked contrast to the overall pattern: of all the countries for which we have size-distribution information, Sri Lanka's EPZ firms have the smallest fraction of employees in firms with fewer than 10 employees and the largest fraction of employees in firms with over 49 workers.

Tables 1 and 2 reveal substantial differences in average firm size and growth patterns consistent with differences in the marginal cost of hiring across the EPZ and nonEPZ regions.

To evaluate the strength of that correlation more formally, we next propose and implement an empirical test that is consistent with the theoretical model presented above.

*4.2. **Identification Strategy***

To isolate the effects of severance pay on employment growth of firms, we employ a difference-in-differences method, using firms at or above the severance threshold as the treatment group, and those with fewer than 14 workers and those in EPZs as control groups. The first control group follows naturally from the design of the TEWA system, excluding firms employing less than 15 workers. The second control group is formed based on the assumption that enforcement is ineffective in EPZs, allowing firms to escape paying separation costs as dictated by TEWA – the assumption tested empirically below.

Before formulating precise empirical tests, it is instructive to examine the distribution of firms by size and by growth rates in the neighborhood of the employment threshold of 15. Figure 4 shows the average number of firms covered by the TEWA law by employment size. In general, the number of firms decreases as employment size increases. The pattern of data in Figure 4 does not support an undue cost of hiring the 15th worker in that we might have expected a spike at 14 workers. Instead, there are fewer firms at 14 workers than at 13 workers.[5] To better isolate a potential effect of the TEWA, it is thus useful to study the fraction of firms which are growing by firm size, as shown in Figure 5. While the likelihood of employment growth rises as firm size increases from 12 to 17 workers, it falls to 33 percent for firms with 14 workers, compared to 35 percent for firms with 13 workers and to 36 percent for firms with 15 workers. This graphical representation gives an indication that firms at the 15 worker threshold may be refraining from growing in order to avoid the severance cost.

The illustration in Figure 5 illustrates the identification method of TEWA effects we formulate below. To get a better frame of reference in which we can control for contemporaneous effects of firms not affected by the policy, we also form a separate control group consisting of EPZ firms. Our theoretical model suggests that the growth of the size of a firm depends on the magnitude of a random productivity shock compared to the change in the cost of hiring labor. The marginal cost of increasing employment differs by prior firm size and by whether the firm is inside or outside an EPZ region.

A simple test for the impact of the TEWA policy is to check for differences in probability of employment growth across firm sizes and across the two regions. This is approximated by comparing the predicted probability of hiring an additional worker in the next period conditional on the current state and size of the firm. This difference-in-difference estimate is a consistent test of the effect of the TEWA policy with the assumption that the effect of being in the EPZ region is the same for firms below and above the threshold.

In order to estimate these probabilities, two logistic models are proposed to capture firm labor demand dynamics. By equation (6), a firm will expand if

$$(1-\alpha)\ln\left(\frac{L_{it}}{L_{it-1}}\right) > \eta_{it} - \ln\left(\frac{w_{it}}{w_{it-1}}\right) - \ln\left(\frac{(1+\delta_{it})}{(1+\delta_{it-1})}\right) \tag{9}$$

where $\eta_{it} = \ln(\frac{\tau_{it}}{\tau_{it-1}})$ is assumed to be random.

We also assume that a firm pays exogenously determined wages which evolve according to a trend stationary process so that

$$\ln(\frac{w_{it}}{w_{it-1}}) = \omega_{it} \tag{10}$$

For ease of notation, let $\Delta l_{it} = (1-\alpha)\ln\left(\frac{L_{it}}{L_{it-1}}\right)$ and define the composite error term as $\varepsilon_{it} = \eta_{it} - \omega_{it}$. We can derive our indicator function as

$$\Delta I_{it} = \begin{cases} 3 \text{ when } \Delta l_{it} + \ln\left(\frac{(1+\delta_{it})}{(1+\delta_{it-1})}\right) > \varepsilon_{it} \\ 2 \text{ when } \Delta l_{it} + \ln\left(\frac{(1+\delta_{it})}{(1+\delta_{it-1})}\right) = \varepsilon_{it} \\ 1 \text{ when } \Delta l_{it} + \ln\left(\frac{(1+\delta_{it})}{(1+\delta_{it-1})}\right) < \varepsilon_{it} \end{cases} \tag{11}$$

We estimate two variants of (11). In MODEL 1, we examine the choice to grow ($\Delta I_{it} = 3$) versus the alternative to decrease employment or stay the same ($\Delta I_{it} < 3$).[6] In MODEL 2, we further differentiate between the last two options, ($\Delta I_{it} = 2$) versus ($\Delta I_{it} = 1$). MODEL 2 allows us to investigate whether firms above the threshold are more likely to shed firms in order to fall back into exempt status compared to workers who are below the threshold.

To operationalize (11), we assume that the cumulative distribution of ε_{it} is logistic. We also need to specify the marginal cost for a firm for adding employment. We assume that

$$\ln\left(\frac{(1+\delta_{it})}{(1+\delta_{it-1})}\right) = \beta_0 + \sum_{k=1}^{n} \beta_k D(k)_{it-1} + \beta_{EPZ}(EPZ_i) + \sum_{k=1}^{n} \gamma_k (D(k)_{it-1} * EPZ_i). \quad (12)$$

This specification relates to the theoretical marginal cost in (6) as follows: The constant β_0 corresponds to the base case which is conveniently set to be $L_{it-1} = 14$ in a nonEPZ region. That is the case with the highest marginal cost of employment $\delta_t = 15\delta$. The $D(k)_{it-1}$ are dummy variables indicating the number of workers at firm i in year $t-1$, ranging from one to more than five hundred employees. We would expect that dummy variables corresponding to $L_{it-1} < 14$ would be cases with low marginal costs of raising employment and dummy variables corresponding to $L_{it-1} > 14$ would be cases with marginal costs of employment $\delta_t = \delta$. A positive value for β_k indicates an increased likelihood of hiring more workers by a firm in the size class k as compared to the firm with 14 workers.

'EPZ' is a dummy variable indicating firms that were in the export processing region with coefficient β_{EPZ}. We also include interaction terms to capture the effect of firms locating in the EPZ region. Positive values of γ_k will imply that firms in the EPZ region have a higher probability of expanding employment compared to equally sized firms in the nonEPZ regions.

The table below illustrates the difference between EPZ and nonEPZ regions in terms of the parameters of our model. It shows how the probability of firm size growth differs across groups conditional on firm employment in period $t-1$. The first column shows the parameters describing firm growth in the EPZ regions for firms below, at and above the threshold. The second column shows the corresponding parameter estimates for firms in the nonEPZ regions. The first differences of the nonEPZ estimates allow us to identify β_{k^-} and β_{k^+}. The double difference allows us to identify γ_{k^-} and γ_{k^+}.

	EPZ	Non EPZ	Difference
$L_{it-1} \leq 13$	$\beta_0 + \beta_{k^-} + \beta_{EPZ} + \gamma_{k^-}$	$\beta_0 + \beta_{k^-}$	$(\beta_{EPZ} + \gamma_{k^-})$
14	$\beta_0 + \beta_{EPZ}$	β_0	β_{EPZ}
Difference	$(\beta_{k^-} + \gamma_{k^-})$	β_{k^-}	$\boldsymbol{\gamma}_{k^-}$
$L_{it-1} \geq 15$	$\beta_0 + \beta_{k^+} + \beta_{EPZ} + \gamma_{k^+}$	$\beta_0 + \beta_{k^+}$	$(\beta_{EPZ} + \gamma_{k^+})$
14	$\beta_0 + \beta_{EPZ}$	β_0	β_{EPZ}
Difference	$(\beta_{k^+} + \gamma_{k^+})$	β_{k^+}	$\boldsymbol{\gamma}_{k^+}$

$\beta_{k^-} > 0$ indicates faster growth than the base case for nonEPZ firms below 14 workers. Similarly, $\beta_{k^+} > 0$ indicates faster employment growth than the base case for nonEPZ firms above 14 workers. $\beta_{EPZ} + \gamma_{k^-} > 0$ indicates that EPZ firms are growing faster than nonEPZ firms below 14 workers and $\beta_{EPZ} + \gamma_{k^+} > 0$ indicates that EPZ firms are growing faster than nonEPZ firms above 14 workers. The coefficient β_{EPZ} tells us if EPZ firms grow faster than nonEPZ firms at the threshold.

5. Results

In Tables 3 and 4, we present the results of the estimation of Model 1 which compares the decision to increase employment $\{\Delta l_{it} = 3\}$ against the option to either retain or lower employment from current staffing levels $\{\Delta l_{it} = 1, 2\}$. We treat the latter as the base case. All coefficients are converted into probabilities to aid interpretation. Table 3 presents the most detailed sets of results, while Table 4 presents a more parsimonious representation that averages decisions below and above the threshold employment level of 14 workers. The conclusions are consistent across the two tables, and so we will focus our comments on the more abbreviated set of results from Table 4.

5.1. *Result 1: EPZ firms are more likely than nonEPZ firms to add workers, both above and below the threshold: $(\gamma_{k^-} + \beta_{EPZ}) > 0$; $(\gamma_{k^+} + \beta_{EPZ}) > 0$.*

Compared to firms at the threshold, nonEPZ firms below the threshold are 11% more likely to stay the same or shrink in the following year. In contrast, EPZ firms below the threshold are 10% more likely to grow. Technically, these nonEPZ firms are not facing a higher marginal cost of employment, but the existence of the threshold may constrain nonEPZ firms to select a smaller scale of operation that retards growth. Once passing the threshold, nonEPZ firms are 5% more likely to add employees in the following year, consistent with the possible role of the permanent growth shock needed to induce a nonEPZ firm to risk hiring the 15th worker. Nevertheless, the EPZ firms above the threshold are even more likely to continue growing with a marginal probability of 18%. In theory, nonEPZ firms should be more likely to grow above than at the threshold, but the effect should be bigger in nonEPZ than in EPZ regions. Apparently there are other benefits of being in the EPZ regions that also contribute to growth above the threshold.

5.2. Result 2: For nonEPZ firms, the probability of raising employment is higher above than below the threshold. $\beta_{k^+} > \beta_{k^-}$*.This increase in employment growth probabilities is larger in nonEPZ regions than in EPZ regions* $\{(\gamma_{k+} - \gamma_{k^-}) > 0\}$

Converting the estimates to their implied marginal probabilities, the pooled effect of being below the threshold is to lower the probability of increasing employment by 11.3% while the pooled effect of being above the threshold raises the likelihood of increasing employment by 5.4%. Comparing the impact of β_{k^+} to that of β_{k^-} , we find that crossing the threshold results in a statistically significant 16.7% increased probability of adding workers. In contrast, passing the threshold only increased the transition probability of employment growth by 8% in EPZ regions. Comparing the change in employment growth above and below the threshold, we find that the 8.6% larger difference in the nonEPZ regions is statistically significant, and so passing the threshold does have a larger effect on employment growth probabilities for nonEPZ firms.

5.3. Result 3: For EPZ firms, there is no significant difference in the probability of raising employment above or below the threshold relative to the probability at the threshold. $(\beta_{k^-} + \gamma_{k^-}) = 0; (\beta_{k^+} + \gamma_{k^+}) = 0.$

In theory, for EPZ firms, there should be no change in the probability of adding employment as firms move from below to above the threshold compared to firms at the threshold. We find weak support for this hypothesis. As shown in Table 4, EPZ firms below the threshold were 3% more likely to add workers than were firms at the threshold, but the difference is not statistically significant. The comparable test for EPZ firms above the threshold were 11% more likely to grow compared to firms at the threshold, but again the estimate is not statistically significant.

We do have evidence that the employment growth probabilities for EPZ firms above the threshold are 8% higher than those below threshold. The implication is that there is no difference in growth probabilities as firms progress marginally from 13 to 14 workers or from

14 to15 workers, but that the grosser comparison of firms below 14 and above 14 workers does establish significant differences in employment probabilities.

When we turn to the more complex model 2 which contrasts the decision to increase employment $\{\Delta l_{it} = 3\}$versus not changing employment $\{\Delta l_{it} = 2\}$ versus lowering employment $\{\Delta l_{it} = 1\}$, all of the results 1-3 still hold. Nevertheless, the increased complexity of the model makes it more difficult to interpret. Instead, we convert the results to their implied transition probabilities which are reported in Table 4. The estimates corresponding to Tables 3 and 4 are reported in the Appendix. The following conclusions can be based on Table 5.

5.4. Result 4: For firms below the threshold, EPZ firms are most likely to grow while nonEPZ firms are least likely to grow.

For firms below 14 employees, the transition growth probability for EPZ firms is twice that of nonEPZ firms of the same size. Compared to their EPZ counterparts, nonEPZ firms are 8% more likely to reduce employment and 14% more likely to retain current staffing levels.

5.5. Result 5: For firms at the threshold, both EPZ and nonEPZ firms are most likely to shrink, but the probability of growing is higher for EPZ firms while the probability of shrinking is higher for nonEPZ firms.

Transition probabilities at the threshold are somewhat imprecise for the EPZ firms because of small samples, but the pattern of results suggests sharp differences between EPZ and nonEPZ firms. EPZ firms are 8% more likely to add employment and 8% less likely to shrink compared to their nonEPZ counterparts.

5.6. *Result 6: Above the threshold, both EPZ and nonEPZ firms have the highest probability of growing compared to smaller firms in the same region. However, nonEPZ firms also have the highest probability of shrinking compared to their smaller counterparts.*

EPZ firms above the threshold have a 52% probability of adding employment in the next year, while nonEPZ firms have a 39% larger probability of growing. Both of these probabilities are higher than the corresponding estimates of firms below or at the threshold. The largest increase in the probability of growing from below to above the threshold occurs in the nonEPZ region.

Nevertheless, there does seem to be an incentive for nonEPZ firms to return to the lower employment levels that are untaxed. While 45% of EPZ firms with over 14 employees lower employment in the next year, 56% of similarly sized nonEPZ firms lowered their employment.

While nonEPZ firms will be charged if the reduction in force is involuntary (i.e. a layoff rather than a quit), there is a potential return if the firm drops below 15 workers and becomes exempt from the TEWA tax.

To summarize, there is a clear difference in the likelihood of changing employment between the EPZ and non-EPZ firms. EPZ firms do not grow differently above or below the threshold relative to the threshold. Smaller non-EPZ firms grow significantly more slowly than firms at the threshold while firms with more than 14 workers grow significantly faster than the threshold firms. Overall, EPZ firms seem to have a significant growth advantage over their nonEPZ counterparts.

6. Extension

In this section, we test for evidence consistent with differences in law enforcement across regions of Sri Lanka. Because of administrative problems, monitoring of companies to ensure compliance with labor and factory laws can be difficult. For example, large scale evasion occurs in the Employees Provident Fund Act (EPF) which covers all employees of a company. The EPF requires that employees pay 8 percent and that the company pay 12 percent of worker earnings into an insurance fund as security for the employees when they are no longer employed. This can result in the firms behaving strategically, comparing the cost of the policy and the cost of evasion. The firm will decide to evade if the expected value of the cost of evasion is lower than the cost of the policy. It is possible that evasion is so inexpensive that nonEPZ firms behave much like EPZ firms in some areas.

In order to measure this effect, we added interaction terms to Model 1 representing each region. The coefficients on these terms can be interpreted as the relative impact on employment growth of locating in a particular region relative to the base region.

The results are presented in Table 6. Firms in Colombo, the capital of Sri Lanka are chosen as the reference group. The results indicate that compared to Colombo, all regions except Mannar, Vauvnia and Muilativue have a lower employment growth rate. The joint test of equal employment growth across the regions easily rejects the null hypothesis of equal growth. Nevertheless, none of the regions including Colombo has a higher employment growth probability than those estimated for firms in the EPZ region either above or below the threshold.

7. Conclusion

Numerous studies have explained the effect of labor market restriction on unemployment, employment growth and wage inequality in OECD countries. This study extends this inquiry to the case of a program imposing severance costs on firms with 15 or more employees in Sri Lanka.

Our theoretical model showed that to grow beyond the threshold employment level of 14 workers, firms must be atypically productive in order to afford the increased expected hiring costs. This leads to firms clustering below the threshold.

Using a discrete choice framework to analyze Sri Lanka's severance pay system, our results show that the presence of firing cost significantly distorts the hiring decisions of firms. Covered firms tend to stop growing at 14 employees. Because of the presence of the need for a large and permanent firm-specific technology shock to grow beyond 14 workers, firms that are able to pass the threshold are atypically productive. In fact, the firms above the threshold grow faster than those below. Firms in enterprise protection zones which are largely exempt from the law experience no significant change in employment growth at the threshold. They also grow faster than nonEPZ firms at all levels of employment.

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Notes

[1]Freeman (2007) presents a review of both theoretical and empirical effects of labor market institutions. Addison and Teixeira (2001) review findings regarding the effects of employment protection legislation

[2]If termination is the result of misconduct or poor discipline, the employer must inform the worker in writing of the reasons for such termination before the second day after such termination, failing which, the worker is entitled to seek redress under the TEWA on the basis that the termination of his services was not for disciplinary reasons.

[3]The amendments of TEWA in December 2003 introduced a formula-based payment that is uniformly applied to all firms. While compensation formulas reduce non-transparency and arbitrariness in the firing process, the process of separation still involves prior approval by the CGL.

[4]The others were an unreliable supply of electricity; uncertain government policy; macroeconomic instability; and the high cost of obtaining external financing.

[5]This pattern of the size distribution of firms holds generally across regions that are covered by the TEWA law, and so we report the pattern for the country as a whole.

[6]There are other measures of employment growth such as the continous case that we could have used in this study. The discrete (0-1) that we adopt is the closest approximation to the marginal choice.

Table 1: Distribution of Sri Lanka firms by initial size, change in employment over the years, and EPZ status, 1995-2003

EPZ Firms	**Percent of sample**	**Shrink**	**Stay**	**Grow**	**Total**
Less than 14 employees	22.5%	29.3%	26.7%	44.0%	100.0%
14 employees	1.1%	45.8%	13.6%	40.7%	100.0%
More than 14 employees	76.4%	45.4%	2.2%	52.4%	100.0%
N=5,441					

non EPZ Firms	**Percent of sample**	**Shrink**	**Stay**	**Grow**	**Total**
Less than 14 employees	75.6%	37.2%	40.8%	22.0%	100.0%
14 employees	1.2%	53.9%	13.2%	32.9%	100.0%
More than 14 employees	23.2%	55.8%	5.1%	39.1%	100.0%
N=320,866					

Table 2: Percent distribution of employment by firm size, Sri Lanka and various other countries

Sri Lanka, 1995-2003	**<10 employees**	**11 to 49 employees**	**>49 employees**
Total	**68**	**20**	**12**
NonEPZ firms only	**69**	**20**	**11**
EPZ firms only	**17**	**26**	**57**
Other countries			
Sierra Leone - 1974	90	5	5
Ghana - 1970	84	1	15
Zambia	83	1	16
Indonesia	77	7	16
Honduras - 1979	68	8	24
Philippines - 1974	66	5	29
Nigeria - 1972	59	26	15
Thailand - 1978	58	11	31
Tanzania - 1967	56	7	37
Colombia - 1973	52	13	35
Kenya - 1969	49	10	41
India-1971	42	20	38
Korea - 1975	40	7	53
Jamaica - 1978	35	16	49

Note: Sri Lanka based on authors' computations. Data for all other countries from Liedholm and Mead (1987, Table 3)

Table 3. Parameter estimates of the likelihood that the firm will increase employment compared to reducing it or keeping it unchanged.

	Model 1	
Variables	$y_{it} = 3$ *vs* 1 or 2.	
No. of workers (k)	coefficient (β_k)	std. errors
$\beta_{k=1}$	**-.1795**	**.0045**
$\beta_{k=2}$	**-.1282**	**.0050**
$\beta_{k=3}$	**-.0897**	**.0056**
$\beta_{k=4}$	**-.07587**	**.0058**
$\beta_{k=5}$	**-.0545**	**.0063**
$\beta_{k=6-7}$	**-.0338**	**.0066**
$\beta_{k=8-9}$	-.0140	.0071
$\beta_{k=10-11}$	0.0020	.0076
$\beta_{k=12}$	0.0040	.0089
$\beta_{k=13}$	0.0147	.0094
$\beta_{k=14}$	-	-
$\beta_{k=15}$	**0.0264**	**.0102**
$\beta_{k=16}$	**0.0269**	**.0106**
$\beta_{k=17}$	**0.0300**	**.0109**
$\beta_{k=18-20}$	**0.0345**	**.0089**
$\beta_{k=21-25}$	**0.0472**	**.0089**
$\beta_{k=26-35}$	**0.0616**	**.0087**
$\beta_{k=36-99}$	**0.0802**	**.0082**
$\beta_{k=100-249}$	**0.0619**	**.0084**
$\beta_{k=250-499}$	**0.0256**	**.0087**
$\beta_{k>500}$	**0.0321**	**.0090**
β_{EPZ}	0.0682	.0580
$k \leq 11$ in EPZ (γ_{11-})	0.0995	.0626
$k = 12$ in EPZ (γ_{12})	0.0849	.0795
$k = 13$ in EPZ (γ_{13})	0.0799	.0802
$k = 15$ in EPZ (γ_{15})	0.0578	.0861
$k = 16$ in EPZ (γ_{16})	0.1645	.0939
$k = 17$ in EPZ (γ_{17})	0.0996	.0906
$k \geq 18$ in EPZ (γ_{18+})	0.0413	.0558

Test for differences in employment growth rate between groups.

Hypothesis	Estimate	p-value	Hypothesis	p-value
$(\beta_{EPZ} + \gamma_{11-}) = 0$	**0.1677**	**0.000**	$(\beta_{11-} + \gamma_{11-}) = 0$	0.7344
$(\beta_{EPZ} + \gamma_{12}) = 0$	**0.1531**	**0.002**	$(\beta_{12} + \gamma_{12}) = 0$	0.2212
$(\beta_{EPZ} + \gamma_{13}) = 0$	**0.1481**	**0.003**	$(\beta_{13} + \gamma_{13}) = 0$	0.1949
$\beta_{EPZ} = 0$	0.0682	0.240	–	-
$(\beta_{EPZ} + \gamma_{15}) = 0$	**0.126**	**0.039**	$(\beta_{15} + \gamma_{15}) = 0$	0.2905
$(\beta_{EPZ} + \gamma_{16}) = 0$	**0.2327**	**0.000**	$(\beta_{16} + \gamma_{16}) = 0$	**0.0203**
$(\beta_{EPZ} + \gamma_{17}) = 0$	**0.1678**	**0.006**	$(\beta_{17} + \gamma_{17}) = 0$	0.1102
$(\beta_{EPZ} + \gamma_{18+}) = 0$	**0.1095**	**0.000**	$(\beta_{18+} + \gamma_{18+}) = 0$	0.0804

Note: Dependent variable: indicator variable taking the value of 1 if employment increases and 0 otherwise. Logistic regression estimates given. Marginal effect with the size of employment equal to 14 and being a nonEPZ firm as the baseline. Bold values are significant at 5%.

Table 4. Estimate for MODEL 1 regrouped to test for differences in employment growth rate below and above the threshold.

Variables	Marginal Effect	std. errors
$L_{t-1} \leq 13$ in EPZ $(\beta_{k^-} + \gamma_{k^-} + \beta_{EPZ})$	**0.0996**	**0.0155**
$L_{t-1} \leq 13$ in nonEPZ (β_{k^-})	**−.1127**	**0.0076**
$L_{t-1} = 14$ in EPZ (β_{EPZ})	0.0693	0.0590
$L_{t-1} = 14$ in nonEPZ (β_{14}) (reference).	–	–
$L_{t-1} \geq 15$ in EPZ $(\beta_{k^+} + \gamma_{k^+} + \beta_{EPZ})$	**0.1802**	**0.0115**
$L_{t-1} \geq 15$ in nonEPZ (β_{k^+})	**0.0538**	**0.0073**
Test for differences in growth rate between groups		
Hypothesis	Estimate	Chi-square
Test for differences in employment growth rate between firms with ($L_{t-1} \leq 13$ in nonEPZ) and ($L_{t-1}=14$ in nonEPZ); $(\beta_{k^-}) = 0$	**−0.1127**	**222.01**
Test for differences in employment growth rate between firms with ($L_{t-1} \geq 15$ in nonEPZ) and ($L_{t-1}=14$ in nonEPZ); $(\beta_{k^+}) = 0$	**0.0538**	**53.73**
Test for differences in employment growth rate between firms with ($L_{t-1} \geq 15$ in nonEPZ) and ($L_{t-1} \leq 13$ in nonEPZ) $\equiv \{(\beta_{k^+} - \beta_{k^-}) = 0\}$	**0.1665**	**8455.52**
Test for differences in employment growth rate between firms with ($L_{t-1} \leq 13$ in EPZ) and ($L_{t-1}=14$ in EPZ) $\equiv \{(\beta_{k^-} + \gamma_{k^-}) = 0\}$	0.0303	0.25
Test for differences in employment growth rate between firms with ($L_{t-1} \geq 15$ in EPZ) and ($L_{t-1}=14$ in EPZ) $\equiv \{(\beta_{k^+} + \gamma_{k^+}) = 0\}$	0.1109	3.15
Test for differences in employment growth rate between firms with ($L_{t-1} \geq 15$ in EPZ) and ($L_{t-1} \leq 13$ in EPZ) $\equiv (\beta_{k^+} - \beta_{k^-}) + (\gamma_{k^+} - \gamma_{k^-}) = 0$	**0.0806**	**26.89**
Test for differences in employment growth rate below and above the threshold for EPZ and nonEPZ firms) $\equiv \left(\begin{smallmatrix}\{L_{t-1} \geq 15 \text{ in } EPZ - L_{t-1} \leq 13 \text{ in } EPZ\} - \\ \{L_{t-1} \geq 15 \text{ in } nonEPZ - L_{t-1} \leq 13 \text{ in } nonEPZ\}\end{smallmatrix}\right) \equiv (\gamma_{k+} - \gamma_{k-}) = 0$	**−0.0859**	**53.91**

Note: Dependent variable: indicator variable taking the value of 1 if employment increases and 0 otherwise. Logistic regression estimates given.
Base case is 14 workers in a nonEPZ region.Bold values are significant at 5%.

Table 5. Predicted transition probability at each employment category.

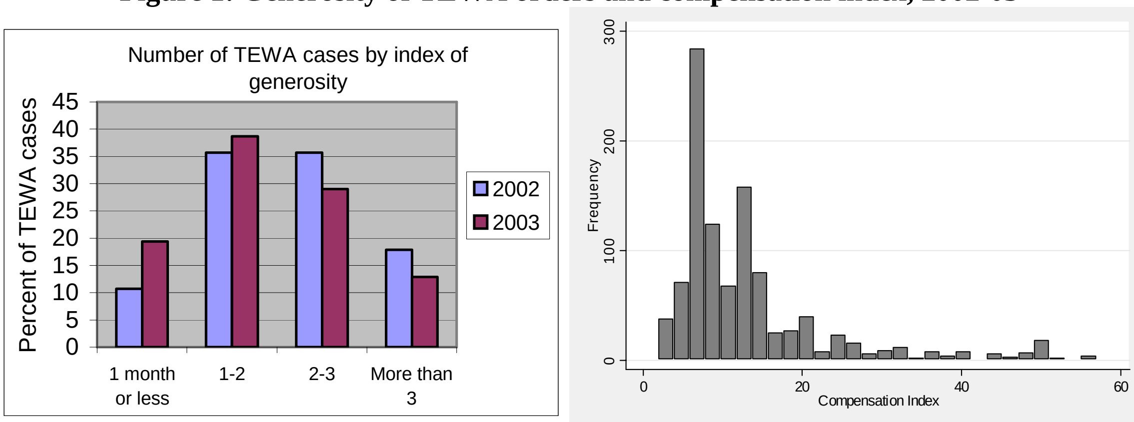
Group	Shrink	Stay the same	Grow
EPZ below the threshold	0.293 $[0.268, 0.318]$	0.267 $[0.242, 0.292]$	0.440 $[0.412, 0.467]$
$nonEPZ$ below the threshold	0.372 $[0.370, 0.374]$	0.408 $[0.406, 0.410]$	0.220 $[0.218, 0.222]$
EPZ at the threshold	0.458 $[0.331, 0.585]$	0.136 $[0.048, 0.223]$	0.407 $[0.281, 0.532]$
$nonEPZ$ at the threshold	0.539 $[0.523, 0.555]$	0.132 $[0.121, 0.143]$	0.329 $[0.314, 0.344]$
EPZ above the threshold	0.454 $[0.439, 0.469]$	0.022 $[0.017, 0.026]$	0.524 $[0.509, 0.539]$
$nonEPZ$ above the threshold	0.558 $[0.554, 0.561]$	0.051 $[0.049, 0.053]$	0.391 $[0.388, 0.395]$

95% confidence intervals in brackets.

Table 6. Estimated model to test differences in law enforcement in the regions.		
	Model 1	
Variables	$y_{it} = 3$ *vs* 1 or 2.	
Regions	Marg. Effects	Std. errors
Colombo - suburb	**-.0027**	**0.0026**
Kalutara	**-.0219**	**0.0032**
Kandy	**-.0324**	**0.0031**
Matale	**-.0262**	**0.0060**
Nuwara Eliya	**-.0259**	**0.0051**
Galle	**-.0208**	**0.0039**
Matara	**-.0141**	**0.0042**
Gampaha	-.0050	0.0031
Jaffna	**-.0441**	**0.0085**
Mannar	0.0268	0.0220
Vauvnia	**0.0295**	**0.0113**
Batticoloa	**-.0464**	**0.0082**
Trincomale	**-.0354**	**0.0093**
Muilativue	0.0305	0.0512
Puttilam	**-.0244**	**0.0041**
Anuradapura	-.0044	0.0068
Polunnaruwa	**-.0174**	**0.0088**
Badulle	**-.0164**	**0.0045**
Ratnapura	**-.0173**	**0.0036**
Kegalle	**-.0485**	**0.0039**
Hambantota	**-.0179**	**0.0072**
Ampara	**-.0457**	**0.0091**
Kurunegala	**-.0332**	**0.0032**
$k \leq 13$ in EPZ (γ_{13^-})	**0.1569**	**0.0143**
$k = 14$ in EPZ (γ_{14})	0.0093	0.0513
$k \geq 15$ in EPZ (γ_{15^-})	**0.1021**	**0.0076**

Note - Dependent variable: indicator variable taking the value of 1 if employment increases and 0 otherwise. Logistic regression estimates given.
Result including regional dummies β_{k^+} and β_{k^-} not reported. Reference group is Colombo, the capital of Sri Lanka. Emphasized values are significant at 5%.

Figure 1: Generosity of TEWA orders and compensation index, 2002-03



Source: Author's computations based on the information provided by the Commissioner.
Notes: The index of generosity is the multiple of the monthly salary per year of work service, above computed from the TEWA orders for firms; compensation index is the multiple of the monthly salary awarded to workers, above computed from compensation awarded to workers in 2002.

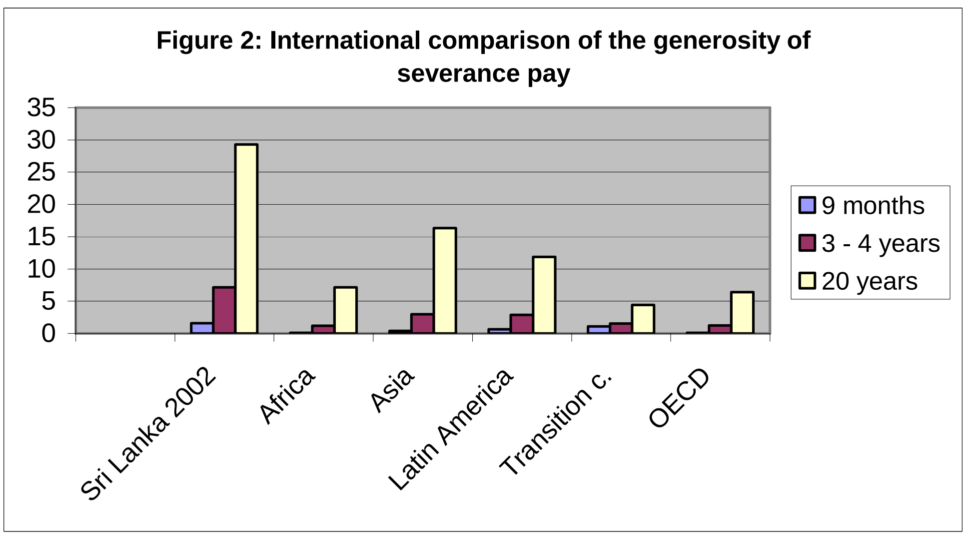
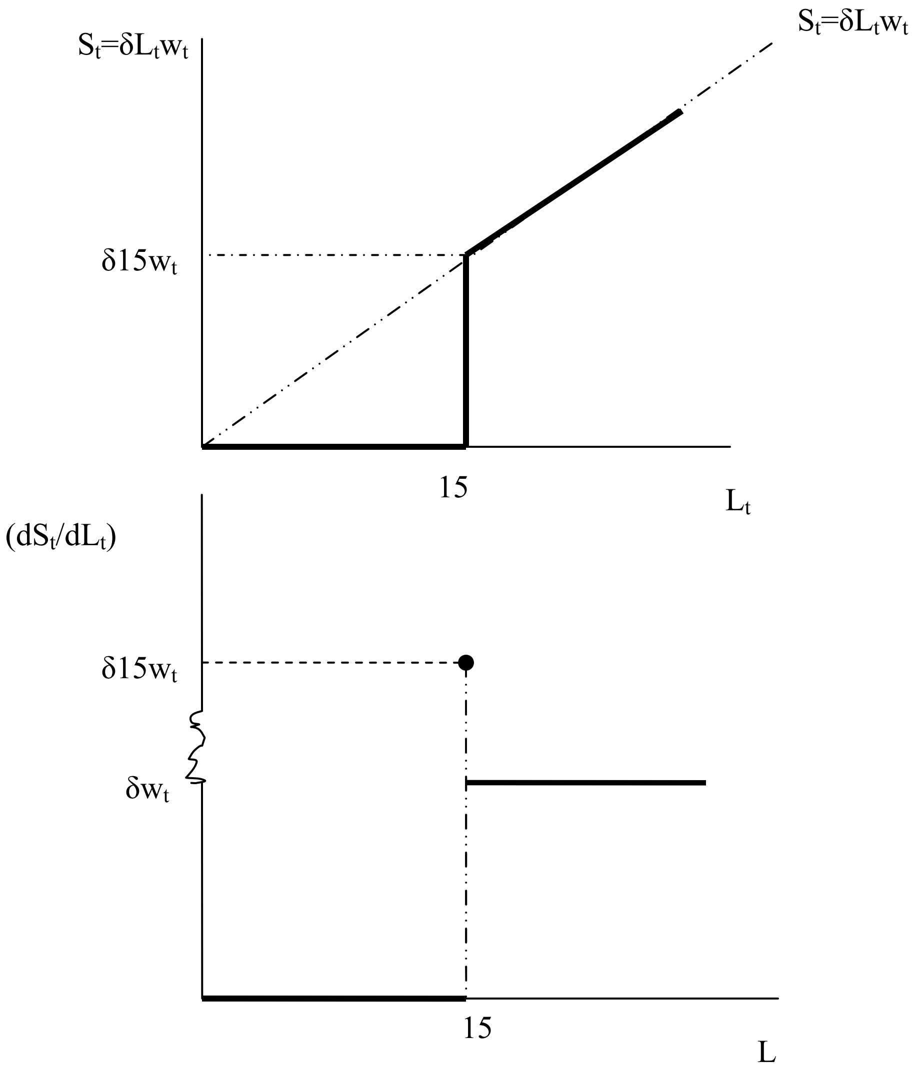


Figure 2: International comparison of the generosity of severance pay

Source: Author's computation, for Sri Lanka; Holzmann, Iyer and Vodopivec (2003), for other countries.
Note: simulated generosity levels for Sri Lanka (inferred from a regression based on data for workers who received compensation in 2002), stipulated generosity levels as prescribed by compensation formulas in other countries.

Figure 3: Severance cost and firm size changes.



S_t= Severance cost in period t.

Figure 4: Annual number of firms covered by TEWA, by number of employees, 1995-2003

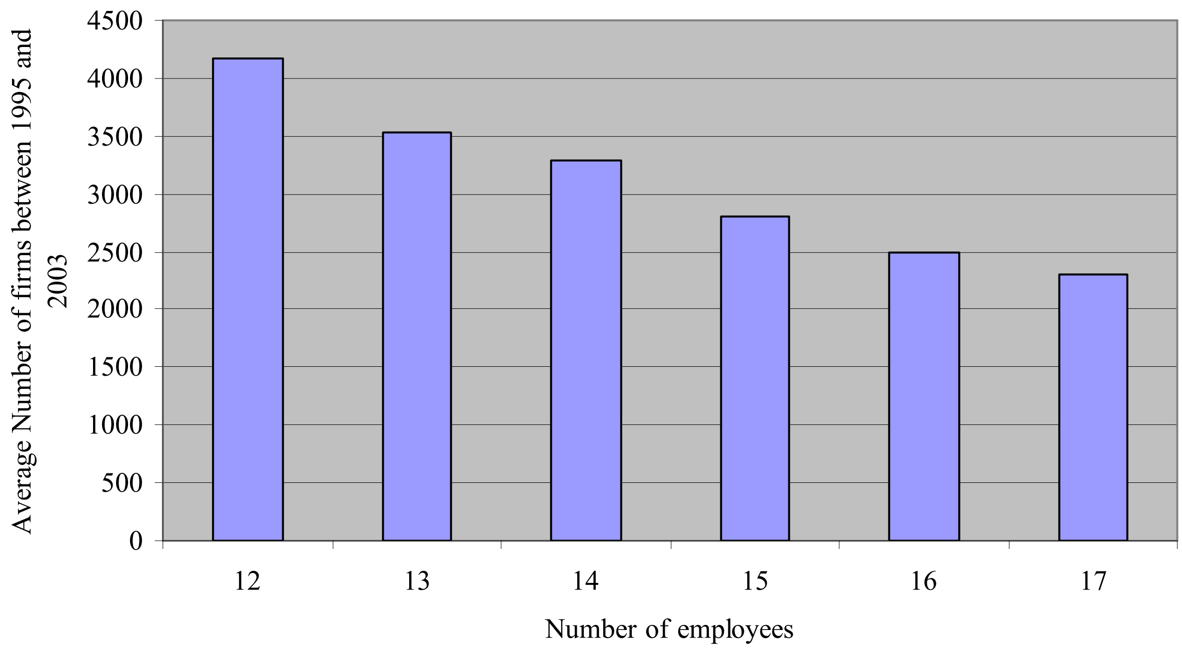
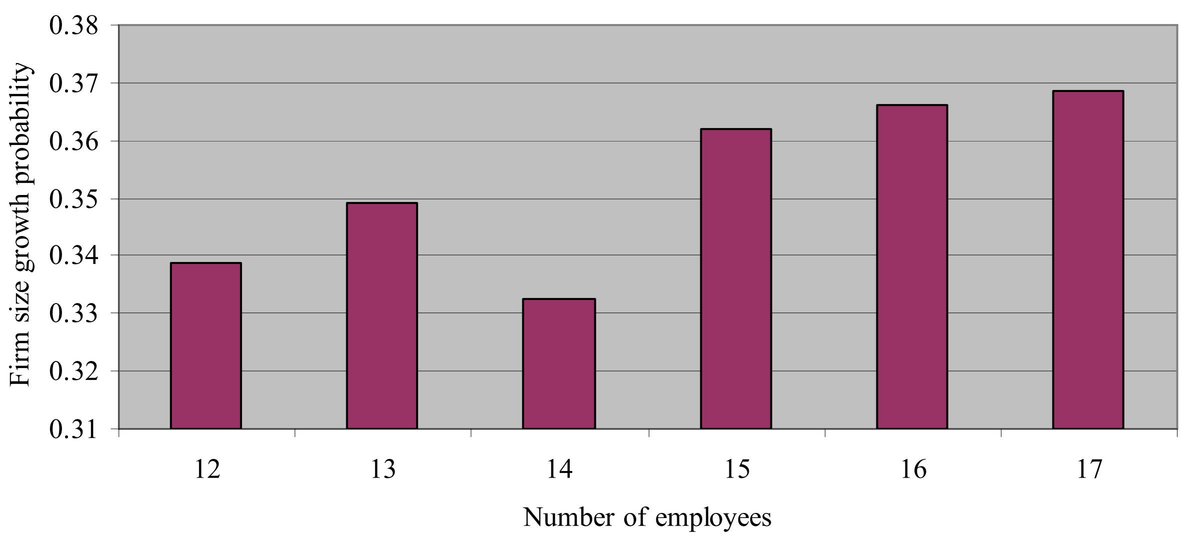


Figure 5: Share of firms covered by TEWA that increased employment during the year, by number of employees at the start of the year, 1995-2003



Appendix

Box 1: A retrenchment at a Shell Gas Lanka

Shell Gas Lanka decided to close down one division of the company and filed an application for a retrenchment of 17 workers on April 18, 2001. The Commissioner General of Labor concluded the cross-examination by November 2001, and issued the order approving application on December 2, 2003 – two years and a half after its filing (in the meantime, the 17 workers remained employed and continued to be paid, although *de facto* they did not work). The order allowed the company to proceed with layoffs of all 17 workers, contingent on paying them:

- to workers with more than 10.5 years of service: 4.5 monthly wages times the sum of years of their service with the company plus the years of future service until normal retirement, with the ceiling of 90 monthly wages; and
- to workers with less than 10.5 years of service: 3.5 monthly wages times the sum of years of their service with the company plus the years of future service until normal retirement, with the ceiling of 70 monthly wages.

During the retrenchment, process, the company has frozen hiring except at the highest level. (Shell Gas was privatized in1995 under the clause of no retrenchment, and in the late 1990s reduced its staff via voluntary retirement programs, offering on average about 74 monthly wages.)

Source: Vodopivec (2004).

The estimated impact of TEWA on employment growth at different employment levels.

Multinomial logit estimation. All results are converted to marginal effects.

	Model 2					
Variables	Shrink		Stay the same		Grow	
No. of workers (k)	coefficient	std. errors	coefficient	std. errors	coefficient	std. errors
$\beta_{k=1}$	-.2975	.0075	**0.5076**	**.0100**	**-.2102**	**.0051**
$\beta_{k=2}$	-.2569	.0081	**0.4234**	**.0111**	**-.1665**	**.0057**
$\beta_{k=3}$	-.2146	.0086	**0.3446**	**.0119**	**-.1300**	**.0063**
$\beta_{k=4}$	-.1640	.0092	**0.2765**	**.0123**	**-.1125**	**.0066**
$\beta_{k=5}$	-.1344	.0095	**0.2209**	**.0125**	**-.0865**	**.0071**
$\beta_{k=6-7}$	-.1002	.0093	**0.1584**	**.0118**	**-.0581**	**.0074**
$\beta_{k=8-9}$	-.0590	.0096	**0.0876**	**.0114**	**-.0287**	**.0079**
$\beta_{k=10-11}$	-.0417	.0097	**0.0481**	**.0111**	-.0064	.0084
$\beta_{k=12}$	-.0161	.0113	0.0146	.0122	0.0015	.0098
$\beta_{k=13}$	-.0113	.0117	-.0044	.0123	0.0157	.0104
$\beta_{k=14}$	-	-	-	-	-	-
$\beta_{k=15}$	-.0076	.0124	-.0235	.0126	**0.0311**	**.0113**
$\beta_{k=16}$	-.0108	.0128	-.0202	.0131	**0.0310**	**.0116**
$\beta_{k=17}$	.0050	.0131	**-.0437**	**.0128**	**0.0387**	**.0120**
$\beta_{k=18-20}$	.0221	.0106	**-.0707**	**.0095**	**0.0485**	**.0098**
$\beta_{k=21-25}$	.0207	.0102	**-.0853**	**.0087**	**0.0646**	**.0097**
$\beta_{k=26-35}$	.0292	.0098	**-.1149**	**.0074**	**0.0857**	**.0095**
$\beta_{k=36-99}$	.0557	.0091	**-.1751**	**.0051**	**0.1194**	**.0090**
$\beta_{k=100-249}$	.1084	.0096	**-.2183**	**.0036**	**0.1099**	**.0095**
$\beta_{k=250-499}$	.1570	.0103	**-.2277**	**.0034**	**0.0707**	**.0101**
$\beta_{k>500}$	.1648	.0105	**-.2476**	**.0022**	**0.0828**	**.0105**
β_{EPZ}	-.0727	.0652	0.0061	.0715	0.0666	.0627
$k \leq 11$ in EPZ (γ_{11-})	-.0792	.0653	-.0376	.0635	0.1168	.0671
$k = 12$ in EPZ (γ_{12})	-.0634	.0885	-.0275	.0885	0.0909	.0849
$k = 13$ in EPZ (γ_{13})	-.1260	.0873	0.0550	.1061	0.0710	.0868
$k = 15$ in EPZ (γ_{15})	.0202	.1040	-.0955	.0893	0.0753	.0940
$k = 16$ in EPZ (γ_{16})	-.1262	.0919	-.0430	.0973	0.1692	.0983
$k = 17$ in EPZ (γ_{17})	-.1004	.0993	0.0054	.1142	0.0950	.0974
$k \geq 18$ in EPZ (γ_{18+})	.0034	.0677	-.0571	.0609	0.0537	.0610

Note: Dependent variable: indicator variable taking the value of 3 if employment increases, 2 if employment is the same and 1 if employment reduces. Logistic regression estimates given. Base case is 14 workers in a nonEPZ region.Bold values are significant at 5%.

Estimate is Model 2 with shrinking below L_{t-1} as base outcome.
Variables regrouped to test for differences in employment growth rate below and above the threshold.

Variables	Shrink ($y_{it}=1$) Marginal Effect	Shrink Standard error	stay the same ($y_{it}=2$) Marginal Effect	stay the same Standard error	Grow ($y_{it}=3$) Marginal Effect	Grow Standard error
$L_{t-1} \leq 13$ in EPZ ($\beta_{k^-}+\gamma_{k^-}+\beta_{EPZ}$)	**−.24**	**.01**	**.20**	**.02**	**0.04**	**0.02**
$L_{t-1} \leq 13$ in nonEPZ (β_{k^-})	**−.14**	**.01**	**.24**	**.01**	**−.10**	**0.01**
$L_{t-1} \leq 14$ in EPZ (β_{EPZ})	−.07	.06	.01	.08	0.10	0.06
$L_{t-1} \leq 14$ in nonEPZ (β_{14})	−	−	−	−	−	−
$L_{t-1} \geq 15$ in EPZ ($\beta_{k^+}+\gamma_{k^+}+\beta_{EPZ}$)	**−.01**	**.01**	**−.22**	**.01**	**0.23**	**0.01**
$L_{t-1} \geq 15$ in nonEPZ (β_{k^+})	.08	.01	**−.17**	**.01**	**0.09**	**0.01**

Test for differences in growth rate between groups ($y_{it}=3$)

Hypothesis	Estimate[1]
Test for differences in employment growth rate between firms with ($L_{t-1} \leq 13$ in nonEPZ) and (L_{t-1}=14 in nonEPZ); $(\beta_{k^-})=0$	**−0.01** (167.96)
Test for differences in employment growth rate between firms with ($L_{t-1} \geq 15$ in nonEPZ) and (L_{t-1}=14 in nonEPZ); $(\beta_{k^+})=0$	**0.09** (141.85)
Test for differences in employment growth rate between firms with ($L_{t-1} \geq 15$ in nonEPZ) and ($L_{t-1} \leq 13$ in nonEPZ) $\equiv \{(\beta_{k^+}-\beta_{k^-})=0\}$	**0.19** (332.18)
Test for differences in employment growth rate between firms with ($L_{t-1} \leq 13$ in EPZ) and (L_{t-1}=14 in EPZ) $\equiv \beta_{k^-}+\gamma_{k^-}=0$	−.02 (3.27)
Test for differences in employment growth rate between firms with ($L_{t-1} \geq 15$ in EPZ) and (L_{t-1}=14 in EPZ) $\equiv \beta_{k^+}+\gamma_{k^+}=0$	0.17 (0.85)
Test for differences in employment growth rate between firms with ($L_{t-1} \geq 15$ in EPZ) and ($L_{t-1} \leq 13$ in EPZ) $\equiv \{(\beta_{k^+}-\beta_{k^-})+(\gamma_{k+}-\gamma_{k^-})\}$	**0.19** (12.16)
Test for differences in employment growth rate below and above the threshold for EPZ and nonEPZ firms) $\equiv \left(\begin{smallmatrix}\{L_{t-1}\geq 15 \; in \; EPZ - L_{t-1}\leq 13 \; in \; EPZ\} - \\ \{L_{t-1}\geq 15 \; in \; nonEPZ - L_{t-1}\leq 13 \; in \; nonEPZ\}\end{smallmatrix}\right) \equiv (\gamma_{k+}-\gamma_{k^-})=0$	**−0.004** (32.75)

Note: Independent variables are dummy variables for firms that belong to stated groups only.
Base case is 14 workers in a nonEPZ region. Bold values are significant at 5%.
(1) Chi squared values reported in parentheses