Labor Adjustment in an Evolving Marketplace
An Empirical Investigation

(Draft – Do Not Quote Without Permission)

Manisha G. Singh

Current version: May 5, 2006
(Earlier version: September 8, 2005)

This paper is about the process of employment adjustment. It studies adjustment costs and their impact on employment and labor demand. It estimates econometrically parameters of labor adjustment based on ASI industry data from 1973 to 1997. Specifically effects of the job security regime in India on employment are estimated while accounting for the concurrent impact of product markets' liberalization. It establishes that adjustment is slow, a significant decline in both average employment and speed of adjustment is evident after the job security regime in India is restricted, and competition mitigates only some of the adverse impact of adjustment costs. These analyses can be better conducted using a panel dataset based on the unit level data of the ASI.

Keywords: Employment, Job creation, Demand for labor, Institutional arrangements
JEL classification: E24, J23, O17

The author thanks Shubhashis Gangopadhyay, Mahesh Gupta, John Haltiwanger, Judy Hellerstein, Howard Leathers, Michael Pries, Martin Rama, John Shea, Ravendra Singh, seminar participants at the India Development Foundation, Gurgaon, India and the Indian Statistical Institute at Delhi, New Delhi, India and officials at the Central Statistical Organization (CSO), New Delhi and the Ministry of Labour, New Delhi for their advice and contributions. The author is responsible for remaining errors. Part of this research is sponsored by The World Bank, Washington D.C., USA.
Please contact author at msingh@idfresearch.org

1 Introduction and Background

This paper is about the process of labor and employment adjustment. The specific issue is jobs and job security. Concern about both have led policymakers in many countries to legislate regulation preventing job loss and so protect means of livelihood and economic welfare. Regulation for job security and severance payments may protect labor but slows labor adjustment. Yet, at times market forces necessitate adjustment larger than that permitted by regulatory frameworks. In many countries this adjustment takes the form of retrenchment programs, specially in the public sector where de facto job security is perpetual. This one-time adjustment accounts for substantial (latent) redundancy or labor hoarding. However, accumulating excess labor and limiting adjustment is costly for firms and may have significant adverse effects.

Economists argue that job security motivated regulation is restrictive. Some find that it is counter-productive because it slows reallocation and subsequent job creation. Others find that it increases employment. Bentolila and Bertola (1990) simulations using aggregate European data find that separation costs impact the separation margin more than the hiring margin. Net employment may increase in the long run despite mandated severance payments. Hopenhayn and Rogerson (1993) simulations using parameter estimates from establishment-level US data find that a firing tax would reduce labor turnover, employment, and average labor productivity in the long run. Blanchard (1997) summarized that "firing restrictions lead to a more sclerotic labor market, a market with lower turnover and lower productivity; but it is not clear at all that they lead to high unemployment." The diverse results follow partly from the data - aggregate versus establishment - and partly from the differing specifications modeling adjustment costs.

In general, the standard symmetric convex costs model is the most widely used with aggregate and industry data whereas asymmetric piecewise linear and lumpy adjustment cost models are being used with microeconomic data. A survey of the various models is presented by Hamermesh and Pfann (1996). Gauging the impact of adjustment costs is best accomplished with establishment level panel data wherein any discontinuities in the labor demand decision rule and the impact of idiosyncratic firm level shocks can be accounted for. This is also important in case of mandated severance payments and job security regulations that directly affect only the separation margin, i.e., these have asymmetric effects. With industry data, using these models is inappropriate since the discontinuities, heterogeneity, and asymmetries would be largely aggregated away. However, using the standard convex costs model with industry data retains value in that it accounts for net adjustment costs that are also substantial.

The idea here is to unravel the effects of adjustment costs, specifically that of mandated severance payments and job security measures, on the process of employment adjustment. In examining this issue, most studies focus on labor market institutions. Here, the attention is also on product markets. If substantial changes occur in the product markets, as in industry deregulation and/or economy-wide reform, the effects of job security policy and mandated severance payments may be masked by the impact of these changes. Or it may be that these costs have no adverse impact on employment. Given that, in India, only 28 million employees of total employment of over 400 million are in the organised sector which is subject to the job security regulations, any impact may be of marginal value to start with. However, it is the organised sector, specially manufacturing industries that may have the potential for higher employment generation. Understanding whether adjustment costs may be dampening job creation is hence important. Although the use of industry data as opposed to establishment data limits analysis, investigating the issue of job security while accounting for the concurrent impact of product markets' liberalization should shed some more light on how it works.

A job security regime has been in place since 1976. Gradual deregulation continued from late seventies to 1991 when a liberalization program was initiated. Apart from job security and mandated severance payments, other institutional (unions, wage-setting) and technological adjustment costs (transaction costs, shopfloor rearrangements) operate in some measure in India. However, the single most visible change in the past two decades has been liberalization in product markets. Below are brief descriptions of the Indian economy with product market changes, and the job security regime.

1.1 The Indian Economy

India is a large democracy with GDP in year 2000 (year 1970) of about $380 ($94) billion at 1993-94 prices but a low per capita income of $375 ($175). With low growth of per capita incomes a principal development objective was poverty reduction through employment generation. Successive five-year development plans underscored the need for progressive reduction of unemployment especially in the rural areas and in cottage industry. This emphasis was driven also by the consideration to encourage wide-spread participation in the development process. Adoption of big bang development theories led to a large government presence in the production sector. The Indian economy became a mixed economy with a substantial public sector (21 percent in 1973–74 to 32 percent in 1997-98) that controlled almost all of the core sector, namely, mining, oil, power, transport and a dominant part of heavy manufacturing, for example, steel and capital goods, and financial services. A large private sector operated in consumer goods and shared the financial sector. Almost all firms were subject to quantity controls through extensive licensing. Foreign competition was limited with phases of ownership dilution of subsidiaries of foreign firms. Protection through prohibitive tariffs and binding quotas was granted on the basis of the infant industry argument. An elaborate and complicated system of taxes, subsidies, and transfers grew from years of such policy practices. Consequently special interest groups emerged which sought to maintain the special privileges.

Economic performance was disappointing with annual growth rates averaging about 3 percent during 1960s and 1970s. This focused attention on the causes of lethargy in the Indian economy leading to several research committees during the seventies. From late-seventies, India began gradual deregulation allowing firms to rationalize costs and expand in related products. From 1983, firms were allowed to expand production and enter closely allied product lines, a process called broad-banding. From 1989, selected industries were delicensed, that is, entry restrictions diluted substantially. Such selective mechanisms continued till July-August 1991. A full-scale adjustment and liberalization program was launched assisted partly by the IMF and the World Bank. The 1991 program aimed at both stabilization and structural adjustment. It attempted to correct the fiscal and balance of payments deficits created largely during the latter half of 1980s, in part due to large foreign short term borrowing, and to build a legal and policy framework to allow restructuring. In 1991, delicensing was extended to all (except a short negative list) industries. Foreign trade and investment regimes were liberalized. Growth responded, rising to about 5 percent per year in 1980s and around 6 percent per year in 1990s. However, per capita growth rates remain sub-5 percent. With about a quarter of the population below poverty line, growth acceleration with job creation remains a key economic objective.

There is a shift of emphasis from socialist, poverty-alleviation, import-competing development strategy to market-oriented, poverty removal & improving standard of living, and globally competing growth strategy. Promoting productive employment growth alongwith allowing greater mobility in industrial employment and developing safety nets for retrenched/displaced labor are being considered. This is expected to lead to improved reallocation, improved labor market functioning and growing human capital. In the attempt to develop safety nets is an implicit acknowledgment of the need to allow greater labor adjustment. There is also a concurrent need to assess the costs and benefits of the job security policy.

1.1.1 The Worker Separation Regime

The socialist and nationalist accent to policy peaked during mid-1970s. During this time the labor law was strengthened and forms the current regime that first came into force March 1976. It requires industrial establishments to seek written permission of the government for any separations. Prior to this, severance pay was fifteen days pay per year of service. Since then, severance is subject to negotiation between employers and workers as separations must be induced or bought. To this extent, the new regime is that of mandated severance payments.

As per the Industrial Disputes Act (IDA) 1947, retrenchment of workers with more than 240 days of service requires one month notice in writing stating reasons for retrenchment and 15 days' average pay per each year of service as compensation. The 1976 Amendment to IDA-1947 required "lay off, retrenchment and closure illegal except with the written permission of the government." Initially it covered establishments employing more than 300 workers on an average day in the 12 months' prior to the amendment. Another amendment in 1982 extended coverage to establishments with 100 or more workers. The penalty for retrenchment or closure without permission includes a fine and/or a prison sentence.

According to Mathur (1989), the number of closures diminished during

1980s, lock-outs increased, and unions put up effective opposition to "casualization" of workers. However, adjustment came via increasing recourse to induced voluntary quits, since this required no government permission. This is costlier and one month pay for each year of service is common. Voluntary retrenchment programs, enabling shedding hoarded and excess labor, typically use severance pay formulae based on the length of service (Haltiwanger and Singh (1999)).

1.2 Objectives

This paper focuses on the econometric estimation of the size of adjustment costs and their impact on employment in India. It attempts to unravel the effects of adjustment costs on employment while accounting for (i) the changes in the job security and mandated severance payments' regime in 1976, (ii) the expanded coverage of job security regime in 1982 as well as the deregulation ("broadbanding") process begun about 1982, (iii) the liberalization and economic reforms' program in 1991, and (iv) average employment size. The discussion centers on labor. Though employment refers to all employees, here the emphasis is on workers. In the literature discussion that follows, workers and employees may be treated as synonymous. Workers are treated as a homogenous input post-training and hours are fixed. Capital and investment demand are ignored (see data limitations below). Substantial evidence (Hamermesh (1993), chapter 7) indicates that estimates of employment dynamics are not biased if the adjustment of capital is ignored. (Anecdotal evidence in India indicates that after job security measures are enforced, some substitution of capital for labor may have taken place. The paper abstracts from this aspect.)

The hypotheses are that average employment and speed of adjustment (a) decrease after job security provisions are more restricted and (b) increase post-economic reform in product markets despite no further change in labor law restrictions. Labor demand is systematically related to the degree of competition; and, the speed of adjustment is also affected by the degree of competition. The effects are greater for larger firms. Note that after 1982, with changes in both job security regime and product markets, the net effect can go either way. Below is a discussion of the nature and types of adjustment costs. The sections following describe the data; present the model and regression equations; and the results.

2 The Issues and Literature

2.1 Nature and Structures of Adjustment Costs

Net costs of adjusting labor demand are those of changing the level (or number) of workers in any productive unit. These include costs due to disruptions in production (new equipment, shopfloor rearrangements) and other similar costs not linked to the identity of the workers. Gross costs of adjustment are related to the flows of workers, i.e., to the identity of workers. These include hiring costs (search costs - advertising, screening, interviewing), training costs, separation costs (severance payments, unemployment benefits), and overhead personnel department costs dealing with recruitments and separations.

Net costs are internal and implicit in nature. Lost output is not measured. Training of new workers by senior workers may reduce average efficiency during the transition period of adjustment. Costs unrelated to production and external in nature, for example, severance payments, may be measurable. Hamermesh and Pfann (1996) survey presents the following "extremely tentative conclusions" - (i) external costs of adjusting labor demand are large, amounting to as much as one year of payroll cost for the average worker; (ii) the average adjustment cost rises very rapidly with the skill of the worker; and (iii) costs of hiring exceed costs of separations.

Adjustment costs may arise from the economic environment (factor markets, technology, product markets) the firm faces. However, these may also arise directly or indirectly from government policies such as mandated severance payments and mandated advance notice of layoffs.

Several forms or structures of adjustment costs have been proposed in the literature, under assumptions about the expectations formation process and that given the expectations-process, the only reason for slow adjustment is the cost associated with changing labor demand. The most used structure of adjustment costs in the literature is that of symmetric convex adjustment costs, usually restricted to be quadratic. Convexity is imposed on marginal adjustment cost and implies that it is increasing in labor demanded. Continuity and differentiability ensure that changes in market conditions, however small, will lead the firm to adjust labor demand continually. Symmetry around zero ensures that the marginal cost of increasing labor is the same as that of an equal-sized decrease. Sargent (1978) formulated a symmetric quadratic adjustment cost function and resultant linear labor demand based on it with the assumption of rational expectations. The quadratic approximation and symmetry imply that even in the presence of unit-specific shocks, the linearity of labor demand function allows its aggregation across units. Thus, this form may be applied to aggregated data with no other consideration and yet retaining its theoretical basis.

The symmetric quadratic form is a convenient tool. However, data from several countries point to differences in magnitude and persistence between positive input adjustments and negative ones. A non-linear functional form that has the quadratic model nested within is proposed by Pfann and Verspagen (1989). It has a parameter that captures asymmetry, which if negative implies that the marginal cost associated with a negative adjustment or separation exceeds that of a positive adjustment and vice-versa. If the parameter is zero, it implies that there is no asymmetry and the symmetric convex costs model applies. Though non-linear, the model can be used with aggregate data with the assumptions of no idiosyncratic shocks and a fixed number of firms. Then, a Taylor-series expansion of the firm's adjustment function around zero net employment change and subsequent aggregation of these across firms is identical to the Taylor-series expansion of the aggregate (of firms) adjustment cost function. The quadratic convex cost structure mostly abstracts from attrition.

Nickell (1978) discussed piecewise linear adjustment costs that are more relevant for asymmetric gross costs or per worker costs such as severance payments and interviewing. Gross adjustment costs such as severance payments are distinct and differ in magnitude from recruitment costs such as interviewing. Further, these are state dependent, that is, severance payments are incurred only for separations and hiring costs are incurred only for hiring. Both separations and hiring may take place simultaneously. In Nickell's model, at any point, the firm is either expanding or contracting in response to a corresponding product demand shock over the business cycle. Attrition is assumed to be zero. His model analyzed regulatory adjustment costs in the context of the business cycle assuming perfect foresight. Demand variations over the business cycle are therefore known. Labor use then varies in terms of employment or hours, though the number of shifts is fixed at one. According to the paper, empirically, differences between the convex costs model and the linear costs model "would tend to be washed out" at the aggregate level but may be picked up at the industry level. These costs engender a discontinuity in the optimal decision rule. In the presence of idiosyncratic shocks and firm heterogeneity, this form requires unit level data. Application to aggregated data amounts to assuming away firm heterogeneity. Using industry data captures inter-industry variation but still loses firm heterogeneity.

In most recent studies of adjustment costs, there is an emphasis on delineating net costs from gross costs. This stems from prior evidence (Hamermesh and Pfann (1996)) that the two are different in magnitude and impact, and partly from evidence on employment flows. Job flows - jobs created and destroyed, by continuing firms and by entrants and exiters - underlying the net result, that is, change in employment stock behave quite differently to net change. Davis and Haltiwanger (1998) document job flows for most developed countries and several developing countries. The salient features across economies remain that gross job flows - job creation and job destruction - co-exist in almost every time period and sector, are substantial, persistent, asymmetric and concentrated at relatively few plants. The key factor is the existence of heterogeneity among firms as reflected in the predominance of idiosyncratic factors as opposed to aggregate and sectoral factors. Gross adjustment costs are related to gross worker flows. Worker flows exceed job flows to the extent of any attrition. Net costs are related to net employment change.

Models of adjustment costs described above deal mostly with net costs as opposed to per worker costs. The symmetric convex costs based model is based on net employment change. The asymmetric convex costs model recognizes that the costs associated with a net negative or a net positive change may be different and hence also examines net costs though asymmetric. The piecewise linear costs model explicitly accounts for gross costs - recruitment costs versus separation costs, each per worker. The symmetric convex costs model, despite its limitations, is the most widely used specification with aggregate macroeconomic data (Hamermesh and Pfann (1996)) and is suitable for disaggregated industry data.

2.2 Evidence on adjustment costs

The evidence on adjustment costs, both for labor demand and investment demand is discussed at length by Hamermesh and Pfann (1996). Here, the emphasis is on mandated severance payments related papers. Two major approaches emerge. One uses simulations based on statistics or estimates of parameters, and the other is the more direct parametric estimation.

Bentolila and Bertola (1990) model a forward looking monopolist firm subject to separation costs and demand uncertainty. Their simulations using aggregate European data find that separation costs impact the separation margin more than the hiring margin. Net employment may increase in the long run despite mandated severance payments, if the shocks faced by the firms are highly persistent and worker attrition is high. With more persistent shocks, the need to alter labor demand is lower. With higher worker attrition, the need for separations is reduced. It is unclear what happens if the shocks are more variable and/or attrition is lower. Hopenhayn and Rogerson (1993) model a competitive firm also subject to a firing tax and idiosyncratic productivity shocks in a general equilibrium framework. They perform simulations using parameter estimates from establishment-level US data and find that a firing tax would reduce labor turnover, employment, and average labor productivity in the long run. The opposing results could be due, in part, to assumptions about market structure (monopolist versus perfect competition) and inclusion of the entry-exit process in the latter study.

Attempts to explain these contrary conclusions include accounting for other labor institutions that might be simultaneously operating in conjunction with a tax on labor adjustment. Bertola and Rogerson (1996) analyze the process of wage-setting. They argue that relative-wage compression in Europe may be part of the puzzle. It is conducive to higher employer initiated job turnover. Both institutions together can explain similar job flows in US and Europe but higher unemployment rates in Europe. Cabrales and Hopenhayn (1997) allow firms to choose between two coexisting types of contracts - permanent and temporary. Their calibrations using Spanish data find that with the inclusion of temporary contracts, there is a substantial increase in reallocation but not in aggregate productivity.

Inferring of adjustment costs within labor demand estimation is attempted by Fallon and Lucas (1991) based on the symmetric quadratic convex cost specification and using disaggregated industry data from India. Job security is instituted via requirements of prior government approval for separation and severance payments for any separations since March 1976. Fallon and Lucas use a difference approach by introducing a dummy variable for regime change to gauge the impact of the severance requirements. They find a significant one-time reduction in labor demand (intercept) but no significant fall in the speed of adjustment.

3 Data

3.1 Dataset

The study dataset comprises the Annual Survey of Industries (ASI) series from 1973 through 1997. The unit of observation is a factory in case of manufacturing industries. It covers registered factories/plants, i.e., units with 10 or more workers in plants using electric power or 20 or more workers in plants using no electric power (and as registered under sections 2m(1) and 2m(11) of the Factory Act, 1948.) It consists of (i) a census of firms with over 50 employees with power (99 without power) and (ii) a sample of the remaining registered plants or factories with 10-50 employees with power (20-99 employees without power.) The reference period for annual coverage of premises is the preceding 12 months. The cut-off point is a registered factory working on any day of the preceding twelve months, and in any part of which a manufacturing process is being carried or ordinarily so carried on. The information generated from the ASI data includes number of workers and number of employees besides the economic profile of the plants. Though the data is collected at plant level, it is publicly available, up to 1997-98, only at the 3-digit industry level of disaggregation.

3.1.1 Study Universe

ASI is classified using the national industrial classification (NIC), that changes from NIC1970 to NIC1987. NIC1970 is applicable to years 1973 through 1988. NIC1987 applies to years 1989 though 1997. Developing a consistent set of series across the 25 years led to merger of several industry groups. These are as follows.

- ASI classification merges some two industry groups of NIC1970 into one group of NIC1987, for example, NIC70-228 and NIC70-229 merge into NIC87-229. To generate a comparable series, data of industries NIC70-228 and NIC70-229 for years under NIC1970 classification (1973-1988) are merged and a 25-year consistent series is obtained for such industry groups.

- ASI classification splits a NIC1970 industry group into two NIC1987 groups, for example, NIC70-253 splits into NIC87-253 and NIC87-256. For these cases, a 25-year consistent series is obtained by merging the split NIC1987 industry groups into one series corresponding to the NIC1970 group.

Some industry groups had missing observations (the entire set of 30 variables) due to ASI data suppression policy wherein data for any industry group with two or less number of factories is not reported in that year. Such industries (11 in number) have been entirely dropped. Also omitted are several new groups included in NIC87 for which no earlier data are available. The truncated dataset is 84% (73%) of the universe (ASI manufacturing) in terms of output for initial-year 1973-74 (end-year 1997-98). The figure in terms of employment (as measured by number of workers) is 85% (78%).

3.1.2 Deflation to constant price data

Each industry group data is deflated using the wholesale price index (WPI) corresponding to that industry. The WPI is the most broad-based deflator available. The CPI is available for industrial workers but not according to industry groups. The GDP deflator can be computed from available national accounts data at the 2-digit level of disaggregation rather than the 3-digit level possible with the WPI. The WPI series has two bases, 1970/71 and 1982/83. The 1970/71 WPI series is spliced to 1982/83 WPI series at the industry group level and the series so obtained is used to deflate the 25-year NIC1987-classification industry data series.

3.1.3 Data Limitations

The dataset is rich in that it includes labor, capital, other inputs, output, value added variables. However, it is available at present at a disaggregated industry level instead of at unit level. Any model based on such a dataset assumes away or ignores idiosyncratic shocks at the factory level. As Davis and Haltiwanger (1998) and Roberts and Tybout (1996) point out, in both developed and developing countries, idiosyncratic shocks are important. Significant variation in economic outcomes may be driven by these shocks. Further, there is a large possibility that the structure of adjustment costs may be lost in industry averages that can be examined with this dataset. Second, the annual frequency may be more than the frequency of decision-making of factory managers, i.e., the economic period may be less than an year (quarterly or semi-annual). Nonetheless, industry level data capture substantial variation, and any variation at an annual level is only likely to understate patterns evident at higher frequency data. Thus, examining this dataset should be quite instructive. Also, the capital series is a financial measure. Appropriate economic capital stock or corresponding investment series exist at macroeconomic level but are not yet available by disaggregated industry. The model adopted hence omits capital but includes output.

3.2 Data Description

3.2.1 Summary statistics

Summary statistics of key variables across industry and year are provided in Table 1. Value of output is rescaled from lakhs (hundred thousand) to thousands to better represent the output values at the lower end of the range. In all variables, the range and standard deviation are quite large. To the extent that estimation is in log-linear form (as is the norm for labor demand estimation), the large range doesn't complicate the results.

3.2.2 Job flows

Employment numbers may reveal only part of the story. Following the methodology developed by Davis and Haltiwanger (1992), computations of manufacturing job flows during 1973/74 - 1997/98 show that job flows in India at 3-digit industry level are large (see Tables 2 and 3). The 1973-1997 average job creation is 5.5 percent of employment (US four-digit data based manufacturing number is 2.5 percent of employment), job destruction is 3.8 percent (US: 3.6 percent), and net employment rate is 1.7 percent (US: -1.1 percent). Further, job reallocation rate[1] is 9.4 percent and excess job reallocation rate is 6.6 per-

[1] Job reallocation is the sum of absolute levels of job creation and job destruction flows. Net employment is the difference of job creation and job destruction. Excess job reallocation

cent. Thus, 70 percent of job reallocation is excess, that is, 70 percent of the turnover is over and above the rate required to accommodate the net change in employment. Yet, somewhat paradoxically, substantial labor adjustment costs exist in India and increased from 1976. This co-existence of high labor turnover and high labor adjustment costs seemingly point to the limited relevance of adjustment costs for reallocation.

A closer look, however, reveals more. Table 2 shows period averages for:

- pre-1976 (1973-75) or pre- labor law restrictions
- 1976-82, immediate period following labor law changes with no change in the product markets' regime
- 1983-90, period of gradual deregulation of product markets
- 1991-97, period post-July/August1991 liberalization package.
- 1976-97, complete period post-labor law changes

Excess job reallocation fell from 7.9 percent during 1973-75 (pre-restrictions) to 5 percent during 1976-82 (immediately after 1976 job security measures) but rose to 7.8 percent during 1983-90 (gradual deregulation) falling to 6.4 percent during 1991-97 (post liberalization program). Similarly, after separation restrictions and induced higher severance requirements are imposed in 1975 (1975/76 - March 1976), both job creation and destruction rates fall in the 1976-82 period. Net employment is about the same. During 1983-90 job destruction rate recovers and surpasses the pre-restrictions level. Unlike job destruction and excess job reallocation, job creation rate does not bounce back and remains depressed. Over 1991-97, job creation rate is higher at 5.8 percent but remains quite below the rate prior to job security restrictions of 7.4 percent. Overall,

is the difference between job reallocation and the absolute value of net employment. It is a measure of simultaneous job creation and destruction.

in 1976-97, job destruction rate recovers but job creation rate falls and remains lower, with net employment rate halving to the previous period's levels. So, there seems to be a dampening effect of adjustment costs on employment if not on job turnover.

Part of the story may lie in product markets reform - gradual deregulation in 1980s and a liberalization package in 1990s creating more productive capacity in response to suppressed demand. With higher demand, job creation will rise and job destruction may fall. However, in that case, excess job reallocation would remain about the same since the flows are accommodating net employment creation. A rise in excess job reallocation points to variation in both flows - creation and destruction. So, the story in India appears to be more than the expanding demand after liberalization. Though the evidence is very limited, it nonetheless points to a shift in labor restructuring activity despite the continuance of a strong job security and high adjustment cost regime.

4 The Model and Regression Equations

Estimations are based on the symmetric quadratic convex cost form. This is a widely used specification with aggregate macroeconomic data (Hamermesh and Pfann (1996)) and is used here with the disaggregated industry data. It is suitable for studying the effects of adjustment costs on employment in India while accounting for (i) the changes in the job security and mandated severance payments' regime in 1976, (ii) the expanded coverage of job security regime in 1982 as well as the deregulation ("broadbanding") process begun about 1982, and (iii) the liberalization and economic reforms' program in 1991, and (iv) average employment size. Estimates of the reduced form labor demand function, that is, coefficients of wage, output, mandays, speed of adjustment, and, changes in average employment and speed of adjustment due to regime changes and employment size are obtained. The estimating equations are briefly derived below.

4.1 Symmetric Quadratic Convex Adjustment Costs

The underlying theory is based on (Sargent (1978)) the standard value maximization by a firm given production function technology and labor-adjustment cost function, and ignoring capital. The firm maximizes the present value of the stream of expected future profits

$$\begin{aligned}
\max_{\{L_t\}} V_t &= E_t \sum_{i=0}^{\infty} R_t^i \pi_{t+i} \\
&= E_t \sum_{i=0}^{\infty} R_t^i [Q_{t+i} - w_{t+i} L_{t+i} - AC_{t+i}] \\
Q_{t+i} &= F(L_{t+i}) = (\overline{\alpha}_o + \alpha_{o,t+i}) L_{t+i} - 0.5\alpha_1 L_{t+i}^2 \\
AC_{t+i} &= 0.5c[\Delta L_{t+i}]^2 \qquad (4.1)
\end{aligned}$$

where $R < 1$ is the discount factor, F is the production function with α parameters, $\alpha_{o,t+i}$ being a random parameter having a zero mean and positive variance, w is the wage, and AC is the adjustment cost, c is adjustment cost parameter. R is assumed to be constant. The Euler equation is

$$RE_t L_{t+i+1} - (\frac{\alpha_1}{c} + R + 1) L_{t+i} + L_{t+i-1} = c^{-1}[w_{t+i} - \overline{\alpha}_o + \alpha_{o,t+i}], \quad i = 0, 1, .. \qquad (4.2)$$

and the solution or decision rule for labor demand is

$$\begin{aligned}
L_t &= \lambda L_{t-1} - \lambda c^{-1} E_t \sum_{i=0}^{\infty} R^i [w_{t+i} - \overline{\alpha}_o + \alpha_{o,t+i}] \\
0 &< \lambda < 1 \qquad (4.3)
\end{aligned}$$

Decision-makers in the firm are assumed to be risk-neutral and have rational expectations, based on the information available at time t about the path of shocks. Simplifying assumptions about the process generating shocks to forcing variables are made. A first order autoregressive process is used as a reasonable approximation to the unknown correct form for these shocks. Then, optimal forecasting implies replacing expected values with their lagged values. Let the autocorrelation parameters be ρ_w and ρ_q. Then the path of labor demand relating current period employment to its lagged value and a vector of forcing variables, wages and productivity shocks can be described as

$$L_t = \lambda L_{t-1} - \lambda c^{-1}[(1 - R\rho_w)^{-1} w_t - (1 - R)^{-1}\overline{\alpha}_o + (1 - R\rho_q)^{-1}\alpha_{o,,t}] \quad (4.4)$$

Sargent (1978) fits his model to data that are deviations from means and trends (partly accounts for omitting capital). This maximization is equivalent to minimizing the present value of the stream of expected costs (Hamermesh and Pfann (1996)). Based on the standard simplifying assumption that deviations from optimal profits are quadratic both in adjustment costs and in deviations of the actual demand for labor from the optimal path, this yields

$$\min_{\{L_t\}} E_t \sum_{i=0}^{\infty} C_{t+i} = E_t \sum_{i=0}^{\infty} R_t^i [0.5\{\alpha L_{t+i}^* - L_{t+i}\}^2 - 0.5c\{\Delta L_{t+i}\}^2] \quad (4.5)$$

where L_{t+i}^* constitutes the optimal path in the static optimization without adjustment costs, i.e., $c = 0$. The above assumption implies that the firm is a price-taker in all its markets. The estimating version is

$$\begin{aligned} L_t &= (1 - \lambda)L_t^* + \lambda L_{it-1} \\ 0 &< \lambda < 1 \end{aligned} \quad (4.6)$$

is a non-linear function of R, c, and α. Given the assumptions, linearity of this equation allows for aggregation even if firms face different shocks. Then, adjustment costs are implied by λ, the closer it is to one, the higher are the adjustment costs and lower is the speed of adjustment.

4.2 The Regression Equations

In this paper, recall that output is included though capital and investment demand are ignored (since appropriate series are not yet available and relying on evidence indicating that the estimates of employment dynamics are not biased if adjustment of capital is ignored). Thus, the forcing variables included in L_t^* are the real wage and output. Further, since the model uses employment and not labor-hours the variable mandays per worker is also included as a regressor. In India, a manday is a fixed number of hours and labor-use varies with number of mandays and number of workers (employment). It is assumed that the first dimension of labor adjustment is the number of mandays and second that of the number of workers. Hence, employment and labor (workers) demand does not affect lagged mandays. The symmetric quadratic convex cost model is readily amenable to aggregation across units as discussed above. Thus, an industry labor demand function is the basis of the log-linear regression equation. Then, with first-order autoregressive processes generating shocks to forcing variables in L_{it}^* and their expected values replaced by their lagged values, the estimating version for industry i ($i = 1, ..., N; N = 136$) in period t ($t = 1, ..., T; T = 25$) is

$$\begin{aligned}
\ln L_{it} &= (1-\lambda)\ln L_{it}^* + \lambda \ln L_{it-1} + u_{it},\ i = 1, ..., N;\ t = 1, ..., T \\
\ln L_{it} &= (1-\lambda)[\beta_0 + (\omega \ln w_{-1} + \gamma \ln Q_{-1} + \theta \ln H_{-1})] + \lambda \ln L_{it-1} + u_{it} \\
\ln L_{it} &= (1-\lambda)[\beta_0 + (\overline{\omega}' \ln \overline{L}_{it}^*)] + \lambda \ln L_{it-1} + u_{it} \\
0 &< \lambda < 1 \\
u_{it} &= \rho_l u_{it-1} + \varepsilon_{it} \\
&\quad \varepsilon_{it} \sim \text{i.i.d. } (0, \sigma_\varepsilon^2)
\end{aligned} \tag{4.7}$$

Rational expectations based on autoregressive processes imply bona-fide use of the lagged values of forcing variables and hence serially uncorrelated disturbance in the labor demand equation. However, the error u_{it} here allows for some serial correlation with i.i.d. errors. L is demand for workers, Q is output, w is wage, H is hours, λ is the measure of adjustment costs. Note that the autoregressive parameters of the forcing variables are embedded within their coefficients.

The estimation procedure is a **difference-in-difference** approach based on size (average employment size) and period dummies. Also, as a measure of evolving competition (protected and licensed production yielding to increasing deregulation from 1982 and substantial delicensing in 1991), price-cost margins are generated and interacted with lagged employment and size dummies.

The primary differences are due to size dummies. The secondary differences in these size-differences are due to the regime changes captured by the period dummies. To the equation 4.7 are added these size dummies. Average employment size is the number of workers in an industry divided by the number of factories in that industry. This is used to generate **two size dummies** (i) for size 100 and above, $S1$ takes the value one and above, and (ii) for size 300 and above, $S3$ takes a value one and above. $S3$ captures industries that come within the ambit of the 1976 job security restrictions (that is, all units with employment 300 workers and above). $S1$ represents industries that are further included in job security restrictions in 1982 (that is, all units with employment 100 workers and above). The size dummies are cumulative, hence their estimated coefficients indicate marginal effects. Being based on average employment size rather than actual employment size may make these size dummies more restrictive than the usual classification of large, medium, and small units of interest with unit-level panel data. $\lambda_{S1}$and λ_{S3} are the increments in effect of adjustment costs due to size differences. Then, the estimating equation is

$$
\begin{aligned}
\ln L_{it} &= (1-\lambda)[\beta_0 + (\overline{\omega}^{'} \ln \overline{L}^{*}_{it})] + \lambda \ln L_{it-1} \\
\ln L_{it} &= [1-\lambda_0 - \lambda_{S1} S1 - \lambda_{S3} S3] * \\
& [\beta_0 + \beta_{S1} S1 + \beta_{S3} S3 + (\overline{\omega}^{'} \ln \overline{L}^{*}_{it})] \\
& +\lambda_0 \ln L_{it-1} + \lambda_{S1} S1 \ln L_{it-1} + \lambda_{S3} S3 \ln L_{it-1} \\
S1 &= 1 \quad \text{if size} \geq \ 100, \ \text{ zero else} \\
S3 &= 1 \quad \text{if size} \geq \ 300, \ \text{ zero else}
\end{aligned} \tag{4.8}
$$

The coefficient for wage is expected to be negative and that of output to be positive. The coefficient for mandays may be positive or negative depending upon whether workers and mandays are complements or substitutes. λ_0 is expected to be positive, that is, some adjustment costs exist prior to the job security restrictions and that speed of adjustment is slow. λ_{S1} and λ_{S2} would be positive if larger industries find it harder to adjust employment. Similarly, average employment coefficient β_0 is expected to be positive and, $\beta_{S1}$and β_{S2} also positive as larger firms are expected to have higher average employment.

There are **three period dummies**, (i) $P1$ is the period dummy that takes value one for all periods from 1976 onward representing job security regime from 1976; (ii) $P2$ is the period dummy that takes value one for all periods from 1983 onward reflecting the expanded coverage of job security regulations in 1982 (in the tables, it is called Year82 dummy to refer to 1982 regime changes as well as the deregulation or "broadbanding" process begun about 1982), and (iii) $P3$ is the period dummy that takes value one for all periods from 1991 onward reflecting the economic reforms and liberalization in 1991. Again, the period dummies are cumulative, hence their estimated coefficients indicate marginal effects. These period dummies are interacted with the size dummies. Below is a version of the estimating equation presented with size dummies and only one period dummy (to avoid notational clutter).

$$
\begin{aligned}
\ln L_{it} &= \{[1 - \lambda_0 - \lambda_{S1} S1 - \lambda_{S3} S3 - \lambda_{P1} P1 - \lambda_{S1.P1} S1.P1 - \lambda_{S3.P1} S3.P1] \\
&\quad *[\beta_0 + \beta_{S1} S1 + \beta_{S3} S3 + \beta_{P1} P1 \\
&\quad + \beta_{S1.P1} S1.P1 + \beta_{S3.P1} S3.P1 + (\overline{\varpi}' \ln \overline{L}_{it}^{*})]\} \\
&\quad + \lambda_0 \ln L_{it-1} + \lambda_{S1} S1 \ln L_{it-1} + \lambda_{S3} S3 \ln L_{it-1} \\
&\quad + \lambda_{P1} P1 \ln L_{it-1} + \lambda_{S1.P1} S1.P1 \ln L_{it-1} + \lambda_{S3.P1} S3.P1 \ln L_{it-1} \\
S1 &= 1 \quad \text{if size} \geq \ 100, \ \text{zero else} \\
S3 &= 1 \quad \text{if size} \geq \ 300, \ \text{zero else} \\
P1 &= 1 \quad \text{if year} \geq \ 1976, \ \text{zero else} \qquad (4.9)
\end{aligned}
$$

Post-1976: Due to job security restrictions and consequent higher severance payments, adjustment costs in general will rise and an increase in the adjustment cost parameter λ or a positive marginal effect λ_{P1} is expected. Further, $\lambda_{S3.P1}$ (size 300 and post-1976 restrictions) should be positive since the restrictions apply particularly to size 300 and above. The intercept terms or average employment parameters β_{P1} and $\beta_{S3.P1}$ may be negative indicating a one-time downward shift of the labor demand function for all industries and specially for those with size 300 and above. $\lambda_{S1.P1}$ (size 100 and post-1976 restrictions) may be positive or insignificant and $\beta_{S1.P1}$ may be negative or insignificant. So, the marginal effects for industries with size 100 and above may be negligible.

Post-1982: $\lambda_{S1.P2}$ (size 100 and post-1982) is expected to be positive on account of job security coverage expanding to units with employment 100 and above but negative on account of deregulation. $\beta_{S1.P2}$ is expected to be negative due to expanded job security coverage and positive otherwise. The net effect may be positive or negative. Similarly, other coefficients may be negative or positive.

Post-1991: If the impact of liberalization in product markets filtered to labor markets, a reduction in adjustment costs, i.e., negative λ_{P3}, $\lambda_{S1.P3}$, and $\lambda_{S3.P3}$ are expected, even though there is no change in the job security regime. β_{P3}, $\beta_{S1.P3}$, and $\beta_{S3.P3}$ may similarly be positive.

Since gradual deregulation in product markets (protected and licensed production yielding to increasing deregulation from 1982 and substantial delicensing in 1991) continued over several years, a competition measure every period to capture the evolutionary change is more appropriate. Herfindahl indexes by industry in India could not be found. Thus, as an inverse measure of gradually evolving competition, **price-cost margins** (PCM, G_{it-1}) are also generated and interacted with lagged employment and size dummies. A truncated version of the estimating equation without period dummies is shown below.

$$\begin{aligned}
\ln L_{it} &= \{[1 - \lambda_0 - \lambda_{S1} S1 - \lambda_{S3} S3 - \lambda_g \ln G_{it-1} \\
&\quad -\lambda_{S1.g} S1 \ln G_{it-1} - \lambda_{S3.g} S3 \ln G_{it-1}] * \\
&\quad [\beta_0 + \beta_{S1} S1 + \beta_{S3} S3 + \delta_g \ln G_{it-1} \\
&\quad +\delta_{S1.g} S1 \ln G_{it-1} + \delta_{S3.g} S3 \ln G_{it-1} + (\overline{\omega}' \ln \overline{L}^*_{it})]\} \\
&\quad +\lambda_0 \ln L_{it-1} + \lambda_{S1} S1 \ln L_{it-1} + \lambda_{S3} S3 \ln L_{it-1} \\
&\quad +\lambda_g \ln G_{it-1} \ln L_{it-1} - \lambda_{S1.g} S1 * G_{it-1} \ln L_{it-1} \\
&\quad -\lambda_{S3.g} S3 * G_{it-1} \ln L_{it-1} \\
S1 &= 1 \quad \text{if size} \geq \; 100, \;\; \text{zero else} \\
S3 &= 1 \quad \text{if size} \geq \; 300, \;\; \text{zero else} \qquad (4.10)
\end{aligned}$$

The premise here is that a higher degree of competition makes the need to adjust more urgent and may thus blunt the impact of adjustment costs and increase the speed of adjustment. So, the change in λ due to competition (PCM) is negative (positive) or that λ_g is expected to be positive. The PCM coefficient, δ_g, will be positive or negative depending upon whether employment increases or decreases with greater price-cost margin. Higher PCM being associated with increasingly imperfect competition and excess capacity, it is expected to be negative. The interactions of PCM and size dummies would reflect these effects coupled with labor hoarding effects.

4.3 GLS and System-GMM Estimators

The estimates are obtained using GLS with errors robust to heteroskedasticity and autocorrelation. In the presence of any disturbance autocorrelation, the lagged variables (lagged dependent variable, lagged output) are endogenous and need to be instrumented. In the absence of external instruments, lagged first differences can serve as instruments for levels equation. However, with substantial sluggishness in employment, the correlation of these instruments with regressors is weak. Shea R-squared (Shea (1997)) is about 0.01 only indicating poor instrument relevance.

A more comprehensive set of instruments is obtained by using the system GMM estimator. Efforts to account for group effects in dynamic panel data estimations with autoregressive panel series produced the first-differenced GMM estimator. The strategy is first-differencing the equation and using lagged levels as instruments for the pre-determined and endogenous variables in first differences. Though sound, the technique performed poorly in that for panels where the series are highly autoregressive, this estimator is found to have large bias and poor precision in finite samples. An alternative is found in the system-GMM estimator (Blundell and Bond (1998)), where equations in first differences use lagged levels as instruments as before and additionally levels equations are instrumented using lagged first differences. The system GMM estimator adds moment conditions based on initial conditions restrictions (jointly stationary means of the regressand and the regressors, to ensure that the respective first differences are uncorrelated with group effects). When the additional moment conditions are valid, the system GMM estimator is found to reduce bias and improve precision (Blundell, Bond and Windmeijer 2000). System-GMM allows for some serial correlation in the residual disturbance, with the lags specified for instruments increasing by the order of serial correlation. The number of moment conditions reduces correspondingly.

To exploit the rich instrumentation possible with the system-GMM technique, these GMM estimates are obtained. However, owing to the use of average employment size dummies and period dummies, only a parsimonious specification is feasible. The interactions of size and period dummies with the forcing variables are excluded. This parsimonious specification is estimated with both GLS and GMM to enable appropriate comparisons. In so doing, the first three years' observations are lost. These are 1973-1975, the years prior to the job security restrictions' regime change in 1976. The impact of these 1976 restrictions alone is thus not directly available with the GMM instruments.

5 Results and Findings

The estimates of model I (symmetric quadratic convex adjustment costs) based equation are presented in Table 4. As noted in the data description above, an year, say 1973, in this dataset refers to the period April73-March74. The equation is estimated for three periods - 1973-1975, the period before the job security restrictions become mandatory; 1973-1982, the period after restrictions but before the job security provisions' coverage is extended and gradual deregulation become operational; and, 1973-1997, the full period for which data are available.

Size dummies are called Size100 and Size300. These dummies are interacted with wages, mandays, output, and lagged workers to assess the impact of regime changes on the relevant regression coefficients. Thus, there are three panels in the base regression for 1973-75: (i) effects for all employment sizes, (ii) marginal effects for size 100 and above, and (iii) further marginal effects for 300 and above.

Period dummies are called Year76, Year82, and Year91. All these dummies are interacted with the entire first set of three panels including wages, mandays, output, lagged workers, and their interactions with size dummies. Year dummies from 1979 onward when a regime (new government) change and before the gradual deregulation process is operational and industry dummies at 2-digit level are also included.

The wage coefficient is statistically significant and negative as expected. The estimate for output is also significant and positive. Mandays (proxy variable for hours) coefficient is significant and positive. The constant term representing average or autonomous employment is significant and positive. The coefficient for lagged workers that captures the effect of adjustment costs (extent of sluggishness in adjustment and opposite of the speed of adjustment) is significant and positive. Note that, this coefficient is high and larger in absolute terms than that of wage, mandays, or output. The evidence for 1973-1975 indicates the existence of adjustment costs even before the job security restrictions came into effect. Size effects are significant. Average employment is substantially higher for size300 industries (but negative for size100 industries). The lagged employment coefficient for size300 industries is negative implying that larger size in India may be associated with lower adjustment costs or higher speed of adjustment.

Most industry and year dummies are insignificant. The results for wage, mandays, output, and lagged workers remain similar in the different model specifications. Following is the discussion on size and period dummies and their interactions. It focuses on average employment and the speed of adjustment.

5.1 Changes in the speed of adjustment - GLS

The impact of the labor restrictions through the period dummy "Year76" is very significant for average employment and quite high (the intercept or the coefficient for Year76). Recall that in the log-linear labor demand equation, this coefficient is log of average employment. Calculations indicate a fall in average employment of about 28 percent (reduces to about 25 percent when the full sample period is taken). The speed of adjustment is the opposite of the coefficient on lagged employment. The coefficient of lagged workers interacted with Year76 is a significant 0.032 or 3 percent (significance declines in the full sample period). Further, the size300 and lagged workers interaction is very significant. It is 0.377 indicating a large 38 percent (36 percent in full sample period) increase in sluggishness or a corresponding decrease in the speed of adjustment over and above the 3 percent found for all sizes. **Post job security restrictions in 1976, (i) there is a one-time fall (about 28 percent) in labor demand and (ii) a fall in the speed of adjustment (3 percent) and additionally so (38 percent) for large industries.** Fallon and Lucas (1991) had found a significant negative coefficient on the period dummy (here, Year76) but no significant change in the speed of adjustment. Note that the interactions of Year76 with wages, mandays, and output are all highly significant and opposite to the signs without interaction. This is consistent with the theoretical model - when λ increases, the coefficients magnitude decreases - and lends considerable support to a significant increase in λ and hence fall in $(1-\lambda)$ or speed of adjustment.

Using the full sample period 1973-1997 and all dummies, results are somewhat unexpected for Year82. The coefficient of lagged employment, size300 and Year82 dummy interaction is significant, about 0.15. This increase in sluggishness is expected for size100 industries (insignificant here) since job security regime coverage extended to units with employment 100 and above (from 300 and above in 1976). Nonetheless, this does indicate increasing adjustment costs for larger industries with increasing coverage. Further, there is a small decrease in sluggishness (-0.026) in lagged employment and Year82 interaction; perhaps the impact of deregulation on industries with size below 100 or those not specifically covered by job security regime. Unlike the case of Year76 and Year82 period dummies, the only significant result for Year91 is the large increase in average employment for size300 or large industries. Until 1997, there is no significant effect of lagged employment-Year91 interactions. So, there is some evidence of increase in employment but no corresponding decrease in sluggishness.

The coefficients of price-cost margin and its interaction with lagged workers are insignificant. However, the size dummy interactions are very significant. For size100, the results are as expected - PCM decreases average employment and increases the sluggishness in adjustment, i.e., a positive coefficient of lagged employment-PCM-size100. Paradoxically, the results are opposite for size300 - PCM-size300 dummy has a positive coefficient (increases employment) and PCM-size300-lagged employment has a negative coefficient or there is a decrease in sluggishness.

Competition thus has differing impacts. **For medium sized (size100) firms, it increases average employment and decreases sluggishness with opposing results for larger (siz300) firms (lower average employment and higher sluggishness). Effects of pre-existing labor hoarding (requiring shedding of excess labor lowering average employment and net employment change) may be responsible.**

5.2 Changes in the speed of adjustment - System GMM Results

The results for system-GMM estimations are shown in table 6 and the corresponding GLS results in table 5. Before presenting the estimates, note that the over-identifying conditions fail to be rejected using the Hansen test or are tested as valid. Though the absence of autocorrelation of the first order in first differenced residuals is rejected (as expected, if the level equations have i.i.d. errors), no-AR(2) fails to be rejected or that no serial correlation in the levels' equation disturbance is valid. The regressions are thus well specified. Second, both tables 5 and 6 use the parsimonious specification. Even so, all relevant variables cannot be instrumented given sample size. With restricted lags for the instruments, along with base regressors there are two distinct sets of variables that are instrumented. One set includes additionally Year82 period dummy with its interactions. The second set includes additionally Year91 dummy and its interactions.

Recall that there are no observations for the pre-1976 period. Results pertain to 1976-1982 and 1976-1997 periods. Hence, a direct before-after comparison is not possible. For both periods and with either set of instruments for the 1976-1997 period, GMM-lagged employment coefficient is very significant and high, the magnitude being slightly smaller than corresponding significant GLS estimates. GMM-size effects are obtained for size100 industries whereas in corresponding GLS these are obtained for size300 industries. Both indicate higher average employment and lower sluggishness for larger industries. The magnitude of GMM estimate is many times over those of GLS.

Additional results are obtained for the full sample with Year82 and Year91 period dummies and the second set of instruments. **GMM-estimates for size100-Year82 show a large fall in average employment and for size100-**

Year82-lagged employment show a large increase in sluggishness. This is expected since the coverage of job security restrictions expanded to size100 industries in 1982. However, this result is not obtained using the first set of instruments, the estimates are insignificant. With corresponding GLS, these results are obtained for size300 industries as also in the full specification GLS and in both, the magnitudes are smaller. Further, there is a decrease in sluggishness or the coefficient of lagged employment-Year82 interaction is negative for small firms. This is not obtained with parsimonious GLS but is found in full GLS model.

Year91-lagged employment GMM estimates are significant but opposing with the two sets of instruments. No significant results for Year91 and its interactions are obtained in corresponding GLS. Similarly, no significant results for PCM and its interaction with lagged employment are obtained in either GMM or corresponding GLS. Note that parsimony led to exclusion of PCM-size dummies' interactions which produced results in the full GLS model.

6 Concluding remarks

Overall, there is evidence that after job security restrictions in 1976, (i) there is a one-time fall (about 28 percent) in labor demand and (ii) a fall in the speed of adjustment (3 percent) and additionally so (38 percent) for large industries. Weaker evidence indicates increasing adjustment costs for larger industries with increasing coverage and lower adjustment costs for smaller ones excluded from coverage. GMM-estimates post-Year82 for size100 industries show a large fall in average employment and a large increase in sluggishness; and a decrease in sluggishness for smaller firms. This is expected since the coverage of job security restrictions expanded to size100 industries in 1982. The liberalization package in 1991 generates a one-time boost to labor demand for large firms but no clear reversal in sluggishness of labor adjustment.

For medium sized (size100) firms, competition increases average employment and decreases sluggishness with opposing results for larger (size300) firms (lower average employment and higher sluggishness). Effects of pre-existing labor hoarding (requiring shedding of excess labor lowering average employment and net employment change) may be responsible.

Industry data used with GLS and system-GMM estimation techniques provides interesting results. Using the system-GMM estimators helps to instrument for endogeneity in the labor demand equation. GMM estimates strengthen the GLS results and provide additional results. These industry data based estimates are revealing but the magnitudes may well vary substantially at the unit level.

Several issues remain to be examined. The assumption that ignoring capital doesn't bias estimates of labor based on studies of the U.S. economy may be less true for the Indian economy. Within the existing framework here, data on trade unions and on external trade should be incorporated. As of now, the trade union data based on voluntary but intermittent reporting is at best indicative. Data on external trade can be used once the industrial and trade classifications are mapped. Finally, heterogeneity arising from idiosyncratic shocks is lost due to the use of industry level data. The industry data based estimates are revealing but the magnitudes may well vary substantially at the unit level. The analysis could also be extended to include the impact on efficiency, growth, and welfare.

Should the job security regime be liberalized to allow for greater labor flexibility, should the mandated severance pay be reduced or raised, should the change in severance pay be temporary or permanent? This debate has been pending resolution since the initiation of reforms in 1991 in India. The evidence of sluggish employment adjustment here urges a re-examination of the costs and benefits of the regime.

Table 1
Summary Statistics
India: Industry (3-digit) Data, 1973-1997

Variable	Obs	Unit	Mean	Std. Dev.	Min	Max
Factories	3400	Number	645	1067	1	10702
Workers	3400	Number	36921	71490	31	783025
Mandays	3400	Thousand	10695	22214	10	250334
Value of output	3400	Rupees thousand	6772286	14500000	1059	170000000
Wage	3400	Rupees	8706	5240	575	58180
Unit severance pay	3400	Rupees	24292	14140	1090	60867
Unit hiring cost	3400	Rupees	735	362	123	1722
Marginal expected adjustment cost - historical memory	3264	Rupees	9416	6667	123	34073
Marginal expected adjustment cost - five year memory	2720	Rupees	11548	7759	153	49038
Market share	3400	Percent	14	19	0.002	100
Price Cost Margin	3398	Percent	33	12	1.000	96

Source: Author's dataset (truncated version of Annual Survey of Industries, 1973-1997)
Note: Rupee values in constant 1982/83 terms.

Table 2
India: Job flows
(Percent of Employment*)
(3-digit Industry Level)

Year	Job creation rate	Job destruction rate	Net employment rate	Job reallocation rate	Excess job reallocation rate
1973	-	-	-	-	-
1974	7.4	4.4	3.0	11.8	8.8
1975	7.4	3.5	4.0	10.9	6.9
1976	6.4	2.9	3.5	9.4	5.9
1977	6.4	0.9	5.5	7.3	1.8
1978	4.5	2.4	2.2	6.9	4.8
1979	7.4	1.7	5.7	9.2	3.5
1980	4.7	3.2	1.5	7.8	6.4
1981	4.6	3.6	0.9	8.2	7.3
1982	5.8	2.7	3.1	8.4	5.3
1983	3.2	6.7	-3.6	9.9	6.3
1984	4.4	6.1	-1.7	10.6	8.8
1985	3.5	7.8	-4.3	11.3	7.0
1986	2.9	3.4	-0.5	6.3	5.8
1987	7.9	3.6	4.3	11.5	7.2
1988	4.0	4.4	-0.4	8.5	8.1
1989	8.0	5.5	2.5	13.5	11.0
1990	4.1	4.4	-0.3	8.5	8.2
1991	4.2	3.9	0.3	8.1	7.8
1992	7.2	2.2	5.1	9.4	4.3
1993	3.7	4.0	-0.3	7.7	7.4
1994	5.8	1.8	4.0	7.6	3.6
1995	10.3	1.6	8.7	12.0	3.3
1996	4.0	5.2	-1.2	9.2	8.0
1997	5.1	6.0	-0.8	11.1	10.3
Average(73-97)	**5.5**	**3.8**	**1.7**	**9.4**	**6.6**
Variance(73-97)	3.4	**2.9**	9.4	3.3	4.9
Correlation with net	0.9	-0.8	1.0	0.1	-0.6
Avg(73-75)	**7.4**	**3.9**	**3.5**	11.3	7.9
Var(73-75)	0.0	**0.4**	0.5	0.4	1.8
Avg(76-82)	**5.7**	**2.5**	**3.2**	**8.2**	**5.0**
Var(76-82)	1.3	0.8	3.4	0.8	3.4
Avg(83-90)	**4.7**	**5.3**	**-0.5**	**10.0**	**7.8**
Var(83-90)	4.1	2.4	8.2	4.9	2.7
Avg(91-97)	**5.8**	**3.5**	**2.3**	**9.3**	**6.4**
Var(91-97)	5.5	2.9	14.0	2.9	7.1
Avg(76-97)	**5.4**	**3.8**	**1.5**	9.2	6.5
Var(76-97)	3.5	**3.3**	10.4	3.3	5.3

* Employment is averaged over current and previous year.
Source: Author's dataset (truncated version of Annual Survey of Industries, 1973-1997)

Table 3
Job Flows: Comparisons

	JC	JD	JR	NT
Industry - level				
US-4I	2.48	3.63	6.11	-1.15
India - 3I	5.5	3.8	9.4	1.7
Establishment - level				
Canada	10.9	11.1	22	-0.2
USA	8.8	10.2	19	-1.4
Denmark	16	13.8	29.8	2.2
France	13.9	13.2	27.1	0.7
Norway	7.1	8.4	15.5	-1.3
U.K.	10.2	11.5	21.7	-1.3
Chile	12.9	13.9	26.8	-1
Colombia	12.5	12.2	24.7	0.3
Estonia	9.7	12.9	22.6	-3.2
Morocco	18.6	12.1	30.7	6.5

Sources:
Davis and Haltiwanger (1998)
Author's dataset - India

Table 4
GLS Estimates: Quadratic Convex Adjustment Costs

Employment	1973-1975	1973-1982	1973-1997		
			With 76-97, 82-97, & 91-97 period dum		
		With 76-82 dummy	No ind. year dum	Ind. dum only	Industry & year dummies
Constant	0.777 ***	0.741 ***	0.841 ***	0.942 ***	0.896 ***
Wage	-0.102 ***	-0.096 ***	-0.101 ***	-0.106 ***	-0.101 ***
Mandays	0.488 ***	0.218 ***	0.202 ***	0.211 ***	0.207 ***
Output	0.064 ***	0.057 ***	0.052 ***	0.048 ***	0.048 ***
Lagged employment	0.960 ***	0.959 ***	0.959 ***	0.962 ***	0.961 ***
Time	0.115 ***	-0.004 **	-0.002 **	-0.002	0.001
Average Emplt. Size(>=100) dummy	-0.661 ***	0.555	0.352	0.446	0.541
Wage*Size100	0.051 **	0.027	0.031	0.017	0.009
Mandays*Size100	-0.381 ***	0.010	0.020	0.020	0.031
Output*Size100	-0.031 **	-0.066 **	-0.050	-0.043	-0.043
Lagged employment*Size100	0.011	0.019	0.015	0.008	0.007
Average Emplt. Size(>=300) dummy	6.846 ***	2.761 *	2.497	1.885	1.880
Wage*Size300	-0.650 ***	-0.344 **	-0.321 *	-0.269	-0.272
Mandays*Size300	1.069 ***	0.205	0.180	0.152	0.150
Output*Size300	0.547 ***	0.379 ***	0.377 ***	0.381 ***	0.380 ***
Lagged employment*Size300	-0.692 ***	-0.447 ***	-0.441 ***	-0.438 ***	-0.435 ***
Year76 dummy	-	-0.533 ***	-0.634 ***	-0.618 ***	-0.563 ***
Wage*Year76	-	0.077 ***	0.083 ***	0.083 ***	0.074 ***
Mandays*Year76	-	-0.162 ***	-0.155 ***	-0.150 ***	-0.139 ***
Output*Year76	-	-0.045 ***	-0.042 ***	-0.041 **	-0.039 **
Lagged employment*Year76	-	0.032 **	0.034 *	0.030	0.031
Average Emplt. Size(>=100)*Year76	-	-0.552	-0.219	-0.307	-0.349
Wage*Size100*Year76	-	-0.016	-0.012	-0.006	-0.002
Mandays*Size100*Year76	-	-0.005	-0.004	-0.018	-0.025
Output*Size100*Year76	-	0.056	0.028	0.025	0.026
Lagged employment*Size100*Year76	-	-0.014	-0.007	-0.002	-0.003
Average Emplt. Size(>=300)*Year76	-	-3.564 *	-3.177	-2.706	-2.822
Wage*Size300*Year76	-	0.455 **	0.397 *	0.356	0.372 *
Mandays*Size300*Year76	-	-0.373	-0.310	-0.267	-0.281
Output*Size300*Year76	-	-0.351 ***	-0.327 ***	-0.329 ***	-0.332 ***
Lagged employment*Size300*Year76	-	0.377 ***	0.362 ***	0.360 ***	0.361 ***
Year82 dummy	-	-	0.000	0.043	dropped
Wage*Year82	-	-	-0.005	-0.010	-0.011
Mandays*Year82	-	-	-0.007	-0.004	-0.006
Output*Year82	-	-	0.018	0.020 *	0.018
Lagged employment*Year82	-	-	-0.025 *	-0.027 **	-0.026 *
Average Emplt. Size(>=100)*Year82	-	-	0.436	0.367	0.201
Wage*Size100*Year82	-	-	-0.001	0.002	0.014
Mandays*Size100*Year82	-	-	0.073	0.045	0.020
Output*Size100*Year82	-	-	-0.022	-0.016	-0.013
Lagged employment*Size100*Year82	-	-	0.001	-0.008	-0.010
Average Emplt. Size(>=300)*Year82	-	-	-0.807	-0.928	-0.201
Wage*Size300*Year82	-	-	0.108	0.128	0.058
Mandays*Size300*Year82	-	-	0.441	0.462	0.556 *
Output*Size300*Year82	-	-	-0.094 *	-0.107 *	-0.095 *
Lagged employment*Size300*Year82	-	-	0.149 **	0.164 ***	0.151 **

Table 4
GLS Estimates: Quadratic Convex Adjustment Costs

Employment	1973-1975	1973-1982	1973-1997		
			With 76-97, 82-97, & 91-97 period dum		
		With 76-82 dummy	No ind. year dum	Ind. dum only	Industry & year dummies
Year91 dummy	-	-	0.146	0.224	dropped
Wage*Year91	-	-	-0.008	-0.014	-0.011
Mandays*Year91	-	-	0.050	0.072	0.065
Output*Year91	-	-	-0.006	-0.004	0.000
Lagged employment*Year91	-	-	0.011	0.008	0.004
Average Emplt. Size(>=100)*Year91	-	-	-0.519	-0.483	-0.304
Wage*Size100*Year91	-	-	-0.027	-0.038	-0.053
Mandays*Size100*Year91	-	-	-0.262 *	-0.264 *	-0.229
Output*Size100*Year91	-	-	0.055	0.056	0.054
Lagged employment*Size100*Year91	-	-	-0.037	-0.032	-0.029
Average Emplt. Size(>=300)*Year91	-	-	4.466 **	4.548 **	3.633
Wage*Size300*Year91	-	-	-0.437	-0.455	-0.339
Mandays*Size300*Year91	-	-	0.117	0.001	0.012
Output*Size300*Year91	-	-	0.082	0.087	0.059
Lagged employment*Size300*Year91	-	-	-0.132	-0.144	-0.118
Price Cost Margin	-	-	-	-	-
Lagged emplt*PCM	-	-	-	-	-
Price Cost Margin*Size100	-	-	-	-	-
Lagged emplt*PCM*Size100	-	-	-	-	-
Price Cost Margin*Size300	-	-	-	-	-
Lagged emplt*PCM*Size300	-	-	-	-	-
Pr > chi2	0.000	0.000	0.000	0.000	0.000
No. of observations	272	1224	3264	3264	3264

Notes:
(1) * significant at 10% level, ** significant at 5% level, *** significant at 1% level
(2) Errors robust to heteroscedasticity and autocorrelation
(3) All variables in logs, except time; wage, mandays, output, average size, PCM lagged one period
(4) Industry dummies at 2-digit level
(5) Year dummies from 1979 onward, to capture gradual liberalization process, begun in 1979

Table 4 (contd.)
GLS Estimates: Quadratic Convex Adjustment Costs

Employment	1973-1997		
	NO interaction of market variables & period dummies		
	Market variables No dummies	Market variables (Ind dum)	Market variables (Ind & year dum)
Constant	0.776 ***	1.068 ***	1.069 ***
Wage	-0.110 ***	-0.114 ***	-0.110 ***
Mandays	0.200 ***	0.213 ***	0.206 ***
Output	0.058 ***	0.054 ***	0.053 ***
Lagged employment	0.955 ***	0.938 ***	0.933 ***
Time	-0.002 **	-0.002	-0.001
Average Emplt. Size(>=100) dummy	2.594 ***	2.382 **	2.543 **
Wage*Size100	0.044	0.031	0.022
Mandays*Size100	-0.033	-0.049	-0.036
Output*Size100	-0.065	-0.056	-0.056
Lagged employment*Size100	-0.204 **	-0.187 **	-0.195 **
Average Emplt. Size(>=300) dummy	-1.489	-2.438	-2.765
Wage*Size300	-0.327 *	-0.266	-0.267
Mandays*Size300	0.232	0.200	0.199
Output*Size300	0.389 ***	0.397 ***	0.397 ***
Lagged employment*Size300	-0.075	-0.055	-0.023
Year76 dummy	-0.643 ***	-0.621 ***	-0.548 ***
Wage*Year76	0.082 ***	0.080 ***	0.070 ***
Mandays*Year76	-0.149 ***	-0.150 ***	-0.134 ***
Output*Year76	-0.041 ***	-0.038 ***	-0.035 **
Lagged employment*Year76	0.034 *	0.029	0.028
Average Emplt. Size(>=100)*Year76	-0.002	-0.026	-0.093
Wage*Size100*Year76	-0.029	-0.028	-0.021
Mandays*Size100*Year76	0.002	0.010	0.000
Output*Size100*Year76	0.030	0.028	0.027
Lagged employment*Size100*Year76	-0.015	-0.010	-0.009
Average Emplt. Size(>=300)*Year76	-3.423	-2.994	-3.021
Wage*Size300*Year76	0.421 *	0.389 *	0.396 *
Mandays*Size300*Year76	-0.290	-0.271	-0.272
Output*Size300*Year76	-0.306 ***	-0.312 ***	-0.311 ***
Lagged employment*Size300*Year76	0.340 ***	0.337 ***	0.333 ***
Year82 dummy	0.005	0.043	
Wage*Year82	-0.006	-0.012	-0.013
Mandays*Year82	-0.015	-0.015	-0.020
Output*Year82	0.019	0.022 *	0.020 *
Lagged employment*Year82	-0.027 **	-0.030 **	-0.028 **
Average Emplt. Size(>=100)*Year82	0.374	0.352	0.190
Wage*Size100*Year82	0.011	0.013	0.023
Mandays*Size100*Year82	0.101	0.079	0.051
Output*Size100*Year82	-0.023	-0.018	-0.016
Lagged employment*Size100*Year82	0.002	-0.008	-0.009
Average Emplt. Size(>=300)*Year82	-0.394	-0.349	0.286
Wage*Size300*Year82	0.071	0.077	0.015
Mandays*Size300*Year82	0.484	0.537	0.597 *
Output*Size300*Year82	-0.104 *	-0.116 **	-0.109 *
Lagged employment*Size300*Year82	0.159 **	0.175 ***	0.164 ***

Table 4 (contd.)
GLS Estimates: Quadratic Convex Adjustment Costs

Employment	1973-1997		
	NO interaction of market variables & period dummies		
	Market variables No dummies	Market variables (Ind dum)	Market variables (Ind & year dum)
Year91 dummy	0.152	0.223	
Wage*Year91	-0.008	-0.014	-0.011
Mandays*Year91	0.048	0.064	0.056
Output*Year91	-0.007	-0.005	-0.001
Lagged employment*Year91	0.011	0.008	0.004
Average Emplt. Size(>=100)*Year91	-0.847	-0.916	-0.706
Wage*Size100*Year91	-0.021	-0.016	-0.032
Mandays*Size100*Year91	-0.358 **	-0.383 **	-0.339 *
Output*Size100*Year91	0.051	0.044	0.042
Lagged employment*Size100*Year91	-0.011	-0.003	-0.001
Average Emplt. Size(>=300)*Year91	4.613 **	4.662 **	3.633
Wage*Size300*Year91	-0.464	-0.469	-0.326
Mandays*Size300*Year91	-0.002	-0.066	0.032
Output*Size300*Year91	0.085	0.088	0.051
Lagged employment*Size300*Year91	-0.144	-0.156	-0.121
Price Cost Margin	0.034	-0.012	-0.024
Lagged emplt*PCM	-0.001	0.005	0.006
Price Cost Margin*Size100	-0.647 ***	-0.577 **	-0.593 ***
Lagged emplt*PCM*Size100	0.064 ***	0.057 **	0.059 ***
Price Cost Margin*Size300	1.145 ***	1.213 ***	1.301 ***
Lagged emplt*PCM*Size300	-0.106 ***	-0.113 ***	-0.121 ***
Pr > chi2	0.000	0.000	0.000
No. of observations	3264	3264	3264

Notes:
(1) * significant at 10% level, ** significant at 5% level, *** significant at 1% level
(2) Errors robust to heteroscedasticity and autocorrelation
(3) All variables in logs, except time; wage, mandays, output, average size, PCM lagged one period
(4) Industry dummies at 2-digit level
(5) Year dummies from 1979 onward, to capture gradual liberalization process, begun in 1979

Table 5

GLS Estimates: Quadratic Convex Adjustment Costs - Parsimonious

Employment	1976-1982	1976-1997	
		82-97 & 91-97 period dummies	
	With 76-82 dummy	NO Market Variables	Market Variables
Constant	0.276 ***	0.274 ***	0.171
Wage	-0.026 ***	-0.030 ***	-0.032 ***
Mandays	0.073 ***	0.074 ***	0.071 ***
Output	0.013 ***	0.016 ***	0.018 ***
Lagged employment	0.989 ***	0.989 ***	0.994 ***
Average Emplt. Size(>=100) dummy	0.077 **	0.199 *	0.189
Lagged employment*Size100	-0.006	-0.018	-0.017
Average Emplt. Size(>=300) dummy	0.635 **	0.507 *	0.528 *
Lagged employment*Size300	-0.051 **	-0.039 *	-0.041 *
Year82 dummy	-	0.045	0.036
Lagged employment*Year82	-	-0.008	-0.009
Average Emplt. Size(>=100)*Year82	-	0.100	0.102
Lagged employment*Size100*Year82	-	-0.009	-0.009
Average Emplt. Size(>=300)*Year82	-	-0.926 **	-0.942 **
Lagged employment*Size300*Year82	-	0.074 **	0.075 **
Year91 dummy	-	dropped	0.015
Lagged employment*Year91	-	0.002	0.002
Average Emplt. Size(>=100)*Year91	-	-0.084	-0.091
Lagged employment*Size100*Year91	-	0.010	0.011
Average Emplt. Size(>=300)*Year91	-	0.578	0.586
Lagged employment*Size300*Year91	-	-0.050	-0.051
Price Cost Margin	-	-	0.031
Lagged emplt*PCM	-	-	-0.002
Pr > Chi2	0.000	0.000	0.000
Observations	952	2992	2992

Notes:
(1) Significant at 1% level***, at 5% level**, at 10%level*
(2) Errors robust to heteroscedasticity and autocorrelation, all variables in logs
(3) Year dummies from 1979 onward, to capture gradual liberalization process begun in 1979, except with period dummy 1991-97, where year dummies until 1990 included

Table 6

Estimates: Quadratic Convex Adjustment Costs - Parsimonious (System GMM Estimators)

Employment	1976-1982		1976-1997				1976-1997: **Market Var.**	
			82-97 & 91-97 period dum				82-97 & 91-97 period dum	
	With 76-82 dum		Instru-ment set 1		Instru-ment set 2		Instru-ment set 1		Instru-ment set 2	
Constant	-1.165		1.087		0.927		2.093	***	2.085	
Wage	0.142		-0.251		-0.240		-0.448	***	-0.115	
Mandays	0.166		0.400	*	0.383	*	0.288	***	0.283	*
Output	0.040		0.199		0.138		0.333	***	0.083	
Lagged employment	**0.960**	********	**0.880**	********	**0.974**	********	**0.780**	********	**0.838**	*****
Average Emplt. Size(>=100) dummy	0.699		**5.426**	*****	**4.476**	*****	**5.735**	********	**4.859**	*****
Lagged employment*Size100	-0.075		**-0.558**	*****	**-0.458**	*****	**-0.593**	******	**-0.502**	*****
Average Emplt. Size(>=300) dummy	-1.525		0.163		2.384		-0.196		2.812	
Lagged employment*Size300	0.159		0.083		-0.130		0.124		-0.159	
Year82 dummy	-		0.703		0.845	*	0.742		0.862	**
Lagged employment*Year82	-		0.008		-0.253	**	-0.003	**	-0.268	***
Average Emplt. Size(>=100)*Year82	-		6.294		-10.633	**	4.847		-8.964	**
Lagged employment*Size100*Year82	-		-0.612		1.091	**	-0.467		0.928	**
Average Emplt. Size(>=300)*Year82	-		-6.840		2.169		-5.011		0.498	
Lagged employment*Size300*Year82	-		0.642		-0.329		0.470	**	-0.169	
Year91 dummy	-		dropped		dropped		dropped		dropped	
Lagged employment*Year91	-		-0.093	**	0.159	*	-0.085		0.170	**
Average Emplt. Size(>=100)*Year91	-		-10.441		7.268		-9.134		4.464	
Lagged employment*Size100*Year91	-		1.049		-0.741		0.921		-0.461	
Average Emplt. Size(>=300)*Year91	-		12.862		2.620		10.149	**	4.317	
Lagged employment*Size300*Year91	-		-1.238		-0.137		-0.988		-0.319	
Price Cost Margin	-		-		-		-0.021		-0.657	
Lagged emplt*PCM	-		-		-		-0.010		0.061	
Hansen Test: Pr>Chi2	0.216		0.285		0.450		0.214		0.586	
Arellano-Bond Test: No AR(1)	0.001		0.000		0.000		0.000		0.000	
Arellano-Bond Test: No AR(2)	0.807		0.170		0.271		0.098		0.279	
Observations	1224		3264		3264		3264		3264	
No. of industry groups	136		136		136		136		136	

Notes: (1) Significant at 1% level***, at 5% level**, at 10%level*
(2) Errors robust to heteroscedasticity, all variables in logs
(3) Year dummies from 1979 onward, to capture gradual liberalization process, begun in 1979, except with period dummy 1991-97, where year dummies until 1990 included
(4) Using lagged instruments leads to losing first three years' observations, i.e., 1973-1975; variables instrumented are the first panel - lagged wage, mandays, ouput, employment- and market variables where included; with industry groups no. 136 and multiple lagged instruments, the no. of variables instrumented for is constrained
(5a) Instrument set 1 also instruments for period dummy 1982 and its interactions
(5b) Instrument set 2 also instruments for period dummy 1991 and its interactions
(6) Lags restricted to account for some serial correlation AR(1) in residual disturbance
(7) No. of observations reports all years used including those used only for lagged instruments

References

Bentolila, Samuel and Bertola, Giuseppe (1990). Firing Costs and Labour Demand: How Bad is Eurosclerosis?. Review of Economic Studies 57, 381-402.

Bertola, Giuseppe and Rogerson, Richard (1996). Institutions and Labor Reallocation. NBER Working Paper Series. Working Paper 5828, November 1996.

Blanchard, Olivier J. (1997). Labor Market Flexibility and Aggregate Employment Volatility: A Comment. Comment on paper by Cabrales and Hopenhayn (1997). Carnegie-Rochester Conference Series on Public Policy 46, 189-228.

Caballero, Ricardo J., Engel, Eduardo M.R.A. and Haltiwanger, John (1997). Aggregate Employment Dynamics: Building from Microeconomic Evidence. American Economic Review, 87(1), March 1997.

Caballero, Ricardo J. and Engel, Eduardo M.R.A. (1999). Explaining Investment Dynamics in U.S. Manufacturing: A Generalized (S,s) Approach. Econometrica 67(4), July 1999.

Cabrales, Antonio and Hopenhayn, Hugo A. (1997). Labor Market Flexibility and Aggregate Employment Volatility. Carnegie-Rochester Conference Series on Public Policy 46, 189-228.

Davis, Steven J. and Haltiwanger, John (1992). Gross Job Creation, Gross Job Destruction, and Employment Reallocation.Quarterly Journal of Economics, 107(3), 819-63.

Davis, Steven J. and Haltiwanger, John (1998). Gross Job Flows. Handbook of Labor Economics, edited by Orley Ashenfelter and David Card (1998).

Domowitz, Hubbard and Petersen (1988). Market Structure and Cyclical Fluctuations. The Review of Economics and Statistics. Volume 70 (1), February 1988, 55-66.

Fallon, Peter R. and Lucas, Robert E.B. (1991). The Impact of Changes in Job Security Regulations in India and Zimbabwe. The World Bank Economic Review, 5(3).

Haltiwanger and Singh (1999). Retrenchment Programs in Developing Countries. The World Bank Economic Review, ,May 1999.

Hamermesh, Daniel (1992). A General Model of Dynamic Labor Demand. Review of Economic Statistics, 74(4), November 1992.

Hamermesh, Daniel (1995). Labor Demand and the Source of Adjustment Costs. The Economic Journal, 105 (May), 620-634.

Hamermesh, Daniel and Gerard A. Pfann (1996). Adjustment Costs in Factor Demand. Journal of Economic Literature, Vol. XXXIV (September), 1264-1292.

Hopenhayn, Hugo A. and Rogerson, Richard (1993). Job Turnover. Journal of Political Economy, 101(5).

Nickell, Stephen (1978). Fixed Costs, Employment and Labour Demand over the Cycle. Economica, 45(180), November 1978, 329-45.

Papola, T.S. (1994). Structural Adjustment, Labor Market Flexibility and Employment. Indian Journal of Labor Economics, 37(1), 1994.

Pfann, Gerard A. and Palm, Franz C. (1993). Asymmetric Adjustment Costs in Non-linear labor Demand Models for the Netherlands and U.K. Manufacturing Sectors. The Review of Economic Studies, 60(2), 397-412.

Roberts, Mark J. and Tybout, James R. (1996). Industrial Evolution in Developing Countries. A World Bank Book. Oxford University Press.