NBER WORKING PAPER SERIES

COSTLY LABOR ADJUSTMENT:
GENERAL EQUILIBRIUM EFFECTS OF CHINA'S EMPLOYMENT REGULATIONS

Russell Cooper
Guan Gong
Ping Yan

Working Paper 19324
http://www.nber.org/papers/w19324

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
August 2013

This research was supported by a National Science Foundation (# 0819682) to Russell Cooper, a National Science Foundation of China grant (# 70903004) to Ping Yan and Russell Cooper, and a National Science Foundation of China grant (#71273162) to Guan Gong and Russell Cooper. The Department of Social Science of Peking University provided additional research funding. Guan Gong also benefited from the support of the Leading Academic Discipline Program, 211 Project for Shanghai University of Finance and Economics and Shanghai Leading Academic Discipline Project (# B801). Huabin Wu provided outstanding research assistance on the initial phases of this project. Immo Schott contributed to further developing the code for the policy analysis. We are grateful to John Haltiwanger and Jonathan Willis for sharing code from an earlier joint project. We are grateful to seminar participants at the European University Institute, the University of Alicante, University of Cyprus, the Federal Reserve Bank of St. Louis and the University of Rochester for helpful questions and comments. The views expressed herein are those of the authors and do not necessarily reflect the views of the National Bureau of Economic Research.

Costly Labor Adjustment: General Equilibrium Effects of China's Employment Regulations
Russell Cooper, Guan Gong, and Ping Yan
NBER Working Paper No. 19324
August 2013
JEL No. E24,J08,J2

ABSTRACT

This paper studies the employment and productivity implications of new labor regulations in China. These new policies were intended to protect workers' employment conditions by, among other things, increasing firing costs and increasing compensation. We estimate a model of costly labor adjustment from data prior to the policy. We use the estimated model to simulate the effects of the policy. We find that increases in severance payments lead to sizable job creation, a significant reduction in labor reallocation and an increase in the exit rate. A policy of credit market liberalization will reduce employment, increase labor reallocation and increase wages. The estimated elasticity of labor demand implies that an increase in the base wage leads to sizable job losses.

Russell Cooper
Department of Economics
The Pennsylvania State University
611 Kern
State College, PA 16802
and NBER
russellcoop@gmail.com

Guan Gong
School of Economics
Shanghai University of Finance and Economics
777 Guoding RD, Shanghai
CHINA
ggong@mail.shufe.edu.cn

Ping Yan
National School of Development
China Center for Economic Research
Peking University
pyan@ccer.edu.cn

1 Motivation

In January 2008, China enacted numerous measures to protect workers. These actions were motivated, in part, by concerns over the employment situation of workers, including job security and wage levels. Often well-intentioned interventions of this form have unintended adverse consequences. Increased firing costs can have an adverse effect on labor demand and may induce exit.[1]

Table 1 in Allard and Garot (2010) compares the scores of different countries on the Employment Protection legislation indicator, which was developed by the OECD to gauge the strictness of labor laws. From this table, the new labor law moves China from a fairly deregulated market to one that could be considered as restrictive as some of the most protective European economies, and much more restrictive than the United States. Allard and Garot (2010) draw particular attention to the increased severance payments, noting that they are now comparable to those found in rigid OECD labor markets, such as Spain and Portugal. From the World Bank, the value of the "Difficulty of firing index" for China rose more than 20% between 2005 and 2009.[2]

In this paper we study the effects of these labor regulations in a general equilibrium model.[3] We estimate both household and plant-level parameters, using observations prior to the labor regulations. For plants, we estimate the revenue function, the driving process for the shocks to profitability, the adjustment costs as well as the discount factor. Since there is entry and exit of plants, we also estimate fixed production and entry costs. For households, we estimate the disutility from work. The estimation uses the allocation of a stationary general equilibrium as a basis for inference.

The estimates from the model of structural parameters are used for the policy analysis. The policies we consider include: (i) the increase of fixed hiring costs, (ii) increased costs of varying worker hours (overtime provisions), (iii) increases in severance pay, (iv) increases in base wages and (v) the liberalization of capital markets.

We study how these policy interventions influence average employment, worker reallocation and aggregate productivity. To the extent that these interventions influence the costs of employment and the costs of adjusting employment, they ought to be reflected in the demand for labor and in the pace of worker reallocation across heterogeneous producers.

The policy analysis is undertaken initially in a partial equilibrium setting, enabling us to study the affects of the interventions on labor demand given wages. This is appropriate for short-run effects and also if, perhaps for institutional reasons, wages do not respond to the interventions.

In the partial equilibrium exercise, the main effects of the interventions come through the in-

[1] Analyses of these regulations in Europe, for example Bentolila and Bertola (1990a) and the references therein, looked at the effects of increased firing costs on hiring and unemployment.

[2] This comes from various issues of the World Bank "Doing Business" reports.

[3] Our earlier analysis, Cooper, Gong, and Yan (2009) was entirely partial equilibrium in nature.

creased severance payments, the liberalization of capital markets and increases in base wages. With our estimates, increased severance payments lead to an **increase** in average plant size and a reduction in productivity, since reallocation is more costly. We find that this effect is directly related to our estimated discount factor of about 0.92. With this relatively low discount factor, a plant will expand employment and output in response to a favorable shock and then hold onto these extra workers in bad times due to the higher firing costs.

This effect on employment is muted when capital markets are liberalized and the discount factor rises to 0.95. We thus conclude that the affects of increased severance pay on employment and productivity interact with the access of plants to capital markets.

Further, we find evidence that the elasticity of labor demand is about -0.43 for Chinese private plants. This implies that a 20% increase in the base wage of workers will lead to nearly a 9% reduction in employment. This estimate of the elasticity of labor demand is very robust across parameterizations of our dynamic labor demand model.

The general equilibrium analysis adds entry as well as market clearing wage variations in response to the policy interventions. Relative to the partial equilibrium results, the increased severance pay has about the same positive impact on employment while credit market liberalization has an even larger adverse effect on employment. In a general equilibrium setting, attempts to increase the base wage are offset by equilibrium wage responses, leaving real allocations unchanged.

2 China's Labor Policies

This section discusses the reforms in China.[4] These reforms, termed the "Labor Contract Law of the People's Republic of China" were passed on June 29, 2007 and were effective January 1, 2008.

As stated in the first chapter of the law:

> Article 1 This Law is formulated to improve the labor contract system, to specify the rights and obligations of the parties to labor contracts, to protect the legitimate rights and interests of workers, and to build and develop harmonious and stable employment relationships.
>
> Article 2 This Law applies to the establishment of labor relationships between, the conclusion of, performance of, amendment of, revocation of and termination of, labor contracts by workers and organizations such as enterprises, individual economic organizations and private non-enterprise units in the Peoples Republic of China (Employers).

[4]This discussion draws on presentation of the new laws at `http://hi.baidu.com/yanyulou/blog/item/1ebba9648ab5f7f3f6365430.html`.

> The conclusion, performance, amendment, revocation and termination of labor contracts between state authorities, institutions or social organizations and workers with whom they establish employment relationships, shall be subject to this law.
>
> Article 3 The conclusion of a labor contract shall be based on the principles of lawfulness, fairness, equality, voluntariness, negotiated consensus and good faith. A lawfully concluded labor contract shall have binding force, both the Employer and the employee shall perform their respective obligations stipulated therein.
>
> Article 4 Employers shall formulate and improve labor rules and regulations in accordance with the law, so as to ensure that employees enjoy their labor rights and perform their labor obligations.

The specifics needed to implement these goals are contained in Chapter IV of the new law. As we shall see, one of the most economically important provisions is the requirement of severance payment upon separation. In addition, the new laws call for the provision of social insurance.

As noted earlier, the severance pay provisions are viewed as most onerous. Before the implementation of new law, the employer was not required to provide a severance payment if an existing employment contract expired without being renewed. The new law changes this so that severance pay is required unless an offer to renew the same contract is rejected by the employee. Further, the law stipulates that for lawfully terminated contracts the severance pay is one month's salary for each year of employment, capped at 12 months or 12 times 300% of the local average monthly salary, whichever is bigger. The severance is twice this if a contract is terminated unlawfully. Evidently, a significant part of lay-offs in which contracts are not expired are considered unlawful termination.

Our estimates of adjustment costs prior to the introduction of the new law includes a significant fixed cost of firing. In our policy analysis we amend the specification of the fixed firing costs from the new law following this provision:

> Article 41 If any of the following circumstances make it necessary to reduce the workforce by 20 persons or more, or less than 20 persons but accounting for 10% or more of the total number of employees of the Employer, the Employer may only do so after it has explained the situation to the labor union or to all of its employees 30 days in advance, has considered the opinions of the labor union or the employees, and has submitted its workforce layoff plan to the labor administrative department: ....

Though the new regulations apply to both private and public firms, we focus on the private plants in our study since these parts are the ones most likely to be influenced by these new policies.

These plants account for over 75% of total employment. Thus we interpret the policy changes as being more about enforcement than actual policy changes.

As with any new regulation, there is the open question of enforcement. There is some evidence that the new regulations have been effective. The Ministry of Human Resources and Social Security of China stated that labor disputes in 2008 rose to 693,000, a near doubling of cases from 2007. From the U.S. Congressional Commission on China, we learn Reports on disputes in 2009 show that this rapid rate of increase is continuing and that the explosion of disputes is particularly apparent in coastal cities and provinces, including Beijing, Shanghai, Jiangsu, Zhejiang and Guangdong.[5]

To provide further evidence, we conducted an informal survey of plants and the New Labor Contract Law (NLCL).[6] Responses are summarized in Table 1.

Table 1: Survey Responses

	much more difficult	more difficult	no change	easier
NLCL makes recruitment	8	1	3	0
NLCL makes firing	1	7	4	0
NLCL increases average labor cost by	>30%	20 to 30%	10 to 20%	< 10%
	4	8	0	0
Law authorities inspect	very strictly	strictly	not strictly	
implementation of NLCL	5	6	1	

When asked about what provisions of the NLCL affect enterprises most, responses included:

- Enterprises are required to make all employees insured. The base insurance payment increases every year, making the cost of doing business increases every year.
- The minimum wage increases steadily every year.
- Recruitment becomes difficult. In the mean time, labor mobility is very large. The newly hired graduated-students cannot and do not want to do hard work.
- The restriction on working hours in New Labor Contract Law imposes huge cost on the apparel industry. The special nature of apparel industry is that the working hours are relatively long; most enterprises export goods to other countries. They have to complete the production in a pressing time, which usually makes employees work extra hours.

[5] The quote comes from the U.S. Congressional Executive Commission on China, 2009 Annual Report, p. 75., available at `http://www.cecc.gov/`.

[6] Thus far, 12 enterprises replied to the survey, located in 6 provinces: Jiangsu, Shandong, Zhejiang, Henan, Sichuan, and Heilongjiang.

- Article 38 where the enterprises are enforced to pay social security insurance for all employees.

Given the size of the survey, the results are only suggestive of the reforms and their enforcement. Yet it does seem that the costs of hiring and firing workers have increased as have labor costs. Moreover, from both the survey and the evidence of labor market strife, the new regulations are being enforced.

Some of these elements of change from the NLCL will be central to our model, such as the increased (social) insurance payments for workers, increased severance payments and increases in the elasticity of compensation with respect to hours. To the extent that the increased hiring costs are in the form of higher wages, these costs are incorporated into our analysis as well. Others, such as the difference between temporary and fixed contracts is not part of our baseline environment.

3 Model Economy

We consider the general equilibrium of a large economy composed of households and firms. The main action in the model comes from the dynamic labor demand of the firms. The next subsection provides a detailed analysis of their dynamic stochastic optimization problem.

The households supply labor to firms. The households also own the firms, though the labor supply decisions are made independently of ownership. As detailed below, the households have heterogenous labor market outcomes. Some are employed, others are not. Among those employed, hours worked may vary across firms. As the analysis is not about these differences in households, we follow Hopenhayn and Rogerson (1993) and consider a single household which shares the risks of these heterogeneous outcomes.

As there are no aggregate shocks in the model, it is relatively straightforward to find a stationary equilibrium. To be clear, in this equilibrium the state of the firm is stochastic due to idiosyncratic shocks and differences in employment. Yet, in aggregate, the economy is in a steady state.

The gain from the general equilibrium model comes from the policy analysis. The estimation of firm dynamic labor demand can be viewed as coming from a partial equilibrium model in which firms take prices and wages as given. But the policy interventions change these prices.

3.1 Dynamic Optimization

In this section we present the dynamic optimization problem of private plants. The optimization problem is the basis of our estimation using the simulated method of moments approach. The policy changes are then evaluated using the estimated parameters.

The dynamic optimization problem for a privately owned plant builds from the specification in Cooper, Haltiwanger, and Willis (2004) and Cooper, Gong, and Yan (2013). At a point in time, the plant is in state (A, e_{-1}) where A is a random variable representing the profitability of the plant and e_{-1} is the stock of workers employed in the previous period.

At the start of a period, the plant will either continue in operation or exit. As there is no capital, we set the value of exit to 0, assuming that any severance pay requirements are not enforceable on a plant that exits.[7]

$$V(A, e_{-1}) = \max\{V^c(A, e_{-1}), 0\}. \tag{1}$$

Here $V(A, e_{-1})$ is the state contingent value of the plant and $V^c(A, e_{-1})$ is the value if it continues in operation, retaining the option of exit in the future.

A continuing plant chooses the number of workers to employ in the current period, e, along with the hours per worker, h. These choices are made to maximize the sum of current profits and the discounted expected value of the firm in the next period. Current profits are defined as revenues less compensation paid to workers and less costs of adjusting the workforce.[8]

The value of the continuing plant in state (A, e_{-1}) is given by

$$V^c(A, e_{-1}) = \max_{h,e} R(A, e, h) - \omega(e, h) - \omega_0\Gamma - C\left(A, e_{-1}, e, h\right) + \beta E_{A'|A} V(A', e) \tag{2}$$

for all (A, e_{-1}). Here $R(A, e, h)$ is the revenue flow of a plant with e workers, each working h hours in profitability state A. Our analysis assumes that the profitability shock is plant-specific.[9]

The revenue function depends on the product of hours per worker and the number of workers. This function comes from the product of a production function and the demand function facing the plant. Factors of production other than labor, such as capital and energy, are freely adjustable within a period. With constant returns to scale and constant elastic demand, the revenue function takes the form in (3). The coefficient α reflects the curvature of the production function along with the elasticity of demand. The parameter A represents both shifts in the production function of a plant, shifts in factor prices and shifts in the demand for that plant's output:

$$R(A, e, h) = A(eh)^\alpha. \tag{3}$$

In (2), there is a fixed cost of operation, denoted Γ, denominated in units of labor input and thus multiplied by the base wage, ω_0. As we observe exit in the data, the presence of Γ will help match

[7] Thanks to Immo Schott for bringing this issue to our attention.

[8] As discussed in the empirical implementation, the data counterpart of this are revenues net of other costs of production.

[9] The model is estimated from cross sectional variation by removing year effects.

that moment. In the policy experiments that follow, the overhead cost will respond to variations in the base wage.

The compensation paid to workers is characterized by

$$\omega(e,h) = e(\omega_0 + \omega_1 h^{\zeta}). \tag{4}$$

This function is an important determinant of how the firm varies its labor input in the face of a change in profitability: through variations in hours or in the number of workers. The parameters (ω_0, ω_1) are set to mimic average hours and average plant size. The parameter ζ determines the elasticity of compensation with respect to variation in hours.[10] Though hours variation is historically small in China, it is nonetheless important to consider this aspect of the demand for labor. One of the effects of an increased firing cost is to reduce the variability of employment and instead to rely on hours variation in response to profitability shocks.

The cost of adjusting the stock of workers is given by $C(e_{-1}, e)$. In general, this function captures the various inputs into the process of hiring a worker, including: search, recruitment and training costs. It may contain both convex and non-convex forms of adjustment costs.[11]

A general cost of adjustment function would be

$$C(e_{-1}, e) = F^{+} + \gamma^{+}(e - e_{-1}) + \frac{\nu}{2}\left(\frac{e - e_{-1}}{e_{-1}}\right)^2 e_{-1} \tag{5}$$

if there is job creation $e > e_{-1}$. Similarly

$$C(e_{-1}, e) = F^{-} + \gamma^{-}(e_{-1} - e) + \frac{\nu}{2}\left(\frac{e - e_{-1}}{e_{-1}}\right)^2 e_{-1} \tag{6}$$

if there is job destruction $e < e_{-1}$. If $e = e_{-1}$, so there are no *net* changes in employment, then $C(e_{-1}, e) \equiv 0$.

There are three types of adjustment costs, with differences allowed for the job creation and job destruction margins. The first is the traditional quadratic adjustment cost, parameterized by ν. A fixed cost of adjustment is parameterized by F. Finally, there are linear adjustment costs. The linear firing cost, γ^{-}, is of particular importance as it captures severance payments to workers. One of the key features of the data is inaction in employment adjustment. The fixed cost and linear costs are all capable of creating inaction.

In addition to the differences in adjustment costs of hiring and firing workers, this study allows a threshold for the non-convex adjustment costs. So, as a leading example, the fixed cost of firing

[10] When ω_0 is zero, the elasticity of compensation with respect to hours is ζ.

[11] Hamermesh and Pfann (1996) contains a lengthly discussion of adjustment costs models and their interpretation.

(F^-) may apply only if the rate of job destruction exceeds a bound. Through this modification of (6), we are able to capture certain institutional features that may generate nonlinearities in adjustment costs.

Finally, there is the prospect of entry. A new entrant pays a cost κ, denominated in units of labor and multiplied by the base wage, ω_0. The entrant then draws a profitability shock and starts operation. The value of entry is determined in equilibrium through labor costs, as in Hopenhayn and Rogerson (1993).

3.2 Households

There are numerous agents who supply labor and consume the produced good. The agents have heterogenous outcomes as some are employed and others are not. Further, the amount worked by a household varies, depending on the productivity of its firm.

Preferences by an individual agent are represented by $u(c - g(h)) - \xi I(h > 0)$ where c denotes the consumption of the single good and h is hours worked. Assume $u(\cdot)$ is strictly increasing and strictly concave while $g(\cdot)$ is strictly increasing and strictly convex. In addition, an employed agent suffers a disutility of ξ, where $I(h > 0)$ indicates that the agent's working hours are not zero.

As in Hopenhayn and Rogerson (1993) these individual agents belong to a large household. Through this household, labor market risks are shared. The objective function of the household is:

$$\sum_{i \in emp} u(c^i - g(h^i)) + (1 - N)u(c^u) - \xi N \tag{7}$$

where N is the fraction of agents in the household currently employed, the remainder are unemployed. The first sum is over the agents, indexed by i, who are employed: $i \in emp$.

The budget constraint of the household is given by:

$$\sum_{i \in emp} c^i + (1 - N)c^u = \sum_{i \in emp} (\omega_0 + \Omega(h^i)) + \omega_u + \Pi - T. \tag{8}$$

Total consumption is funded from a number of sources. The first is the total earning of employed agents, including compensation for excessive hours. This is supplemented by welfare payments, denoted ω_u, to the household from the government or severance payments paid by the firm to the government which flow to the household.[12] The household owns the firms and hence gets profits of

[12]For simplicity, these flows are independent of the current and past labor supply choices of the household. Hopenhayn and Rogerson (1993) have a similar structure. If the unemployment insurance flows are internalized by the household, then the calibration of ξ is modified to take into account that ω_u is a fraction of the base wage.

Π. In the event there is unemployment insurance funded by the government, the household may incur some tax obligations, denoted T.

The household's optimal allocation equates the marginal utility of consumption across all of its members, both employed and unemployed: $u'(c^u) = u'(c^i - g(h^i))$ so that $c^i = c^u + g(h^i)$ for all $i \in emp$. We construct an equilibrium in which $\Omega(h) = g(h)$.[13] In this way, workers are exactly compensated for the disutility of working at a particular firm. The level of consumption per household member, denoted $\bar{c} = c^u = c^i - g(h^i)$ $i \in emp$, is determined directly from the budget constraint.

Given the compensation function and its redistribution between members, the household chooses the fraction of its members who will work. At the margin, the household is indifferent with respect to the hours worked of an additional worker. Thus the fraction of household members working is determined from the first order condition of $\omega_0 u'(\bar{c}) = \xi$.

3.3 Equilibrium

An equilibrium is a base wage, ω_0, and a participation decision such that: (i) the labor market clears given the optimal choices of households and plants (including the continuation decision) and (ii) the free entry condition holds. As noted earlier, $\Omega(h) = g(h)$ in equilibrium so that the effects of hours variation on household labor supply vanish. Consequently, only the base level of the wage remains to be determined in equilibrium. Essentially the free entry condition determines the base level of wages. Then labor market clearing determines the participation rate, N, of the household.

The estimation finds the base wage, parameters of the plant's revenue and cost of adjustment functions as well as other parameters to minimize the distance between simulated and plant-level moments. This inference is based on the dynamic labor demand of plants within a general equilibrium. Once the estimation is completed, the results pin down two additional parameters through the equilibrium conditions.

First, the expected value to an entrant is determined in the solution of the plant dynamic optimization problem. The cost of entry, κ, is set equal to this expected value of entry.

Second, the plant optimization problem generates aggregate labor demand. In equilibrium, the household level of consumption is determined as well. Labor market equilibrium is determined by the choice of ξ so that $\omega_0 u'(\bar{c}) = \xi$ holds.[14]

[13] Below we link $\Omega(h)$ to(4).

[14] The household preference parameter, ξ is set so the the labor market clears at a participation rate of 75.1%. This participation rate is needed to construct average household consumption. For this, we use log utility.

4 Estimation

The estimation of parameters for plants and households is a necessary component for the policy analysis. The procedure uses information prior to the introduction of the policies to estimate underlying parameters. Evaluating the effects of the policies pursued by the Chinese government is impossible without a structural model. Thus the estimation component is key to the policy analysis.

We first discuss the data and then provide more details on the estimation procedure and the parameter estimates. Additional details as well as numerous robustness exercises are provided in the Appendix.

4.1 Data and Moments

The data used in this study and in Cooper, Gong, and Yan (2013) are from Annual Surveys of Industrial Production (1998-2007), conducted by the National Bureau of Statistics (NBS) of China. The panel used in that study includes all private plants with more than five million Yuan in revenue.[15] Private plants are identified through a variable, **control of shares**, which indicates ownership shares.

Data moments used in the estimation are reported in the first row of Table 2. All moments except the exit rate are computed from a balanced panel of private plants in operation during the period 2005-2007.

There are a couple of key features of the data which are important in the estimation. The first is inaction: about 37% of the observations entail essentially no net change in the number of workers.[16] The second is the presence of significantly large employment changes. Over 20% of the observations entail job creation in excess of 20% of the workforce and over 10% have job destruction in excess of 20% of the plant work force. Yet, about 20% of the observations have job creation or job destruction rates less than 10% (in absolute value). As discussed further below, these moments are key to the estimation of the parameters of adjustment costs which, in turn, are important for analyzing policy effects.

Included in the moments are the OLS estimates of the curvature of the revenue function as a function of employment as well as estimates of the stochastic process of the profitability shock. These estimates are summarized as the last three elements in Table 2.

To be clear, these OLS estimates are not taken to be estimates of the structural parameters for two reasons. First, the OLS procedure, of course, does not control for the response of employment

[15] From the discussion in Brandt, Biesebroeck, and Zhang (2012), this cut-of based on revenues is likely to eliminate less than 1% of the private plants.

[16] Importantly, we observe only net flows, not gross hires and fires.

Table 2: Moments for plants

	std(r/e)	sc	JC30	JC1020	JC10	0	JD10	JD1020	JD30	xrate	$\hat{\alpha}$	$\hat{\rho}$	$\hat{\sigma}$
Data	0.988	0.914	0.158	0.075	0.122	0.349	0.103	0.053	0.058	0.071	0.700	0.867	0.882
Base	0.901	0.963	0.081	0.074	0.128	0.424	0.098	0.056	0.043	0.058	0.935	0.721	0.927

In this table, std(r/e) is the standard deviation of the log of revenue per worker, sc is the serial correlation in employment, JC30 is a job creation rate in excess of 30%, JC1020 is a job creation rate between 10% and 20% and JC10 is a job creation rate greater than 0 and less than 10%. The job destruction (JD) moments are defined symmetrically. The entries are the fractions of observations with these rates of job creation and job destruction. "xrate" is the average exit rate. The last three moments are the OLS estimates of the curvature of the function, $\hat{\alpha}$, the serial correlation of the residual from the regression, $\hat{\rho}$, and the standard deviation of this residual, $\hat{\sigma}$.

to profitability shocks, thus biasing the estimate of α upwards. Second, the revenue function in our model depends on hours as well as employment. Yet, hours are not measured in our data set. This will create additional bias in the estimates. As we shall see, the structural analogues of these parameters are quite different from the OLS estimates, indicative of the bias in the OLS regressions.

The model we estimate includes exit. Thus the average annual exit rate of 7.1%. The exit is induced, in part, by the overhead cost, Γ, but is also influenced by the discount factor, β.

For the estimation, the model with exit is simulated. The exit rate is matched using the unbalanced panel. Following the procedures used in the creation of the data moment, a balanced panel is selected to match the moments in Table 2.

4.2 Procedure

The estimation procedure finds parameters to match moments using Simulated Method of Moments (SMM). The main challenge to the estimation is to match these prominent features of the data shown in Table 2. In particular some form of nonlinear adjustment costs are needed to produce this high level of inaction in employment adjustment. That same type of non-convexity can produce observations in the tails of the distribution. A major difficulty arises in matching the relatively small job destruction and job creation rates since models with non-convex adjustment costs alone will usually not imply these small adjustments. Our specification of adjustment costs allows for the non-convexity to appear after a threshold of adjustment.

In addition, these moments indicate asymmetry in the distribution of employment changes. Thus our model allows for asymmetries in adjustment costs.

The parameters estimated by SMM are $\Theta \equiv (\zeta, \nu, F^{+}, F^{-}, \gamma^{+}, \gamma^{-}, \beta, \Gamma, \alpha, \rho, \sigma)$. This approach finds the vector of structural parameters, Θ, to minimize the weighted difference between simulated and actual data moments:

$$\pounds(\Theta) \equiv (M^d - M^s(\Theta))W(M^d - M^s(\Theta))'. \tag{9}$$

There are 13 moments used to estimate the 11 parameters. So the model is slightly over identified.

The estimation method starts by solving the dynamic programming problem in (2) for a given value of Θ.The decision rules are calculated as part of this solution. Shocks to profitability are then drawn in a manner consistent with the process estimated in the first stage. Given these shocks and the decision rules at the plant level, a simulated panel data set is created and the simulated moments are calculated. The weighting matrix, W, is obtained by inverting an estimate of the variance/covariance matrix obtained from bootstrapping the data.

Table 2 indicates the moments used in the estimation. The moments were intended to capture variations in the data needed to estimate key parameters that in turn, determine the effects of the policies on target variables, such as employment and productivity.

Of course, there is not a one-to-one mapping from moments to parameters. The Appendix also includes a matrix, Table 11, summarizing the effects of small variations in parameter values on the simulated moments. This matrix provides information on the nature of the identification. These responses underlie the standard errors for the estimated model, presented in Table 3.

The cross sectional distribution of employment adjustment (job destruction and creation) is informative about the various adjustment costs. The serial correlation of employment, sc, is particularly responsive to the quadratic adjustment cost parameter. The standard deviation of the log of revenue per worker, $std(r/e)$, is included to capture the role of employment adjustment relative to (unobserved) adjustments in hours worked. The curvature of the compensation function is identified from the standard deviation of the log of revenue per worker.[17] An increase in ζ will lead to a larger variation in employment relative to hours and thus a reduction in this moment. Variations in β influence all the moments, particularly the standard deviation of the log of revenue per worker. When, for example, β is low, the future gains from employment adjustment are more heavily discounted and so the plant relies more on hours adjustment.

As noted earlier, the estimation includes the curvature of the revenue function, α, as well as the parameters of the stochastic profitability process. While these parameters are directly linked to their counterparts in the OLS reduced-form regression, variations in the these parameters also influence other aspects of dynamic labor demand. A decision on inaction in employment adjustment, for example, depends on the serial correlation of the shock. Likewise, large employment adjustments

[17]We do not have direct information on hours in the data set.

reflect realizations of relatively large, persistent profitability shocks.

The parameters of the compensation function, (ω_0, ω_1) vary with Θ to match two additional moments: the steady state median size of plants and average hours per week of 40.[18] The parameterized compensation function, (4), is related to the household optimization problem by imposing $g(h) = \Omega(h) = \omega_1 h^{\zeta}$.

4.3 Results

The parameter estimates are given in the first row of Table 3, along with their standard errors. Here the fixed costs of hiring and firing are in terms of average revenues. The moments for this estimated model are those reported above in Table 2.

An important parameter is the estimated linear firing costs, $\gamma^- = 0.1755$. This is about 61% of annual average compensation paid to a worker.[19]

The estimated discount factor of 0.9223 is low relative to the discount factor of 0.95 assumed in many macroeconomic model. It is noteworthy that this estimated discount factor is consistent with capital market imperfections associated with private plants in China.[20]. The experiment labeled "cl", denoting capital market liberalization, increases the discount factor to 0.95 and we also will study the interaction of credit market liberalization with other policy measures.

The estimated fixed hiring costs were essentially zero and the linear costs are small. In fact, the estimation allows for negative hiring costs, which could be interpreted as political hiring bonuses. The presence of firing costs is important for explaining the asymmetry in the data between large the nearly 16% frequency of job creation in excess of 30% relative to only 6% of job destruction in excess of 30%. The low discount factor, as explained further below, implies that hiring and firing costs are distinct.

Parameter estimates for other cases are presented in the Appendix. The model with fixed and linear costs fit the data moments better than models with just hiring costs or quadratic adjustment costs alone. Accordingly, we refer to the estimates in the first row of Table 3 as the "base".

Though the simulated moments in Table 2 appear close to the data, the difference is statistically significant. That is, the value from (9) is $45.57x10^3$ so that the hypothesis that $\pounds(\Theta) = 0$ is soundly rejected. Given the large number of plant year observations, the moments are tightly estimated and thus the elements of the weighting matrix W are very big. Thus the $\pounds(\Theta)$ is large though the

[18] To ease the computational burden, these two parameters are calibrated in a deterministic steady state. Later we explore the robustness of our results with respect to the setting of (ω_0, ω_1).

[19] This is calculated in the simulated data from the ratio of the estimate of γ^- to the mean wage, including compensation for extra hours, received per worker.

[20] See the discussion and references in Song, Storesletten, and Zilibotti (2011).

estimated model succeeds in matching key aspects of the data.

Table 3: Parameters Estimates and Policy Experiments

case	ζ	ν	F^+	F^-	γ^+	γ^-	β	Γ	α	ρ	σ
base	1.1726	0.2167	-0.001	0.006	0.0209	0.1755	0.9223	1133.89	0.5612	0.9832	2.3196
se	0.002	0.004	0.007	0.003	0.002	0.001	0.003	34.310	0.001	0.000	0.017
fc	1.1726	0.2167	-0.001	0.0072	0.0209	0.1755	0.9223	1133.89	0.5612	0.9832	2.3196
sp	1.1726	0.2167	-0.001	0.006	0.0209	0.2106	0.9223	1133.89	0.5612	0.9832	2.3196
cl	1.1726	0.2167	-0.001	0.006	0.0209	0.1755	0.95	1133.89	0.5612	0.9832	2.3196
cl,sp	1.1726	0.2167	-0.001	0.006	0.0209	0.2106	0.9297	1133.89	0.5612	0.9832	2.3196

Here: (i) base are the baseline estimates, with standard errors (se), (ii) fc is a doubling of the fixed cost, (iii)sp is a doubling of severance pay, (iv) he is an increase in the hours elasticity of 10%, (v) cl is credit market liberalization, (vi) cl, sp combines an increase in severance pay with credit market liberalization. Three additional experiments not shown in the table, (vii) $fc(10)$ applies the baseline firing cost at a 10% job destruction rate, (viii) bw increase of base wage by 20%. and (viii) he increases w_1 and thus the cost of hours variation

The moments for the baseline parameters are indicated in Table 2. The estimated model does fine with matching the standard deviation of revenue per worker as well as the serial correlation of employment. The model produces a bit too much inaction and does not quite capture the job creation rates over 30%.

As noted earlier, one of the challenges for models of adjustment costs is to capture the intermediate adjustments along with the inaction and bursts of job creation and destruction. The model does match the intermediate levels of job destruction because the fixed cost of firing applies for job destruction in excess of 20%. There are essentially no hiring costs so that low job creation rates are not difficult to match. The inaction is a consequence of the linear firing costs.

One of the interesting features of the estimation results is that the asymmetric adjustment costs are able to reproduce the more symmetric distribution of job creation and destruction rates. That is, though our findings indicate the significance of firing costs, the model is still capable of matching the moments of job creation. This is partly due to the fact that hiring decisions are influenced by the prospects of firing and thus the costs associated with job destruction.

5 Policy Implications: Partial Equilibrium

We use the estimated model to study the effects of recent job protection measures. It is not possible to accurately incorporate all elements of the policy measures into our analysis. Instead, we use the policy measures as motivation for changes in various parameters. The results are indicative of the direction of movements created by these policy actions. We look at the effects of these policies on employment and productivity.

Reflecting both model and parameter uncertainty, we present evidence of the robustness of our findings to variations in the parameters of the estimated model and also to competing models. Further, given that the policies can promote exit, we supplement the discussion with a study of the implications of the policies for firm exit.

The policy analysis is undertaken in two stages. The first stage studies the effects of the policies on labor demand, given the compensation function. This is a **partial equilibrium** exercise which allows us to identify which interventions will have labor demand effects. For this analysis, the base wage is held fixed as the various policy measures are introduced. The simulations do allow for exit, in accord with the estimated decision rules.

The second stage, presented in section 6, takes these findings and explores the policy implications in a **general equilibrium** model with entry and exit. For the second exercise we focus on a subset of policies that the first stage identifies as influential. In the general equilibrium exercise, we re-solve the model to determine the equilibrium wage as well as the entry and exit induced by the policy intervention.

The partial equilibrium approach is informative for the short-run response to the policy as well as settings in which, perhaps due to government intervention, base wages do not adjust in response to the policy. The general equilibrium approach, in contrast, allows for complete wage adjustment as well as entry.

5.1 Policies

Here is how we go from the presentation of the Chinese policies in section 2 to changes in parameter values. These changes are summarized by the various rows of Table 3.

There are two experiments associated with changes in the fixed firing cost. One interpretation of this parameter is that it reflects administrative and political costs of large job destruction. One policy experiment, labeled “fc”, increases this fixed cost by 20%. A second, labeled “fc(10)” assumes that this fixed cost applied for job destruction above 10% rather than the 20% found in the estimation. As noted earlier, labor disputes have risen sharply under the new law, leading to increased costs of firing workers.

The policy measures include the extension and enforcement of severance pay provisions. We model this as a 20% increase in the linear firing costs. As noted earlier, the estimated linear firing cost could be interpreted as severance payment of about 7 months of average annual wages. This experiment, labeled “sp” amounts to an increase in severance pay to cover an additional 6 weeks of average wages.

The estimated discount factor is considerably lower than the commonly parameterized value of β in dynamic general equilibrium models. One interpretation, discussed in more detail in Cooper, Gong, and Yan (2013), is that the estimated discount factor reflects capital market imperfections. The treatment labeled "cl" increases the discount factor to 0.95.

As we shall see, it is of interest to combine the experiments of increasing severance pay with capital market liberalization. This experiment is labeled "cl,sp". Here the discount factor is set at 0.9297 for reasons discussed below.

There is an experiment associated with a 20% increase in the base wage, ω_0. This case is labeled "bw". This experiment captures the increased social security insurance contributions and the principle of equal pay for equal work by Article 11. Under the new law, the employer is required to contribute to the social benefits of workers on contracts.

The enforcement of overtime provisions means that hours variation is more costly. The treatment labeled "he" increases the component of compensation associated with hours by increasing ω_1, 20%.

5.2 Employment Effects

Table 4 summarizes the implications of the policies on employment and productivity. The policies are listed as rows. The first column is the average employment level, where the average is both across plants and time of a **balanced panel**.[21]

Relative to the baseline, the policy experiments associated with variations in the fixed costs of firing, "fc" and "fc(10)" have relatively small effects on the average level of employment. From Table 4 these policies, particularly the fc(10) experiment, do impact the distribution of job creation and destruction rate, but these effects tend to average out and not influence average employment.

There are relatively large employment effects for variations in severance pay, credit liberalization and increases in the base wage. Interestingly, these effects also interact.

An increase in severance pay, the "sp" experiment leads to a 6.7% increase in employment. An increase in linear firing cost is naturally going to have two effects. One is to reduce job destruction since it is more expensive to fire workers. But, this increased cost of firing means that firms are reluctant to hire workers. Which effect dominates is not clear. Hopenhayn and Rogerson (1993) find that an increase in linear firing costs reduces employment while Bentolila and Bertola (1990b) find that employment rises when firing costs increase.

In our model, we can trace this employment enhancing effect of an increase in linear firing

[21] The average size is larger than that in the data. This is discussed further in the Appendix and leads to an alternative model in Table 14.

Table 4: Policy Experiments: Partial Equilibrium

Policy	Employment		Productivity				
	E(e)	reall.	$E(p_t)$	$cov(A_{it}, s_{it})$	$E_t(std_i(arlp_{it}))$	$cov(e_{it}, arpl_{it})$	$cov(A_{it}, arpl_{it})$
base	714.563	0.098	2.724	0.724	0.683	166.234	0.782
no ac	728.764	0.486	3.525	1.700	0.000	-0.000	-0.000
fc	714.792	0.098	2.723	0.724	0.683	166.151	0.782
sp	762.050	0.078	2.643	0.621	0.691	160.112	0.810
cl	520.620	0.123	2.759	1.082	0.694	172.428	0.757
cl,sp	713.004	0.084	2.637	0.676	0.699	165.279	0.817
fc(10)	715.259	0.098	2.721	0.721	0.683	166.779	0.783
bw	652.378	0.105	2.864	0.655	0.767	156.179	0.859
he	687.266	0.082	2.760	0.550	0.669	127.212	0.772

For the employment numbers, E(e) is the mean establishment size and "real" is the mean level of reallocation, defined as the sum of job creation and job destruction. For the productivity means, $E(p_t) \equiv E(A_{it} \times shr_{it})$ is the time-series average of the product of the profitability shock and the establishment employment share, $cov(A_{it}, shr_{it})$ is the time-series average covariance between the profitability shock and the employment share, $E_t(std_i(arlp_{it}))$ is the time-series average standard deviation of the average revenue product of labor, $cov(e_{it}, arpl_{it})$ is the time-series average covariance of employment and the average revenue product of labor at the establishment and $cov(A_{it}, arpl_{it})$ is the time-series average covariance of the profitability shock and the average revenue product of labor at the establishment.

costs to the high discount rate of private plants. From simulated data, when the firing cost is increased, plants experiencing relative low profitability realizations do not fire workers while those with relatively high profitability expand. The overall effect is an expansion of employment. This asymmetric response is driven by the low discount factor so that job creation responds to the current shock and the future prospects of costly job destruction are given less weight.

This point drives the effects on employment of credit liberalization, the "cl" experiment. When the discount factor rises to 0.95, employment falls since plants incorporate into hiring decisions a higher present value of firing costs.

The "cl, sp" experiment combines the "sp" treatment with a particular value of the discount factor. The idea was to illustrate the combined effect by finding the discount factor such that the employment enhancing effects of "sp" were offset. An increase of β from the baseline value of 0.9223 to a value of 0.9297 is sufficient to offset the employment enhancement of the increased severance pay. For the 20% increase in severance pay, if borrowing rate were lower so that β exceeded 0.9297, the employment would decrease rather than increase in the "sp" experiment. This experiment is also indicative of the extreme sensitivity of average employment to the discount factor.

This combination of policy changes does seem to be taking place in China recently, though not as part of an integrated policy. In particular, in late 2011 the Chinese government unfroze credit, provided financial support and relieved tax loads for private enterprises.

Large employment effects arise from variations in the base wage, the "bw" experiment. The 20% increase in the base wage is associated with an employment reduction of nearly 9%: the elasticity of labor demand is about -0.43.

Likewise, the employment effects of overtime provision, the "he" experiment which increases the cost of hours variation, reduces employment. From simulation, this policy does reduce the $std(r/e)$ to 0.855 compared to the baseline moment of 0.901. Employment variations play a more important role in adjusting the labor input once hours variations are more expensive.

5.3 Productivity Effects

Hsieh and Klenow (2009), Song, Storesletten, and Zilibotti (2011) and Deng, Haltiwanger, McGuckin, Xu, Liu, and Liu (December 2007) have chronicled the importance of reallocation for the growth process of China. Those studies focus on the period of transformation during the 1990s and the 2000s. Our focus, in contrast, is with the productivity implications of policy interventions. These effects arise in two principal ways. First, the policies may introduce barriers to labor mobility. This additional friction in the reallocation process can have aggregate productivity implications. Second, these policies may influence the continuation decisions of plants.

The second column under "Employment" in Table 4 reports job reallocation rates for the simulated data. The flows are calculated from the simulated data using the same definitions as in, for example, Foster, Haltiwanger, and Kim (2006). The rates are thus weighted by plant size. As there are no aggregate shocks, the average job creation and destruction rates are equal to one-half of the reallocation rate.

It is useful to use both the baseline and an experiment with no frictions as reference points.[22] In the frictionless case, labeled "no ac" in Table 4, the reallocation rate is considerably larger than in the baseline model, reflecting the large variability of the plant-specific profitability shocks.

Relative to the baseline, the large affects on reallocation come from the "sp" intervention, where job destruction, job creation and thus reallocation are reduced significantly. This effect is consistent with the explanation for the employment creation of increased severance pay. The increased cost of job separations reduces job destruction and thus relatively low productivity plants are left with too many workers.

A similar effect, though not as large, comes from the mixture of credit market liberalization and the increase in severance pay. It is interesting that though this mixture of policies tends to mitigate

[22]The no frictions case is the same parameterization as the baseline except adjustment costs are set to zero.

the effects of severance pay on employment, the distortions due to the increased frictions from the higher cost of separations remains.

The effects of these policies on productivity are found in the last five columns. We study a couple of measures of the misallocation of labor on productivity. For this discussion, it is useful to think of a large economy producing a single product with differences in productivity across plants. In this way, the reallocation is linked to total output rather than its composition.

Let $s_{it} \equiv \frac{e_{it}}{\sum_j e_{jt}}$ be the share of employment at establishment i in period t. Then the weighted profitability in period t is given by $p_t \equiv E(A_{it} \times s_{it})$. As in Olley and Pakes (1996), interpret p_t as aggregate productivity and decompose it as:

$$p_t = \bar{p}_t + cov(A_{it}, s_{it}) \tag{10}$$

where $\bar{p}$ is the unweighted mean of A_{it}. For our analysis, $\bar{p}_t$ is effectively constant as there are no aggregate shocks and the number of plants is large.

The average weighted profitability shock, $E_t(p_t)$, as well as the covariance of the time-series average of the employment share and the profitability shock, $cov(A_{it}, s_{it})$ are shown in the first two columns under productivity in Table 4. The mean of weighted profitability as well as the covariance are highest in the frictionless ("no ac") case. Both of these terms are lower when frictions are present, indicating the misallocation of labor across establishments. Relative to the baseline, productivity loses are largest in the "sp" experiment alone and then this policy is combined with credit market liberalization.

It is also useful to study the distribution of the average revenue product of labor, denoted $arpl_{it}$. In a frictionless world, the distribution of the marginal revenue product of labor and thus, using our model, the average revenue product of labor is degenerate. This is seen by the "no ac" row in Table 4. But frictions in labor adjustment change this distribution and its covariance with employment and profitability.

The other rows, including the baseline, do not have a zero standard deviation of $arpl_{it}$ nor zero covariances. These are all indicative of productivity gains to reallocation, reflecting the frictions to labor reallocation. These frictions are significantly higher in the "sp" and "cl,sp" cases. Note too that this covariance between the shock and the average revenue product of labor is positive indicating that the most profitable plants have higher than average marginal revenue products of labor. Thus, on efficiency grounds, labor should be reallocated to the more profitable plants.

5.4 Robustness

The Appendix contains a lengthy presentation of the policy effects, focusing on employment, of alternative models and parameterizations. The idea is to study the employment effects of the different interventions under very different models of dynamic labor demand. Though our estimated model generates moments closer to the data than these alternatives, understanding the employment effects in these different models is revealing. A main difference across models is the response of employment to an increase in severance pay. In the specifications with hiring costs or quadratic adjustment costs only, the introduction of severance payments leads to a reduction in employment.

A related exercise is to study policy effects for parameter values near the baseline model. Among other things, this exercise reveals which parameters are key for the policy effects. The results indicate that the discount factor as well as the serial correlation of the profitability shock and the (utility) cost of hours variation are important for employment effects of the various policies.

5.5 Dynamics

The analysis thus far compares the long-term averages of two regimes. The first is created by the baseline parameter estimates. The second comes from these parameters augmented by the various policy interventions. The results on employment, productivity and so forth provide guidance as to the long-run impact of these policies, given wages.

There are transitional effects that arise when the policy is first implemented. Since the increase in severance pay has the large and counterintuitive effects, we focus on the transitional dynamics associated with that policy. To do so, we simulate a panel data set under the baseline parameters. The policy changes then occurs, unexpectedly. The policy change is assumed to remain in force.[23]

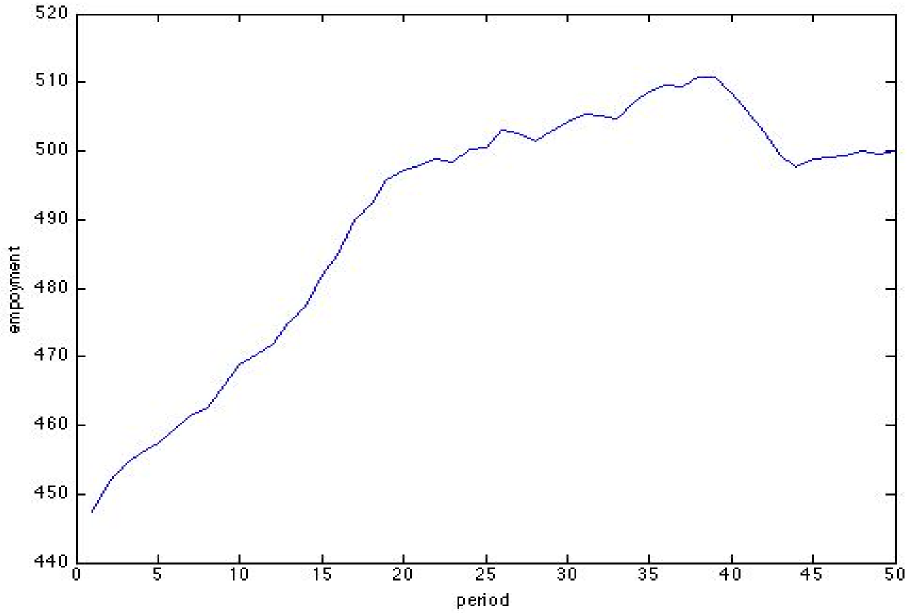
We trace out the path of aggregate employment for 50 periods are shown in Figure 1. In contrast to the moments presented in Table 4, the employment size is not for a balanced panel. Instead, employment in Figure 1 is computed from averaging across plants that might subsequently exit. Hence employment is lower in this figure compared to that in Table 4.

In the initial period, the policy is not in force and the average level of employment is about 445 workers. Aggregate employment is closer to 500 by the end of the simulation period for the "sp" experiment.

The response to the policy in the first twenty periods is striking. Employment grows rapidly. At the estimated discount factor, firms with positive profitability shocks respond more to the current

[23] Of course one could introduce the policy change itself into the model using a two-state Markov process. The experiment we study is one where the two states are permanent which, by continuity, will be close to the responses when the transitions between states are close to zero.

Figure 1: Employment Transitional Dynamics: Severance Pay Increase



The series come from the "sp" experiment.

positive gains of adding workers, discounting the higher future firing costs. Yet those firms with relatively low profitability do not fire due to the higher severance payments. Thus employment increases rapidly when the policy is first introduced.

By contrast, if the policy intervention was introduced for a value of β around 0.96, then the employment effects would be minimal. That is, leaving parameters at baseline values, if $\beta = 0.96$, then the policy would leave mean employment unchanged. This is instructive: the policy effects are quite different if firms discount the future less.[24] In section 7, we make use of the employment dynamics of the "sp" experiment shown in Figure 1 by comparing the short-run employment response of private firms to a control group with a higher discount factor.

6 Policy Implications: General Equilibrium

This section studies the effects of the two key interventions in a general equilibrium model with entry and exit. Those policies were studied in partial equilibrium holding base wages fixed. In this way, the effects of the policy on labor demand are highlighted. But potential offsetting (or reinforcing) effects from wage adjustments are ignored. This section analyses those interventions in

[24]This is not the same as the "cl,sp" experiment as we are comparing employment before and after the introduction of "sp" given a discount factor.

the general equilibrium model allowing base wages to adjust so that labor markets clear under the various policy measures.

Table 5: General Equilibrium Effects: Alternative Policies

policy	w_0	part. rate	employment	exit rate	JD exit
base	0.085	0.751	714.563	0.058	0.017
fc	0.085	0.751	714.563	0.058	0.017
sp	0.085	0.763	763.856	0.060	0.021
cl	0.105	0.705	465.052	0.051	0.011
cl,sp	0.104	0.704	480.083	0.053	0.013
fc(10)	0.085	0.751	715.331	0.058	0.017
bw	0.085	0.751	714.565	0.058	0.017
he	0.071	0.762	765.401	0.060	0.021

To do so requires us to solve for the general equilibrium of the model for given policies. As in Hopenhayn and Rogerson (1993) this reduces to two conditions: (i) free entry and (ii) labor market clearing.

The free entry condition determines the base wage. Given this wage, the household participation condition is determined from the household first order condition so that the labor market clears.

As described earlier, to construct the equilibrium, two parameters, in addition to those estimated in Θ are needed. One is the fixed cost of entry, κ, and the second is the household disutility of work, ξ, from (7). Both of these parameters are determined from the pre-policy estimation. They are held fixed for the subsequent policy analysis.

For an estimated of Θ, the expected value of entry is determined from the plant level dynamic optimization problem as $E_A V(A, e_-)$ where e_- is the minimal level of employment and thus the level employment for an entrant. Since the estimation is of an equilibrium with free entry, $\kappa = E_A V(A, e_-)$. This value of κ is taken as given for the policy experiments. To the extent the policy experiments influence the value of entry, they will be compensated for by a change in the base wage so that this free entry condition holds.

Likewise, for an estimated value of Θ and given a base wage, labor demand is determined. The disutility of work, ξ, is set so that $\omega_0 u'(\bar{c}) = \xi$ holds as explained earlier. Hence policy induced variations in the base wage must be offset by changes in $\bar{c}$ so that this first-order condition holds. One of the main determinants of $\bar{c}$ is the household participation (employment) rate.

6.1 General Equilibrium: Employment Effects

For the various policies, the first column of Table 6 shows ω_0, the base wage. Comparing the base wage under the policies to that in the baseline indicates how the policy affects the value of entry since the base wage adjusts to set this value to the entry cost. Recall that the base wage influences the cost of workers directly but also influences the overhead costs and the entry costs as these are two costs are denominated in labor units.

The second and third columns summarize the employment effects. The participation rate indicates the labor supply of the household while employment again measures average plant size.[25]

As in the partial equilibrium case, the increase of the fixed cost has essentially no affect. As the value of a firm does not change, the market clearing base wage does not change either.

The "sp" treatment increases employment about as much as it did in the partial equilibrium case. In the general equilibrium model, there is a higher participation rate though no change in the base wage. From this experiment, the change in severance pay reduces the value of entry only slightly, leaving the base wage essentially unchanged.

Relative to the baseline, the "cl" and "cl,sp" treatments increase the value of a firm. Consequently the base wage rises. This reduces employment rates. This general equilibrium effect is an enhanced version of the partial equilibrium effect.

The steady state exit rate and job destruction from exit are both lower in the experiments with credit market liberalization. The introduction of higher severance pay increases exit.

The results for the "bw" experiment are noticeably different between the partial and general equilibrium cases. Notice that ω_0, the wage paid by the firm, is the same in the base and in the "bw" treatments. Essentially the government mandated 20% increase in the base wage is offset by market forces so that in equilibrium, there is no change in wages or in real outcomes.

The increase compensation for extra hours, the "he" experiment, leads to a lower base wage as the value of entry is lower. The increase in ω_1 under the policy reduces the value of entry, all else the same, by about 25%, leading to a substantial reduction in the base wage. For the workers first-order condition to hold, average consumption must rise. This is accomplished both through increased participation rate of workers and thru the higher overtime compensation. The level of employment is higher. This is very different from the partial equilibrium results where the increased hours compensation lead to a fall in employment. In the general equilibrium model, the nearly 20% fall in the base wage creates employment.

Table 6 in the Appendix summarizes the general equilibrium effects on employment and pro-

[25] To facilitate comparison, these are average employment levels for a balanced panel constructed from the data set with entry and exit.

ductivity. It is interesting to see that they exhibit similar patterns to the partial equilibrium case.

6.2 General Equilibrium Productivity Effects

Table 6 comes from the policy effects in the general equilibrium model. It is analogous to the partial equilibrium case presented in Table 4. With some exceptions, the productivity implications are close to those from the partial equilibrium model.

For the "sp" and "he" experiments, which have large employment effects, reallocation is substantially lower as is mean (weighted) productivity. For these two policy experiments, the covariance between productivity and employment share is lower. The "he" experiment reduces the covariance between employment size and productivity substantially. And again the "cl" experiment increases employment weighted productivity.

Table 6: Policy Experiments: General Equilibrium

Policy	Employment		Productivity				
	E(e)	reall.	$E(p_t)$	$cov(A_{it}, s_{it})$	$E_t(std_i(arlp_{it}))$	$cov(e_{it}, arpl_{it})$	$cov(A_{it}, arpl_{it})$
base	714.563	0.098	2.724	0.724	0.683	166.234	0.782
fc	714.802	0.098	2.723	0.724	0.683	166.151	0.782
sp	763.856	0.078	2.644	0.620	0.690	160.047	0.809
cl	465.052	0.133	2.853	1.015	0.801	164.929	0.869
cl,sp	480.083	0.119	2.794	0.933	0.823	167.140	0.915
fc(10)	715.331	0.098	2.720	0.722	0.683	166.78	0.783
bw	714.563	0.098	2.724	0.724	0.683	166.234	0.782
he	765.401	0.073	2.616	0.597	0.594	132.779	0.698

For the employment numbers, E(e) is the mean establishment size and "real" is the mean level of reallocation, defined as the sum of job creation and job destruction. For the productivity means, $E(p_t) \equiv E(A_{it} \times shr_{it})$ is the time-series average of the product of the profitability shock and the establishment employment share, $cov(A_{it}, shr_{it})$ is the time-series average covariance between the profitability shock and the employment share, $E_t(std_i(arlp_{it}))$ is the time-series average standard deviation of the average revenue product of labor, $cov(e_{it}, arpl_{it})$ is the time-series average covariance of employment and the average revenue product of labor at the establishment and $cov(A_{it}, arpl_{it})$ is the time-series average covariance of the profitability shock and the average revenue product of labor at the establishment.

7 Direct Evidence on Policy Effects

This section presents the evidence of the effects of labor regulation implications on employment following the implementation of the New Labor Contract Law in January 1, 2008. We analyze data from 2007 and 2008 to evaluate the model's prediction that firms who discount the future more respond to the increase in severance pay by increasing employment.

Table 7: Summary of Key Variables: 2007-2008 Data

Variable	Subsample 1 Private	Subsample 1 State-Controlled	Subsample 2: Private Domestic	Subsample 2: Private Foreign
1. *Sample in 2007*				
Mean employment	139.51	560.37	123.93	283.10
	(179.51)	(929.91)	(131.23)	(384.29)
Mean wage	18.10	27.30	16.95	29.67
	(14.82)	(22.75)	(12.88)	(24.67)
Mean welfare payment	2.08	2.77	1.99	2.92
	(3.67)	(4.91)	(3.35)	(5.72)
No. of firms	193,778	16,121	174,813	18,965
2. *Sample in 2008, excluding closed firms*				
Mean employment	137.96	550.63	122.78	274.08
	(169.59)	(877.22)	(125.32)	(354.00)
Mean wage	23.63	32.03	22.37	34.55
	(20.56)	(25.93)	(18.98)	(28.84)
Mean welfare payment	2.65	3.51	2.54	3.65
	(5.66)	(6.28)	(5.48)	(6.98)
No. of firms	179,780	14,565	161,916	17,864
Exit rate	7.22%	9.65%	7.38%	5.81%

Notes: All monetary terms are in 1,000 RMB, deflated to 2007 level. The welfare payment includes health insurance, special contribution award, year-end bonus, subsidies for low income family, etc. Standard errors are given in parentheses.

Of course, in any comparison of 2007 and 2008, it is necessary to control for changes in other economic variables, such as wage changes, to isolate the effects of the policy. The approach studies the behavior of firms with high discount factors **relative** to those who are less likely to be credit market constrained. The estimates reported in Cooper, Gong, and Yan (2013), which studies both private and public plants, suggest that public plants as well as private foreign plants discount the future much less than domestic private plants.[26] Building on this evidence, we analyze two sub-samples categorized by ownership, each consisting of two groups: private firms *vs.* state-controlled firms, and domestic private firms *vs.* foreign private firms. The hypothesis is that the change in employment induced by the severance pay component of the policy will be larger for firms with lower discount factors, such as domestic private firms.

Table 7 summarizes several key variables in the data, generated from the Annual Survey of Industrial Production. The 2007 survey, used in the estimation, is supplemented by data from 2008. We follow the firms in 2007 to 2008. We take account of employment changes at the closed (producers that exit) firms to analyze the overall effect of labor regulation on labor demand.

Table 7 shows that average employment of firms decreases after the implementation of New Labor Contract Law. The average employment, excluding closed firms, decreases slightly, while the average employment for state-controlled firms and foreign firms decreases significantly. In the meantime, there is a large increase in wage for private (30%, and 32% for domestic private) firms. The corresponding increase of wage for state-controlled firms and foreign firms is 17% and 16%, respectively. The percentages of welfare payment (e.g. health insurance and bonuses) increase are relatively close, around 27% with domestic private firms having increased most. The exit rate for private firms increase a little, from 7.14% averaging between 2005 and 2007 to 7.22% in 2008.

We use the following reduced form regression model for our estimation:

$$\Delta e_i = \varphi_0 + \varphi_1 HCC_i + \varphi_2 X_i + \varepsilon_i \tag{11}$$

where Δe_i is the change in employment from year 2007 to year 2008 at firm i, X_i is a set of control variables of firm i, and HCC_i is a dummy variable that equals 1 if firm i faces high credit constraint (i.e., belongs to group 1 in Table 7).

Tables 8 and 9 report the estimation results. In Table 8, we restrict our analysis to the set of firms with available employment in both years of 2007 and 2008. In Table 9, we take account of employment changes at the closed firms, setting their employment in 2008 to 0. The model in column (i) does not control any set of firm characteristics. We introduce variety set of control

[26] On the differential incidence of credit constraints, also see empirical studies such as Poncet, Steingress, and Vandenbussche (2010) and Hale and Long (2010).

variables in the models (ii)-(v): change in wage, change in wage and welfare, dummies for industries, and dummies for regions. We do not observe wage and welfare payment data for those closed firm in 2008. To calculate the change of wage (the change of wage and welfare), we set the wage (wage and welfare) in 2008 to the mean wage (wage and welfare) per capita, averaging across all firms which continued in operation in 2008. This mean wage (wage and welfare) is kind of like reserved wage (wage and welfare) for the closed firms.

The estimates in the simple model (i) of Table 8 imply a significant increase in employment for private (and domestic private) firms relative to state-controlled firms (and foreign private firms). Taking account of the closed firms, as reported in Table 9, results in a larger increase in labor demand for private firms relative to state-controlled firms. This is because that the size of the closed state-controlled firms are much larger than that of the closed private firms. However, taking account of the closed firms adds little to the amount of increase in employment for domestic private firms, implying that the closed domestic and foreign private firms are at the close size. Introducing control variables in models (ii)-(v) implies that the private and state-controlled comparison and the domestic private and foreign comparison are similar, whether or not we exclude the closed firms or not.

8 Conclusion

This paper studies the effects of labor market policies in China on the employment and productivity of private plants. Using a model of dynamic labor demand estimated from moments prior to the introduction of policy measures, we characterize the impact of these new labor regulations. We do this for our baseline estimated model and for other parameterizations to gauge the robustness of our findings.

There a couple of findings that seem robust across parameterizations. First the policy of increased severance payments has the largest impact on employment and productivity. Since we estimate a relatively low discount factor, the increase in severance pay leads to an increase in employment. This policy also leads to a higher covariance between productivity and average labor productivity, which is indicative of a less efficient cross-sectional allocation of labor services.

Second, credit market liberalization would induce a reduction in employment once plants discount less heavily future firing costs. The employment increase from a severance pay increase is reduced when this policy is combined with credit market liberalization.

Finally, the partial equilibrium elasticity of labor demand with respect to variations in the base wage is -0.43 in the estimated model without exit, and is very robust across specifications and parameterizations. This response is completely offset by adjustments in the base wage in the general equilibrium model.

9 Appendix

The Appendix includes further discussion of the Data as well as various robustness exercises. A table indicating the response of simulated moments to parameters is included as well.

9.1 Data

Table 10 summarizes capital, employment (number of workers employed), revenue, and value-added by enterprise type for the 2005-2007 period. All monetary terms are deflated to thousand Yuan in 2005 using CPI. Capital (plant and equipment) is calculated by the book value of fixed capital net of depreciation. Hours information is not available.

The column called "trimmed" is a subsample in which the top and bottom 2.5% of the plants, by employment size, are removed to deal with outliers. This subsample is used in the estimation.

9.2 Identification

The matrix in Table 11 shows the elasticities of moments (rows) to parameters (columns). This matrix provides information on how each of the parameters is identified. So, for example, variations in β have large effects on the job destruction rates as well as the largest job creation rate. The moments are relatively sensitive to variations in the parameters. These changes underlie the computation of the standard errors for the baseline parameter estimates.

9.3 Parameter and Model Sensitivity

This part of the appendix studies the robustness of the policy results. We look both at how small variations in parameters influence the effects on employment of the different policies and some alternative models. These are all partial equilibrium exercises.

9.3.1 Parameter Sensitivity

It is also important to focus on which of the parameters are important for generating the effects of the policies on policy targets. For example, if there is interest in the effects of policies on employment, then it is useful to isolate the parameters that are most important for this policy goal.

To study this issue, we undertook small variations in parameters in the neighborhood of the baseline estimates. For each of the parameters, we simulated the model by raising (lowering) the parameter by 1%. In Table 12, the variations in parameters are the rows. So, for example, for the row labeled ν, the first entry is the average employment level when ν is 1% higher than the baseline and the row below is the result when ν is 1% less than the baseline. All other parameters are held at their baseline values.

The columns of Table 12 indicate the baseline and the different policies. The entries are the mean employment levels for the combinations of parameters and policies. For example, looking across the ν row reveals the employment levels under the baseline and four policy experiments when ν is 1% above baseline.

Looking down one of the columns of the table gives some ideas about what parameters are important for the employment effects of the various policies. So, for example, looking at the severance pay (sp) experiment, β matters a lot for the employment effects while ν matters relatively little.

In general we see that regardless of the policy, the employment effects of the intervention depend mainly on β, ρ and ζ. Other parameters, such as $(\nu, \gamma^+, F^+, F^-)$, while important for matching the moments, seem relatively unimportant for judging the effects of these interventions on employment.

9.3.2 Alternative Models

The estimation results for a variety of alternative specifications are shown in Tables 13 and 14. Table 13 shows the parameter values for models other than the baseline. The baseline allows for both hiring and firing fixed and linear costs. The model in the second row, labeled 'hiring', uses the baseline parameters with all adjustment costs set at 0. The "quad" model is the quadratic adjustment cost alone. The parameters for these last two rows were re-estimated, holding (ω_0, ω_1) at their baseline levels to facilitate comparisons.[27] The final row, labeled "small size" is a model estimated to better match the actual rather than steady state level of employment. As indicated in various tables, the average firm size is around 715 workers. The median firm size in the baseline is around 500, in excess of the target median. This alternative estimation comes closer to matching that additional moment. Yet the parameter values are close to the baseline levels.

Table 14 reports the moments for these alternative models. None are severely at odds with the data though the fit is not as good as the baseline model as these alternatives are nested by the baseline.

[27] The use of the base wages is particularly relevant for the 'quad' case which has a very high average employment level. If the model is re-estimated including resetting the base wages, the parameters are close to those in Table 13 while average employment is close to 1000 workers.

The point of this exercise is to see if the employment effects of the policies depend on the specification. Table 15 shows employment levels for various combinations of models (the rows) and policies (the columns). The policies studied are those described earlier. However, for both the hiring and quad experiments, there are no fixed and linear firing costs to increase. For these cases, for the "fc" and "sp" policy experiments, we set the fixed and linear firing costs to their baseline levels.

Looking at the "fc" interventions, the introduction of this cost reduces employment considerably for both the hiring and quad cases. The "sp" intervention leads to a sizable employment increase in the baseline but an employment decrease for the other models. The "sp" intervention has relatively small effects in the case of the small sized firms. The effects of the credit market liberalization, "cl", reduces employment for all models.

When credit liberalization occurs at the same time as the increase in severance payments, the reduction in employment from the two policies is slightly less than from the credit liberalization alone. This finding is robust across models.

References

Allard, G., and M.-J. Garot (2010): "The impact of the new labor law in China: new hiring strategies for foreign firms?," *Revista Direito GV*, 6(2), 527–40.

Bentolila, S., and G. Bertola (1990a): "Firing Costs and Labour Demand: How Bad is Eurosclerosis?," *Review of Economic Studies*, 57(3), 381–402.

——— (1990b): "Firing costs and labour demand: how bad is eurosclerosis?," *The Review of Economic Studies*, 57(3), 381.

Brandt, L., J. V. Biesebroeck, and Y. Zhang (2012): "Creative Accounting or Creative Destruction? Firm-Level Productivity Growth in Chinese Manufacturing," *Journal of Development Economics*, 97(2), 339–351.

Cooper, R., G. Gong, and P. Yan (2009): "Costly Labor Adjustment : Effects of China's Employment Regulations," Available at.

——— (2013): "Dynamic Labor Demand in China: Public and Private Objectives," NBER Working Paper # 16498.

Cooper, R., J. Haltiwanger, and J. Willis (2004): "Dynamics of Labor Demand: Evidence from Plant-level Observations and Aggregate Implications," NBER Working Paper #10297.

Deng, H., J. Haltiwanger, R. McGuckin, J. Xu, Y. Liu, and Y. Liu (December 2007): "The Contribution of Restructuring and Reallocation to China's Productivity and Growth," EPWP #07-04.

Foster, L., J. Haltiwanger, and N. Kim (2006): "Gross job flows for the US Manufacturing sector: Measurement from the Longitudinal Research Database," Center for Economic Studies, US Dept. of Commerce, Bureau of the Census.

Hale, G., and C. Long (2010): "What are the Sources of Financing of the Chinese Firms?," Hong Kong Institute for Monetary Research, Working Paper No. 19.

Hamermesh, D., and G. Pfann (1996): "Adjustment Costs in Factor Demand," *Journal of Economic Literature*, 34, 1264–92.

Hopenhayn, H., and R. Rogerson (1993): "Job turnover and policy evaluation: A general equilibrium analysis," *The Journal of Political Economy*, 101(5), 915–938.

Hsieh, C.-T., and P. Klenow (2009): "Misallocation and Manufacturing TFP in China and India," *Quarterly Journal of Economics*, CXXIV(4), 1403–1448.

Olley, S., and A. Pakes (1996): "The dynamics of productivity in the telecommunications equipment industry," *Econometrica*, 64(6), 1263–1297.

Poncet, S., W. Steingress, and H. Vandenbussche (2010): "Financial Constraints in China: Firm-Level Evidence," *China Economic Review*, 21(3), 411–422.

Song, Z., K. Storesletten, and F. Zilibotti (2011): "Growing like China," *The American Economic Review*, 101(1), 196–233.

Table 8: Reduced-Form Estimation Results for Change in Employment, Excluding Closed Firms

	Subsample 1					Subsample 2				
	Model					Model				
Independent variable	(i)	(ii)	(iii)	(iv)	(v)	(i)	(ii)	(iii)	(iv)	(v)
HCC dummy	9.13	11.58	12.37	16.93	16.20	11.82	14.33	14.65	11.55	11.84
	(2.67)	(3.26)	(3.28)	(3.47)	(3.53)	(1.30)	(1.48)	(1.51)	(1.43)	(1.45)
Change in wage [a]	-	0.0016	-	-	-	-	0.0011	-	-	-
	-	(0.0006)	-	-	-	-	(0.0006)	-	-	-
Change in wage and welfare [b]	-	-	0.0015	0.0015	0.0015	-	-	0.0011	0.0011	0.0011
	-	-	(0.0005)	(0.0005)	(0.0005)	-	-	(0.0006)	(0.0006)	0.0006
Controls for industry [c]	no	no	no	yes	yes	no	no	no	yes	yes
Controls for region [d]	no	no	no	no	yes	no	no	no	no	yes

Notes: Standard errors are given in parentheses. All models include an unrestricted constant (not reported).
[a] The change in per capita annual wage from year 2007 to 2008.
[b] The change in per capita annual wage plus welfare payment from year 2007 to 2008.
[c] Dummy variables for 519 industries (4-digit) are included.
[d] Dummy variables for 30 provinces are included.

Table 9: Reduced-Form Estimation Results for Change in Employment,
Setting employment at Closed Firms to 0

	Subsample 1					Subsample 2				
	Model					Model				
Independent variable	(i)	(ii)	(iii)	(iv)	(v)	(i)	(ii)	(iii)	(iv)	(v)
HCC dummy	51.64	55.24	56.25	57.97	58.48	11.74	13.08	13.37	11.54	12.19
	(3.81)	(4.11)	(4.13)	(4.37)	(4.49)	(1.24)	(1.36)	(1.38)	(1.33)	(1.35)
Change in wage [a]	-	0.0017	-	-	-	-	0.0012	-	-	-
	-	(0.0007)	-	-	-	-	(0.0007)	-	-	-
Change in wage and welfare [b]	-	-	0.0016	0.0016	0.0016	-	-	0.0012	0.0012	0.0012
	-	-	(0.0005)	(0.0005)	(0.0005)	-	-	(0.0006)	0.0006	0.0006
Controls for industry [c]	no	no	no	yes	yes	no	no	no	yes	yes
Controls for region [d]	no	no	no	no	yes	no	no	no	no	yes

Notes: Standard errors are given in parentheses. All models include an unrestricted constant (not reported).
[a] The change in per capita annual wage from year 2007 to 2008. For firms closed in 2008, the wage in 2008 is set to the mean annual wage per capita, averaging across all firms which were in operation in 2008.
[b] The change in per capita annual wage plus welfare payment from year 2007 to 2008. For firms closed in 2008, the wage plus welfare in 2008 is set to the mean per capita wage plus welfare payment, averaging across all firms which were in operation in 2008.
[c] Dummy variables for 519 industries (4-digit) are included.
[d] Dummy variables for 30 provinces are included.

Table 10: Characteristics of Plants by type, 2005-2007 balanced panel.

	All	Trimmed	Domestic	Foreign
# plants	156,185	148,390	120,719	35,466
Value added (VA)	24,228	17,665	18,146	44,931
	(147,014)	(53,062)	(96,231)	(251,206)
Revenue (Rev.)	92,074	64,290	66,417	179,407
	(712,869)	(205,842)	(356,131)	(1,340,289)
Employment (Emp.)	224	172	180	385
	(751)	(190)	(569)	(1,186)
Capital (Cap.)	21,752	15,397	15,362	43,502
	(153,506)	(69,207)	(124,991)	(223,570)
Cap./Emp.	92	88	80	136
	(636)	(430)	(422)	(1,108)
VA/Emp.	133	127	127	155
	(376)	(309)	(277)	(613)
VA/Cap.	5.5	5.3	5.6	5.3
	(92)	(89)	(80)	(125)
Rev./Emp.	487	461	467	561
	(1,166)	(1,18)	(934)	(1,769)
Rev./Cap.	23.2	22.2	24.1	20.2
	(319)	(312)	(332)	(267)

All monetary terms are in 1,000 RMB, deflated to 2005 level. The trimmed sample excludes the upper and lower 2.5% tails by employment size. Standard deviations are parenthesized.

Table 11: Elasticity of Moments to Parameter Variations

	Parameters										
Moments	ζ	ν	F^+	F^-	γ^+	γ^-	β	Γ	α	ρ	σ
std(r/e)	-0.936	0.150	-0.001	0.004	0.007	0.316	0.302	-0.101	2.486	-20.155	0.762
sc	-0.169	0.002	0.000	0.000	-0.002	0.010	0.267	-0.031	0.452	0.303	0.004
JC30	-2.725	-0.227	0.001	-0.015	-0.007	-0.960	7.398	-0.646	14.971	-24.915	5.512
JC1020	-1.703	0.849	0.006	-0.008	-0.022	0.784	6.081	0.072	10.989	-3.663	3.178
JC10	-4.926	0.099	0.047	-0.006	0.006	-0.300	-2.156	-0.282	-10.483	-13.277	-10.840
0	3.748	-0.059	-0.013	-0.008	-0.001	0.763	-1.995	0.220	-1.405	21.590	1.174
JD10	4.320	0.208	-0.010	0.029	0.010	-2.001	-11.383	0.267	-9.655	-9.551	-6.269
JD1020	-5.184	1.154	0.015	0.000	-0.129	0.752	2.406	0.630	-25.302	-10.500	-19.423
JD30	-9.411	0.191	-0.000	-0.106	0.009	-1.016	31.360	-2.532	56.909	-17.067	5.438
xrate	3.644	0.000	0.000	0.000	0.000	0.247	-6.898	0.708	-9.309	-18.155	-0.162
$\hat{\alpha}$	-0.682	-0.019	0.000	-0.001	0.001	-0.055	-0.152	0.039	-0.651	2.475	-0.078
$\hat{\rho}$	0.051	0.068	-0.000	0.002	0.003	0.138	0.430	-0.076	1.195	4.503	-0.100
$\hat{\sigma}$	-0.799	0.143	-0.001	0.004	0.006	0.312	0.775	-0.152	3.228	-20.558	0.821

Table 12: Employment Effects: Alternative Parameters

parameter	baseline	fc	sp	cl	cl,sp
base	714.6	714.8	762.1	520.6	531.0
ζ	669.8	670.8	735.5	514.6	521.6
	729.6	730.2	789.0	531.1	550.8
ν	713.9	714.0	761.5	520.8	530.7
	714.7	715.1	762.4	520.7	528.4
F^+	714.4	714.6	761.9	520.6	528.7
	714.4	714.7	761.0	520.6	530.2
F^-	713.5	713.5	759.1	520.2	530.8
	715.2	715.0	763.7	521.2	530.7
γ^+	714.6	714.8	761.9	520.6	531.2
	714.5	715.0	762.1	520.6	528.7
γ^-	712.5	712.6	756.7	520.3	529.2
	716.2	716.4	764.6	521.1	529.1
β	749.1	749.6	859.0	520.6	531.0
	621.5	621.9	659.9	520.6	531.0
Γ	712.1	712.5	755.6	520.3	529.7
	715.3	715.5	764.8	521.2	532.1
α	653.3	653.4	755.8	504.3	515.5
	731.0	732.5	777.8	548.6	555.3
ρ	638.3	639.1	747.6	463.6	479.4
	816.1	816.1	843.6	622.1	687.9
σ	707.9	708.0	756.3	516.6	525.1
	718.4	718.7	762.0	524.9	534.4

Table 13: Parameter Estimates: Alternative Models

model	ζ	ν	F^+	F^-	γ^+	γ^-	β	Γ	α	ρ	σ
base	1.1726	0.2167	-0.001	0.006	0.0209	0.1755	0.9223	1133.89	0.5612	0.9832	2.3196
hiring	1.138	0.249	0.018	0.000	0.055	0.000	0.929	944.600	0.582	0.990	2.839
quad	1.095	0.362	0.000	0.000	0.000	0.000	0.917	1105.624	0.655	0.994	3.067
small size	1.128	0.273	0.000	0.005	0.001	0.198	0.929	361.652	0.544	0.984	2.221

Here: (i) baseline are the baseline estimates, (ii) hiring allows just hiring and quadratic adjustment costs, (iii) quad allows just quadratic adjustment costs and (iv) matches firm size on average. Wages were held at baseline levels except for the 'small size' experiment.

Table 14: Moments: Alternative Models

	std(r/e)	sc	JC30	JC1020	JC10	0	JD10	JD1020	JD30	xrate	$\hat{\alpha}$	$\hat{\rho}$	$\hat{\sigma}$
Data	0.988	0.914	0.158	0.075	0.122	0.349	0.103	0.053	0.058	0.071	0.700	0.867	0.882
baseline	0.901	0.963	0.081	0.074	0.128	0.424	0.098	0.056	0.043	0.058	0.935	0.721	0.927
hiring	0.907	0.947	0.135	0.107	0.113	0.269	0.108	0.056	0.079	0.032	0.982	0.732	0.904
quad	0.973	0.988	0.100	0.061	0.093	0.398	0.104	0.081	0.061	0.013	1.012	0.792	0.951
small size	0.884	0.976	0.084	0.065	0.146	0.404	0.106	0.055	0.043	0.049	0.983	0.741	0.893

In this table, std(r/e) is the standard deviation of the log of revenue per worker, sc is the serial correlation in employment, JC30 is a job creation rate in excess of 30%, JC1020 is a job creation rate between 10% and 20% and JC10 is a job creation rate greater than 0 and less than 10%. The job destruction (JD) moments are defined symmetrically. The entries are the fractions of observations with these rates of job creation and job destruction.

Table 15: Employment Effects: Alternative Models

Model	baseline	fc	sp	cl	cl,sp	bw	he
base	714.6	714.8	762.1	520.6	531.0	652.38	687.27
hiring	1025.22	590.88	600.39	436.14	442.29	859.94	889.27
quad	6348.46	464.98	483.24	345.44	367.48	5835.49	5714.11
small size	177.1	176.98	182.51	137.69	138.76	157.96	163.6