Compliance Level and Market Consequence of Labor Contract Law in China

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Abstract

This paper empirically examined the impact of Labor Contract Law (LCL) to social security coverage expansion, as well as the influence of increased payroll tax to labor market dynamics, with city-level data year from 2003 to 2015. By RDD stragegy I show that LCL enforcement significantly contribute to the increase of both pension and unemployment insurance participation rate. For workers' disposable wage and job vacancy to applicant ratio, within-group estimation results suggest that LCL enforcement do not have significant impact in general. But in the scenario of severe labor shortage, LCL as treatment decrease the log-disposable wage by 5 perentage points; unemployment insurance participation expansion, as a proxy of strict compliance level of LCL, caused the cutoff of disposable wage and enlarged labor demand-supply gap significantly.

1 Introduction

The economic effectiveness of Labor Contract Law (henceforth referred to as LCL) has been a controversial topic in China. Went into effect on January 2008, as an amendment of Labor Law, LCL requires every employer to sign a standard written contract, which specifies working hours, remuneration and social security insurance, to every employee which including temporary

workers[1]. Government officials claim that LCL improves corporate governance, capital-labor relations and total productivity. But voices from entrepreneurs and economists, including Steven Ng-Sheong Cheung and former Minister of Finance Lou Jiwei, criticised LCL for reducing the flexibility of labor market and harming the industries. Following Cheung's argument that LCL increased firms' hiring cost, this paper uses the change of social security participation level to measure the compliance level of LCL, then evaluate the impact of LCL to labor market demand-supply ratio, to provide empirical evidence that LCL did cause market distortion.

Hiring cost, besides disposable wage to workers, is mainly consisted of two parts in China: income tax (progressive tax, 3 to 45%) and social security payments (including pension, medical insurance, unemployment insurance, work injury insurance and maternity insurance, in total 35% to 45%, depend on local regulation). Thereby tax plus payroll tax, which are brought by the written contract, accounts for at least 40% percent of hiring cost. Literally, besides the enforcement to employers of signing a standard contract to every, even temporary, employee, LCL did not change the main content of old labor law (which was implemented since 1994 and still legally binding) or other existing employment protection regulations; it just specified some additional clauses. For instance, if a firm hired a worker on February 2007 and dismissed him or her on October 2007, by old labor law this firm have defray this worker's social security insurances for nine months and pay him or her one more month salary as economic compensation; but in practice, it was not compulsory to have a contract at the beginning of hiring and the substance of the contract can be obscure, hence firm could easily to cut the period or coverage of social security payment, and labor dispute can be settled with much lower price. Therefore, the major change which brought by LCL is that firms are not allowed to hire

[1]Temporary or informal workers used to work with oral contract. LCL requires every temporary employment relationship to have written contract with labor dispatch agencies. Appendix A1 exhibits the difference of Labor Law (1995) and LCL in mandatory terms of contract

informal workers, and employee's non-wage benefits is fully granted[2]. Then the direct economic consequence is that firms will pay more to cover employees' social security.

Existing research on LCL's economic influence exhibited ambiguous results: based on different kinds of surveys, some studies show that LCL has increased workers' wage and social security benefit significantly, especially for the low-wage migrate workers (Chen & Liu, 2010; Freeman & Li, 2013; Gao et al.,2017), while some other paper claim that LCL has very limited impact on wage and social security coverage (Gallagher et al., 2013; Qing & Liu, 2014). Even in the same area of Guangdong province (Pearl river delta), Han et.al. (2011) found labour costs per capita increased up to 5% by LCL in sample firms; Freeman & Li (2013) estimated that without LCL firms could save 20% to 30% of labour costs.

The main reason of these contradictory results is due to the difficulty in identifying the influence from LCL. As an emerging economy, wage, tax payment and social security coverage in China are all increasing every year before and after LCL was implemented; meanwhile the regulatory circumstance is changing rapidly, for example some literature considered the impact from minimum wage provision (enforced in January 2004) but some did not. In addition, LCL went into effect simultaneously in the whole country, therefore the standard difference-in-difference (DID) approach is not feasible in evaluating the overall impact of LCL. In section 3 I use a regression discontinuity design (RDD) on panel data to show that LCL is contributing to the expansion of social security coverage, in terms of pension participation and unemployment insurance participation (participated number divide by total labor force) [3]. Data sample

[2]In the case of temporary hiring, in order to reduce the risk of legal disputes, employers usually hire a dispatch agency to provide contract to employees. After the 2008, the volume of dispatch agencies' business increased sharply. Because the cost of hiring is after all covered by principle employer, therefore this paper will not discuss the market friction with dispatch system.

[3]This paper do not examine the participation rate of medical insurance here because the system reformed several times over past ten years, and medical insurance participation may

includes 74 cities from year 2003 to 2015, is collected from local governments' annual statistical bulletin. I assume that social security participation rate is an autoregressive process which controlled by economic growth, then embed the enforcement of LCL as treatment. Regression results find the impact of LCL treatment is significant.

Pension and unemployment insurance coverage represent different aspects of labor market mechanism. Pension participation takes 20% to 30% of total wage, as a result it either remarkably increases hiring cost or decreases disposable income, which means firm and workers have to renegotiate the distribution of net profit; therefore pension coverage reflects the market acceptance level of LCL. For unemployment insurance, although the rate is small (1% to 3% of wage), the administrative process of getting refund is cumbersome and also the benefit paid out is very low, therefore both employer and employees do not have incentive to pay this kind of insurance, unless it is required by law, which means unemployment insurance participation represent a strict compliance of LCL. In Section 4 I first explain the theoretical relationship of hiring cost, workers' disposable wage and job vacancy to applicant ratio (henceforth referred to as VU ratio) with a standard search-matching model; then use city-level panel data and within-group estimation to show the impact of social security participation level to disposable wage and labor demand-supply ratio. Here pension and unemployment insurance participation rates can be regarded as different proxies of LCL compliance level, which indirectly connected LCL enforcement and labor market outcome.

Empirical results suggest that LCL enforcement do not have significant impact in general; but in the scenario of severe labor shortage, LCL as treatment and unemployment insurance participation expansion decrease disposable wage level significantly, increased hiring cost also exacerbate the labor demand-supply gap. In conclusion, this paper support the argument that Labor Contract Law caused some negative consequence to Chinese labor market, but only for those

not from working relations. For work injury insurance and maternity insurance participation, many cities did not report the data.

cities less flexibility to adjust the legal environment change.

The rest of this paper is organized as follows: Section 2 is a brief literature review of emloyment protection legislation on developing countries, as well as some stylized facts of Chinese labor market and social security system; Section 3 is the impact evaluation of LCL to social security coverage with RDD strategy; Section 4 first presents a model, which is derived from my paper on Beveridge curve of Chinese cities, to explain the influence of hiring cost to labor market dynamics, then estimate the impact with dynamic panel data; Section 5 is robustness check; Section 6 is conclusion remarks.

2 Literature Review

2.1 EPL in developing countries

According to OECD's definition, "employment protection refers both to regulations concerning hiring (for instance, rules favouring disadvantaged groups, conditions for using temporary or fixed-term contracts, training requirements) and firing (for instance, redundancy procedures, mandated prenotification periods and severance payments, special requirements for collective dismissals and short-time work schemes)". For developed economies, labor economists tend to believe that employment protection legislation (EPL) lowers wage inequality (Freeman, 2007), stabilizes employment over the economic cycle and enhance employment performance in the long run(Amable, Demmou & Gatti, 2007). But in developing countries and micro-economic perspective, a series of empirical studies on Indian manufacturing sector (Fallon & Lucas, 1993; Besley & Burgess, 2004; Ahsan & Pages, 2009;) found pro-worker legislation would squeeze out capital investment then lower output and employment; Almeida & Carneiro (2007) found stricter enforcement of EPL increased firm's total labor costs and also worker's non-wage benefit, but decrease the wage premium of formal workers to informal workers, by using city level data from Brazil. World Development Report 2013 concluded that "there is no consensus on what the

content of labor policies should be" but "either misguided intervention or lack of voice and social protection should be avoided".

The latest OECD EPL index (2012 to 2015, table 1[4]), which "measure the procedures and costs involved in hiring and dismissing workers", show that Chinese EPL performs much better than world and OECD average in protecting permanent individual employment, but performs poorly in protecting collective or temporary workers. This is in line with the main stream criticism on LCL that in lack of flexibility (in terms of dismiss individuals) and collective bargaining power ("absence of independent trade union", Wang et.al. 2009).

	permanent employment	individual dismissal	collective dismissal	temporary employment
China 2012	3.01	3.31	2.25	1.88
OECD average	2.27	2.03	2.89	2.07
world average	2.18	2.15	2.26	2.24

Table 1: OECD EPL index

2.2 Social security system in China

Social Securities in China are all managed by the government foundations with pay-as-you-go system[5]. The insurance base is floating slightly across the cities and years[6]. From 2003 to 2015, total number of pension participants increased from 147 million to more than 354 million, which is one quarter of Chinese population and half of labor force. ISSA (2013)'s comparative study on BRICS countries' social security system pointed out that this a rapid expansion

[4]resource: http://www.oecd.org/els/emp/oecdindicatorsofemploymentprotection.htm

[5] "pay-as-you-go" means each generation of workers supports the preceding generation's retirees.

[6]there is a standard ratio with highest and lowest payment in each city, for instance, year 2015, in Beijing, Pension is 28% of total wage, medical insurance 10%, unemployment insurance 1.2%, injury insurance 0.2 to 2%, fertility insurance 0.8%; in Shanghai, Pension 29%, medical insurance 13%, unemployment insurance 2.2%, injury insurance 0.5%, and maternity insurance 1.5%.

is due to the "enhanced efforts for the extension of coverage[7]" since 2003; and also "institutional segmentation" is a feature of Chinese system, as "most of the schemes are administered at county or city level by different authorities".

Chinese labor market is segmented into three parts by the unique household registration ("Hukou") system: rural labors, who usually work at agriculture sector and enjoy limited social security benefit; urban labors, who basically work at industrial or service sector and enjoy the full social security benefit which is paid by employers; and migrant labors, who work at city A but his or her "Hukou" is registered at city or village B. Migrant workers still have social security account at A as urban workers, but can only enjoy social security benefits at B after applying a transfer from A to B; and there is a large transfer lost and delay. According to National Health and Family Planning Commission, the number of migrant worker is about 250 million in 2015, which accounts for one-third of total labor force in China. Lam et.al(2015) asserted that "migrant flows are key to understanding China's labor market conditions".

2.3 Labor shortage in China

As a developing economy, China's migrant workers are mainly from rural surplus labor. Arthur Lewis(1954 & 1958)'s classic theory tells that at the beginning of industrialization, rural surplus labor force gradually transferred from the low value-added agriculture sector to higher value-added industry sector, and the growth of wage was slow because of the excessive labor supply; then until the extra rural labor is completely absorbed by industry sector, when we call it as Lewis turning point, a further development of economy will lead to labor deficit and a rapid growth of wage. An crucial point of time is 2002 (Tajima, 2008), when Chinese government abolished agriculture tax and started to subsidize farm products, thereby the return of labor input in agriculture sector increased significantly, and shortage of labor force started at several most developed Chinese cities in 2003.

[7] for example, set the minimum payment amount, strengthen administrative supervision

With different measure of rural surplus labor, Garnaut & Huang (2006) and Cai (2007, 2009) believed that China have passed through the Lewis turning point; but Kwan (2007), Das & N'Diaye (2013) shows there are still a considerable surplus labor at rural area now; and compared with Japan's experience (Minami & Ma, 2010) and World Development Indicators (Wang & Zhong, 2011), apparently the share of labor force in agriculture sector is larger and marginal productivity is still lower than other developed countries' turning point. Another group of literature (Golley & Meng, 2011; Knight et al. 2011; Athukorala & Wei, 2015) call this labor deficit as "quasi Lewis turning point"; their argument is that the institutional frictions in China'a labor market, especially the Hukou system, is the reason which kept the left surplus labor away from industrial sector.

In the light of Kwan (2007) and Mitsuo & Yamamoto (2010), Figure 1 expresses why institutional friction caused a "quasi" turning point: without friction, that is hiring cost equals perceived wage of workers, Lewis turning point is supposed to arrive at point A with the upper shift of marginal productivity curve; but with labor market friction, more people will stay at agriculture sector and labor deficit start early at point B.

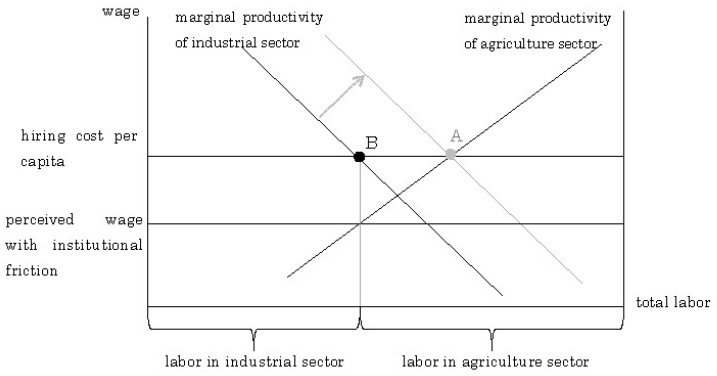

Figure 1: Turning point with institutional friction

Adopting the idea that institutional friction is crucial to labor supply, the purpose of this paper is not to argue that the turning point of labor shortage in China is Lewisian or not, but to prove that the implementation of LCL is response to the change of labor market structure. It is also not yet to say that LCL is the institutional friction itself, but at least it expand the multiplier effect of the friction.

3 LCL on Social Security Participation

This section shows LCL significantly contribute to the growth of social security coverage in Chines cities with regression discontinuity design (RDD) designs on panel data. Table 2 reports the statistical summary of city-level pension and unemployment insurance participation rate[8]. It shows the average level of social security coverage is increasing gradually, as well as the standard deviation of participation rate. By 2015, major cities like Beijing have almost full participation, whilst in some cities less than 10% workers have unemployment insurance, which reveals the very different compliance level of labor law across China.

RDD is "a way of estimating treatment effects in a nonexperimental setting where treatment is determined by whether an observed forcing variable exceeds a known cutoff point" (Lee & Lemieux, 2010). Because "Chinese social security system has followed a developmental welfare approach, which attaches great importance to economic development and strives to integrate welfare policies within a planned national development process" (ISSA, 2013), I assume the social security participation rate is an autoregressive process which controlled by GDP growth, the underlying theory here is that social security coverage is expanding with economic development. In RDD strategy, the cutoff point of

[8]Some observations of participation rate is bigger than 1, because by regulation, before withdraw pension, employees have to contribute to social security account for at least 15 years, therefore those workers who did not participate in early years continued to pay social security after retirement, which also reflects the quick expansion of social security coverage

Pension					
year	Obs	Mean	Std.Dev.	Min	Max
2003	42	0.224	0.147	0.051	0.638
2008	61	0.325	0.176	0.107	0.865
2013	65	0.411	0.203	0.127	1.149
2015	51	0.452	0.216	0.167	1.201
Total	773	0.341	0.197	0.034	1.204
Unemployment insurance					
year	Obs	Mean	Std.Dev.	Min	Max
2003	42	0.211	0.124	0.044	0.543
2008	61	0.222	0.128	0.058	0.626
2013	65	0.239	0.149	0.074	0.898
2015	51	0.260	0.152	0.093	0.912
Total	773	0.225	0.136	0.044	1.047

Table 2: Summary of social security participation rate in selected years

treatment (LCL enforcement) is year 2008, thereby the estimated equation is as follows:

$$h_{it} = \tau D_t + \gamma_1 h_{it-1} + \gamma_2 g_{it} + \xi_i + \mu_{it} \tag{1}$$

$$D_t = \mathbf{1}[t \geq 2008];$$

Here h_{it} is city-level social security participation rate, g_{it} is annual GDP per capita growth rate, ξ_i is city-fixed effect, μ_{it} is the error term. Data sample is collected from 74 Chinese cities' economic statistics bulletin, which released annually by local government, from year 2003 to 2015. Each of these cities has more than 600 thousand working population.

Different kinds of social security are not necessarily being complied at the same time, accordingly unemployment insurance participation rate is lower than pension participation rate in average. There are two possible explanations for the difference: first, due to the aging society, pension fund in many cities is running behind its expense, thereby government is more harsh in pushing pension participation; second, depend on different level of cross-region institutional friction, migrant workers will be more or less benefit from pension funds, they are

more or less motivated to participate, but unemployment insurance can hardly be refunded[9]. Therefore, pension coverage reflects the market acceptance of LCL, and unemployment insurance coverage reflects the strict compliance level of LCL.

Table 3 reports the regression results of equation (1); big R-squares at the bottom line show this model accurately presents the left-hand side variable. The first two columns use pension participation rate as P, whilst the second two columns take unemployment insurance participation rate as P. Both within estimations find the treatment D being significantly correlated to the dependent variable, and the coefficients are not small. For pension, LCL enforcement brought additional 3.2 percent labor force to participate annually; and for unemployment insurance, LCL increase the participation rate by 67 basis points every year.

4 Market Consequence of Increased Payroll Tax

This section use social security coverage as a proxy of LCL compliance level to examine the impact of LCL enforcement to disposable wage and labor market tightness. subsection 4.1 is a standard search-matching model which derives the relationship of hiring cost, disposable wage and job vacancy to demand ratio; subsection 4.2 is a empirical estimation with city-level data.

4.1 the Model

This model follows Zenou (2008)'s notional frame work that assuming labor market equilibrium of formal (urban) and informal (rural) sectors reaches

[9]Unemployment benefits are not transferable so far, therefore migrant workers can not withdraw it either in migrated city or hometown. For urban workers, duration of unemployment benefits is up to 24 months and the pay out is lower than local minimum wage. According to China Labor Bulletin, just two million workers actually received unemployment benefit in 2017, out of a registered unemployed urban population of 9.7 million, according to official statistics.

	pension		unemployment insurance	
	OLS	Within	OLS	Within
D	0.0086	0.0321***	0.0043*	0.0067***
	(0.0044)	(0.0050)	(0.0019)	(0.0018)
L.h	1.0076***	0.8151***	1.0154***	0.9225***
	(0.0104)	(0.0233)	(0.0063)	(0.0174)
g	0.0787**	0.0461	0.0225	0.0233*
	(0.0264)	(0.0271)	(0.0115)	(0.0110)
cons	0.0005	0.0524***	-0.0054	0.0133**
	(0.0065)	(0.0087)	(0.0029)	(0.0044)
N	678	678	678	678
R-sq	0.9424	0.8030	0.9755	0.8366

Standard errors in parentheses

* p<0.05, ** p<0.01, *** p<0.001

Table 3: RDD of LCL on social security participation rate

when expected payoffs of working in both sides are the same. There are three presumptions to my model. First, migrant workers and urban workers are homogeneous in job market. Second, all workers have zero unemployment benefit, migrant workers have to pay the payroll tax (due to LCL enforcement) but can not enjoy social security benefit (due to "Hukou" system), therefore firms' hiring cost at migrant wand urban workers are the same, but migrants do not value social security payment. Third, a migrant worker could choose either to live and work in rural area or work at urban area at each period, if he or she can not find a job or the job destructs, he or she go back to rural sector and make a new choice, thus there is no competition between cities in attracting labor force, each city only competes with rural sector.

Consider a labor market with homogeneous jobs and workers, denote the number of job vacancy as V and number of job applicants as U. By standard search-matching model, the number of job match can be expressed as market

efficiency times a constant-return-to-scale function of vacancy and unemployed number:

$$M = em(V,U) = eV^{\frac{1}{\theta}}U^{1-\frac{1}{\theta}} \tag{2}$$

Here M is the number of job matches, $0 < e < 1$ is job market efficiency. $m(V,U)$ is a CRS matching function of job vacancy and applicant number; following Shimer(2005), I assume the matching function is in Cobb-Douglas form and $\theta > 1$.

Denote p as the possibility of unemployed to find a job, q as the possibility of firm to get a job match, we also have

$$p = \frac{M}{U} = e(\frac{V}{U})^{\frac{1}{\theta}} \tag{3}$$

$$q = \frac{M}{V} = e(\frac{V}{U})^{\frac{1}{\theta}-1} \tag{4}$$

Assume the migrant workers are risk neutral and taking market condition as given. Denote the expected lifetime payoff of employed worker as I^L and unemployed worker as I^U. By Bellman equation, in steady state,

$$I^U = \frac{pw}{r(r+\delta+p)} \tag{5}$$

$$I^L = \frac{(r+p)w}{r(r+\delta+p)} \tag{6}$$

Here w is workers' disposable wage, δ is the exogenous job destruction rate; r is discount rate.

On the other hand, for firms, denote the current value of a filled job as I^J and value of a vacancy as I^V, again by Bellman equation, I^J and I^V can be derived at steady state as:

$$I^J = \frac{(r+q)(y-(1+h)w)-\delta\kappa}{r(r+\delta+q)} \tag{7}$$

$$I^V = \frac{q(y-(1+h)w)-(r+\delta)\kappa}{r(r+\delta+q)} \tag{8}$$

Here y is the marginal output of a filled job; κ is the marginal cost of posting a job vacancy; h is the rate of hiring cost. Notice that vacancies will only be

created when its value is non-negative, therefore $I_i^V = 0$ and

$$I^J = \frac{\kappa}{q} = \frac{y - (1+h)w}{r+\delta} \tag{9}$$

For filled jobs, assume that wage is determined by a Nash-bargaining process which maximize the weighted total surplus of firm and worker:

$$w = \arg\max_w (I^L - I^U)^\beta (I^J - I^V)^{1-\beta} \tag{10}$$

here $0 \leq \beta \leq 1$ is the bargaining power of workers to wage. Solution of equation (13) satisfies:

$$I^L - I^U = \frac{\beta}{1-\beta}(I^J - I^V) \tag{11}$$

Combine equation (7), (8), (9) and (1), we have:

$$w = \frac{\beta}{1+\beta h}(y + \frac{p}{q}\kappa) \tag{12}$$

4.1.1 Scenario 1: Harris-Todaro equilibrium

Denote the average one-period income in agriculture sector as c, then discounted life-time income of a farmer is c/r; if he or she choose to leave countryside and look for jobs at urban area, he or she become an unemployed migrant worker with life-time expected payoff I_U. According to Harris-Todaro model, market equilibrium reaches when $\frac{c}{r} = I_U$, thereby we have

$$I^U = \frac{pw}{r(r+\delta+p)} = \frac{c}{r} \tag{13}$$

$$\frac{V}{U} = \frac{p}{q} = \frac{c(1-\beta)}{\beta\kappa} \tag{14}$$

and

$$w = \frac{c + \beta(y-c)}{1+\beta h} \tag{15}$$

$$\frac{V}{U} = \frac{[y - (1+h)w]c}{(w-c)\kappa} \tag{16}$$

4.1.2 Scenario 2: labor supply shortage

There are many cities vacancy number exceeds applicant number by 100%, which means every two job vacancies only have one applicant. In this scenario clearly Harris-Todaro equilibrium is not reached because urban jobs can not attract enough workers from agriculture sector. But on the other hand, the probability of migrant worker to find a job equals to one, then we have the following expressions:

$$p = e(\frac{V}{U})^{\frac{1}{\theta}} = 1 \tag{17}$$

$$q = e(\frac{V}{U})^{\frac{1}{\theta}-1} = p\frac{U}{V} = \frac{U}{V} \tag{18}$$

$$\frac{V}{U} = \frac{1}{q} = \frac{(1-\beta)y}{[r+\delta+\beta+(r+\delta+1)\beta h]\kappa} \tag{19}$$

and

$$w = \frac{\beta(r+\delta+1)y}{r+\delta+\beta+(r+\delta+1)\beta h} \tag{20}$$

$$\frac{V}{U} = \frac{(1+\beta h)w-\beta y}{\beta\kappa} \tag{21}$$

4.1.3 Interpretation

The model implies that LCL may affect labor market dynamic by three channels: hiring cost, job destruction rate and bargaining power to disposable wage. For the ratio of hiring cost, which includes income tax and payroll tax, LCL do not address income tax specifically, but the compulsory provision on having written contract even for temporary worker enlarges the income tax base for tax bureaus; for payroll tax, mandatory term of social security contribution by LCL makes it legally inevitable; therefore theoretically LCL enforcement increased ratio of hiring cost by increasing income tax base and social security coverage. Equation (14) and (15) show that at given rural income and output level, increase of hiring cost do not affect VU rate when labor demand-supply is balanced, but would decrease workers' disposable wage. Equation (19) and (20) means that if there is labor shortage, caeteris paribus, increase of h would decrease both VU level and wage. However, we should consider that wage can

be sticky in practice, therefore by equation (16) and (21), at given disposable wage level, increase of hiring cost lower VU ration in scenario 1 and increase VU ration in scenario 2.

The second parameters which might be affect by LCL enforcement is job destruction rate. Theoretically LCL enforcement would increase firing cost by enhanced provisions on layoff conditions and severance payment (Friedman & Kwan Lee, 2010), thereby decrease job destruction rate. Although there are evidence that harsh EPL make firms especially foreign investors shut down their business (Han et.al, 2011), which may cause a increase of job destruction rate, but withdraw investment also means a decrease of output, therefore I assume at given output level, LCL only decrease job destruction rate. Equation (14) and (15) show that *delta* is irrelevant to either VU ratio or wage in scenario 1; Equation (19) (20) and (21) imply that in scenario 2, δ is either negatively correlated to both VU ratio and wage (the multiplier effect of δ change is bigger to VU than to w) or have no influence if wage is sticky.

The third concern is workers' bargaining power to disposable wage. Although EPL is supposed to strengthen employees' bargaining power in general, but it is not necessary lead to wage inflation, because EPL usually affect employment and non-wage benefit, not earnings (Betcherman, 2015). LCL also do not reinforce collective bargaining power as "unions in China remain exclusively reactive to collective action" (Friedman & Kwan Lee, 2010). Therefore I assume that β is endogenously given or depend on labor market tightness, and LCL enforcement do not affect β.

In summary, for scenario 1, LCL enforcement may have very limited influence on either wage or VU ratio. At the scenario of labor shortage, if disposable wage is sticky, labor demand-supply gap will be enlarged by the increase of hiring cost; if w decreases with the increase of h, LCL may also cause a increase of VU ratio by decreasing job destruction rate.

4.2 Empirical Findings

4.2.1 Empirical strategy

Based on equation (15), (20), (14) and (19), I estimate the following equations to evaluate the impact of LCL enforcement to disposable wage and VU ratio by within-group regression:

$$W_{it} = \begin{cases} \zeta_1 H_{it} + \zeta_2 h_{it-1} + \rho X_1 + \upsilon_i + \mu_{it}, & \text{if } p_{it} < 1 \\ \zeta_3 H_{it} + \zeta_4 h_{it-1} + \rho X_2 + \upsilon_i + \mu_{it}, & \text{if } p_{it} = 1 \end{cases} \tag{22}$$

$$v_{it} = \begin{cases} \zeta_5 H_{it} + \zeta_6 H_{it-1} + \rho X_3 + \upsilon_i + \mu_{it}, & \text{if } p_{it} < 1 \\ \zeta_7 H_{it} + \zeta_8 H_{it-1} + \rho X_4 + \upsilon_i + \mu_{it}, & \text{if } p_{it} = 1 \end{cases} \tag{23}$$

$$\begin{cases} X_1 = (YC_{it}, YC_{it-1}, \ln c_t)', \\ X_2 = (Y_{it}, Y_{it-1}, lnr_t)'T, \\ X_3 = (\ln c_t)', \\ X_4 = (Y_{it}, Y_{it-1}, \ln r_t)' \end{cases}$$

Here H_{it} is the logarithm of social security participation rate of city i at year t. $W_{it} = \ln w_{it}$, $Y_{it} = \ln y_{it}$, $YC_{it} = \ln(y_{it} - c_t)$; y_{it} is output level and w_{it} is average disposable income of city i at year t. c_t is national average rural income at year t; r_t is real interest rate; c_t and r_t can also be regarded as year-fixed control. $v_{it} = \ln V_{it}/U_{it}$ is the logarithm of job vacancy to applicant ratio of city i at year t; υ_i is the unobservable heterogeneity of city i, which might include the information of vacancy-posting cost; μ_{it} is the error term.

There are lagged values for each explanatory variable in equation (22) and (23), because in practice, wage can be sticky and labor market dynamic can be affected by intertemporal factors: firms' hiring decisions could be brought forward or postponed, migrate workers might have information lag, jobs which did not get match can be left to next year. Therefore following the methods from Blundell and Bond (2000), Bond (2002), I estimate the model with an auto-regressive component in the error term, which derives the dynamic equations.

4.2.2 Data

Data of social security coverage is the same as Section 3. We have pension participation rate as a proxy of market acceptance level of LCL, and unemployment insurance participation rate as a proxy of LCL strict compliance level.

Data of output level, wage and rural income are all collected from the database of national or local Bureau of Statistics. For w_{it}, the reported wage by statistic bureau is pre-tax wage, thereby I use per capita disposable income of urban household as a proxy of urban disposable wage; correspondingly, I use GPD per capita instead of GDP per worker as a proxy of output level; rural income c_t is national average rural income, as migrate workers are assumed to be homogeneous. r_t is "lending interest rate adjusted for inflation as measured by the GDP deflator", which is downloaded from word bank database.

Data for v_{it}, the VU ratio, is collected from public employment agencies[10]. Public employment agency is the primary channel of recruiting and job searching in China, especially for the low-wage jobs. The reported aggregate number do not necessarily represent the total amount of each city's labor supply and demand, for example some companies and job seekers can just find matches through internet or campus hiring. Table 4 is the statistical summary of city-level VU ratio at selected years. It shows the average of observations is increasing gradually over the years, which is similar to the expansion of social security coverage.

year	Obs	Mean	Std.Dev.	Max	Min
2003	47	0.82	0.36	2.45	0.40
2008	63	1.02	0.42	2.86	0.31
2013	68	1.25	0.59	4.05	0.74
2015	53	1.25	0.59	4.48	0.56
Total	805	1.11	0.54	5.50	0.31

Table 4: Summary of city-level VU ratio in selected years

[10]Data resource: Ministry of Human Resource and Social Security, old.chinajob.gov.cn/DataAnalysis/node_1032.htm

4.2.3 Estimation Results and Interpretation

A foregoing problem is how to identify the crucial point that $p_{it} = 1$. According to search-matching model literature, matching efficiency e is around 0.8 to 1.4, whilst θ, the inverse of matching function elasticity with respect to labor demand, is around 1.5 to 2.5 (Pissarides &Petrongolo, 2001); then by theory, as $p = e(\frac{V}{U})^{\frac{1}{\theta}}$, the critical point of VU ratio for $p = 1$ can be from 0.6 to 1.5. Take $\theta = 2$ and $e = 0.8, 0.9$, I divide the sample set by critical point of $VU = 1.2$ and $VU = 1.5$, then estimate the sub-samples separately. With $VU < 1.2$ and $VU \geq 1.2$, I did not find any significant results; for the sake of brevity, only the results with $VU < 1.5$ and $VU \geq 1.5$ are reported here.

Table 5 is the within-group estimation results of equation (22). First three columns show that for labor market that vacancy to applicant ratio is smaller than 1.5, neither pension nor unemployment insurance coverage is correlated to the level of disposable wage; and if take LCL as a treatment, there is no treatment effect. However, the next three columns suggest that for cities with severe labor shortage, LCL as treatment have significant impact at 95% confidence level that LCL enforcement cause about 5 percentage points decrease of the logarithm of disposable wage; by the sixth column, it might come from the expansion of unemployment insurance coverage that 1 percentage point increase of log-participation rate cause 0.2 percentage point decrease of log-disposable wage (although this effect of current year is to be offset at next year); and by equation (20), the impact of LCL enforcement may also come from the decrease of job destruction rate, of which we do not have available data.

Table 6 reports the estimation results of equation (23), which shows LCL as treatment do not have significant effect at labor market tightness in either scenario. The only significant observation is that at 99% confidence level, 1 point increase of log-unemployment insurance coverage will cause about 2 percentage points increase of VU ratio. The reason that in scenario 2, LCL enforcement have significant impact on disposable wage but no impact on VU ratio can be explained by equation (19) and (20): evidently LCL cause a increase of hiring

lnw	VU <1.5			VU ≥ 1.5		
	LCL	pension	uninsure	LCL	pension	uninsure
L.lnw	.837***	.837***	.824***	.632***	.601***	.600***
	(.024)	(.024)	(.025)	(.095)	(.138)	(.130)
D	.001			-.049*		
	(.005)			(.020)		
H		-.002	-.014		-.083	-.235*
		(.011)	(.016)		(.053)	(.108)
L.H		.013	-.013		.010	.244*
		(.011)	(.016)		(.061)	(.107)
ln(y-c)	.119***	.143***	.147***			
	(.019)	(.020)	(.020)			
L.ln(y-c)	-.037	-.059**	-.053*			
	(.021)	(.022)	(.022)			
lnc	.040	.031	.041*			
	(.021)	(.021)	(.021)			
lny				.496***	.352	.373*
				(.132)	(.176)	(.183)
L.lny				-.119	.049	-.029
				(.133)	(.195)	(.199)
lnr				-.045	-.009	-.022
				.046	(.050)	(.050)
obs	601	575	575	64	51	51
R^2	0.9955	0.9956	0.9957	0.9983	0.9975	0.9977

Standard errors in parentheses;* p<0.05, ** p<0.01, *** p<0.001

Table 5: Within-Group Estimation Results of Equation (22)

cost and decrease of job destruction rate, these two effect decrease w at same time but offset each other to VU ratio.

Both Table 5 and Table 6 show that change of pension participation rate

v	VU <1.5			VU ≥ 1.5		
	LCL	pension	uninsure	LCL	pension	uninsure
L.v	.403***	.400***	.406***	.564**	.556**	.107
	(.037)	(.037)	(.037)	(.159)	(.117)	(.183)
D	.011			.008		
	(.019)			(.147)		
H		.000	.100		.189	1.965**
		(.046)	(.066)		(.357)	(.684)
L.H		.077	-.023		-.280	-.588
		(.045)	(.067)		(.419)	(.625)
lnc	. 094***	.062**	.096***			
	(.022)	(.024)	(.017)			
lny				.170	-.353	1.344
				(1.004)	(1.194)	(1.105)
L.lny				-.179	-.434	-1.638
				(.919)	(1.131)	(1.128)
lnr				.000	.043	-.119
				.315	(.318)	(.263)
obs	603	577	577	56	51	51
R^2	0.7179	0.7169	0.7161	0.8054	0.7954	0.8605

Standard errors in parentheses;* p<0.05, ** p<0.01, *** p<0.001

Table 6: Within-Group Estimation Results of Equation (23)

does not have impact on labor market dynamic whilst change of unemployment insurance coverage does in the scenario of labor shortage; this is possibly because migrant workers will be more or less refunded from pension funds, therefore for equation (5) to (8), when migrant worker calculate their payoffs, pension participation should be more or less be counted in w rather than hiring cost h. Unemployment insurance participation is unlikely to be refunded, therefore it strictly belongs to h.

The reason that unemployment insurance participation, which represent the strict enforcement level of labor law, has significant impact on labor market dynamic in scenario 2 but has no impact in scenario 1 might be a reversed causality: migrant workers are more willing to work at those cities where they have a strong bargaining position to keep the level of disposable wage, therefore even when h is changed, w is unchanged and labor demand-supply is relatively balanced; and those cities where firms do not absorb the increasing hiring cost are less attractive to migrant workers, therefore labor shortage emerges.

5 Robustness

I did following robustness checks to validate my empirical results. All additional or alternative tests are consistent with the findings of Section 4.2.3. The detailed results of robustness checks are not reported in paper for the sake of brevity.

5.1 Alternative model

The empirical model in Section 4.2, equation (23), is derived from equation (14) and (19). By equation (16) and (21), we have an alternative model with more explanatory variables:

$$v_{it} = \begin{cases} \zeta_5 H_{it} + \zeta_6 H_{it-1} + \rho X_3 + \upsilon_i + \mu_{it}, & \text{if } p_{it} < 1 \\ \zeta_7 H_{it} + \zeta_8 H_{it-1} + \rho X_4 + \upsilon_i + \mu_{it}, & \text{if } p_{it} = 1 \end{cases} \tag{24}$$

$$\begin{cases} X_3 = (YW_{it}, YW_{it-1}, WC_{it}, WC_{it-1}, \ln c_t)', \\ X_4 = (YW_{it}, YW_{it-1}, \ln y_{it}, \ln y_{it-1}, \ln r_t)' \end{cases}$$

Here $YW_{it} = \ln(y_{it} - w_{it})$, $WC_{it} = \ln(w_{it} - c_t)$. Within-group estimation result of equation (24) is the as Table 6 in terms of the significance level of LCL and social security coverage impact, and the size of coefficients are also similar.

5.2 Alternative data

In section 4.2, data of y_{it} is GDP per capita, because for equation (22) we only have disposable income per capita of urban households as proxy of w_{it}. For y_{it} in equation (23), I use GDP per labor force instead, the result of Table 6 is unchanged.

For H_{it} in equation (22) to (24), I use the original data of participation rate instead of the logarithm of data, which also do not change the impact evaluation findings from Table 5 and Table 6.

5.3 GMM method

The size of my data sample is is $T = 13$ and $N = 74$, therefore according to the text book of dynamic panel econometrics (Arellano, 2003, page 90), in case of "small T, large N" and $\frac{T}{N}$ is positive, 2SLS estimators will be inconsistent, whilst both within-group and one-step GMM estimators might have negative biases in asymptotic distribution, only system GMM will provide efficient and consistent estimators (Bond, 2002). But my T is relatively big and N is relatively small, therefore system GMM estimator may not be valid or unbiased due to the sample size.

The system GMM estimation of equation (22), (23) and (24) by $VU < 1.5$ again do not find significant effect of LCL treatment or social security coverage($t - 11$ as valid internal instrument for equation (22), $t - 3$ as valid instrument for (23) and (24), in terms of both valid orthogonal condition test and overidentification test). For the subset of $VU \geq 1.5$, there are only 56 observations in maximum, system GMM either do not have valid internal instrument or generate biased results.

5.4 Province-fixed-effect

Those 74 cities in my data sample belong to 26 different provinces. Provincial-level policy might be important to labor market, especially for the unobservable variable of vacancy-posting cost. I use province-fixed effect instead of city-fixed

effect for equation (22), (23) and (24), but within-group estimation did not generate any significant result.

6 Conclusion

With city-level data, this paper empirically examined the impact of Labor Contract Law to social security coverage expansion, as well as its influence to wage and labor market tightness through hiring cost increase. Within-group estimation show that LCL enforcement brought additional 3.2 percentage point increase of pension participation rate every year from 2008 to 2015, and also caused additional 67 basis points annual increase of unemployment insurance participation rate during the same period. For labor market dynamics, LCL enforcement do not have impact on workers' disposable wage or job vacancy to applicant ratio in general, but would significantly (95% confidence level) decrease (log) disposable wage by 5 percentage points if there is a severe labor shortage; pension participation rate does not affect disposable wage or VU ratio at all, whilst 1 point increase of log-unemployment insurance participation rate leads to 23.5 percentage points decrease of log-disposable wage (95% confidence level) and 2 points increase of log-VU when VU ratio is bigger than 1.5 (99% confidence level).

Based on institutional setups and different likelihood of getting refunded, pension coverage can be regarded as market acceptance level of LCL, which means it can be counted into disposable wage rather than hiring cost, and explains why it have very limited impact on labor market dynamics; on the other hand, unemployment insurance participation rate can be regraded as LCL strict compliance level, and its expansion is purely an increase of hiring cost; cities with $VU < 1.5$ tend to keep the change of hiring cost with employers whilst cities with $VU \geq 1.5$ tend to make employees to pay the increased cost. Moreover, in the second scenario , LCL enforcement as treatment do not have influence on VU ratio might because the decrease of job destruction rate offset the effect which brought by hiring cost increase.

In conclusion, this paper support the argument that Labor Contract Law caused some negative consequence to Chinese labor market, but only for those cities which already have severe labor shortage; and the reason of this different impact might be due to the characteristics of the city itself: those cities with less institutional friction or more flexibility to adjust the legal environment change tend to have a balanced labor market, and the cities which would cut disposable wage with hiring cost increase are less attractive to workers.

Appendix

A1. Mandatory Terms of employment Contract

	Labor Law 1995	Labor Contract Law 2008
andatory terms of employment contract	(1) contract period; (2) working contents; (3) working conditions and protection; (4) remuneration; (5) working disciplines; (6) conditions of contract termination; (7) responsibilities of contract breach.	(1) employer's name, address and legal representative (2) employee's name, address and Identification number (3) contract period (4) working contents and workplace (5) working hours, rest and leave (6) remuneration (7) social insurance (8) working conditions and protection, occupational hazards protection (9) other matters required by labor law and regulations

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