Economic analysis of Chinese urban labour market: effects of labour laws reform and *hukou* reform

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Abstract

The thesis consists of three main chapters. Chapter 2 studies the effects of Employment Protection Legislations (EPL) on labour market outcomes in the Mortensen Pissarides (1994) job search and matching model with an informal sector. The model predicts that rising costs of laying off workers unambiguously decrease the labour market's tightness and a firm's reservation productivity. Both job creation and job destruction are eschewed. In addition, given a Cobb–Douglas-form job matching function, there is a U-shaped relationship between layoff costs and the size of the informal sector and an inverse U-shaped relationship between layoff costs and the wage rate in the formal and informal sectors.

Chapter 3 empirically examines the effect of 2008 China's Labour Contract Law (CLCL) on the formal–informal divide in the China's urban labour market. We use a range of indicators measure the regional enforcement of EPL and regional judiciary orientation. Panel data discrete choice models are employed to predict individuals' probabilities of being in each employment status. The results provides weak evidence for an association between the regional enforcement of EPL and worker's employment decisions.

Chapter 4 explores the wage gap between urban workers and rural-to-urban migrants with a non-parametric matching approach proposed by Nopo (2008). Results show that the share of the unexplained wage gap to the mean wage gap between urban workers and rural migrants decreases significantly from nearly 50% to 29.7% if we compare only comparable individuals.

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Declaration

I, Jialong Tan, declare that this thesis titled, 'Economic Analysis of China's Urban Labour Market' and the work presented in it are my own. I confirm that:

- This work was done wholly while in candidature for a research degree at this University.
- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given.
- I have acknowledged all main sources of help.

Chapter 1: Introduction to the Thesis

1.1 Introduction

The economic effects of employment protection legislations (EPL hereafter) are a controversial topic in the literature (Deakin, 2016). EPL, including all rules regulating employment relations, are governmental interventions into the labour market to increase the job security of workers. However, they are also associated with adverse effects such as lower levels of wage and employment flexibility in the labour market. The governmental intervention can only be considered to be efficient if the gain of better protection of workers outweighs its possible costs (Botero et al., 2004). Therefore, the study of the effectiveness of EPL has great policy implications. Over the past decades, numerous studies, both theoretical and empirical, have been conducted to examine the economic effects of EPL in both developed and developing countries. Although there is consensus on the role of labour laws in restricting both recruiting and laying off with regard to jobs, their effects on a range of economic outcomes such as unemployment and labour mobility are inconclusive (Freeman, 2007). In addition, previous studies of the effects of EPL on labour market outcomes often focus on the formal sector or formal employment (e.g. Lazear (1990); Hamermesh (1989) and Cahuc and Zylberberg (2004)). Few of them explore its effects on the formal-informal divide of the labour market. The purpose of chapter 2 is to fill in the gap by analysing the effects of EPL on labour market outcomes in a Mortensen and Pissarides (1994) job search and matching model where there exist segmented labour markets.

In chapter 3, we provide an empirical study of the effects of EPL in the context of China's urban labour market. Chapter 3 is motivated by recent reforms in Chinese

labour laws. In 2008, China enacted the Labour Contract Law (CLCL hereafter) to increase the protection of workers in the labour market. It is the first major law change since the 1994 Labour Law. In 1994, China enacted its first Labour Law to regulate labour relations. However, because of the vague and confusing provisions in it, there has been a trend of increasing informal employment in the urban labour market ever since (Park and Cai, 2011). The main purpose of the CLCL is to reverse this trend in the labour market. It requires all employers to sign labour contracts and purchase social insurance for their employees. Failing to do so invokes heavy penalties.

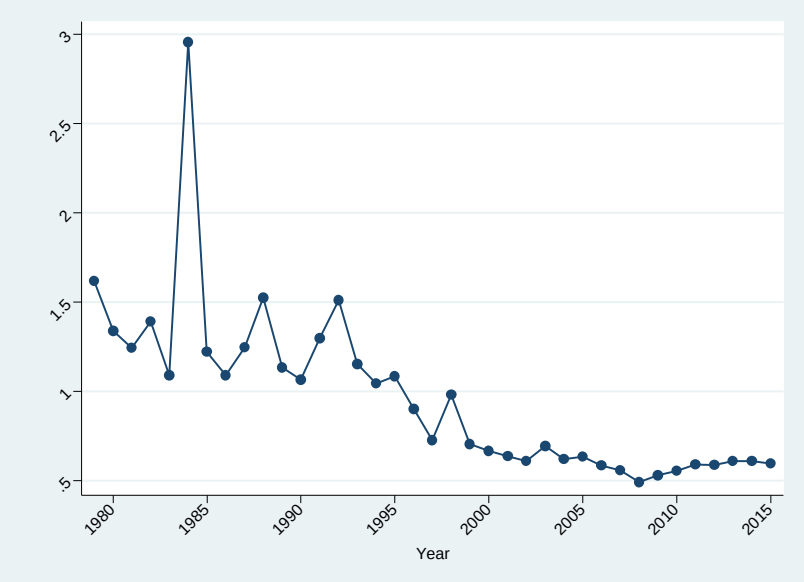
By far, several empirical studies have been carried out to evaluate the effects of the CLCL. One strand of literature focuses on workers' benefits such as labour contracts, social insurance and wage (see Li and Freeman (2015), Cui et al. (2013), Cheng et al. (2014) and Gallagher et al. (2013)). Another strand of studies focuses on the impacts of the CLCL on firms' labour demand (see Sun (2010) and Liu & Liu (2014)). In Chapter 3, we contribute to the literature by looking at the effects of the CLCL on the formal-informal divide. Particularly, we would like to see how the CLCL affects individual's employment choices.

Chapter 4 is motivated by the recent reform of Chinese household registration system (or *hukou* system). In 2014, the State Council of the People's Republic of China has set out guidelines to reform its *hukou* system. It aims at abolishing the distinction between rural and urban populations in socioeconomic status that was created by *hukou* system 60 years ago. One of the reasons for the reform is that the *hukou* system has put rural migrant workers in a disadvantageous position in the urban labour market (Song, 2014). It reflects in lower wage rates, lower job opportunities, and no access to urban social benefits compared with urban residents. Since 2000, the wage ratio between rural migrant workers and urban workers has been consistently

below 0.7 (See Figure 1.1). Such a wage gap, however, can also be attributed to differences in individual characteristics, such as the level of education and work experience. Therefore, the purpose of chapter 4 is to explore the sources of the observed wage gap between rural migrant workers and urban workers. We are keen to determine the extent to which the wages of rural migrant workers change if they are treated on par with urban workers. The contribution of this study is that, as far as we know, we are the first to use a nonparametric method to look at this issue in the Chinese context.

The rest of this chapter includes an introduction to the background of Chinese labour law reforms, an introduction to the Chinese *hukou* system, and an overview of each chapter.

Figure 1.1: Wage ratio between rural migrants and urban workers



Source: Lu (2012), National Bureau of Statistics Database

1.2 Background of Chinese labour laws reform

Before the economic reform in 1978, the Chinese government adopted a state allocation system in the urban labour market. The main feature of this system was Chinese workers receiving lifetime employment in state-owned enterprises. Young workers were allocated to a work unit by the local labour administration department. Social welfare under this system was secured, including housing, pension, free basic health care, education, and other welfare benefits. Wages were set by a national standard system regardless of performance or productivity. This wage system was designed to reduce disparities in income. Wage differences within and across enterprises were very small. Moreover, enterprises were prohibited from laying off any workers; thus, there was no need to sign labour contracts between employers and employees (Ding et al., 2001).

In the late 1970s, China started its economic reform and started opening up economically to the rest of the world. Foreign capital was allowed to lead China's economic development. Consequently, the incidence of Chinese workers employed by foreign investment companies increased. Labour contract regulations were initially enacted to protect workers working at foreign investment companies.

The Chinese economy was gradually moving toward a market-oriented economy, which featured the decentralisation of state-owned enterprises. The decentralization process included the relaxation of personnel management of each enterprise and other reforms that curtailed the pervasiveness of lifetime employment and other related welfare benefits. Since the 1980s, the number of state-owned enterprises was reduced significantly with the removal of lifetime employment in most cases. Instead, fixed-term labour contracts and new wage systems that gave employers the discretion to set wages based on individuals' productivity and performance were introduced.

In the 1990s, with China's joining the World Trade Organization, the pace of market reforms was accelerated. In 1994, the Labour Law of the People's Republic of China was enacted in order to regulate employment relationships. It symbolizes the significant fact that the labour contract system was established in the entire China's labour market. The provisions of the labour law regulated a wide range of issues, including the conclusion, variation, and termination of labour contracts, reasonable working hours, paid leave, an end to discrimination, and a dispute resolution framework. It protected employees by providing the circumstances under which employers could revoke a labour contract and by listing all illegal dismissal cases. With regard to employers dismissing a worker in a situation that warranted dismissal, firms were asked to explain the situation to the trade union or all of the employees 30 days in advance. With regard to cases in which employers revoked labour contracts in violation of the labour law, employers shall be ordered by the labour administrative department to make corrections, and shall bear the responsibility for compensation if damage has been caused to workers. It also includes provisions to protect labours rights with respect to probation periods, unemployment insurance, health insurance, pension, and so on.

However, the enactment of the labour law does not mean the job security of workers were enhanced. In the late 1990s, China has experienced a wave of lay-offs from the state-owned enterprises. The number of workers in state-owned enterprises had decreased significantly from 1.077 billion in 1997 to around 70 million[1] in 2002. Most of the displaced workers are unemployed. Figures from the official statistics shows that the urban registered unemployment rate had risen from 2.9% in 1997 to 4% in 2002. The number would be much higher if we take rural to urban migrants into

[1] Figures are from China Statistics Yearbook in 2000 and 2003

consideration. Moreover, there is much evidence to suggest that regulations included in the 1994 Labour Law were widely violated in China (Cooney, 2007). For instance, wages were often unpaid, in particular for rural migrant workers, working hours were often unreasonably long and migrant workers were often discriminated against (Greenfield and Prigle, 2002; Liu & Tan, 2003; Solinger, 1999). This indicates that the employment legislation system still had many shortcomings that led to poor enforcement of the labour law. First, the Labour Law itself had a disordered internal structure. The labour law system consists of two elements. The major laws, passed by China's supreme legislative organisation, contained general statements of obligations. The detailed provisions were brought to bear by lower levels of administrative regulations and pronouncements. The problem with this system was that there were many confusing and vague provisions. For example, it failed to clarify situations with invalid contracts, define wages, or explain what forms of work require payment. This was an obstacle to enforcing the Labour Law properly. Secondly, the level of enforcement was low due to administrative issues. Although many labour administration departments and labour inspection agencies were established after the enactment of Labour Law, they were often understaffed (Zimmerman, 2008). Thus, they could not fully supervise or enforce the Labour Law. Moreover, since the labour administrative departments were funded and staffed by local governments, they were greatly influenced by local governments. In order to attract business, local governments sometimes were refrained from fully enforcing the law when there were conflicts of interests with their favoured business. Thirdly, labour agencies were often weak (Cooney, 2007) even when they sought to enforce the law. The penalties that they could impose on businesses were very limited, only including warnings,

correction notices, fines, compensation orders, and suchlike. The cost for businesses that violated the law was very low.

To overcome the deficiencies, China enacted its Employment Protection and Supervision Regulations in 2005. This was the first time the Chinese government established its formal labour inspection system. It entitled labour inspectors to greater power in dealing with labour abuses. Nevertheless, the gaps and vague provisions within the Labour Law itself still existed. Many other problems evolved simultaneously. For example, there was a trend of shortening labour contracts and informalizing of employment relations. Informalization refers to situations in which employers refused to sign labour contracts with employees, did not provide them with social insurance, and so on (Josephs, 2009). Moreover, new employment relations aiming at reducing labour costs such as hiring and firing costs appeared in the China's labour market. Labour dispatching is a very common practice. Dispatched workers often have a labour contract with a labour dispatching agency. They are then dispatched to work in a third company. Dispatched workers often cannot enjoy the same level of wages and social benefits as they would if they had signed the labour contract with this third company directly. The practice of hiring dispatched workers is often employed by large companies as a way of reducing their labour costs.

After a long debate over the inefficient labour laws and regulations, the CLCL was enacted in 2008. The CLCL is no major departure from the 1994 Labour Law; however, the CLCL is more specific and detailed in some aspects so as to deal with the gaps in the old law. There are two major changes of the CLCL. First, it increases the costs of laying off workers. Second, it formalises employment relations by requiring employers to establishing employment relationships with employees in written form. To be specific, they are reflected in the following aspects:

- It has clear provisions on the scope of the law (Article 2[2]),
- It requires employers to sign a written contract with an employee within 30 days of full-time employment (Article 7; 10),
- The probation time-period should depend on the length of the labour contract (Article 17),
- It restricts the cut down of more than 20 workers or less than 20 but above 10% of the total number of workers (Article 41),
- How and to what extent economic compensations should be made (article 23; 47; 50; 85; 87; 93),
- Compensation should be made even when the labour contract expires and the worker disagrees to renew it (paragraph (5) of article 46).

Meanwhile, the provisions of the 2008 CLCL and its subsequent revision in 2012 cover regulations for dispatched workers for the first time. Worker-dispatching agencies are required to be regulated by a licensing and registration system (Section 2).

With this as the backdrop, chapter 3 will examine the effects of the labour law reform, particularly the changes in the strictness of EPL, on labour market outcomes. Since one of the main concerns for the CLCL is the trend of informalization in the urban labour market, Chapter 3 will examine the effect of EPL on the formal–informal divide in the context of China's urban labour market. Whether the formalization of the employment relationship makes it easier for individuals to find a formal job in the labour market, or makes it harder to find one and thus quit the labour market in China.

[2] The English version of CLCL is available at: http://www.fdi.gov.cn/1800000121_39_2135_0_7.html

1.3 Background of household registration system and rural urban migration

The household registration system, or *hukou* system, has played a very important role in China's labour market since 1949. The *hukou* system is not only designed to provide population statistics but also to supervise the population distribution among rural and urban areas. Many believe that it restricts rural-to-urban migration and creates the rural–urban divide in China (Chan and Zhang, 1999). The household registration system was initially introduced to urban areas in 1951 and was expanded to the rural areas in 1955. In 1958, it was formally established through the enactment of the Regulations on Household Registration in the People's Republic of China (RHR hereafter). The *hukou* system was initially aimed at overall state administration, such as securing social and political order. According to the 1958 RHR, every person in China has to register with the authority and retain a *hukou* record. A *hukou* record is the official identification of a person's place of residence and other personal information, such as name, gender, date of birth, parents, and spouse.

Officially, there are two classifications of *hukou* registration (Chan and Zhang, 1999). The first one records the place of *hukou* registration. Everyone is required to register with only one regular place of residence. In the past, before the 1978 economic reform, the government allocated food and meat according to *hukou* registration. Even today, the place of *hukou* registration defines individuals' rights in some local social and economic activities. For example, many jobs are only open to applications from local *hukou* holders.

The second classification is the category of *hukou* registration: "agricultural" or "non-agricultural". This classification is more important than the place of residence because "non-agricultural" *hukou* holders are always entitled to get more subsidies

and privileges. It reflects the holder's socioeconomic eligibility and other related rights. Originally, this classification is from the occupational division as to whether the individual works as a farmer. However, this classification gradually becomes irrelevant to the occupation status. Basically, one's *hukou* status at birth follows his/her mother's *hukou* status.

Before the economic reform in 1978, rural-to-urban *hukou* conversion was close to impossible (Meng, 1998). The criteria for this conversion were extremely strict and complicated; moreover, the government controlled it with quotas in order to regulate rural-to-urban migration. Because of the *hukou* system, the Chinese population is largely segmented into agricultural (rural) and non-agricultural (urban). There was inequality between rural and urban *hukou* holders with respect to job opportunities, obligations, and socioeconomic status. It is worth mentioning that migration control between rural and urban areas was not mainly achieved by the police along with inspection of the *hukou* status. Rather, it was achieved by its integration with other social and economic control mechanisms. For example, daily necessities were allocated according to the *hukou* status, whereas additional necessities that were available in the market were usually unaffordable. It was rather difficult for people to live anywhere outside his/her place of *hukou* registration or beyond his/her *hukou* status. Therefore, the labour market was segregated into urban and rural section.

The migration control began to relax after the changes in *hukou* policies in the 1980s. With the development of the urban economy, there was increasing demand for workers in urban areas. On the other hand, the productivity increased in rural area, which resulted in surplus labour in rural areas. Migrant workers started to appear in urban labour market. Migrant workers usually refer to those workers with agricultural *hukou* working in urban areas. Because most of them are less educated and lack of skills

training opportunities, migrant workers were always treated as second class citizens. More than half of them working in manufacturing, construction, wholesale and retail sectors (China National Bureau of Statistics, 2009) without labour contracts, they faced great health and financial risk. Because of the *hukou* system, they did not have access to local medical services, educational services. They even had difficulties in enrolling their children to school.

The low living standard of migrant workers and increasing mobility of the population has challenged the prereform *hukou* system. As a response, the government introduced several new regulations to improve the population registration system. New official documents (e.g. Temporary Residence Permit [3]) with fewer administrative hurdles were introduced to allow migrant workers to get access to local services, education, medical services, and so on. However, institutional discrimination against rural migrant workers still exists in urban areas. The labour law before 2008 was relatively weak in protecting migrant workers. Some of the employers did not sign contract with migrant workers to avoid regulation and punishment if there were any conflicts. Even if employers had signed contracts with them, some of the clauses are unfair including unpaid excessive overtime work or self-liability for work accidents in construction sectors with great health risk. Cases like employers fail to pay full amount of remunerations attracted social attention.

2008 CLCL was launched in part trying to address the problem of discrimination against migrant workers through making clear and transparent provisions on above mentioned issues. For example, Article 7 requires "an employer to establish labour relationship with a worker as of the date of start to use the worker". Article 4 requires

[3] Temporary Residence Permit was first introduced to Shenzhen in 1984 as a way to monitor the increasing migrants' population. It was soon introduced to other cities across China.

employers to “establish and perfect labour bylaws so as to ensure that workers can enjoy labour rights and perform labour obligations”. Those labour rights and obligations include remuneration, working time, rest and vacation, work safety and health care, social insurance and welfare, job training, job discipline or quota management etc.

In 2007, China also enact its first ‘Employment Promotion Law’. The employment promotion law make it clear that ‘workers shall be entitled by law to enjoy the right to equal employment and to seek their own employment. No worker seeking employment shall suffer discrimination on the grounds of ethnicity, race, gender or religious belief.’ (Article 3). However, the practicality of the law against employment discrimination is questioned. There is no detailed clauses defining employment discrimination and how in details it should be monitored and regulated.

There has been improvement in terms of the institutional discriminations against migrant workers. However, the wage ratio of rural migrants to urban workers is constantly below 1 (National Bureau of Statistics of China, 2016), which suggests that the average wage of migrant workers is systematically lower than workers with non-agricultural *hukou.* Nevertheless, a wage gap between two groups of workers in the labour market does not necessarily mean that one group is discriminated against.

Given this background, the chapter 4 of the thesis examines how rural migrant workers are treated unequally in the urban labour market. Particularly, we would like to figure out whether the wage gap observed in Figure 1 is caused by differences in individual characteristics or by different returns to individual characteristics.

1.4 Overview of the thesis

1.4.1 Chapter 2

The second chapter studies the effects of one aspect of EPL (increasing firing costs) on labour market outcomes in a model which is an extension of the classic Mortensen and Pissarides (1994) job search and matching model. The main extension consists in introducing an informal sector.

The informal sector is an important component in both developed and developing countries' labour markets. Its size can be up to 80% of total non-agricultural employment (Schneider and Enste, 2000; ILO, 2016). The informal sector often rears its head when earning opportunities in an economy are scarce for individuals and families. It can also be attributed to the behaviours of entrepreneurs to avoid state regulations such as tax arrangements and EPL (William & Lansky, 2013). Considering these features, in our model, we assume that the informal sector is marginal and competitive. Workers in the sector can find a job instantaneously and earn their marginal products. The informal sector is also assumed to be beyond the ambit of EPL.

According to Cazes and Nesporova (2003), EPL refers to "regulatory provisions that relating to 'hiring and firing', particularly those governing unfair dismissals, termination of employment for economic reasons, severance payments, minimum notice periods, administrative authorization for dismissals, and prior consultations with trade unions and/or labour administration representatives". It directly increase the firing costs of firms. In this sense, we measure EPL as the cost of firms to fire a worker. In contrast, firms in the informal sector bears no cost of firing workers as they are out of formal regulations.

With respect to the formal sector, we assume that it is characterized by search frictions and is subject to EPL. The assumption of search frictions indicates that it takes time for workers and firms to calibrate. Once an unemployed worker and a vacancy have been matched, the firm starts to produce. The job relationship ends when the firm finds it unprofitable to continue it. Since the job relationship is subject to employment protection legislation, the firm bears a cost to job separation. In terms of the linkage between the formal and informal sectors, one crucial assumption in this study is that workers in the informal sector cannot find jobs directly in the formal sector. Rather, they need to be unemployed in the formal sector to begin with. Workers' decisions to move between two sectors then depends on the relative gain of making the movement.

In this chapter, the effects of EPL on a range of labour market outcomes are evaluated. The comparative statics indicate that rising costs of laying off workers unambiguously decrease the labour market's tightness and a firm's reservation productivity. Both job creation and job destruction are eschewed. The model also predicts that given a Cobb–Douglas-form job matching function, there is a U-shaped relationship between layoff costs and the size of the informal sector and an inverse U-shaped relationship between layoff costs and the wage rate in the formal and informal sectors. When layoff costs are low, rising layoff costs increase the wage rate in the formal and informal sectors. However, it makes the prospect of working in the formal sector better than that in the informal sector. There is a movement of workers from the informal sector to the formal sector. As layoff costs pass a certain threshold, both formal and informal wages fall with rising layoff costs. In addition, as layoff costs increase, workers who are seeking jobs in the formal sector would find it more profitable to work in the informal sector. Consequently, there is a movement of

workers from the formal sector to the informal sector. The results indicate that although EPL do not apply to the informal sector, they can still affect the informal sector through their effects on the formal sector. A numerical study is also conducted in this chapter. The calibration results are consistent with the model predictions.

1.4.2 Chapter 3

In chapter 3, we empirically examine the effect of EPL on the formal–informal divide in the context of China's urban labour market. As an emerging economy, China has been undergoing sweeping reforms in its labour market in recent years. In 2008, it enacted the CLCL to regulate labour relations and enhance the protection of workers. Ever since its enactment, it has attracted heated debate. A stricter employment protection legislation will in no doubt increase the job security for formal workers. However, it is argued that informal workers and the unemployed could find it more difficult to find jobs in the formal sector. (Bosch, 2007). Therefore, the study of the effects of EPL on the labour market has great policy implications.

In this study, the main challenge is the empirical strategy. In the Chinese context, as the CLCL is a one-off law reform and regulates all labour relations, there is only a one-off change in the overall level of EPL. No regional variation can be found in the level of EPL before or after the changes in the law. In addition, the CLCL is applied to all labour relations, which means that we are unable to identify an appropriate control group to study the policy effects. In other words, it is difficult to extricate the pure effect of EPL change from other factors such as the financial crisis in 2008. To overcome this problem, we explore the effects of EPL by examining the effects of regional variations in the enforcement of EPL and the judiciary orientation.

In this study, a range of indicators are used to measure the enforcement of EPL and the judiciary orientation, including the labour inspection rate, incidence of labour dispute, court efficiency, and share of pro-worker resolutions. Panel data discrete choice models are estimated to predict individuals' probabilities of being in each employment status. The main advantage of panel data is that we are able to control for the individual unobserved heterogeneity. A problem with these indicators is the potential endogeneity. Stricter enforcement of EPL in one province can be a response to the large share of informal employment in the total employment. In this sense, the purpose of this chapter is not to evaluate the causal relationship between EPL and labour market outcomes. Rather, we would like to examine the associations between the enforcement of EPL, the judiciary orientation and individuals' employment status choices.

The dataset we use in this study is China Health and Nutrition Survey (CHNS). It is a longitudinal dataset with rich information on individuals' employment information. An individual's employment status is divided into four categories in our study, i.e., out of labour force, unemployed, informally employed, and formally employed. The decision making process of an individual is to choose one employment status which maximise his/her personal utility. A multinomial logit model with random effects is estimated to account for correlated random effects. The results show that there is weak evidence for an association between EPL enforcement and the judiciary orientation indicators and labour force participation, and for the association between these indicators and employment status choices. The results indicate that workers from provinces with high incidence of labour disputes are associated with higher probability of formal employment and lower probability of informal employment.

1.4.3 Chapter 4

Chapter 4 considers another important issue of the China's urban labour market: the wage gap between urban workers and rural-to-urban migrants. According to the National Bureau of Statistics of China (2016), the number of rural migrants in the urban labour market is estimated to have reached 270 million in 2015. Although the migrant urban wage gap is generally narrowing, the wage ratio of rural migrants to urban workers is constantly below 1 (Lu, 2012; National Bureau of Statistics of China, 2016). Nevertheless, a wage gap between two groups of workers in the labour market does not necessarily mean that one group is discriminated against.

In this study, we use the wage decomposition method to study the wage gap between urban workers and rural-to-urban migrants. Particularly, a nonparametric matching approach proposed by Nopo (2008) is employed. The main advantage of the approach lies in the fact that it deals with the common support problem. The common support problem is often considered in program evaluation literature. When drawing causal inferences, researchers usually attempt to compare observations in one state with comparable observations in another state (Lechner, 2001). Thin common support or no common support is likely to increase the bias and variance of estimators (Kahn and Tamer, 2010). Another advantage of the approach is that the nonparametric decomposition of the wage gap overcomes the misspecification problem.

The dataset that we use in this study is the second wave of the Rural to Urban Migration in China (RUMiC) dataset. It contains more than 9,000 observations on each group of workers and covers the main provinces and cities exporting and importing migrants. The results show that the size of the unexplained wage gap (the residual wage gap after correction for individual heterogeneity) compared with the mean wage gap between urban workers and rural migrants in the China's urban labour

market decreases significantly from nearly 50% to 29.7% if we compare comparable individuals. In addition, results indicate that labour market segmentation also contributes to the unexplained wage gap between urban workers and urban migrant workers in China. The size of the unexplained wage gap compared to the mean wage of rural migrant workers decreases from 10.8% to 9.4% when we control for occupation in the matching process. We also see a reduction in the size of the unexplained wage gap from 10.8% to 9.2% when we control for firm ownership. The results on the distribution of the unexplained wage gap show that male migrants face a larger unexplained wage gap than female migrants. The unexplained wage gap is also larger in group with higher education and in group with more job experience. We also find almost all of the unexplained wage gap is from state sector.

Chapter 2: The Effect of employment protection legislations on labour market outcomes in a model with an informal sector

2.1 Introduction

EPL generally refers to the regulatory provisions on dismissals and severance payments (Cazes and Nesporova, 2003). It plays a key part of the labour market institutions throughout the world. However, the economic effect of EPL on labour market outcomes is a controversial issue and has attracted heated debate among economists and policymakers. Economists who advocate the need of EPL argue that EPL is an important tool to deal with labour market failures such as underinvestment to human capitals and discrimination (Botero et al., 2004; Boeri and van Ours, 2013). Those who are against EPL claim that it is responsible for the high unemployment observed in the Europe (e.g. OECD (1994)).

Previous theoretical studies of the effects of EPL on labour market outcomes often focus on the developed countries (e.g. Lazear (1990); Hamermesh (1989) and Cahuc and Zylberberg (2004)). Very few look at the issue in the context of developing countries. What makes the developing countries labour market distinct is the large informal sector. Although the informal sector is an important component in both developed and developing economies. Its size can be up to 80% of the total labour force in the developing countries (Schneider and Enste, 2000). In addition, the informal sector in the developing countries features low productivity, bad work conditions and is usually out of any formal regulations. Although EPL is designed to

directly regulate the formal sector, it may have some indirect impact on informal sector. For example, following a reform of EPL, the value of working in formal sector might be higher, which makes it more attractive for those working in the informal sector to search for a job in the formal sector. The size of the informal sector may be reduced. Therefore, it is of great policy implications to research the links between EPL and the informal sector.

The purpose of this chapter is to evaluate the effects of EPL in an equilibrium search model which includes an informal sector. The study has been constructed on a basic job search and matching model based on the Mortensen and Pissarides (1994). In this model, the formal sector is characterised with search frictions and is also subject to EPL. EPL in this model is measured as firing costs to firms. The model also contains an informal sector which is assumed to be marginal, competitive and out of any formal regulations. In the meantime, workers can find jobs instantaneously in the informal sector. Worker's decision to move between two sectors then lies on the relative gains of making the movements. One crucial assumption about the model is the formal-informal linkage. We follow an assumption widely made in the migration literature (e.g. (Fields, 1975), Zenou (2008)) that workers in the informal sector should be employed first in order to find a formal sector job. Under these assumptions, worker's employment decisions are determined by the expected payoff in different sector.

Our model indicates that EPL restrains both job hiring and job firing. Its effects on wages and employment in each sector and unemployment is ambiguous. However, given the functional form of the matching function, we found a U-shape relationship between EPL and the size of the informal sector; and an inverted U-shape relationship between EPL and the size of the formal sector, the average wage in the formal sector and the wage in the informal sector. The net effect on unemployment is ambiguous. It

indicates that a moderate level of EPL in an economy can serve as a tool to tackle the informality.

The chapter is organised as follows. Section 2.2 is a review of relevant theories and developments in linking EPL and labour market outcomes. Section 2.3 provides the details of the model and its predictions. Section 2.4 presents the model calibration. Section 2.5 provides some concluding remarks.

2.2 Literature Review

For the past three decades, numerous theories and empirics have been carried out to establish links between EPL and labour market outcomes. Early studies mainly focus on partial equilibrium analysis. Hamermesh (1989) asserts that stricter EPL might result in a lower labour demand if wage is constant and capital and labour are the only two factors of input. In this case, a firm can always substitute labour with capital in response to the rising hiring costs. Bentolila and Bertola (1990) use stochastic control techniques to see the effects of both rising hiring and firing costs on firm's dynamic labour demand. Under the assumption of a fixed cyclical pattern of wage, they find that labour turnover costs will reduce a firm's propensity to fire and hire simultaneously during recession. It means labour turnover rate decreases. However, the average employment effect is ambiguous since the net amount of workers being deterred from firing and hiring are unclear and depend entirely on model specifications (e.g. the shape of marginal product of labour (MPL) and the assumptions over discounting and voluntary job turnover (Bertola, 1992)). To see, for example, how the effect of EPL on employment depends on shape of MPL, Blau and Kahn (2002) illustrate that if the shape of marginal product of labour during recession is relatively flatter than it is during boom, rising firing costs due to EPL will deter relatively more

displacements and result in relatively fewer job hires. It is because without firing costs, it requires more dismissals and less hires to bring the marginal product of labour equal to wage. Hence, the average employment level is higher. Conversely, the average employment will be lower when marginal product of labour at recessions is steeper than at booms.

The resulting reduction in labour turnover rate, according to Hamermesh (1993), can play a role of smoothing the employment fluctuations along business cycles. In the presence of EPL, firms would fire less when they are facing negative demand shocks and would have less incentive to hire when economy is booming to avoid high firing costs in future. Bertola (1999) also point out that lower labour turnover rate resulting from EPL may deter the job reallocation from shrinking old sectors to booming new sectors.

EPL can also affect the employment structure of the labour market. If information asymmetry is introduced, firms would prefer to hire those job-seekers with previous work experiences than those without because productivity of the former is easier to be identified. In this case, for job seekers without work experiences would be more difficult to find a job with stricter EPL (Kugler & Saint-Paul, 2004). Moreover, in certain labour-intensive industries like construction and manufacturing industries, employers would be less likely to hire young and senior workers (Montenegro and Pages, 2004).

However, as Lazear (1990) points out, under a flexible wage assumption firms can always respond to an increase in labour turnover costs by signing contracts with workers at lower wage rate before jobs start. In this case, the above mentioned effects

of EPL on worker turnover, employment level and employment structure could be exactly offset.

The link between EPL and wage can be captured by efficiency wage theory. According to Shapiro and Stiglitz (1984), the existence of an equilibrium efficiency wage above market clearing level is attributable to the need for preventing workers from shirking. In other words, the efficiency wage acts as a threat to dismiss for misconduct. Fellal (2000) states that high efficiency wages, potentially also stimulate employers to make more efforts in recruitments to ensure that employees are of high quality so that dismissals may decrease. However, Boeri and Jimeno (2005) asserts that, the introduction of EPL will dampen these efforts. Because EPL in most countries has strict restrictions on both economic and disciplinary dismissals, firms usually find it difficult to prove misconducts. As a consequence, probabilities of those non-disciplinary workers being dismissed will decrease and equilibrium efficiency wage rate is expected to increase.

Lindbeck and Snower (2001) asserts that the introduction of EPL will exacerbate an insider-outsider segmentation. According to insider-outsider theory, the existence of unemployment can also be explained by an insider-outsider divide or dual labour markets of which insiders enjoys more privileges on wage settings than outsiders. The privileges often come from the existence of labour turnover costs for employers or labour unions. Hiring of an outsider will induce job specific training costs and the labour unionization can enhance the bargaining power of insiders. In this case, employers will not accept an underbidding of the wage from outsiders. Clearly, there is an instantaneously 'labour hoarding' effect of the EPL. However, its long run effect over firm's employment level is ambiguous and relies on economic conditions. (Kan and Lin, 2011)

In recent years, equilibrium search models have become the standard tools to study the effects of EPL. The main assumption of this type of models is that there are search frictions in the labour market. It means that it takes time for employers and employees to match. This search friction assumption in an equilibrium model provides us with a quite tractable framework to study unemployment fluctuations, worker flows and a large range of other variables which other models can not characterize. Cahuc and Zylberberg (2004) have extended Mortensen and Pissarides (1994) model to examine the effects of EPL under different wage settings. In their model, EPL is associated with firm's firing costs only. Setting the wage to be exogenous, it predicts that stricter EPL results in less job turnover, longer unemployment duration and also ambiguous unemployment effect. And these effects will be strengthened when wage is set through bargaining between employers and employees. It also predicts that the hiring wage is driven down by stricter EPL which is consistent with Lezear's argument. Similar results are also reported by Garibaldi (1998). The distinctive feature of his model is that instead of fixed firing costs, EPL is assumed to be associated with mandatory firing permissions. In addition, he has compared the variations of both job destructions and job creations along business cycles.

There is also a growing trend to model informality in the labour market and its interactions with EPL. Motivated by the empirical evidence from Mexico and Brazil where the labour markets are characterized by changes in the proportion of formal jobs, Bosch (2007) justify the assumption that firms can create both formal and informal contracts for similar jobs in a Mortensen and Pissarides (1994) type search matching model. In his model, the EPL is associated with a firing cost for ending a formal contract. Informal contracts are not regulated by EPL but are subject to job destruction and fines once being detected. Hence, there is an opportunity cost of signing informal

contracts and the choice over formal and informal contract depends on each party's trade-off among contracts. The comparative statics of the model show that an increase in the firing costs will not only reduce job creation and job destruction in the formal jobs but also reallocate jobs from the formal to the informal type. Since the opportunity costs for informal jobs are generally low in developing countries, this reallocation effect is very likely to be large.

Rather than modelling intra-firm decision choices, Albrecht et al. (2009) build a Mortensen and Pissarides type model with an informal sector to study the effects of EPL on inter-sectoral mobility of workers. In this model, EPL is modelled as a pure severance tax and also only applied to formal jobs. The rules governing the labour flow among sectors are complicated. Workers are assumed to be ex-ante heterogeneous in terms of formal sector productivities and equally productive in the informal sector. However, workers cannot sort themselves perfectly. Most productive workers will always choose to stay in formal sector and least productive workers will always stay in informal sector. Therefore, the increase in severance payment will only affect those in the middle. Due to the complexity of the model, the policy effect can only be solved numerically. Their simulation results show that stricter EPL depresses both average productivity and net output. It also results in a flow of workers from formal to informal sector and lower overall unemployment and therefore lower the number of formal-sector works. Average employment duration in the formal sector increases.

Another strategy is to take informal sector as competitive. Zenou (2008) has assumed that informal sector is simply competitive and there is no friction in this sector. Every worker can find a job instantaneously in the informal sector and earns

his marginal product. He then examines the effects of various policies over the labour outcomes. However, the effects of EPL can hardly be examined in this framework.

Our model is to fill the gap by introducing a competitive informal sector as in Zenou (2008) and firing costs as a measure of stringency of EPL in a Mortenson and Pissarides (1994) type endogenous job search matching model. The main difference between our model and Bosch (2007) and Albercht et al. (2009) lies in the assumption about informal sector and how changes in policies affect the flow of workers among sectors. One advantages of our model is that it is more computationally simpler and tractable.

2.3 The Model

To see the effect of EPL on labour mobility in the context of developing countries, we have developed a variation of the Mortenson and Pissarides (1994) model. In this variation, we add an unregulated but competitive informal sector to the economy.

There are two sectors in this economy: a formal sector and an informal one. The formal sector is regulated by the government which in our context, means that firms in this sector are subject to severance tax payments. There are search frictions in the formal sector. Wage rates for workers in the formal sector are set through negotiations between firms and workers. In contrast, the informal sector is out of the formal regulation and firms can fire workers without incurring any payments. Workers in the informal sector can find job instantaneously and earn their marginal product. Hence, there is no unemployment in the informal sector.

The total labour force in this economy is L and we assume that all workers are ex ante identical in their productivity. Let

$$L = L_f + L_i + L_u$$

L_f is the volume of workers working in the formal sector. L_i is the volume of workers in the informal sector. L_u is the volume of unemployed in the formal sector.

Time is continuous in this model. For simplicity, capital is ignored and all products are sold to competitive markets (i.e. producers are price-takers). We also normalise the price for one unit of goods produced in two sectors to be equal to 1.

2.3.1 The formal sector

There are many firms in the formal sector. Firms enter the sector with vacancies which can either be filled by workers or remain vacant. The formal sector is characterised by search frictions which means it takes time for firms and workers to match. A job is filled when a firm and a worker are matched and an employment contract has been signed. There is no on the job search. For convenience, we assume that each firm can hire up to one worker. Following Mortensen and Pissarides (1999), we can write the job matching function as follow:

$$M = M(L_u, v)$$

Where v is the volume of job vacancies. Assume that *M(.)* is increasing in its arguments, concave and homogenous of degree 1. Given the matching function, we can derive the expressions for job finding rate and job filling rate. The probability for an unemployed to find a job in the formal sector is $\frac{M(L_u,v)}{L_u}$ and a vacancy is filled in each period with probability $\frac{M(L_u,v)}{v}$. Let $\theta = \frac{v}{L_u}$ be the labour market tightness. The job filling rate can be expressed as $\frac{M(L_i,v)}{v} = M\left(\frac{1}{\theta}, 1\right) = q(\theta)$ and job finding rate can be expressed as

$\frac{M(L_i,v)}{L_i} = M\left(1, \frac{v}{L_u}\right) = \theta q(\theta)$. In addition, we assume that $q'(\theta) \leq 0$ and $\frac{\partial(\theta q(\theta))}{\partial \theta} \geq 0$[4]. These imply that as labour market tightness increases vacancies are more difficult to be filled and it is easier for an unemployed to find a job. By definition, both $q(\theta)$ and $\theta q(\theta)$ should be in the range [0, 1].

Once a vacancy is filled, the worker starts to produce. The productivity of the job is x and it is idiosyncratic. We assume that the job productivity is subject to idiosyncratic shocks. The productivity of the job would change from x to a new level x' once a shock arrives. x' is drawn from distribution G(x) and with $0 \leq x \leq 1$. Moreover, as in Pissarides (2000), we assume that once a job is filled, the worker starts to work with his maximum idiosyncratic productivity 1. Job ends when the new realized productivity falls below a certain level which makes it unprofitable for the firm to sustain the job and this job separation incurs a firing cost to the firm.

2.3.2 The informal sector and formal-informal linkage

The informal sector is assumed to be competitive in this two sector economy. Each worker can get a job instantaneously in this sector so there is no unemployment in the informal sector. Informal sector in this economy is not subject to any formal labour regulations. Labour is the only factor of production in the informal sector. The production function can be written as $f(L_i)$ with $f'(L_i) > 0$ and $f''(L_i) < 0$. The wage rate for an informal worker is simply $w_i = f'(L_i)$.

One crucial assumption is that workers in the informal sector cannot directly search for a job in the formal sector but need first to be unemployed in the formal sector. Similar assumption can be found in Fields (1975) where in a modified Harris-Todaro

[4] For example, a Cobb-Dauglas form matching function $AL_u{}^{\alpha}v^{1-\alpha}$ satisfy these properties.

(1970) model rural workers need to be unemployed first in urban area in order to find an urban sector job. In the case of our model, it can be attributed to the long working hours of the informal sector jobs which are common in many developing economies. Assuming in this way, we have modelled an economy where informal sector is a marginal sector and is taken as the last resort to avoid unemployment which is believed to be the case in many less developed economies.

2.3.3 Utility functions

We look at the steady state situations. Let $J_f(x)$, be the present discounted value of a formal sector job with idiosyncratic productivity x. $w_f(x)$ is the associate wage rate paid to the worker. V is the expected profit for a firm with a vacancy. r is the discount rate. The idiosyncratic productivity shocks follow a Poisson process with a rate of λ. Value functions for a filled job and a vacancy are therefore,

$$rV = -c + q(\theta)\left[J_f(1) - V\right] \tag{2.1}$$

$$rJ_f(x) = x - w_f(x) + \lambda \int_0^1 max\left[J_f(s), V - F\right]dG(s) - \lambda J_f(x) \tag{2.2}$$

A vacancy has an instantaneous cost of –c. The vacant job meets workers with a probability $q(\theta)$. Once the vacancy is matched with a worker, the worker starts to produce at his maximum productivity 1. Equation (2.2) is also easy to interpret. A filled job with current productivity *x* generates an instantaneous profit $x - w_f(x)$. At rate λ the job is subject to an idiosyncratic shock. After the realization of new productivity, the firm has two choices. It can either produce at the new productivity level or simply fires the worker if it is not profitable to sustain the job relationship. The firing cost is assumed to be F and for simplicity we assume it is a severance tax so it is not transferred to the fired worker.

Let W_f(x) be the present discounted value for a worker with current productivity x in the formal sector. U is his associated expected benefit while unemployed. The following value functions hold,

$$rU = b + \theta q(\theta)[W_f(1) - U] \tag{2.3}$$

$$rW_f(x) = w_f(x) + \lambda \int_0^1 max\left[W_f(s), U\right] dG(s) - \lambda W_f(x) \tag{2.4}$$

The flow value of an unemployed worker is his instantaneous unemployment benefit b plus his future expected incomes. A job offer comes with a probability $\theta q(\theta)$ in each period. Once the job relationship is established between a worker and the firm, the flow value for a worker with current productivity x equals his instantaneous wage $w_f(x)$ plus expected future incomes. The productivity shock arrives at rate λ. If the new realised productivity is really low, the firm will choose to end the job relationship so the worker becomes unemployed.

2.3.4 Wage bargaining and equilibrium conditions

Both workers and firms can benefit from job match and the joint surplus from a job match is $S_f(x) = W_f(x) - U + J_f(x) - V + F$. Here we assume it is shared through a generalised Nash Bargaining Process by the firm and the worker. Let β be the worker's bargaining power and 1-β be the firm's bargaining power. The Nash Bargaining solution gives

$$W_f(x) - U = \beta[J_f(x) + W_f(x) - V + F - U] \tag{2.5}$$

It is not difficult to see that both $W_f(x)$ and $\mathrm{J}_f(x)$ are increasing in x [5]. Let us define R be the cut-off productivity point where firms find it unprofitable to sustain the job relation. We have

$$W_f(R) = U \tag{2.6}$$

$$J_f(R) = V - F \tag{2.7}$$

To close the model, a set of equilibrium conditions are needed. The first equilibrium condition is the free entry condition of the firms. In equilibrium, the present discounted value of holding a vacancy should be equal to zero otherwise firms can generate profits by simply opening vacancies. Hence we have,

$$V=0 \tag{2.8}$$

Given the property of *R* and (2.8), we can also rewrite (2.2) and (2.4) as

$$r\mathrm{J}_f(x) = x - w_f(x) + \lambda \int_R^1 \mathrm{J}_f(s)dG(s) - \lambda G(R)F - \lambda \mathrm{J}_f(x) \tag{2.9}$$

$$rW_f(x) = w_f(x) + \lambda \int_R^1 W_f(s)dG(s) + \lambda G(R)U - \lambda W_f(x) \tag{2.10}$$

In addition, the zero flow condition ensures that the flow of workers in and out of employment in the formal sector are equal in equilibrium

$$\lambda G(R)L_f = \theta\, q(\theta)L_u \tag{2.11}$$

According to equation (2.1), (2.3), (2.5), (2.9) and (2.10) we can derive the expressions for U and $w_f(x)$,

$$rU = b + \frac{c\theta\beta}{1-\beta} + \frac{\beta\theta q(\theta)F}{1-\beta} \tag{2.12}$$

[5] See Appendix A.

$$w_f(x) = \beta x + (1-\beta)b + c\theta\beta + r\beta F + \theta q(\theta)\beta F \quad (2.13)$$

Equation (2.13) is the formal sector wage function with current productivity *x*. It is straightforward to see that it increases in θ and F. As labour market tightness increases, firms find it more difficult to recruit a worker and the wage rate he would like to pay to the worker also increases. The stricter the EPL, firms pays more severance tax if the job ends so they would like to pay more to the workers to keep them longer.

Substituting (2.13) into (2.9), we obtain

$$r\mathrm{J}_f(x) = x - \beta x - (1-\beta)b - c\theta\beta - r\beta F - \theta q(\theta)\beta F + \lambda \int_R^1 \mathrm{J}_f(s)dG(s) - \lambda G(R)F - \lambda \mathrm{J}_f(x) \quad (2.14)$$

Evaluating (2.14) at $X=R$ and deducting it from (2.14), we have

$$\mathrm{J}_f(x) = \frac{(1-\beta)(x-R)}{(r+\lambda)} - F \quad (2.15)$$

Evaluate (2.15) at x=1 gives us the job creation condition,

$$(r+\lambda)\frac{c}{q(\theta)} = (1-\beta)(1-R) - (r+\lambda)F \quad (2.16)$$

It implies that the expected gains from creating a new job must be equal to the expected cost of hiring a worker. Clearly, R is negatively correlated with θ.

Replacing the term $\mathrm{J}_f(s)$ on the right hand side of (2.14) with (2.15), we have

$$(r+\lambda)\mathrm{J}_f(x) = x - \beta x - (1-\beta)b - p\theta\beta - r\beta F - \theta q(\theta)\beta F + \frac{\lambda(1-\beta)}{r+\lambda}\int_R^1 (\mathrm{s} - R)dG(s) - \lambda F \quad (2.17)$$

Evaluating (2.17) at x=*R*, we obtain

$$(1-\beta)R = c\theta\beta + (1-\beta)b + \theta q(\theta)\beta F - (1+t-\beta)rF - \frac{\lambda(1-\beta)}{r+\lambda}\int_R^1 (\mathrm{s} - \mathrm{R})dG(s) \quad (2.18)$$

Equation (2.18) is the firm's job separation conditions. It is also not difficult to see that R is positively correlated with θ. Given (2.16) and (2.18), the values for R and θ are unique in equilibrium.

Workers' decisions to move into the formal sector depend on relative gain from making the movement. Let w_i be the wage rate received by informal sector workers. The value of an informal sector job should be equal to the discounted present value of all its current and future gains which are $\frac{w_i}{r}$. The value of being unemployed in the formal sector is U. In steady state,

$$U = \frac{w_i}{r} \quad (2.19)$$

Otherwise, workers would have incentives to move cross sectors.

Since the informal sector is competitive and labour is the only factor of production, we have

$$w_i = f'(L_i) \quad (2.20)$$

Given (2.12) (2.18) and (2.20), we have

$$rU = b + \frac{c\theta\beta}{1-\beta} + \frac{\beta\theta q(\theta)F}{1-\beta} = f'(L_i) \quad (2.21)$$

According to (2.21), the size of informal sector depends on labour market tightness. As labour market tightness increases, the informal sector shrinks which is due to the

greater job prospect in the formal sector. The effect of firing cost or severance tax over the size of informal sector is not clear because F also enters the expression for θ.

2.3.5 Definition and uniqueness of the equilibrium

Equilibrium of the model is a set of values for $\theta, L_f, L_i, L_u, R, V$ such that job creation condition (2.16), job destruction condition (2.18), free entry condition (2.8), zero flow condition (2.11) and no mobility condition (2.19) are all satisfied.

To illustrate, given a specific functional form for *G(x)* and exogenous parameter values, we can solve for R and θ according to (2.16) and (2.18) and they are unique. With values for R and θ, we can then calculate the values for L_f ,L_i and L_u seperately. Hence the equilibrium distribution of workers among sectors is recovered.

2.3.6 Comparative Statics

In this section I examine the effects of changes in firing costs over set of labour market outcomes.

Proposition 1: *An increase in the firing costs F will unambiguously decrease the labour market tightness and the reservation productivity in the formal sector. An increase in the firing costs F will decrease both job finding rate and job destruction rate.*

Proof: According to (16),

$$R = 1 - \frac{(r+\lambda)}{(1-\beta)}\frac{c}{q(\theta)} - \frac{(r+\lambda)}{(1+t-\beta)}F \quad . \tag{2.22}$$

Substituting (2.22) into (2.18) and differentiating (2.18) with respect to F, we have

$$\left\{\frac{(r+\lambda)cq\prime(\theta)}{[q(\theta)]^2}-\frac{d[\theta q(\theta)]}{d\theta}\beta F-c\beta+\frac{\lambda(1-\beta)}{(r+\lambda)}\int_R^1(s-R)\left[\frac{(r+\lambda)cq'(\theta)}{[q(\theta)]^2}\right]dG(s)\right\}\frac{\partial\theta}{\partial F}=\lambda+$$

$$\beta\theta q(\theta)+\beta r+\lambda\int_R^1(s-R)dG(s) \quad (2.23)$$

Since $q'(\theta)<0$, $\frac{d[\theta q(\theta)]}{d\theta}>0$ and all exogenous parameter values are assumed to be positive, terms in the bracket of the LHS of equation (2.23) are all negative and terms on the RHS are all positive. Therefore, it is straightforward that $\frac{\partial\theta}{\partial F}<0$.

Also, differentiating both side of (2.22) with respect to F, we have

$$\frac{dR}{dF}=-\frac{(r+\lambda)}{(1-\beta)}\frac{cq\prime(\theta)}{[q(\theta)]^2}\frac{\partial\theta}{\partial F}-\frac{(r+\lambda)}{(1-\beta)}$$

Since $\frac{\partial\theta}{\partial F}<0$, it is easy to see that $\frac{dR}{dF}<0$.

It is also straight forward that $\frac{d\theta q(\theta)}{dF}=\frac{d[\theta q(\theta)]}{d\theta}\frac{\partial\theta}{\partial F}<0$ and $\frac{d\lambda G(R)}{dF}=\lambda G'(R)\frac{dR}{dF}<0$.

■

The increase in the firing costs has decreased the labour market tightness which makes the firms difficult to fill their vacancies. At the same time, firms are more cautious in firings. They can bear a lower reservation productivity level than before which incurs less job destructions.

Proposition 2: *An increase in the firing cost F has an ambiguous effect on wages in both the formal and the informal sector. It also has an ambiguous effect on the relative size of the informal sector and the formal sector unemployment rate.*

Proof: differentiating (2.13) and (2.21) with respect to F, we have

$$\frac{dw_f(x)}{dF}=\beta\left\{c+F\{\frac{d[\theta q(\theta)]}{d\theta}\}\right\}\frac{\partial\theta}{\partial F}+\beta[r+\theta q(\theta)] \quad (2.24)$$

$$\frac{dw_i}{dF}=\frac{\beta}{1-\beta}\{c+F\left\{\frac{d[\theta q(\theta)]}{d\theta}\right\}\}\frac{\partial\theta}{\partial F}+\frac{\beta}{1-\beta}\theta q(\theta) \quad (2.25)$$

Since $\frac{\partial\theta}{\partial F} < 0$, the signs of both $\frac{dw_f(x)}{dF}$ and $\frac{dw_i}{dF}$ are ambiguous and the directions of the partial effect can be different according to (2.24) and (2.25). As $w_i = f'(L_i)$, the sign of $\frac{dL_i}{dF}$ is also ambiguous in this model.

Given the zero flow condition in (2.11), the formal sector unemployment rate can be derived as:

$$u_f = \frac{L_u}{L_u + L_f} = \frac{\lambda G(R)}{\lambda G(R) + \theta\, q(\theta)} \tag{2.26}$$

Differentiating u_f with respect to *F*,

$$\frac{du_f}{dF} = \frac{\lambda G'(R)\frac{dR}{dF}[\lambda G(R) + \theta\, q(\theta)] - \lambda G(R)\{\lambda G'(R)\frac{dR}{dF} + \frac{d[\theta q(\theta)]}{d\theta}\frac{\partial\theta}{\partial F}\}}{[\lambda G(R) + \theta\, q(\theta)]^2} \tag{2.27}$$

The effect of firing costs on unemployment is also ambiguous and depends on the net flow of workers among formal employment and unemployment as both job hiring and job firing are constrained. ■

Different from common predictions in the literature where firing costs in the formal sector will lead to a flow of workers from formal to informal sector, we find the size of formal sector may rise. If firing cost raises the value of an unemployed, informal sector workers will find it profitable to move into the formal sector.

The Proposition 2 can be further explored by explicitly assuming the functional form of job matching functions. Assuming that the matching function is in Cobb-Dauglas form where $\mathrm{M}(L_u, v) = A{L_u}^{\alpha}v^{1-\alpha}$ where A>0 and $0 < \alpha < 1$. Then we have job finding rate $\theta q(\theta) = \mathrm{A}\theta^{1-\alpha}$ and job filling rate $q(\theta) = \mathrm{A}\theta^{-\alpha}$. By definition, $0 < A\theta^{1-\alpha} < 1$ and $0 < A\theta^{-\alpha} < 1$.

Proposition 3: *Wages in formal and informal sector increase with firing costs when firing costs are small and decreases with it when F is above a certain threshold. There is a U-shape relationship between F and the size of the informal sector. To be exact,*

$$\frac{dw_f(x)}{dF} > 0 \text{ if } \begin{cases} 0 < \alpha < \frac{1}{2} \text{ and } F < \frac{r-c+1}{(1-\alpha)A^2} \\ \frac{1}{2} \leq \alpha < 1 \text{ and } F < \frac{r-c+1}{(1-\alpha)A^{\frac{1}{1-\alpha}}} \end{cases}$$

$$\frac{dw_f(x)}{dF} < 0 \text{ if } \begin{cases} 0 < \alpha < \frac{1}{2} \text{ and } F > \frac{r-c+1}{(1-\alpha)A^2} \\ \frac{1}{2} \leq \alpha < 1 \text{ and } F > \frac{r-c+1}{(1-\alpha)A^{\frac{1}{1-\alpha}}} \end{cases}$$

$$\frac{dw_i(x)}{dF} > 0 \text{ if } \begin{cases} 0 < \alpha < \frac{1}{2} \text{ and } F < \frac{1-c}{(1-\alpha)A^2} \\ \frac{1}{2} \leq \alpha < 1 \text{ and } F < \frac{1-c}{(1-\alpha)A^{\frac{1}{1-\alpha}}} \end{cases}$$

$$\frac{dw_i(x)}{dF} < 0 \text{ if } \begin{cases} 0 < \alpha < \frac{1}{2} \text{ and } F > \frac{1-c}{(1-\alpha)A^2} \\ \frac{1}{2} \leq \alpha < 1 \text{ and } F > \frac{1-c}{(1-\alpha)A^{\frac{1}{1-\alpha}}} \end{cases}$$

Proof: following Proposition 2, $\frac{dw_f(x)}{dF} > 0$ if $\frac{d[\theta q(\theta)]}{d\theta} F + c - \theta q(\theta) - r < 0$. To explore this condition, we can find if $0 < \alpha < \frac{1}{2}$, we have $0 \leq \theta \leq (\frac{1}{A})^{\frac{1}{\alpha}}$ and $\frac{d[\theta q(\theta)]}{d\theta} = A(1-\alpha)\theta^{-\alpha} \geq (1-\alpha)A^2$. In the case $\frac{1}{2} \leq \alpha < 1$, we have $0 \leq \theta \leq \left(\frac{1}{A}\right)^{\frac{1}{1-\alpha}}$ and $\frac{d[\theta q(\theta)]}{d\theta} = A(1-\alpha)\theta^{-\alpha} \geq (1-\alpha)A^{\frac{1}{1-\alpha}}$.

Therefore, we have $\frac{dw_f(x)}{dF} > 0$ *if* $0 < \alpha < \frac{1}{2}$ and $F < \frac{r-c+\theta q(\theta)}{A(1-\alpha)\theta^{-\alpha}} \leq \frac{r-c+\theta q(\theta)}{(1-\alpha)A^2} \leq \frac{r-c+1}{(1-\alpha)A^2}$; $\frac{dw_f(x)}{dF} > 0$ *if* $\frac{1}{2} \leq \alpha < 1$ *and* $F < \frac{r-c+1}{(1-\alpha)A^{\frac{1}{1-\alpha}}}$; $\frac{dw_f(x)}{dF} < 0$ if $0 < \alpha < \frac{1}{2}$ *and* $F > \frac{r-c+1}{(1-\alpha)A^2}$; $\frac{dw_f(x)}{dF} < 0$ *if* $\frac{1}{2} \leq \alpha < 1$ and $F > \frac{r-c+1}{(1-\alpha)A^{\frac{1}{1-\alpha}}}$.

Similarly, $\frac{dw_i}{dF} > 0 \; if \; 0 < \alpha < \frac{1}{2} \; and \; F < \frac{1-c}{(1-\alpha)A^2}$; $\frac{dw_i}{dF} > 0$ if $\frac{1}{2} \leq \alpha < 1$ and $F < \frac{1-c}{(1-\alpha)A^{\frac{1}{1-\alpha}}}$.

$\frac{dw_i}{dF} < 0 \; if \; 0 < \alpha < \frac{1}{2}$ and $F > \frac{1-c}{(1-\alpha)A^2}$; $\frac{dw_i}{dF} > 0$ if $\frac{1}{2} \leq \alpha < 1$ and $F > \frac{1-c}{(1-\alpha)A^{\frac{1}{1-\alpha}}}$.

Since $w_i = f'(L_i) > 0 \; and \; f''(L_i) < 0$, L_i is negatively correlated with informal sector wage. So we have

$$\frac{dLi}{dF} < 0 \text{ if } \begin{cases} 0 < \alpha < \frac{1}{2} \; and \; F < \frac{1-c}{(1-\alpha)A^2} \\ \frac{1}{2} \leq \alpha < 1 \; and \; F < \frac{1-c}{(1-\alpha)A^{\frac{1}{1-\alpha}}} \end{cases}$$

$$\frac{dLi}{dF} > 0 \text{ if } \begin{cases} 0 < \alpha < \frac{1}{2} \; and \; F > \frac{1-c}{(1-\alpha)A^2} \\ \frac{1}{2} \leq \alpha < 1 \; and \; F > \frac{1-c}{(1-\alpha)A^{\frac{1}{1-\alpha}}} \end{cases} \quad \blacksquare$$

When firing costs are relatively low, an increase in firing costs would result in an increase in wages in both formal and informal sector. However, further increase in F would result in lower wages when F is over a certain threshold. The graph below illustrate the relationship between F and L_i. The size of informal sector goes down first and then goes up with firing costs. There is a U-shape relationship between firing costs and the size of the informal sector in this urban labour market. It implies a moderate level of firing costs can reduce the level of informality in the urban labour market.

This is different from the traditional theoretical prediction that firing costs will unambiguously lead to informality in urban market. The mechanism underlying previous literature such as Bosch (2007) and Albrecht et al (2009) is usually that firing costs lower formal sector firm's reservation productivity. Therefore, as workers are ex-ante identical, workers are less likely to be working in informal sector. In contrast,

our model employs a competitive informal sector setting and workers decision makings are based on comparing expected payoffs from informal sector jobs and formal sector unemployment. In this context, an increase in firing costs will on one hand decreases workers probability to be fired in the formal sector. On the other hand, part of the increase in firing costs are transferred to workers through wage bargaining. When firing costs are relatively small, increases in job security outweighs the increase in wage loss caused by firing costs. The value to be unemployed in the formal sector increases. We can observe a flow of workers from informal sector to formal sector. On contrary, when firing costs are large, value to be unemployed in the formal sector decreases, we can observe a flow of workers from formal sector to informal sector until $'(L_i) = w_i$.

2.3.7 Introduction of capital to the model

Capital decisions can also be included in the model. Pissarides (2000) has discussed about this issue and shows that under the assumption of a perfect second hand market for capital goods, main features of the equilibrium unemployment model are unchanged. In addition, the assumption of matching frictions doesn't affect the capital decisions. To see these, let's assume that there is perfect market for formal sector firms to trade in capital goods. The firm can also buy and sell capital goods at the price of the output. There is also no time lapse for the firm to execute the decision of selling the capital goods. Therefore, capital goods will only be bought once a job is filled. Let *H(K, L)* be the two factor production function with first-order and second order partial derivatives satisfying $H_K > 0, H_L > 0, H_{KK} > 0, H_{LL} > 0$. We also assume *H(K, L)* is strictly quasi-concave which means the isoquants are strictly convex to the origin. We also assume *H(K, L)* is homogenous of degree 1. Let *k* be the unit of capital goods per efficient unit of labour and *h(k)* be the production per efficient unit of labour. The

realised productivity *x* is in the range of [R, 1] which can be interpreted as efficient unit of labour. Hence, the total output of a filled job can be expressed as *xh(k).* The total capital purchased by the firm is *xk.* When a productivity shock arrives and the new realised productivity *x'* is less than *R*, the job matching will separate and the firm will sell the capital. If *x'* is greater than *R*, the firm will sell *(x-x')k* units of capital goods in the market. (2.2) then can be rewritten as,

$$r[J_f(x) + xk] = x[h(k) - \delta k] - w_f(x) + \lambda \int_0^1 max\left[J_f(s), V - F\right]dG(s) - \lambda J_f(x) \quad (2.28)$$

Here δ is the rate of depreciation of capital goods. Differentiate (2.22) with respect to *k* will obtain

$$h'(k)=r+\delta \quad (2.29)$$

(2.28) is another equilibrium condition to the model. It is the firm's decision rule for capital goods. However, the introduction of capital in this model won't affect value functions for workers, profit sharing condition, free entry condition, zero flow condition and no mobility condition. In this sense, (2.13) can be derived as

$$w_f(x) = \beta x[h(k) - (r + \delta)k] + (1 - \beta)b + c\theta\beta + r\beta F + \theta q(\theta)\beta F \quad (2.30)$$

In equilibrium, the value of *k* is given by (2.28). The difference between (2.13) and (2.30) is that it is simply a multiply of $h(k) - (r + \delta)k$ to the productivity *x.* It is not difficult to verify that all the properties of the model are not changed and the comparative statics are unaltered.

2.4 Model calibration

In this section, we explore the effects of firing costs numerically. Assume that the distribution function *G(x)* is uniform on the interval [0, 1] and the productivity shock arrives at rate 0.15.The matching function is assumed to be in Cobb-Douglas form $M(L_u, v) = AL_u{}^{\alpha}v^{1-\alpha}$. A is the scale factor which should be less than 1 to ensure an interior solution.(Rib ó and Vilalta-Buf í,2012). In this calibration, I set the value of A at 0.25. The informal sector production function is assumed to be in Cobb-Dauglas form where $(L_i) = 8L_i{}^{0.5}$. The total population in this economy is L=100. Other exogenous parameter values are listed in the Table 2.1.

Table 2.1: Policy configurations

β	λ	α	a	c	r
0.5	0.15	0.5	0.4	0.3	0.05

I start the calibration with a baseline case which models a labour market with a moderate size of its informal sector. I set the baseline firing cost F=0.3. The calibrated unemployment rate is 12% and about 34.4% of the population are working in the informal sector. The population of formal sector worker is 53.6. The calibrated job creation and job destruction rate are 23.6% and 5.3% respectively. The informal-formal wage ratio in this calibrated model is about 86%.

The Figure 2.1 to Figure 2.8 below show the effects of firing costs over labour outcomes. The calibration results show a decrease in both job creation and job destruction as firing costs increase. The trends are consistent with findings in other theoretical literature and empirical studies. If we focus on the formal sector, as firing costs go up, the formal sector employment shrinks. It implies the increase in the

expected formal sector employment duration outweigh the reductions in the job creation so that the unemployment in the formal sector decreases. As firing costs increases, jobs are less likely to be destroyed which makes formal sector jobs more attractive to workers in the informal sector. The reallocation of workers from informal to formal sector makes informal sector wage rate increase since marginal product of labour in informal sector increases.

Interestingly, although the model predictions are inconclusive, the calibration results are quite different from predictions from the literature where it is generally believed that firing costs lead to the informalization of the economy. It means the size of informal sector should be increasing rather than decreasing with firing costs in our calibrated model. According to Figure 2.1 – 2.8, rising firing costs not only increases formal sector wage and employment but also decreases unemployment. It implies employment protection legislation has led to a win-win situation for workers in both sectors. However, as was discussed in Proposition (3) the impacts of firing costs on formal/informal wage rates are largely affected by values of exogenous parameters. The calibrated results are valid as long as those parameters are corrected measured.

Figure 2.1: Effects of firing costs on labour market tightness θ

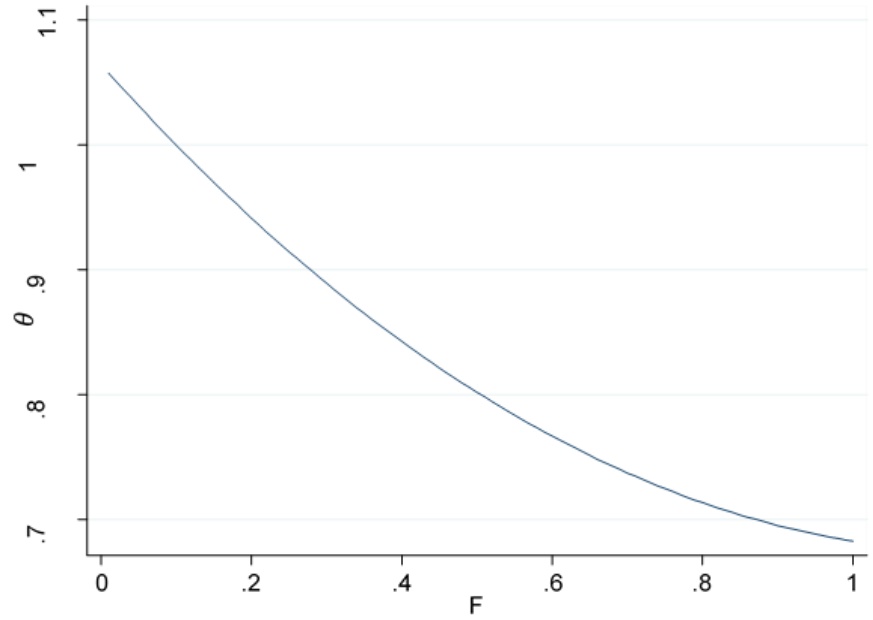


Figure 2.2: Effects of firing costs on job finding rate $\theta q(\theta)$

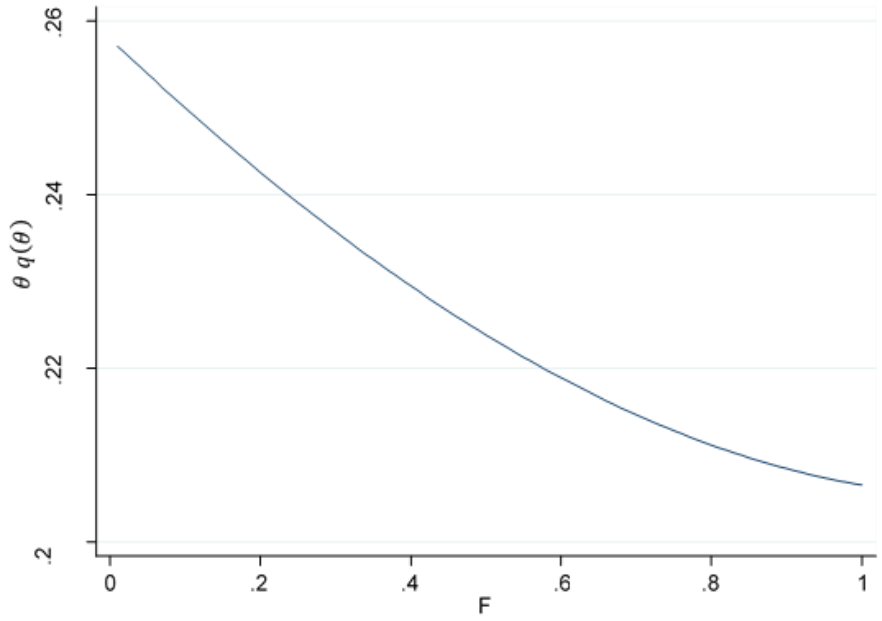


Figure 2.3: Effects of firing costs on job separation rate $\lambda G(R)$

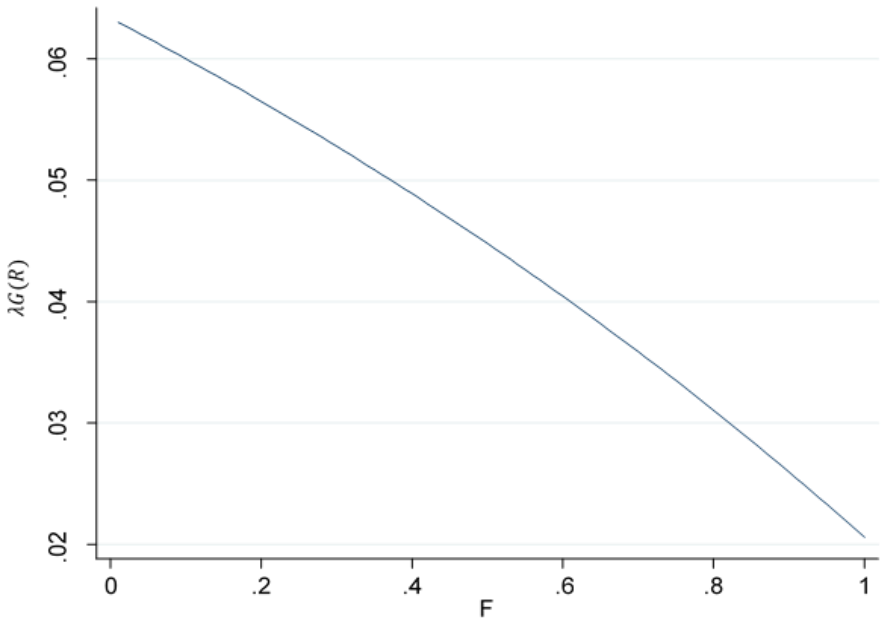


Figure 2.4: Effects of firing costs on average wage in formal sector w_f

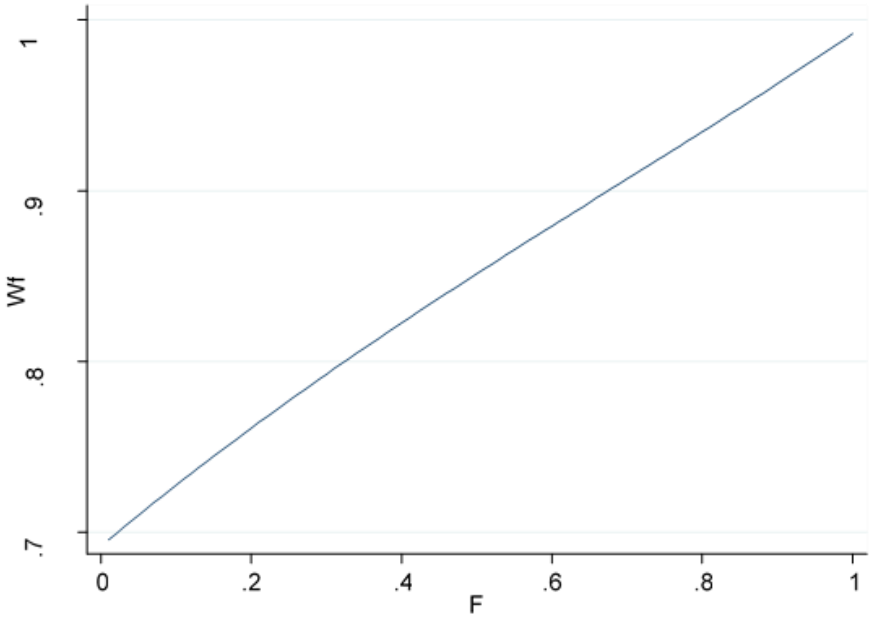


Figure 2.5: Effects of firing costs on average wage in formal sector w_i

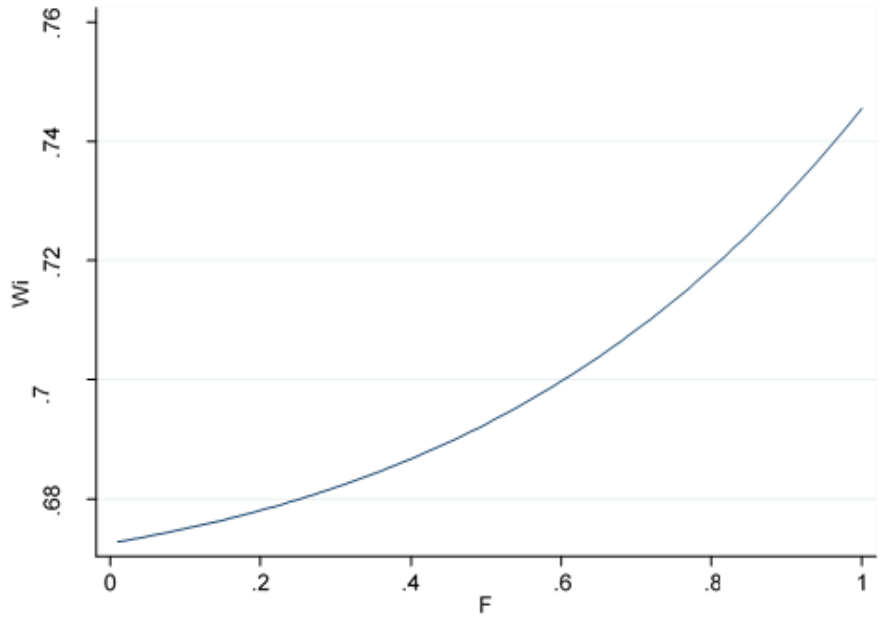


Figure 2.6: Effects of firing costs on size of the informal sector L_i

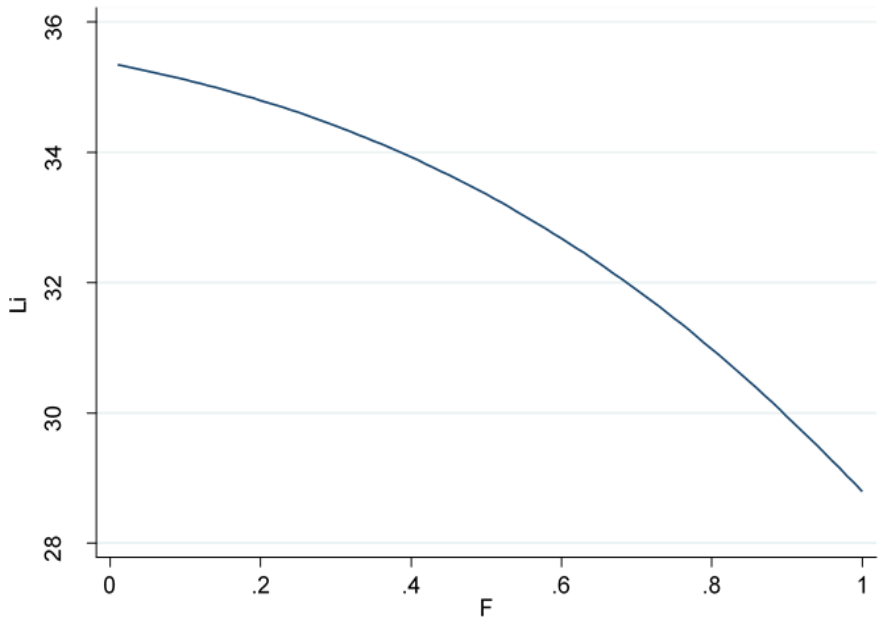


Figure 2.7: Effects of firing costs on size of the formal sector L_f

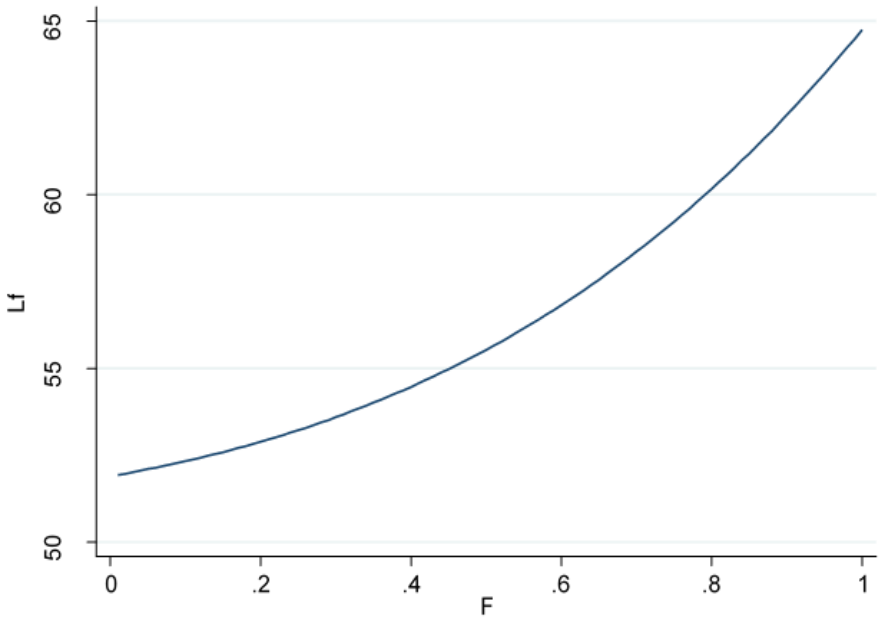
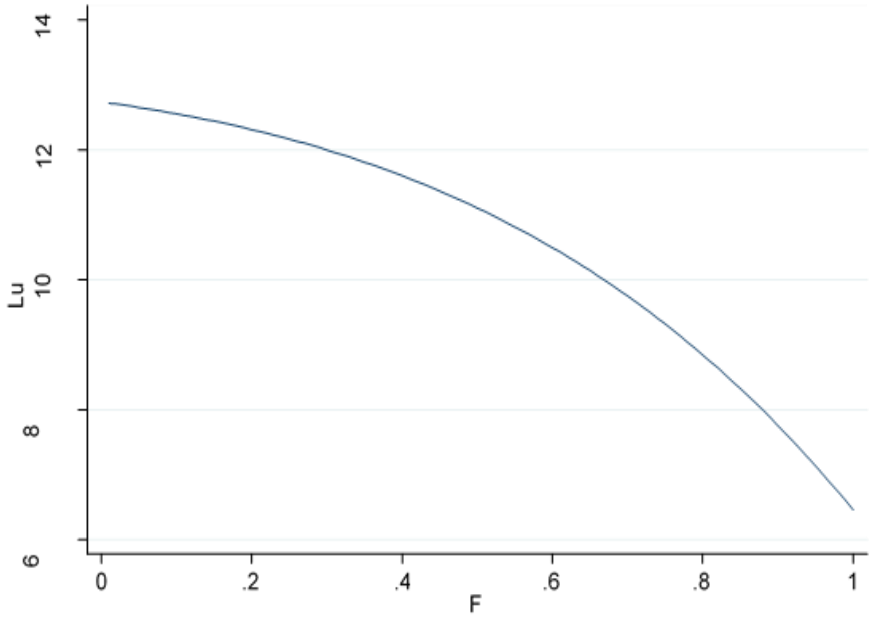


Figure 2.8: Effects of firing costs on size of unemployed L_u



2.5 Conclusion

I have examined the effect of EPL on inter-sectoral mobility of workers. EPL increases firing costs of firms in a formal sector which directly affect their incentive to create and destroy jobs in response to exogenous shocks. EPL also affects expected welfare of ongoing workers and unemployed workers. Although the effect is ambiguous, the model predicts that under certain circumstances, EPL can improve the values to be unemployed which indirectly causes a flow of workers from informal to formal. The effect over unemployment then depends on the net flow of reallocations from informal to formal sector and reallocations from unemployment to formal employment. One variant of the model indicates that size of the informal sector is decreasing in firing costs when firing costs are relatively small but starts to increase with firing costs when firing costs are above a certain threshold. It is a result of the assumption about the informal sector being competitive and the assumption that workers in the informal sector needs to be unemployed in order to look for a formal sector job. In this context, workers make decisions based on comparing expected payoffs from being unemployment in the formal sector and working in the informal sector. When firing costs are small, value for unemployed increases and workers flow form the informal sector to formal sector. I then calibrate and solve the model numerically. The calibration results are generally consistent the theoretical predictions.

Chapter 3: EPL and employment decisions in China's urban labour market

3.1 Introduction

Ever since its appearance in Europe after World War II, EPL have attracted extensive research among economists and policy makers. China has enacted its first Labour Contract Law (CLCL hereafter) in 2008. It soon represents a significant piece of EPL in China. The CLCL has been described as "the most significant reform to the law of employment relations [in China] in more than a decade" (Cooney et al., 2007). The CLCL aims to deal with the inefficiencies of previous labour market legislations and protect the rights of labour force (Remington & Cui, 2015). It requires employers to provide written labour contracts and social insurance to their employees. Failure to do so would result in double wage payments to employees for the period without labour contract and fines from labour inspection agencies. In addition, employers now need to make severance payments to employees even when the labour contract expires. Moreover, the CLCL specifies that any employee who has worked for more than a decade with an employer or signed two successive fixed term contracts, must be given an open-ended contract. All these amendments since 2008 have made the employment protection legislation in china one of the strictest in the world (Gallagher et al., 2013).

The enactment of the CLCL provided us with an opportunity to study the effects of EPL in the context of China's urban labour market. Although the level of employment protection increases, concerns over enactment of the CLCL including higher labour costs to firms, higher unemployment rate and lower international competitiveness still exist (Gallagher and Dong, 2011; Gallagher et al., 2013). Recently, several studies

have been carried out to examine the effect of the CLCL. One strand of literature focuses on workers' benefits. With a longitudinal survey data for migrant workers in the Chinese Pearl River Delta area, Li and Freeman (2015) find that migrant workers have a higher probability to be provided a labour contract after the law reform. The probability to receive social insurance also increases in the presence of a written labour contract. However, they also find evidence of an increase in the incidence of wage arrears after the reform. Similar results are also found in Cui et al. (2013), Cheng et al. (2014) and Gallagher et al. (2013). Another strand of studies focuses on the impacts of the CLCL on firms' labour demand. Sun (2010) uses a large panel data of Chinese industrial enterprises to show that firms' speed of adjustment to the level of employment significantly reduces as EPL becomes stricter. Liu & Liu (2014) also find a decrease in firms' speed of labour adjustment to exogenous shocks with panel data from Chinese listed firms. In addition, their results reveal that an increase in the labour adjustment costs has led to a substitution between labour and capital among Chinese industrial enterprises.

In this chapter, we contribute to the existing literature by empirically examining the effect of EPL on formal-informal divide in the China's urban labour market. Informal employment is generally perceived as employment out of formal labour regulations including own-account workers, contributing family workers, employees with informal jobs (Hussmanns, 2004). The informal employment in China's urban labour market is often associated with low income, long working hours, unstable employment, poor work conditions and less legal protections (Cooke, 2008; Park et al., 2012; Liang et al., 2016) Although there is no precise definition on informal employment and the official statistics in China is absent, the size of the informal sector is estimated to account for about 20% of total employment which is about a population of nearly 150

million workers (Cooke, 2011). Estimates with survey data indicates the share of urban informal employment can be up to 57% of total the urban labour force (Park et al., 2012; Liang et al. 2016). a stricter EPL will undoubtedly increase the job security for formal workers. However, it could also become more difficult for those unemployed or informal workers to find formal jobs. Therefore, the empirical examination of the effects of EPL on the formal-informal divide is of great policy implications.

In the Chinese context, as the CLCL is a one-off law reform and regulates all labour relations, there is only a one-off change in the overall level of EPL but no regional variation in the level of EPL before and after the law change. In addition, it is applied to all labour relations which means that we are not able to find an appropriate control group. In this sense, it is difficult to disentangle the pure effect of EPL change from other unobservable factors such as the financial crisis of 2008. To overcome this problem, we explore the effects of EPL by examining the effects of regional variation in the enforcement of EPL and the judiciary orientation. Specifically, discrete choice models with panel data are estimated to predict individuals' probabilities to participate in the labour market and the conditional probabilities to be in each employment status (formal, informal, and unemployed). Next, we examine the associations between these indicators and individual's employment status choices. The indicators we consider here include labour inspection rate, incidence of the labour disputes, court efficiency and pro-worker share of labour dispute resolutions. Labour inspection rate is a measure of the intensity of labour inspections. Incidence of labour disputes reflects how EPL are complied. Court efficiency and pro-worker share of labour dispute resolutions are measures of provincial judiciary efficiency.

The results show that there is weak evidence for an association between EPL enforcement and the judiciary orientation indicators and labour force participation,

and for the association between these indicators and employment status choices. The results indicate that workers from provinces with high incidence of labour disputes are associated with higher probability of formal employment and lower probability of informal employment. Section 3.2 introduces the relevant literature. Section 3.3 is a description of the Chinese labour regulations and their enforcement. Section 3.4 discusses the empirical methods used in this study. Section 3.5 introduces the dataset. Section 3.6 is a discussion of the empirical results. Section 3.7 concludes and discuss about the policy implications of the study.

3.2 Related Literature

Empirical studies of the effects of EPL on labour market outcomes can be traced back to Lazear (1990). Using a cross-country aggregate panel data, Lazear (1990) finds that countries with relative high firing costs have a relatively low labour market participation rate and higher unemployment rate. The level of employment is decreasing with firing costs. When firing costs increase from zero to an equivalence of three months' wage of a typical blue collar worker, level of employment decreases by 1%. The measures of strictness of EPL that Lazear (1990) uses include advance notification periods and severance payments. Addison and Teixeira (2005) then extended Lazear's study in various aspects. They use a set of more comprehensive measures of strictness of employment protection, including the OECD composite index of the severity or coerciveness of employment laws. In addition, a set of robustness tests are carried out. Their findings show that although unemployment increases with employment protection, the effects on long term unemployment and employment are much weaker than in Lazear's findings. Similarly, findings from OECD (1994, 2004) studies show that unemployment and employment has no significant relation with the stringency of employment protection. A cross country

study conducted by Bassanini and Duval (2006) also finds no evidence that the EPL has any effect on aggregate unemployment. Generally speaking, as Skedinger (2006) points out, cross country aggregate data shows no evidence of correlation between employment protection and aggregate employment or unemployment. This empirical result is consistent with the prediction from theoretical literature. However, empirical studies based on cross-country evidence have some limitations: (1) a universal measure of stringency of employment protection is implausible as the culture or enforcement of labour regulations may differ across countries; cross-country studies rarely take those into consideration; (2) cross-country studies with aggregate data cannot capture the heterogeneous effects of EPL on groups of people. For instance, young workers may be more vulnerable to stricter employment protection compared to mature workers.

Another indicator of the strictness of the EPL is its level of enforcement. Although it has been widely acknowledged, the research over the enforcement of EPL in practice is very rare. One recently study is from Gimpelson et al. (2010). They look at the effects of regional variation in EPL enforcements on Russia's labour market outcomes. In their study, three measures of regional EPL enforcements are used: number of labour inspectors, number of labour disputes filed by courts and perception of enforcement. By regressing regional employment and unemployment on EPL enforcements, they find that regions with higher levels of EPL enforcement are associated with lower levels of employment and higher levels of unemployment. Same results are found even after controlling for other regional characteristics. Another study conducted by Almeida and Carneiro (2012) in the context of Brazil used a richer set of measures (such as distance to the nearest labour inspectorate office and so on) for the EPL enforcements and concludes that stricter EPL enforcement leads to lower

informal employment within firms, but at the cost of lower average wages, lower productivity and higher unemployment. Nevertheless, both studies have ignored the potential endogeneity of law enforcements. As Bertola, et al. (2000) emphasizes, the level of labour law enforcements in practice may be endogenous to the economic outcomes.

Cross-country studies with disaggregate data often focus on the effect of employment protection on job reallocation and a firm's employment dynamics. Abraham et al. (1994) compare the employment adjustment speed in West Germany, France and Belgium with the US. The former European countries are often seen to have stronger labour regulations than the latter. Using aggregate industry level data, they find that job security regulations do not decrease the employment flexibility of employers. They suggest that employers in countries with strict employment protection may have developed alternate strategies to escape regulations. In contrast, Burgess et al. (2000) analyse the effect of employment protection over the speed of adjustment to changes in output and labour demand in seven OECD countries. Their results show that the speed of adjustment in response to exogenous shocks is slower in countries with strict employment protection. Nevertheless, they admit that it is hard to measure the magnitude of such effect to the labour market since job security regulations are not price regulations. Addison and Teixeira (2005) compare the speed of employment adjustment with time series data in Portugal and Germany. German labour market features strong trade unions while Portuguese labour market is trapped in low job creations and destructions. By estimating with an ECM model they found that employment adjustment speed is faster in Portugal than in Germany. Nickell and Nunziata (2000) examine the interactions between trade unions and employment protection laws and their effect over the speed of employment adjustment in 20 OECD

countries. They find strict employment protection and high trade unions density[6] can both reduce the speed of adjustment. However, in countries with high trade union coverage[7] and union coordination, strict employment protection can help to increase the employment flexibility. It is consistent with the view that employers would focus on the shocks to the employment margin and have more rapid response.

Within-country studies of the effects of employment protection often focus on a typical law reform which affect only a group of people. One advantage of within country studies is that the policy effect can be revealed because a partial reform creates an appropriate control group. Another advantages of within-country study is the possibilities to control for country specific conditions where cross country studies are hard to account for. One example is from Kugler and Pica (2008). They have studied the effect of the 1990 Italy labour reform where only firms with more than 15 employees bear a cost of unjust dismissals. Small firms were not affected by this reform. The result shows that small firms have more job accessions and job separations than large firms after the reform. Schivardi and Torrini (2008) study the effect of 1990 Italy labour reform on firm growth. Their results show that firms with a threshold of 15 employees are less likely to grow. At the same time, large firms have a higher labour turnover after the reform, which may be due to the use of informal workers because those workers are not covered by labour regulations (Schivardi and Torrini, 2008).

In the context of developing countries, Besley and Burgess (2004) exploits time and regional variation of employment protection in India. They use a difference-in-

[6] It is defined as trade union members as a percentage of all wage earners.
[7] It is defined as number of workers covered by collective agreements as a percentage of wage earners.

difference methodology and the results suggest significant effects of employment protection on output and employment. They argue that different states hold different attitudes towards workers and employers in terms of labour market legislation. Some of the states are pro-workers while others pro-employers. Their findings show that states with pro-worker legislations have slower manufacturing growth compared with pro-employer states. They also find that pro-worker legislation has increased the size of the informal sector. In fact, there are a large number of empirical evidence focusing on Latin-American and Caribbean countries' labour market reform in past decades (e.g. a book edited by Heckman and Pages (2004)). Kugler (2000) has looked at the effects of the 1990 Columbian labour market reform on worker's entry and exit to the formal and informal sectors. Using a difference-in-differences method, he finds that a reduction in the strictness of EPL leads to an increase in the hazard rate into and out of unemployment. The rising flexibility can also be used to explain the increasing unemployment rate during recessions after the labour reform because firings become relative easier.

With respect to the effects of EPL over workers mobility between formal and informal sectors (or between formal/informal employment), the empirical evidence is less conclusive. As mentioned in the literature survey above, most studies focus on the effects of EPL on the level of employment or on formal employment. Studies relating EPL to informal employment mainly focus on self-employment. Márquez and Pagés (1998) estimates the correlation between self-employment and EPL index for a sample of Latin-America and OECD countries. Their results indicate a strong correlation between the two. However, as they argued, the evidence cannot be used to infer whether self-employment is a voluntary choice or is simply due to the fact that they have limited access to formal employment. In contrast, with a panel data from 16

Latin-American countries, Heckman and Pages (2000) have found a positive relationship between job security and self-employment. Galli and Kucera (2003) have attributed these contradictory results to the short and long run effects of EPL. In the short run, weaker EPL could result in an increase in job firings. Therefore, the share of informal employment rises. As job firing and hiring adjust to their long-run equilibrium, the process could be positive to formal employment. In addition, Bosch et al. (2012) look at the relationship between EPL and informal employment. Motivated by the increasing informality of Brazilian metropolitan labour markets, the authors examine a range of policy variables including trade liberalization, unionization of industries and firing costs of industries on share of informal employment. With a dynamic specification, their results indicate that labour reforms can account for 30-40 percent of the rising share of informal employment in Brazil metropolitan labour markets. In this chapter, we contribute to the literature by looking at the effects of EPL on formal-informal divide in the context of China's urban labour market. In the next section, we introduce the evolution of Chinese EPL, discuss about how well these labour regulations are enforced and the judiciary orientation towards it.

3.3 EPL in China

3.3.1 Evolution of EPL in China

The evolution of China's labour laws has been introduced in chapter 1. Generally, the strictness of EPL is highest in the early decades of the People's Republic of China. The fixed-employment system in the urban labour market has made it impossible for firms to dismiss a worker. There is also no labour contracts between employers and employees as employees were believed to be the natural owners of the enterprises.

The late 1970s and 1980s has witnessed a rapid growth of private sector and decentralisation of state sector in China. Although labour contract regulations were introduced to the whole country, rigidities in the labour market were largely reduced.

The Enactment of the Labour Law in 1994 symbolized that the formal employment protection system was established in the whole China's labour market. It protects employees by providing the cases that the employer can revoke labour contract and by listing all illegal dismissal cases. Employers are asked to explain the situation to its trade union or all employees 30 days in advance if they are about to dismiss a worker. With regard to the cases where employers revoke labour contracts in violation to the Labour Law, employers "are ordered by labour administrative departments to make corrections and assume responsibility over compensation for any losses that may be sustained by labourers therefrom" (Brown, 2009). It also includes provisions to protect labours rights with respect to probation periods, unemployment insurance, health insurance and pension. Together with the enactment of the Employment Protection and Supervision Regulations in 2005, the Labour Law have significantly increased the strictness of EPL in China.

However, as is also discussed in chapter 1, the problem with the Labour Law is that there are many confusing and vague provisions. For example, it failed to clarify situations with invalid contracts, define wages, or explain what forms of work require payments. This was an obstacle to enforce the Labour Law properly. In addition, many new situations evolve. For example, there is a trend of shortening labour contracts and informalising of employment relations (National People's Congress Standing Committee, 2005).

Under this background, the CLCL was enacted in 2008 to increase the job security and protect the rights of workers. There is no major departures between the 1994 Labour Law and 2008 CLCL. However, it is more specific and detailed to avoid employers getting around the Labour Law. Table 3.1 below compares some clauses between 1994 Labour Law and 2008 CLCL.

Table 3.1: A selected comparison of 1994 Labour Law and 2008 CLCL

	1994 Labour Law	**2008 CLCL**
Probationary Period	Maximum 6 months	Maximum 2 months
Labour Contracts	Written contracts, allow to be extended to non-fixed term contract after 10 years of service	Compulsory written contract and is automatically transferred to non-fixed term contract after 10 years of service or signing two consecutive fixed-term contracts
Severance Payments	1 month wage if tenure≤1 year. It increases with job tenure to a maximum of 20 months	1 month wage if tenure≤1 year. It increases with job tenure to a maximum of 20 months. Severance payment should be made even when the contract expires
Social Insurance	Should be provided	Should be provided and written in the labour contract

The enactment of CLCL has enabled China to be among the countries with strictest employment protection. Table 3.2 compares the strictness of EPL in OECD and 7 emerging economies. The OECD indicators on the EPL measure the strictness of EPL in each country from 4 aspects: protection of permanent workers against individual and collective dismissals, protection of permanent workers against (individual) dismissal, specific requirements for collective dismissal, regulation on temporary forms of employment lists the details of the measurements of EPL by OECD.

According to Table 3.2, China has the highest level of protection of permanent workers against individual and collective dismissals.

Table 3.2: The OECD indicators on the EPL[8]

Scale from 0 (least restrictions) to 6 (most restrictions)

	Protection of permanent workers against individual and collective dismissals	Protection of permanent workers against (individual) dismissal	Specific requirements for collective dismissal	Regulation on temporary forms of employment
OECD unweighted average	**2.29**	**2.04**	**2.91**	**2.08**
Argentina	2.86	2.45	3.88	3.04
Brazil	1.75	1.84	1.5	4.08
China	**3.22**	**3.31**	**2.25**	**1.88**
India	2.61	3.49	0.44	2.54
Russian Federation	2.47	2.86	1.5	1.25
Saudi Arabia	1.15	1.61	0	3.46
South Africa	2.01	2.06	1.88	0.58

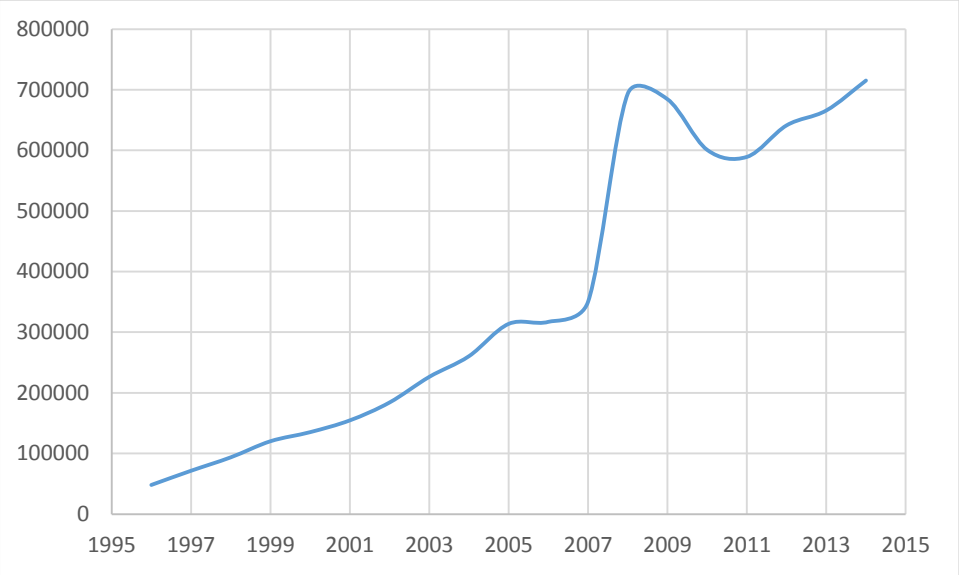
Source: OECD/IAB Employment Protection Database, 2013 update.

The 2008 CLCL was immediately put into effect in China after its enactment. The figure below shows the number of labour disputes files by all level labour dispute arbitrage agencies before and after the law enactment. The number of labour disputes soared up from 350,000 to nearly 700,000 after the reform and remains over 600,000

[8] The table does not compare the EPL indicators in the same year. The EPL indicators for OECD countries measures the labour regulations in force in 2013. The EPL indicators for Brazil, China. India, Russia, Saudi Arabia and South Africa reflects the respective labour regulations in force in 2012.

thereafter (China Labour Statistical Yearbook, 2015). In fact, the numbers could even be doubled if we consider those mediated cases by labour disputes mediation agencies.

Figure 3.1: Total number of cases accepted by labour arbitration and mediation agencies



Source: China Labour Statistical Yearbook 2015

3.3.2 The EPL enforcement and the judiciary orientation

A stricter EPL does not imply higher level of protection of workers in practice. Although China ranks high in terms of the strictness of EPL in the world, the ineffective law enforcement has been a chronic problem (Zheng, 2009).

After the enactment of the Labour Law in 1994, Labour administration departments have been established at each local government, acting as the main department that is responsible for enforcing China's Labour Law. According to China Law Yearbook (2003), more than 3,000 labour inspection agencies and 40,000 inspectors were in places to deal with labour complains, and for conducting inspections. Legal provisions about regulating these departments are included in 2005 Employment Protection and

Supervision Regulations. However, it does not necessarily mean a high enforcement level.

There are several reasons to explain the low enforcement level in China. First, although labour departments are directly subordinate to the central government, local governments are at a better position to influence these labour departments. This is because funding and staffing are both provided by local governments. To attract businesses, local governments sometimes refrain from properly enforcing the law (Taylor et al., 2003). Besides, the primary goal for local labour departments is promoting employment rather than enforcing the labour regulations (Yang, 2002).

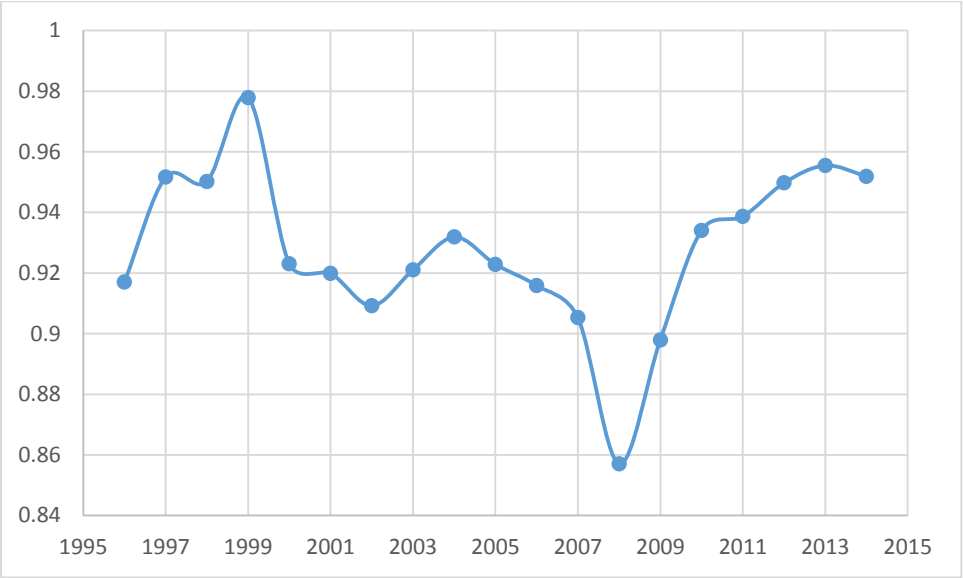
Secondly, even if they want to enforce the law, labour inspection agencies are either understaffed or have weak powers (Zimmerman, 2008; Cooney, 2007). Before the enactment of the 2008 CLCL, there has always been an understaffing problem in the labour inspection agencies. This led to a consequence that they could not fully supervise or enforce the Labour Law (Zimmerman, 2008). This situation has been gradually improved during the recent years; however, the speed of improvement varies across different regions. In addition, penalties that local labour departments can impose to business were very limited, especially before the 2008 CLCL. The penalties only included warnings, correction notice, fines and compensation orders. The cost for businesses to violate the law was very low. In most cases, labour departments could not order a business to close unless there is a public disturbance (Cooney, 2007). Moreover, due to the vagueness in the Labour Law, there is scope for business to go challenge the inspections by labour inspection agencies. Under this background, the 2008 CLCL was enacted to deal with the legal deficiencies of previous labour laws and regulations. Labour departments are entitled with stronger power under this law,

but they are still subject to regional variations because of administrative differences across different local governments.

Another important factor associated with the effectiveness of EPL is the judiciary orientation toward labour disputes. China clearly stated certain procedures to deal with labour disputes. It is a linear process, including consultation, dedication, arbitration, litigation and appeal. When a dispute occurs, it initially begins with an informal consultation between the two parties. If the consultation stage fails or is ignored, the two parties can start intra-firm mediation or more formal arbitration. If this process failed or is ignored, parties can refer the dispute to labour arbitration, which is conducted by labour disputes arbitration committees. Further, if either party does not satisfy the labour arbitration, they can refer the dispute to local People's courts to seek a formal resolution.

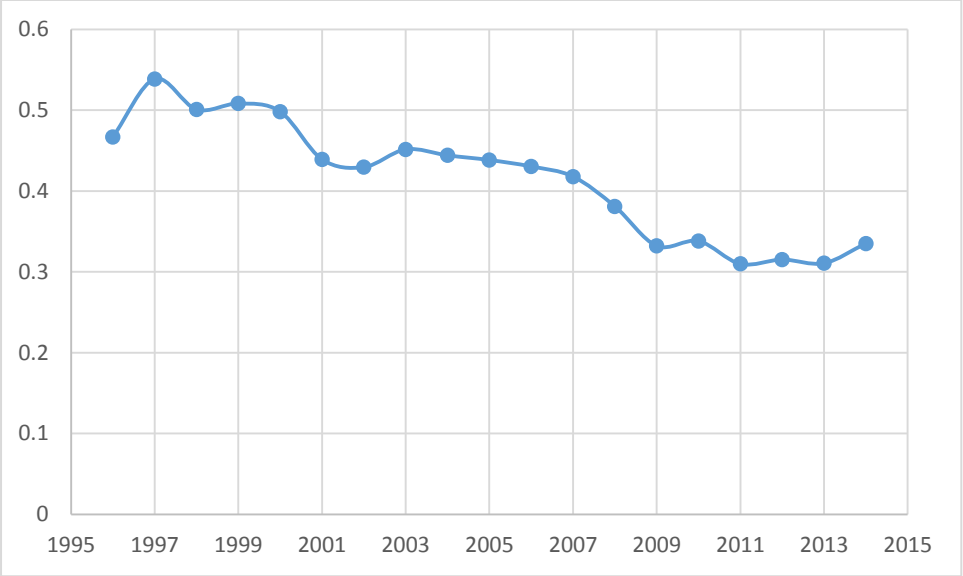
As EPL becomes stricter in China, there is also a shift of judiciary orientation over the labour disputes after 2008. Figure 3.2 illustrate the share of cases resolved by all level labour disputes arbitration agencies in each year. Generally, there is a downward trend before 2008. After 2008, the overall court efficiency is improved. Figure 3.3 depicts the overall share of labour disputes cases won by employees in each year. According to the Figure 3.3, the pro-worker share of labour disputes resolutions is decreasing from over 50% in 1997 to slightly more than 30% in 2009. The downward trend has been locked in since then.

Figure 3.2: Share of labour disputes resolved in each year



Source: China Labour Statistical Yearbook 2015

Figure 3.3: Share of labour disputes cases won by employees



Source: China Labour Statistical Yearbook 2015

3.4 Empirical methods

Based on the literature review, there are mainly three empirical methods to measure the effects of EPL on labour market outcomes. First, most country-specific studies are conducted in a natural experiment setting. These studies show that only a part of the labour force were affected by the change of EPL. In this case, those unaffected by the change of EPL become an ideal control group to capture the causal effect of EPL on labour market outcomes. Second, cross-country/region studies usually take advantage of the cross-country/region variation in the level of EPL. Third, the effects of EPL can be studied by considering the regional variation in the level of enforcement of the EPL and judiciary orientation towards EPL. Since the CLCL is a one-off law change and is applied to all labour relations, the first and second method are unfit for our study. An EPL indicator in this case is equivalent to a time dummy. Even if we control for macro indicators and time trend, the estimated effect of EPL may still capture the effects from other unobserved factors.

To overcome the problem discussed above, we study the effects of EPL on individuals' employment status choices by exploring the regional variation in the enforcement of EPL and judiciary orientation. The qualitative response models are common to be used in the analysis of categorical dependant variables such as the employment status choices. Particularly, we employ a random effect multinomial logit model. The framework is derived from the random utility model which is developed by McFadden (1974). Under the framework, we assume a utility is associated with each employment status (formal, informal, unemployed, out of labour force). The utility is completely known only to the person himself/herself. The person chooses his/her employment status in order to maximise his/her utility. Arguably, the choice of alternative employment status is more likely to be determined by the demand side

such as the job availability and employers, or by general macro conditions such as tightness of the labour market. It is worth noting that the utility used in the model is an indirect utility which takes both demand and supply factors into consideration. In other words, it is a reduced form expression to determine the classification of individuals into employment statuses.

Model and estimation methods

Let $Q_{it} \in \{1, \dots, J\}$ be the employment status for individual i at time t. J is the number of employment statuses in the labour market. Let V_{ijt} be the value for an individual i in employment state j at time t.

$$V_{ijt} = \boldsymbol{x}_{it}\boldsymbol{\beta}_j + \alpha_{ij} + \theta_{j1} Reform_t + \theta_{j2} ind_{mt} + \varepsilon_{ijt} \quad (3.6)$$

Here $\boldsymbol{x}_{it}$ is a vector of control variables for observation i at time t. ind_{mt} is an indicator for labour laws enforcement or judiciary orientation in province m. α_{ij} captures the individual heterogeneous effects. The reason to include α_{ij} is because we have a longitudinal data and there are repeated observations for the same individual. Unobserved individual heterogeneity is likely to present. We assume α_{ij} is a random intercept and arise from a multivariate normal distribution with zero mean and a 4x4 variance covariance matrix $\sum$. ε_{ijt} is the error term that is independent of $\boldsymbol{x}_{it}$ and α_{ij} and follows a Type I extreme value distribution. $\boldsymbol{\beta}_j$ θ_{j1} and θ_{j2} are associated parameters to be estimated. We assume that the log-odds of each employment status to the reference employment status J follow a linear model:

$$\log\left(\frac{\Pr(Q_{it}=j)}{\Pr(Q_{it}=J)}\right) = \boldsymbol{x}_{it}\boldsymbol{\beta}_j + \alpha_{ij} + \theta_{j1} Reform_t + \theta_{j2} ind_{mt} + \varepsilon_{ijt} \quad (3.7)$$

We assume $\exp\left(\boldsymbol{x}_{it}\boldsymbol{\beta}_J + \alpha_{iJ} + \theta_{1J} Reform_t + \theta_{J2} ind_{mt}\right) = 1$ so that (3.7) holds when $j = J$. Here $\boldsymbol{\beta}_j$, θ_{j1} and θ_{j2} can also be interpreted as marginal effect of control variables on

log-odds of alternative employment status *j* to the reference employment status. In this study, we consider formally employed as the reference employment status *J*. The probability of an individual choosing employment status *j* can then be written as

$$\Pr(Q_{it}=j)=\frac{\exp(\boldsymbol{x}_{it}\boldsymbol{\beta}_j+\alpha_{ij}+\theta_{j1}Reform_t+\theta_{j2}ind_{mt})}{\sum_{k=1}^{J}\exp(\boldsymbol{x}_{it}\boldsymbol{\beta}_k+\alpha_{ik}+\theta_{k1}Reform_t+\theta_{k2}ind_{mt})} \tag{3.8}$$

In this case, for the reference employment status *J*. $\Pr(Q_{it}=J)=\frac{1}{1+\sum_{k=1}^{J-1}\exp(\boldsymbol{x}_{it}\boldsymbol{\beta}_k+\alpha_{ik}+\theta_{k1}Reform_t+\theta_{k2}ind_{mt})}$. As the choices probabilities depend on α_{ij}, we need to integrate over the distribution of unobserved heterogeneity α_{ij} and derive the sample likelihood function which is:

$$L=\prod_{i=1}^{N}\int_{-\infty}^{+\infty}\prod_{t=1}^{4}\prod_{j=1}^{4}\{\frac{\exp(\boldsymbol{x}_{it}\boldsymbol{\beta}_j+\alpha_{ij}+\theta_{j1}Reform_t+\theta_{j2}ind_{mt})}{\sum_{k=1}^{4}\exp(\boldsymbol{x}_{it}\boldsymbol{\beta}_k+\alpha_{ik}+\theta_{k1}Reform_t+\theta_{k2}ind_{mt})}\}^{d_{ijt}}f(\alpha)d\alpha \tag{3.9}$$

Where d_{ijt} is a dummy variable that is equal to 1 if individual *i* choose *j* at time *t*. A standard assumption regarding α is that it is strictly not correlated with $\boldsymbol{x}_{it}$. A solution to the maximization of (3.9) cannot be analytically obtained. Instead, we need to use approximation methods such as Gauss–Hermite quadrature and the adaptive Gauss–Hermite quadrature. In this study, we use Stata build-in program GSEM (Generalised Structural Equation Modelling) to estimate the random effects multinomial logit model. The default estimation methods implemented by this program is the adaptive Gauss–Hermite quadrature as it is believed to be generally more efficient (Rabe-Hesketh, Skrondal, and Pickles, 2005).

The sample estimates of the random effect multinomial logit model cannot be directly interpreted. Instead, the marginal effect of the CLCL on probabilities to be in each status can be calculated as follows:

$$\frac{\partial\Pr(Q_{it}=j)}{\partial ind_{mt}}=\Pr(Q_{it}=j)*[\theta_{j2}-\sum_{k=1}^{J-1}\Pr(Q_{it}=j)\theta_{k2}]$$

Clearly, the marginal effect of the enforcement of the CLCL and the judiciary orientation on the probability of being in employment status j depends not only on parameter θ_{j2} but also on the average of θ_{j2} across employment status and the predicted probabilities to be in employment status j. It is worth noting that the sign of the marginal effect can be opposite to θ_j.

3.5 Data

3.5.1 The China Health and Nutrition Survey (CHNS)

The main source of data used to study the effects of EPL in China on employment status choices are the China Health and Nutrition Survey (CHNS) that were conducted by the Carolina Population Centre at the University of North Carolina at Chapel Hill and the National Institute for Nutrition and Health at the Chinese Centre for Disease Control and Prevention (CCDC). The longitudinal CHNS datasets aim at providing information for health, demographic, socioeconomic and nutrition policy studies. It is not designed to be national representative but covers nine provinces from north to south of China with different geographies, economic development, public resources and health indicators. This survey uses a multistage and random cluster process to draw samples. To be exact, in each province, counties are stratified by low, middle and high income groups. Four counties are randomly chosen from a weighted sampling scheme. Provincial cities and a lower income city are chosen in seven provinces, while large cities were selected in other two provinces. Households from three autonomous cities (Beijing, Shanghai and Chongqing) are included in the 2011 survey.

By far, nine waves of surveys have been conducted since 1989 (1989, 1991, 1993, 1997, 2000, 2004, 2006, 2009 and 2011) on four different levels, including household

survey, individual survey, community survey, and nutrition and physical examination. Different questionnaires are designed for different levels of survey. For each wave, they take three consecutive days to collect data for all four surveys. The household survey questionnaire enquires about demographic information and economic activities (e.g. income, expenditure) of the household. Information relating to an individual's employment status is included in individual survey. Overall, the datasets cover around 4,400 households and 19,000 individuals for all nine waves. Although new households and cities are added into the survey, the overall attrition rate to the previous wave is around 80-88% (Zhang et al., 2014). In this study, we use the latest 4 waves (2004, 2006, 2009, and 2011) of CHNS datasets to estimate the relationship between EPL and individual's employment status choice. We only use the latest four waves because indicators relating to the enforcement of EPL and the judiciary orientation in most provinces are available after 2001.

To identify an individual's employment status, we use answers to a series of questions listed in Table 3.3 below. First, a respondent is asked whether or not he/she is employed. If an individual is not employed at the moment, the reasons for will be asked. The answers to this question will help us distinguish those who are unemployed but are looking for jobs against those who are simply out of the labour force. In this study, among individuals who are not employed, we classify those who are looking for jobs as unemployed and the rest as out of the labour force. If an individual is working at the time of the survey, he/she is then asked about the occupation and employment position in the occupation. Workers in CHNS survey are classified into seven types of employment positions. They can be permanent workers in enterprises, contractors for others or enterprises, temporary workers, self-employed with or without employees, and paid or unpaid household workers.

We further classify these seven types of employment positions into two categories of employment status: formally and informally employed. Informal employment is generally defined as jobs that are outside the framework of labour regulations (Hussmann, 2004). According to the 2008 CLCL and its subsequent revision, all labour relationships are governed by the CLCL. In this sense, only self-employed individuals without employees fit with the definition of informal employment. However, in reality, those temporary workers, contractors and household workers in the China's labour market usually enjoys less social protection than permanent workers. Therefore, we also classify temporary and household workers as informally employed. In addition, informally employed workers also refers to contractors who received no social benefits contribution from their employers. The rest of the workers are then classified as formal employed. Together with the unemployed and those out of the labour force, we have defined four types of employment statuses in the China's labour market.

Table 3.3: Survey questions related to employment status

1)	Are your presently working? 0 no 1 yes
2)	Why are you not working?
1.	Seeking work
2.	Doing housework
3.	Disabled
4.	Student
5.	Retired
6.	Other
7.	Unknown
3)	What is your primary occupation?

Table 3.3 continued

1. Senior professional/technical worker (doctor, professor, lawyer, architect, engineer)
2. Junior professional/technical worker (midwife, nurse, teacher, editor, photographer)
3. Administrator/executive/manager (working proprietor, government official, section chief, department or bureau director, administrative cadre, village leader)
4. Office staff (secretary, office helper)
5. Farmer, fisherman, hunter
6. Skilled worker (foreman, group leader, craftsman)
7. Non-skilled worker (ordinary labourer, logger)
8. Army officer, police officer
9. Ordinary soldier, policeman
10. Driver
11. Service worker (housekeeper, cook, waiter, doorkeeper, hairdresser, counter salesperson, launderer, child care worker)
12. Athlete, actor, musician
13. Other (specify: _____)
14. Unknown

4) What is your employment position in this occupation
1. Self-employed, owner-manager with employees
2. Self-employed, independent operator with no employees (includes farmer)
3. Works for another person or enterprise (includes small-, medium-, and large-scale collective enterprise, farm, and private enterprise) as a permanent employee
4. Contractor with other people or enterprise
5. Temporary worker
6. Paid family worker
7. Unpaid family worker
8. Other (specify: _____)
9. Unknown

Table 3.4 and Table 3.5 below show the distribution of individuals in different types of employment and employment statuses respectively. To restrict our focus on the urban labour market, we have excluded all rural observations and farmers. Among individuals who were working at the time of the survey, the share of self-employed,

temporary and household workers is relatively stable across four waves. Although there is a slight downward trend, the share of permanent workers is still around half of the total number of workers. The most significant change is the share of contractors that sees an increase by nearly 10% of the total workers from 2004 to 2011. According to Table 3.5, the labour market participation rate in the China's labour market has been relatively stable from 2004 to 2011. The share of the formally employed increased from 14% in 2004 to 31% in 2011 and the share of the informally employed workers decreases from 37% in 2004 to 25% in 2011. The changes are partly due to the inclusion of new households from three developed autonomous cities in 2011. If we exclude the newly added observations from the three autonomous cities, the changes are mostly compromised. However, there is still a steady increase in formal employment (11%) and a decrease in informal employment (6%).

Table 3.4: Type of employment (age 16-65), percentage share

	2004	2006	2009	2011
Self-employed	0.18	0.22	0.19	0.17
Permanent	0.56	0.50	0.47	0.49
Contractor	0.11	0.12	0.19	0.21
Temporary	0.13	0.14	0.14	0.13
Household workers	0.01	0.01	0.01	0.00
Total urban workers	1767	1808	1925	2982

Table 3.5: Type of employment status (age 16-65), percentage share

	2004	2006	2009	2011	2011 (excluding autonomous cities)
Formally employed	0.14	0.22	0.24	0.31	0.25
Informally employed	0.37	0.31	0.28	0.25	0.31
Unemployed	0.07	0.07	0.06	0.04	0.05
Out of labour force	0.42	0.41	0.41	0.40	0.39
Total urban working age sample	3427	3426	3644	5323	3446

Table 3.6 presents the data descriptive statistics to provide a general picture of the scenario. The sample for analysis is restricted to those who are above 16 and below 65 years old. In addition, to obtain more consistent distributions of observations across waves, we have excluded the newly added observations from three autonomous cities. The variable 'Urban' is included to distinguish urban *hukou* holders against rural *hukou* holders. Altogether, there are approximately 65% of observations having urban *hukou* in the urban labour market. The fluctuation across the four waves is not tremendous. The average age in the sample is 44.47 years old, among which 48% of them are male and 82% of them are married. Over 70% observations age over 35 in the sample. With respect to education, we have classified observations into five levels of education: illiterate, primary, secondary, vocational and tertiary education. According to Table 3.6, about 75% of individuals have secondary education or lower. Although there is an increase in the share of individuals with tertiary education or higher from 9% in 2004 to 17% in 2011, on average, the share is only about 13%. The size of households are stable across the four waves; on an average, there are 3.48 people in each household.

Table 3.7 describes the panel structure of the dataset. We have a unbalanced panel. The average number of observations for each individual is around 2.14. It reports

both between and within variation of each variable. Although they cannot be compared directly due to different degree of freedom, they can be used a good approximation. Time invariant variables such as 'Urban' have no within-individual variation. Table 3.7 indicates that for most time-varying variables in our dataset, the between-individual variation is greater than the within variation.

Table 3.8 shows the transition matrix of four employment status. The upper numbers in the Table represent the number of transitions from one employment state at t-1 to another state at t. The lower numbers refer to the associated transition probabilities. For instance, of 1371 informal workers at t-1, 746 (54.41%) remain informal at t; 245 (17.87%) becomes formal workers; 86 (6.27) are unemployed and 294 (21.44%) are out of the labour force. Clearly, such transitions are substantial.

Table 3.6: Descriptive statistics

	2004		2006		2009		2011		Whole sample			
Variable:	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Min**	**Max**
Urban	0.65	0.48	0.64	0.48	0.63	0.48	0.64	0.48	0.64	0.48	0	1
Illiterate	0.08	0.27	0.10	0.29	0.09	0.28	0.08	0.27	0.09	0.28	0	1
Primary education	0.14	0.34	0.11	0.31	0.11	0.32	0.10	0.30	0.12	0.32	0	1
Secondary education	0.56	0.50	0.54	0.50	0.54	0.50	0.52	0.50	0.54	0.50	0	1
Vocational education	0.13	0.34	0.14	0.34	0.14	0.34	0.12	0.33	0.13	0.34	0	1
Tertiary education	0.09	0.29	0.12	0.33	0.12	0.32	0.17	0.38	0.13	0.33	0	1
Age	42.99	12.27	44.01	12.16	45.08	12.29	45.75	12.03	44.47	12.23	16	65
Age: 16-24 yrs	0.09	0.29	0.08	0.28	0.08	0.28	0.07	0.25	0.08	0.27	0	1
Age: 25-34 yrs	0.19	0.39	0.16	0.36	0.14	0.34	0.14	0.35	0.16	0.36	0	1
Age: 35-50 yrs	0.39	0.49	0.39	0.49	0.38	0.48	0.39	0.49	0.39	0.49	0	1
Age: 50+ yrs	0.33	0.47	0.37	0.48	0.40	0.49	0.40	0.49	0.37	0.49	0	1
Marital status	0.81	0.39	0.82	0.39	0.83	0.38	0.84	0.37	0.82	0.38	0	1
Male	0.48	0.50	0.48	0.50	0.48	0.50	0.48	0.50	0.48	0.50	0	1
Household size	3.48	1.24	3.50	1.26	3.49	1.23	3.49	1.22	3.49	1.23	1	11
Number of Observations	3427		3426		3644		3446		13943			

Table 3.7: Panel structure

Variable:		Mean	Std. Dev.	Min	Max	Obs
Formal	overall	0.35	0.48	0.00	1.00	N = 13943
	between		0.44	0.00	1.00	n = 6507
	within		0.22	-0.40	1.10	T-bar = 2.14
Informal	overall	0.19	0.39	0.00	1.00	N = 13943
	between		0.34	0.00	1.00	n = 6507
	within		0.22	-0.56	0.94	T-bar = 2.14
Unemployed	overall	0.06	0.24	0.00	1.00	N = 13943
	between		0.22	0.00	1.00	n = 6507
	within		0.15	-0.69	0.81	T-bar = 2.14
Out labour force	overall	0.41	0.49	0.00	1.00	N = 13943
	between		0.45	0.00	1.00	n = 6507
	within		0.23	-0.34	1.16	T-bar = 2.14
Urban	overall	0.64	0.48	0.00	1.00	N = 13925
	between		0.48	0.00	1.00	n = 6493
	within		0.00	0.64	0.64	T-bar = 2.14
Illiterate	overall	0.09	0.28	0.00	1.00	N = 13943
	between		0.26	0.00	1.00	n = 6507
	within		0.12	-0.66	0.84	T-bar = 2.14
Primary	overall	0.12	0.32	0.00	1.00	N = 13943
	between		0.29	0.00	1.00	n = 6507
	within		0.16	-0.63	0.87	T-bar = 2.14
Secondary	overall	0.54	0.50	0.00	1.00	N = 13943
	between		0.47	0.00	1.00	n = 6507
	within		0.21	-0.21	1.29	T-bar = 2.14
Vocational	overall	0.13	0.34	0.00	1.00	N = 13943
	between		0.31	0.00	1.00	n = 6507
	within		0.15	-0.62	0.88	T-bar = 2.14
Tertiary	overall	0.13	0.33	0.00	1.00	N = 13943
	between		0.32	0.00	1.00	n = 6507
	within		0.13	-0.62	0.88	T-bar = 2.14
Age	overall	44.47	12.23	16.05	65.00	N = 13943
	between		13.02	16.05	65.00	n = 6507
	within		2.03	40.38	48.60	T-bar = 2.14
Marital status	overall	0.82	0.38	0.00	1.00	N = 13943

Table 3.7 continued

Variable:		Mean	Std. Dev.	Min	Max	Obs
	between		0.39	0.00	1.00	n = 6507
	within		0.13	0.07	1.57	T-bar = 2.14
Male	overall	0.48	0.50	0.00	1.00	N = 13943
	between		0.50	0.00	1.00	n = 6507
	within		0.00	0.48	0.48	T-bar = 2.14
Household Size	overall	3.49	1.23	1.00	11.00	N = 13943
	between		1.22	1.00	11.00	n = 6507
	within		0.35	0.24	7.99	T-bar = 2.14

Table 3.8: Sample probabilities of employment status transitions

State at t-1 \ State at t		Formal	Informal	Unemployed	Out labour force	Total
Formal	Obs	2,026	239	71	316	2,652
	%	76.4	9.01	2.68	11.92	100
Informal	Obs	245	746	86	294	1,371
	%	17.87	54.41	6.27	21.44	100
Unemployed	Obs	117	139	75	126	457
	%	25.6	30.42	16.41	27.57	100
Out labour force	Obs	181	316	112	2,347	2,956
	%	6.12	10.69	3.79	79.4	100
Total	Obs	2,569	1,440	344	3,083	7,436
	%	34.55	19.37	4.63	41.46	100

3.5.2 EPL and macro indicators

We use four indicators to proxy the provincial variation in the level of EPL enforcement and the judiciary orientation in China. The source of data to calculate these indicators are from the 2005, 2007, 2010 and 2012 China Labour Statistical

Yearbook and the provincial Statistics for Human Resource and Social Security Development in the respective year. The most direct measurement to the level of EPL enforcement is the provincial labour inspection rate. It is calculated as the ratio of the number of firms being inspected by labour inspection agencies in a year to the total number of firms in each province. It directly reflects the regional variation in the intensity of labour inspection. The second indicator measures the incidence of labour disputes in each province. It is calculated as the ratio of number of workers involved in the labour disputes to the total number of workers in each province. The indicator reflects the degree of compliance to EPL in each province. The third indicator is the court efficiency. It is calculated as the ratio of total number of cases settled to the total number of cases accepted by all level labour dispute arbitration and mediation agencies and courts in a year in each province. The fourth indicator is the pro-worker share of labour disputes resolutions. It is calculated as the share of cases won by workers to total cases. The third and fourth indicator reflects the judiciary orientation in each province.

Table 3.9 below shows a summary of the EPL indicators in each province. According to Table 3.9, the labour inspection rate varies across provinces. The mean labour inspection rates in Heilongjiang and Guangxi are over 35% while it is just about 5% in Hunan province. With respect to the incidence of labour disputes, Liaoning province sees the highest average incidence of labour disputes with 3.5 out of 1000 workers involved in labour disputes. Heilongjiang, Henan and Hubei are among provinces with the lowest incidence of labour disputes. According to the China National Bureau of Statistics (2017), provincial variation in number of labour disputes in highly correlated with the level of development. For example, of 589244 cases accepted by all level labour dispute and arbitration agencies, 93817 cases are in

Guangdong Province, around 60000 cases are in Beijing, 55000 cases in Shanghai, 54000 cases in Jiangsu province and 38000 cases in Zhejiang provinces. These provinces and cities are perceived as most developed regions with large private sector in China. However, taking the total number of worker in each province into consideration, the provincial variations in the incidence of labour dispute become smaller. In addition, as is discussed in chapter 1, most labour disputes are mediated before they are brought to courts. As for court efficiency, there is no significant variation across provinces as is the case of labour inspection rate. Over 90% of labour disputes can be resolved in all provinces within a year except for Liaoning. With respect to the pro-worker share, Heilongjiang province tops the table with over 60% cases won by workers; it is just over 40% in Guangxi and Shandong provinces. In Heilongjiang and Guizhou, the union coverage is over 70% while in provinces like Jiangsu, the union coverage is less than 50%.

Other variables included in the study that might affect an individual's employment status choices are vacancy unemployment ratio and log GDP per capita. The former is to control for the local labour market conditions and the latter controls for the general level of economic development. Table 3.10 below summarise the two macro indicators in each province. The vacancy unemployment ratio is lower in Guangxi and Henan than in other provinces. It indicates that unemployed workers face a tighter labour market which means more people are competing for jobs.

Table 11 shows the correlation coefficients between the EPL indicators and macro indicators and within EPL indicators. There is a positive and significant correlation between VU ratio and log GDP per capita. It indicates that workers in wealthier provinces are associated with a higher probability to find a job. Correlations between EPL indicators are moderate. However, we observe a high correlation between macro

indicators and EPL indicators. The correlation between labour inspection rate and log GDP per capita and is -0.4. The correlation between VU ratio and union coverage is 0.44. These should be accounted for when we carry out the regression analysis.

Table 3.9: Descriptive statistics for indicators of EPL enforcement and the judiciary orientation

Indicators	Province	Obs	Mean	Std. Dev.	Min	Max
Inspection Rate	Liaoning	4	0.231	0.061	0.122	0.288
	Heilongjiang	4	0.36	0.058	0.271	0.433
	Jiangsu	4	0.162	0.077	0.075	0.285
	Shandong	4	0.188	0.088	0.093	0.308
	Henan	4	0.177	0.047	0.101	0.22
	Hubei	4	0.313	0.076	0.202	0.39
	Hunan	4	0.053	0.029	0.022	0.098
	Guangxi	4	0.391	0.091	0.291	0.537
	Guizhou	4	0.228	0.054	0.162	0.298
Incidence (per 1000 workers)	Liaoning	4	3.48	3.396	0.73	9.086
	Heilongjiang	4	1.18	0.447	0.521	1.769
	Jiangsu	4	2.161	0.577	1.484	2.919
	Shandong	4	1.705	0.735	0.636	2.518
	Henan	4	1.149	0.369	0.494	1.412
	Hubei	4	1.165	0.512	0.508	1.782
	Hunan	4	1.488	1.318	0.501	3.783
	Guangxi	4	1.388	0.495	0.625	1.997
	Guizhou	4	2.002	1.084	0.614	3.632
Efficiency	Liaoning	4	0.888	0.064	0.782	0.944
	Heilongjiang	4	0.936	0.023	0.904	0.969
	Jiangsu	4	0.95	0.017	0.927	0.975
	Shandong	4	0.916	0.016	0.905	0.945
	Henan	4	0.915	0.035	0.855	0.946
	Hubei	4	0.944	0.017	0.916	0.962
	Hunan	4	0.926	0.054	0.829	0.96
	Guangxi	4	0.953	0.012	0.943	0.973
	Guizhou	4	0.936	0.007	0.924	0.944
Pro-worker share	Liaoning	4	0.567	0.074	0.439	0.626
	Heilongjiang	4	0.661	0.041	0.603	0.712
	Jiangsu	4	0.424	0.057	0.356	0.516
	Shandong	4	0.417	0.051	0.375	0.501
	Henan	4	0.471	0.047	0.412	0.54
	Hubei	4	0.476	0.102	0.355	0.629
	Hunan	4	0.482	0.14	0.293	0.65
	Guangxi	4	0.41	0.062	0.357	0.512
	Guizhou	4	0.507	0.062	0.445	0.612
Unionization	Liaoning	4	0.579	0.093	0.5	0.735
	Heilongjiang	4	0.715	0.152	0.511	0.873
	Jiangsu	4	0.415	0.02	0.387	0.436
	Shandong	4	0.488	0.133	0.315	0.619
	Henan	4	0.54	0.141	0.379	0.681
	Hubei	4	0.637	0.106	0.491	0.759
	Hunan	4	0.529	0.088	0.435	0.639
	Guangxi	4	0.484	0.105	0.356	0.588
	Guizhou	4	0.778	0.41	0.398	1.39

Table 3.10: Descriptive statistics for macro indicators

Indicators	Province	Obs	Mean	Std. Dev.	Min	Max
VU ratio	Liaoning	4	0.938	0.183	0.775	1.267
	Heilongjiang	4	0.933	0.033	0.892	0.982
	Jiangsu	4	0.947	0.090	0.858	1.102
	Shandong	4	1.022	0.047	0.945	1.070
	Henan	4	0.863	0.368	0.556	1.480
	Hubei	4	1.108	0.190	0.898	1.395
	Hunan	4	0.914	0.159	0.642	1.049
	Guangxi	4	0.779	0.209	0.532	1.046
	Guizhou	4	0.967	0.167	0.800	1.250
Ln(GDP)	Liaoning	4	9.917	0.450	9.292	10.469
	Heilongjiang	4	9.496	0.499	8.693	10.036
	Jiangsu	4	10.1641	0.445089	9.506289	10.66146
	Shandong	4	9.974	0.403	9.356	10.400
	Henan	4	9.421	0.446	8.777	9.908
	Hubei	4	9.525	0.443	9.023	10.083
	Hunan	4	9.371	0.462	8.783	9.948
	Guangxi	4	9.216	0.494	8.497	9.787
	Guizhou	4	8.668	0.484	8.046	9.330

Table 3.11 Correlation coefficients between EPL and macro indicators

	Ln(GDP)	VUratio	Unionization	Inspection rate	Incidence	Court efficiency	Pro-worker share
Ln(GDP)	1						
VUratio	0.54	1					
Unionization	0.21	0.44	1				
Inspection rate	-0.40	-0.31	-0.06	1			
Incidence	0.09	0.03	0.14	-0.04	1		
Court efficiency	0.08	0.28	0.02	0.11	0.12	1	
Pro-worker share	-0.24	-0.15	0.13	0.28	0.03	-0.07	1

3.6 Results

As stated in the last section that we use the GSEM (Generalised Structural Equation Model) program built in the Stata software to estimate the multinomial logit model with random effect. Also, there are 4 types of employment status: formal employment, informal employment, unemployment and out of labour force. We use formal employment as the base category. We also assume random effects within individuals are correlated. It means individual's employment decision choices are assumed to be correlated. Otherwise, a pooled multinomial logit model will be sufficient.

Table 3.12, Table 3.13, Table 3.14 and Table 3.15 present the results for the multinomial logit models with random effects. Here we assume that $\alpha_{ij} = 1$ and report only marginal effects (average partial effects) for the convenience of interpretation. Marginal effects can be interpreted as the change of probability by increasing one unit of explanatory variable. Nine models are estimated to account for the possibility of multicollinearity caused by high correlation between EPL and macro indicators. Model 1 contains all EPL indicators. Model 2-4 excludes the EPL indicators one by one. Model 5-9 include each EPL indicators only. Table 3.12 contains nine separate sets of marginal effects to predict the probability of being formally employed; Table 3.13 contains nine separate sets of marginal effects to predict the probability of being informally employed; Table 3.14 contains nine separate sets of marginal effects to predict the probability of being unemployed and Table 3.15 contains nine separate sets of marginal effects to predict the probability of being out of labour force respectively. Table 3.16 shows the goodness of fit (pseudo R2) for all nine models and the details of random effects (their variance and covariance). According to Table 3.16, covariance of random effects within individual are substantial and statistically significant at 1% level. It confirms the plausibility of a

panel model to study repeated employment status choices by individuals. Here only a 3x3 variance covariance matrix is estimated as we treat formal employment as the reference group. In (3.7), we assume that $\exp(\boldsymbol{x}_{it}\boldsymbol{\beta}_J + \alpha_{iJ} + \theta_{1J}Reform_t + \theta_{J2}ind_{mt}) = 1$ for j=J. Hence, $\boldsymbol{\beta}_J = 0, \alpha_{iJ} = 0, \theta_{1J} = 0$ and $\theta_{J2} = 0$ by assumption.

Our results show that several explanatory variables do have effects on individual's employment status choices. We first turn to the effects of individual characteristics. In our models, we include individual's human capital factors such as level of education and age. An individual's human capital factors play a key role in his/her labour market performance. Level of education reflects one's skill level. Age can be generally used a proxy for work related experience. According to Table 3.12 – Table 3.15, for an average worker with no education attainment, having a vocational education will raise the probability of being formally employed by 5.4%. The probability will increase by around 10% if he/she has received a tertiary education. In contrast, having a vocational education will decrease his/her probability of being informally employed by 7.5%. It will decrease by 16.9% if he receives a tertiary education. Having higher levels of education (vocational or above) have significantly decrease the chance of being unemployed and out of labour force. The largest effect is on labour market participation. According to Table 3.14, having a tertiary education will decrease the probability by 38%. With respect to age, other things being equal, an individual between 35-49 years old will be more likely to be formally employment compared with the same individual aged between 16-24 years old. The probability will increase by 11.8% if he is over 50. However, there is no significant age effect on probabilities of being informally employed except for those over 50 (decrease by 13.2%). Getting over 50 will significantly increase the individual's probability of out of the labour force (by around 28.7%).

Other individual characteristics we include in the models are gender, *hukou* status, household size and the marital status. Compared with females, males are more likely to be in formal employment (by around 4.7%) and less likely to be informal employment (by around 6.1%). Although males in average are more likely to be unemployed than females (by 4%), they are much more likely to participate in the labour market than females (by 24.8%). The finding is consistent with the data that labour market participation rate is higher for males. With respect to the rural and urban divide, the *hukou* status has widely been regarded as barrier for rural to urban migrants getting access to certain jobs or being treated equally in the urban labour market (Song, 2015). Nevertheless, our results shows that obtaining an urban *hukou* has no significant effect on the probability of being formally employed, informally employed. Holding an urban *hukou* decreases one's probability of out of labour force by 4%. Similarly, marital status has no significant effect on probabilities of being formally employed and informally employed. However, a married individual is less likely to be out of labour force than singles. In terms of the household size, we find small but significant effects on individual's employment status choices. Other things being equal, as household size increases, individuals are less likely to be in formal employment (by 0.9%) and more likely to be in informal employment (by 1.9%).

Let's look at the effects of general macro background. We include the log GDP per capital in each province to show its effect on employment status choices. We don't find evidence of a positive effect on probability of being formally employed. However, we do find a negative relationship between log GDP per capital and informal employment. A unit increase in log GDP per capita will decrease the probability by 1.9%.

The associations between employment choices and EPL indicators are our main concern. According to Tables 3.12 – 3.15, the enactment of the CLCL has decreased the probability of being formally employed by about 1.5%. It also has increased the probability of being unemployed by around 1.5%. However, its effects on probability of being informally employed and out of labour force are insignificant. It indicates that after controlling for other individual characteristics, the enactment of the CLCL results in a lower probability for individuals to be formally employed. It may be caused by the increasing labour turnover costs associated with the CLCL. Firms are reluctant to employ formal workers. Although the purpose of the CLCL is to regulate labour relations and increase the protection of workers in China, we see insignificant effect on individual's probability on informal employment. Part of it can be explained the use of labour despatching agencies by firms in the Chinese labour market. However, we do see adverse effects of the CLCL on unemployment.

With respect to the effects of EPL enforcement and the judiciary orientation, we include 5 indicators: incidence of labour dispute, share of pro-worker resolutions, share of unionized workers, court efficiency and probability of being inspected by labour inspection agencies. One of our hypothesis is that if EPL is strictly enforced or better complied with, workers are more likely to be formally employed and less likely to be informally employed. Another hypothesis is that if the provincial judiciary system is more worker oriented, workers are more likely to be formally employed and less likely to be informally employed. Due to the high correlation between some of the indicators, we estimate 9 models with different combinations of indicators. However, generally, among the 9 models no evidence has been found on the association between workers employment status choices and court efficiency, labour inspection rate, unionization, and pro-worker share. The only exception is the

incidence of labour disputes. One unit increase in the incidence of labour disputes is associated with a higher probability (by 0.03%) to be formally employed and is associated with a lower probability of 0.06% to be informally employed. In addition, it is also associated with lower probability (by 0.02%) to be unemployed. In this case, it is hard to conclude that the enforcement of labour regulations and the efficiency of judiciary system have a significant impact on individual's employment status choices. Thus, the relationship between employment status choices and EPL indicators are ambiguous. However, it is arguable that the sample size of the data is relatively small and time dimension of the panel is short.

Table 3.12: Marginal effects: Employment status = formally employed

	(1.a)	(2.a)	(3.a)	(4.a)	(5.a)	(6.a)	(7.a)	(8.a)	(9.a)
Primary	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.005	-0.006
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Secondary	0.001	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
	(0.007)	(0.009)	(0.009)	(0.009)	(0.009)	(0.007)	(0.009)	(0.007)	(0.007)
Vocational	0.054	0.054	0.053	0.054	0.053	0.053	0.054	0.053	0.054
	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***
Tertiary	0.101	0.100	0.101	0.101	0.101	0.101	0.101	0.101	0.102
	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***
Age (25-34)	0.005	0.005	0.005	0.005	0.005	0.006	0.005	0.006	0.006
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
Age (35-49)	0.028	0.028	0.029	0.029	0.029	0.029	0.029	0.029	0.029
	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***
Age (50+)	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.118	0.119
	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***
Male	0.047	0.047	0.047	0.047	0.047	0.047	0.047	-0.047	-0.047
	(0.0040)***	(0.0040)***	(0.0040)***	(0.0040)***	(0.0040)***	(0.0040)***	(0.0040)***	(0.0040)***	(0.0040)***
Urban	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0001	0.0003
	（0.004）	（0.004）	（0.004）	（0.004）	（0.004）	（0.004）	（0.004）	（0.004）	（0.004）
Household size	-0.009	-0.009	-0.009	-0.009	-0.009	-0.009	-0.010	-0.009	-0.010
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Married	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
Ln(GDP)	-0.001	-0.001	0.000	0.000	0.000	-0.001	-0.001	-0.002	-0.002
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)

Table 3.12 continued

	(1.a)	(2.a)	(3.a)	(4.a)	(5.a)	(6.a)	(7.a)	(8.a)	(9.a)
Reform	-0.015	-0.015	-0.011	-0.011	-0.010	-0.008	-0.008	-0.007	-0.008
	(0.006)**	(0.006)**	(0.006)*	(0.005)**	(0.005)**	(0.006)**	(0.005)*	(0.005)	(0.005)*
Efficiency	0.067	0.063	0.055	0.053			0.081		
	(0.043)	(0.043)	(0.042)	(0.041)			(0.041)**		
Union	0.009	0.004	0.002			0.003			
	(0.012)	(0.012)	(0.012)			(0.012)			
Pro-worker	-0.024								-0.019
	(0.017)								(0.016)
Incidence	0.0003	0.0003	0.0004	0.0004	0.0004				
	(0.0001)***	(0.0001)***	(0.0001)***	(0.0001)***	(0.0001)***				
Inspection rate	-0.015	-0.018						-0.012	
	(0.017)	(0.017)						(0.016)	
N	13,913	13,913	13,913	13,913	13,913	13,913	13,913	13,913	13,913

(* significant at 10% level; ** significant at 5% level; *** significant at 1% level)

Table 3.13: Marginal effects: Employment status = informal employment

	(1.b)	(2.b)	(3.b)	(4.b)	(5.b)	(6.b)	(7.b)	(8.b)	(9.b)
Primary	0.018	0.018	0.018	0.018	0.019	0.019	0.018	0.019	0.019
	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Secondary	0.010	0.010	0.010	0.010	0.011	0.011	0.009	0.010	0.010
	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)	(0.013)
Vocational	-0.075	-0.075	-0.075	-0.075	-0.074	-0.074	-0.076	-0.075	-0.075
	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***	(0.017)***
Tertiary	-0.169	-0.169	-0.169	-0.169	-0.169	-0.169	-0.170	-0.169	-0.170
	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.009)***	(0.019)	(0.019)
Age (25-34)	0.017	0.017	0.017	0.017	0.017	0.016	0.017	0.017	0.017
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Age (35-49)	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001	-0.002	-0.001
	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)	(0.014)
Age (50+)	-0.132	-0.132	-0.132	-0.132	-0.132	-0.132	-0.132	-0.132	-0.133
	(0.016)***	(0.016)***	(0.016)***	(0.016)***	(0.016)***	(0.016)***	(0.016)***	(0.016)***	(0.016)***
Male	-0.061	-0.061	-0.061	-0.061	-0.061	-0.061	-0.061	0.061	0.061
	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***	(0.008)***
Urban	0.005	0.005	0.005	0.005	0.005	0.006	0.006	0.006	0.006
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Household size	0.015	0.015	0.015	0.015	0.015	0.015	0.016	0.015	0.016
	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***	(0.003)***
Married	0.019	0.019	0.019	0.019	0.019	0.018	0.018	0.018	0.018
	(0.010)*	(0.010)*	(0.010)*	(0.010)*	(0.010)*	(0.010)*	(0.010)*	(0.010)*	(0.010)*

Table 3.13 continued

	(1.b)	(2.b)	(3.b)	(4.b)	(5.b)	(6.b)	(7.b)	(8.b)	(9.b)
Ln(GDP)	-0.019	-0.019	-0.017	-0.017	-0.018	-0.020	-0.020	-0.023	-0.021
	(0.008)**	(0.008)**	(0.008)**	(0.007)**	(0.007)**	(0.008)**	(0.007)**	(0.008)***	(0.008)***
Reform	0.014	0.011	0.010	0.008	0.007	0.004	0.004	0.003	0.003
	(0.011)	(0.011)	(0.011)	(0.008)	(0.008)	(0.010)	(0.010)	(0.008)	(0.008)
Efficiency	-0.077	-0.073	-0.059	-0.056			-0.104		
	(0.078)	(0.078)	(0.077)	(0.075)			(0.074)		
Union	-0.012	-0.007	-0.005			-0.007			
	(0.023)	(0.022)	(0.021)			(0.021)			
Pro-worker	0.023								0.018
	(0.032)								(0.030)
Incidence	-0.0006	-0.0006	-0.0006	-0.0006	-0.0006				
	(0.000)***	(0.000)***	(0.000)***	(0.000)***	(0.000)***				
Inspection rate	0.030	0.034						0.027	
	(0.031)	(0.031)						(0.030)	
N	13,913	13,913	13,913	13,913	13,913	13,913	13,913	13,913	13,913

(* significant at 10% level; ** significant at 5% level; *** significant at 1% level)

Table 3.14: Marginal effects: Employment status = unemployment

	(1.c)	(2.c)	(3.c)	(4.c)	(5.c)	(6.c)	(7.c)	(8.c)	(9.c)
Primary	-0.007	-0.007	-0.007	-0.007	-0.006	-0.006	-0.007	-0.006	-0.006
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
Secondary	-0.011	-0.011	-0.011	-0.011	-0.010	-0.011	-0.011	-0.011	-0.011
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Vocational	-0.042	-0.042	-0.042	-0.041	-0.041	-0.041	-0.042	-0.042	-0.041
	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***
Tertiary	-0.051	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050	-0.050
	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***
Age (25-34)	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029
	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***
Age (35-49)	-0.061	-0.061	-0.061	-0.061	-0.061	-0.061	-0.061	-0.061	-0.061
	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***	(0.007)***
Age (50+)	-0.125	-0.125	-0.125	-0.125	-0.125	-0.125	-0.125	-0.125	-0.125
	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***
Male	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040	0.040
	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***	(0.005)***
Urban	-0.007	-0.008	-0.008	-0.008	-0.008	-0.007	-0.007	-0.008	-0.007
	(0.004)*	(0.004)*	(0.004)*	(0.004)*	(0.004)*	(0.004)*	(0.004)*	(0.004)*	(0.004)*
Household size	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005
	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***	(0.002)***
Married	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.029	-0.030
	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***	(0.006)***
Ln(GDP)	0.018	0.018	0.018	0.018	0.018	0.018	0.018	0.017	0.017
	(0.005)***	(0.005)***	(0.005)***	(0.004)***	(0.004)***	(0.005)***	(0.005)***	(0.005)***	(0.004)***

Table 3.14 continued

	(1.c)	(2.c)	(3.c)	(4.c)	(5.c)	(6.c)	(7.c)	(8.c)	(9.c)
Reform	0.019	0.015	0.015	0.015	0.014	0.012	0.014	0.012	0.014
	(0.008)**	(0.007)**	(0.007)**	(0.006)**	(0.005)***	(0.007)*	(0.007)**	(0.005)**	(0.005)**
Efficiency	-0.069	-0.063	-0.059	-0.059			-0.073		
	(0.050)	(0.050)	(0.049)	(0.049)			(0.048)		
Union	-0.007	0.0003	-0.0002			0.0002			
	(0.015)	(0.014)	(0.014)			(0.013)			
Pro-worker	0.029								0.023
	(0.020)								(0.019)
Incidence	-0.0002	-0.0002	-0.0002	-0.0002	-0.0002				
	(0.000)*	(0.000)*	(0.000)*	(0.000)*	(0.000)*				
Inspection rate	0.003	0.006						0.000	
	(0.017)	(0.017)						(0.017)	
N	13,913	13,913	13,913	13,913	13,913	13,913	13,913	13,913	13,913

(* significant at 10% level; ** significant at 5% level; *** significant at 1% level)

Table 3.15: Marginal effects: Employment status = out of labour force

	(1.d)	(2.d)	(3.d)	(4.d)	(5.d)	(6.d)	(7.d)	(8.d)	(9.d)
Primary	-0.034	-0.034	-0.034	-0.035	-0.034	-0.034	-0.034	-0.034	-0.034
	(0.020)*	(0.020)*	(0.020)*	(0.020)*	(0.020)*	(0.020)*	(0.020)*	(0.020)*	(0.020)*
Secondary	-0.136	-0.136	-0.136	-0.136	-0.135	-0.135	-0.136	-0.135	-0.135
	(0.018)***	(0.018)***	(0.018)***	(0.018)***	(0.018)***	(0.018)***	(0.018)***	(0.018)***	(0.018)***
Vocational	-0.297	-0.297	-0.297	-0.297	-0.296	-0.297	-0.297	-0.296	-0.296
	(0.021)***	(0.021)***	(0.021)***	(0.021)***	(0.021)***	(0.021)***	(0.021)***	(0.021)***	(0.021)***
Tertiary	-0.380	-0.380	-0.380	-0.379	-0.379	-0.380	-0.379	-0.379	-0.379
	(0.022)***	(0.022)***	(0.022)***	(0.022)***	(0.022)***	(0.022)***	(0.022)***	(0.022)***	(0.022)***
Age (25-34)	-0.149	-0.149	-0.149	-0.149	-0.149	-0.149	-0.149	-0.149	-0.149
	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***
Age (35-49)	-0.092	-0.092	-0.093	-0.092	-0.093	-0.093	-0.092	-0.092	-0.093
	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***	(0.020)***
Age (50+)	0.287	0.287	0.287	0.288	0.287	0.287	0.288	0.287	0.287
	(0.019)***	(0.019)***	(0.019)***	(0.019)***	(0.019)***	(0.019)***	(0.019)***	(0.019)***	(0.019)***
Male	-0.248	-0.248	-0.248	-0.249	-0.249	-0.249	-0.249	-0.249	-0.249
	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***	(0.010)***
Urban	-0.040	-0.040	-0.040	-0.040	-0.040	-0.040	-0.040	-0.041	-0.040
	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***	(0.011)***
Household size	-0.006	-0.006	-0.006	-0.007	-0.007	-0.006	-0.007	-0.007	-0.007
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)*	(0.004)	(0.004)*	(0.004)*	(0.004)*
Married	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035	-0.035
	(0.015)**	(0.015)**	(0.015)**	(0.015)**	(0.015)**	(0.015)**	(0.015)**	(0.015)**	(0.015)**

Table 3.15 continued

	(1.d)	(2.d)	(3.d)	(4.d)	(5.d)	(6.d)	(7.d)	(8.d)	(9.d)
Ln(GDP)	-0.018	-0.018	-0.015	-0.018	-0.018	-0.015	-0.018	-0.021	-0.018
	(0.011)*	(0.011)*	(0.010)	(0.010)*	(0.010)*	(0.010)	(0.010)*	(0.011)*	(0.010)*
Reform	-0.015	-0.014	-0.012	-0.004	-0.005	-0.014	-0.004	-0.006	-0.005
	(0.015)	(0.015)	(0.015)	(0.011)	(0.011)	(0.014)	(0.011)	(0.011)	(0.011)
Efficiency	-0.041	-0.042	-0.061	-0.078			-0.077		
	(0.105)	(0.105)	(0.103)	(0.102)			(0.100)		
Union	0.031	0.030	0.027			0.030			
	(0.030)	(0.029)	(0.029)			(0.028)			
Pro-worker	-0.005								-0.001
	(0.042)								(0.040)
Incidence	-0.000	-0.000	-0.000	0.000	-0.000				
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)				
Inspection rate	-0.041	-0.042						-0.042	
	(0.042)	(0.042)						(0.041)	
N	13,913	13,913	13,913	13,913	13,913	13,913	13,913	13,913	13,913

(* significant at 10% level; ** significant at 5% level; *** significant at 1% level)

Table 3.16: Regression statistics

	N	log-likelihood	Pseudo R^2	var(u2)	var(u3)	var(u4)	cov(u2, u3)	cov(u2, u4)	cov(u3, u4)
Model 1	13913	-15473.2	0.569	4.238	1.999	4.027	2.168***	0.576***	0.947***
Model 2	13913	-15474.5	0.563	4.230	1.988	4.029	2.160***	0.579***	0.944***
Model 3	13913	-15475.1	0.558	4.246	1.995	4.035	2.170***	0.581***	0.950***
Model 4	13913	-15475.2	0.550	4.247	1.996	4.037	2.171***	0.581***	0.952***
Model 5	13913	-15476.2	0.549	4.252	1.995	4.043	2.171***	0.582***	0.953***
Model 6	13913	-15483.6	0.553	4.196	1.985	4.040	2.140***	0.566***	0.930***
Model 7	13913	-15481.6	0.549	4.200	1.993	4.044	2.149***	0.569***	0.921***
Model 8	13913	-15483.3	0.541	4.186	1.983	4.041	2.136***	0.570***	0.928***
Model 9	13913	-15482.8	0.546	4.204	1.992	4.035	2.149***	0.563***	0.933***

(* significant at 10% level; ** significant at 5% level; *** significant at 1% level)

3.7 Conclusion

The chapter has evaluated the effects of EPL on individuals' employment status choices with micro survey data from China. We use random effect discrete choice models to control for individual unobserved heterogeneity and identify various factors associated with the individual's employment status choices. Our results find no significant change of male and female labour force participation before and after the enactment of the CLCL. We also find weak association between the EPL enforcement and labour force participation and weak association between the judiciary orientation and labour force participation. Our results show that female from provinces with higher labour inspection rate are more likely to participate in the labour force.

With respect to individual's choices over employment status conditional on participating in the labour market, our results show that generally workers are more likely to be formally employed and unemployed, and are less likely to be informally employed after 2008. The enforcement of EPL and the judiciary orientation appear to have little association with worker's choices of employment status. One exception is for the pro-worker share of court resolutions. Workers from provinces with higher pro-worker shares are associated with higher probability of being formally employed, lower probability to be informally employed and higher probability to be unemployed.

The weak association between the enforcement of EPL and the judiciary orientation and worker's choices of employment suggests that workers labour force participation decisions and employment status are hardly affected by labour inspections and judiciary system orientation. It may derive from firm's counter strategy to the stricter EPL and its enforcement. For example, the use of dispatched workers by firms becomes common after 2008 (Wang et al., 2016). Although dispatched workers are offered labour contracts, those labour contracts are signed between workers and labour

dispatching agencies. It can hardly be considered formal employment as most dispatched workers are employed without social insurance. Another possible reason to the results found in our study is the insufficient variation of the indicators for law enforcements and the judiciary orientation due to data availability. The indicators are aggregated at provincial level and only 9 provinces are included in our study.

Workers decisions over labour market participation are likely to be affected by many factors. Although we find minimal role of law enforcement and the judiciary orientation, it is worth to note that individual's demographic and social economic characteristics such as level of education, age and *hukou* status play important roles in individual's labour market decisions. These factors are more relevant for policy implications.

Chapter 4: The wage gap between rural migrants and urban workers in China: a matching approach

4.1 Introduction

The wage gap between rural migrants and urban workers in the urban labor market is persistent in China. The institutional discrimination associated with the household registration system is widely believed to be one of the main causes of the wage gap. Under the system, every Chinese national should be registered and given a *hukou* according to his/her place of residence, either rural (agricultural) or urban (non-agricultural). Although rural *hukou* holders are each allocated a piece of farmland, they are excluded from highly subsidized urban social benefits such as medical care, education, housing, and pensions. These rural residents were also restricted from finding non-agricultural jobs in urban areas in the past. Due to the development of the Chinese economy, the restriction on labor migration was gradually relaxed in recent decades. The number of rural migrants in the urban labor market is estimated to have reached 270 million in 2015 (National Bureau of Statistics, 2015). However, there are concerns that rural migrants in the urban labor market are still treated differently from their urban counterparts in terms of wages, social welfare, and work conditions (Demurger et al., 2009). Figures from national statistics indicate that although the migrant urban wage gap is generally narrowing, the wage ratio of rural migrants to urban workers is constantly below 0.7 in the last two decades (see Figure 1.1). It has also been highlighted in the literature that rural migrants face higher job mobility

(Knight and Yueh, 2004), late payment of wages (Demurger et al., 2009), and restrictions on getting access to certain well-paid jobs (Knight et al., 1999; Appleton et al., 2004).

Nevertheless, a wage gap between two groups in the labor market does not necessarily mean one group is discriminated against. The difference in labor income might be a result of a difference in human capital such as investment in education, knowledge, and ability (Mincer, 1970). It could also be attributed to a segmented labor market where one group of workers is concentrated in low paid sectors or occupations. The segregation can be either associated with discrimination by employers or just a reflection of individual preferences or household decisions (Meng and Zhang, 2001). The purpose of this paper is to contribute to the understanding of the origin of the wage gap between migrants and urban workers in the China's urban labor market. Only by carefully looking into all factors that determine individuals' wage formation can we have a better understanding of the urban labor market and think of policies to tackle urban inequality.

In fact, there is much literature investigating the wage gap between groups of workers in the context of the China's urban labor market. Most of the studies employ an empirical strategy developed by Oaxaca (1973) and Blinder (1973). This strategy involves a decomposition of the wage gap into parts that can be attributed to differences in individual characteristics and parts that represents different wage returns to the same characteristics, i.e. discrimination. Another popular approach is its extension in Brown et al.'s (1980) decomposition in which the effect of occupation segregation on the wage gap is further investigated. There is also growing interest in the approach proposed by Machado and Mata (2005) and Melly (2006), where the wage gap is decomposed along the wage distribution. These approaches often impose

a restriction on the structures of wage formation for different groups of workers. For example, wage formation in Oaxaca-Blinder type approaches often are assumed to be linear. In addition, they are parametric. The former approach uses OLS to fit a linear model for the conditional mean, while the latter uses quantile regression to fit a linear model for the conditional quantiles. The predetermined linear model is often criticized because of a potential misspecification problem (Wooldridge, 2015). Moreover, the conventional approaches might have a common support problem (i.e., the distribution of individual characteristics for different groups of workers have little common support). The common support problem is often considered in literature evaluating programs. When drawing causal inferences, researchers usually attempt to compare observations in one state with comparable observations in another state (Lechner, 2001). Very little or no common support is likely to increase the bias and variance of estimators (Kahn and Tamer, 2010). In this respect, if we want to measure the extent to which the wage gap (either at the mean or at different quantiles) between rural migrant and urban workers is caused by differences in individual characteristics, it would be pointless to include those workers outside the common support as they are incomparable.

The method we employ is a non-parametric matching approach. As far as we know, we are the first to study the wage gap between rural migrants and urban workers in the China's urban labor market with a matching approach. Particularly, we follow a matching method proposed by Nopo (2008) to deal with the common support problem. In the conventional parametric approach researchers are keen to know to what extent the wage gap between rural migrants and urban workers can be explained by the difference in wages of urban workers and the counterfactual wages of rural migrant workers if they have the same wage structure as urban workers. The non-parametric

method we use constructs the counterfactual wages distribution rural migrant workers would have if they had the same distribution of individual characteristics as urban workers. Another advantage of Nopo's approach is that it also provides rich information on the distribution of the unexplained wage gap. Moreover, the non-parametric feature of the method eases the reliance on assumptions of specification and the assumption of conditional independence. Nevertheless, it is undeniable that the matching approach has limitations. It has the problem of dimensionality where the more variables we choose to match with, the smaller the size of the matched sample will be.

A second contribution is to employ a dataset with a large coverage of individuals in urban areas, with the rural and urban *hukou*. To carry out the study, we use a national representative dataset (Rural to Urban Migration in China) collected in 2009. It contains more than 9000 observations in each group of workers and covers the main migrants to exporting and importing provinces and cities. Problems with previous studies over the wage gap between rural migrant and urban workers include the relative small sample size and the concentration on limited area/cities (Demurger et al., 2009). For example, Meng and Zhang (2001) study the migrant urban worker wage gap in Shanghai. Wang et al. (2015) looks at the same issue with data from 4 large cities. Another national representative dataset is from the 2005 One Percent Population Survey collected by the Chinese National Bureau of Statistics and contains rich information on migrants and urban workers (e.g., Zhang and Wu, 2013). However, this dataset was collected before 2008 and cannot reflect the current labor market situations, as China has experienced major labor law reform since 2008.

Our results show that the size of the unexplained wage gap compared to the mean wage gap between urban workers and rural migrants in the China's urban labor market

decreases significantly from nearly 50% to 29.7% if we compare comparable individuals on common support. We have also examined the effect of labor market segmentation (occupational segregation and sector segregation) on the wage gap. Results imply that the size of the unexplained wage gap to the mean wage of rural migrant workers decreases from 10.8% to 9.4% when we control occupation in the matching process. We can also see a reduction in the size of the unexplained wage gap from 10.8% to 9.2% when we control for firm ownership. It indicates that the existence of labor market segmentation enlarges the unexplained wage gap between urban workers and urban migrant workers in China. Results from the distribution of the unexplained wage gap show that male migrants face a larger unexplained wage gap than female migrants. Migrants are also more disadvantaged in the state-owned enterprises than in the private sector.

The rest of the chapter will be divided into 5 sections. Section 4.2 presents the literature review, including the review of the empirical methods used to address the problem and related Chinese empirical studies on this topic. Section 4.3 introduces the data used and its descriptive analysis. Section 4.4 introduces the empirical strategy we use to explore the wage gap between rural migrants and urban workers in the China's urban labor market. Section 4.5 presents the results. The last section includes some remarks in conclusion.

4.2 Literature Review

In this section a review of the existing literature will be presented. First, theories and empirical strategies that are adopted to investigate wage gap will be reviewed. Second, we will present empirical studies that look at, in particular, the wage gap between urban and rural migrant workers in the China's urban labor market.

4.2.1 Theories and empirical strategies used in existing literature

Beside the non-discriminatory factors such as differences in preferences and skills, discrimination and labor market segmentation are the most widely used theories to explain the wage gap between two groups of workers (Wang et al., 2015). Becker (1957) discusses three types of taste-based discrimination in the workplace: employer discrimination, employee discrimination, and customer discrimination. The wage gap may result from distaste on the part of the employer toward a group of workers. A discriminatory employer would rather give up part of his profit to satisfy his prejudice. The wage gap can also be caused by employee discrimination where the majority group of workers dislike working with the minority group of workers. Consumer discrimination against one group of workers can also lower the expected remuneration of these workers when consumers are mostly prejudiced members. Phelps (1972) and Arrow (1973) discuss the effects of statistical discrimination on the wage gap between two groups of workers. Under imperfect information assumption, some employers are likely to statistically discriminate against a group of workers based on easily observable characteristics.

The labor market segmentation theory suggests that the labor market consists of two segments: a primary market and a secondary market (Piore and Doeringer, 1971). The primary market features good jobs (e.g., good pay, good working conditions, etc.). In contrast, the secondary market features bad jobs (e.g., low pay, bad working conditions, etc.). The presence of occupational segregation in the segmented labor market will lead to a wage gap between groups of workers. The occupational segregation could simply be a result of employer discrimination or institutional discrimination against one group of workers. It can also be attributed to group preferences. Moreover, the

occupational segregation can be a result of differences in pre-labor market human capital investment (Altonji and Blank, 1999).

Decomposition methods are perhaps the most popular way to study the effects of various factors on wage gap between groups. Oaxaca (1973) and Blinder (1973) have independently developed similar decomposition techniques to study the mean wage gap among two groups of workers. In particular, their method decomposes the mean wage gap among groups into two parts. Part of the wage differential can be explained by differences in individual characteristics (characteristic effect) and the rest is unexplainable (which is often called "coefficient effect"). For better clarity, let us consider two groups of workers, $i = \{u, r\}$. Here, *u* denotes the group with relatively higher wages (urban workers in our case) and *r* denotes the group with relatively lower wages (rural migrant workers in our case). A Mincer type wage equation can be estimated for each group,

$$\ln w^i = x^i \beta^i + \varepsilon^i \text{ where } i = \{u, r\}. \quad (4.1)$$

x is a vector of individual characteristics with $x_1 = 1$ as the constant term, and β contains associated coefficients. *w* is the equilibrium wage in the labor market. *ε* is the error term that has $E(\varepsilon|x) = 0$. The OLS estimation will give us $\ln \bar{w}^i = \bar{x}^i \hat{\beta}^i$ where $\bar{w}^i$ is the average wage across group i, and $\bar{X}^i$ denotes the sample average of individual characteristics. Hence, the wage gap between u and r can be expressed as

$$\ln \bar{w}^u - \ln \bar{w}^r = x^u \hat{\beta}^u - x^r \hat{\beta}^r \quad (4.2)$$

Simple transformations of (2.2) can lead to:

$$\ln \bar{w}^u - \ln \bar{w}^r = (x^u - x^r)\hat{\beta}^u + x^r(\hat{\beta}^u - \hat{\beta}^r) \quad (4.3)$$

If $\hat{\beta}^u$ is believed to be the non-discriminatory wage structure, then the first term on the right hand side of (2.3) can be interpreted as the part of the wage gap caused by differences in individual characteristics and the second term on the right hand side of (2.3) is the part of the wage gap due to differences in wage structure across groups (i.e., differences between discriminatory wage structure and non-discriminatory wage structure).

The traditional Oaxaca-Blinder technique explicitly chose a non-discriminatory wage structure. It suffers from an index problem where the choice of another non-discriminatory wage structure such as $\hat{\beta}^r$ would result in a different size of coefficient effect. Ever since then, economists have been trying to overcome the index problem by finding more convincing non-discriminatory wage structures. Reimers (1983) suggests that a non-discriminatory wage structure can be a weighted sum of wage structures for two groups. However, the weights he imposes are not justified and can be any number. In contrast, Cotton (1988) considers different forms of discrimination in the labor market. He argues that in addition to a direct discrimination against a low wage group, high wage group workers tend to be overvalued in the labor market. In this case, a proper non-discriminatory wage structure should be between the wage structures of two groups. The weights he suggests are relative proportions of each type of worker in the whole sample. However, both Reimers (1983) and Cotton (1988) are criticized by Neumark (1988). Neumark argues that non-discrimination wage structure should be "derived from a theoretical model of discriminatory behavior." He extends Becker (1957) and Arrow (1973) type employer discrimination models and considers two types of discriminatory behavior as in Cotton (1988): the existence of nepotism toward one group and discrimination against another. Under the assumption that "the utility function of an employer is homogeneous of degree zero with respect to labor

inputs from each group," the non-discriminatory wage structure is approximately equal to the wage structure from pooled regression.

Juhn et al. (1991) propose an extension of the Oaxaca and Blinder method to explore the causes of slower convergence of the Black-White wage gap in the US. In their approach, they ignore the index problem by assuming that African Americans and Caucasians should have the same wage structure in the absence of discrimination. In addition, wage distributions are assumed to be identical among two groups. The change in wage gap between two groups can then be decomposed into two parts. One part can be explained by changes in the wage structure of groups and changes in individual characteristics across time. The other part attributes the wage gap to unobservable changes in two groups and changes in the distribution of wages of Caucasians across time. Their empirical results show that increased wage dispersion has played an important role in the slower convergence of the Black-White wage gap in the US since 1979. However, the strong assumption of identical wage distribution across groups is criticized by Guo et al. (2011). They argue that in the US labor market, the wage distribution of Caucasians is more dispersed than it is in the case of African Americans.

Occupational segregation can also have an impact on the wage gap between groups (Brown et al., 1980). In the Oaxaca (1973) and Blinder (1973) type literature, occupation is often regarded as exogenous in the wage structure estimation. They implicitly assume that the occupational distribution of two sub-groups studied is random and thus that there is no inequality of opportunity to enter certain occupations. Brown et al. (1980) relax the assumption and estimate two separate occupational choice equations for each group of workers. Their decomposition method indicates the wage gap may be caused not only by differences in individual characteristics and wage

structure but also by differences in occupational choice structures. Similar to Oaxaca (1973) and Blinder (1973), this method also suffers from an index number problem. On the one hand, it still uses the wage structure of high wage group workers as a non-discriminatory structure while decomposing the wage gaps. On the other hand, they have used the occupational choice structure of high wage groups as a non-discriminatory one, which is quite arbitrary. Appleton et al. (1999) correct these problems with a strategy borrowed from Neumark (1988), that is, using wage structure derived from the estimation of a pooled sample wage equation as a non-discriminatory one. The non-discriminatory occupational choice structure is obtained through a weighted sum of sub-group occupational choice structures.

Wage decomposition techniques such as the ones used by Oaxaca-Blinder and its extensions often use a linear OLS model to obtain wage structures. The linear model focuses on the conditional mean of the response variable and describes the average partial effects of independent variables on the dependent variable. It cannot show the conditional distributional properties of the dependent variable. Juhn et al. (1993) look at the causes of the changes in wage inequality within a group across time. The study extends Juhn et al. (1991) to consider the distribution of residuals. In particular, they measure the changes in wage inequality within groups across time as changes in distance between two quantiles in wage distribution. The problem with the Juhn (1993) decomposition method is that the effects of unobservable changes on group wage inequality cannot be further decomposed (i.e., we are unable to see the exact price effect/quantity effect of those unobservable.

Conditional quantile regression can estimate the potential differential effect of the independent variables on various quantiles of the conditional distribution. Machado and Mata (2005) develop a conditional quantile regression decomposition method to

study the wage gap between two groups of workers along the entire wage distribution. The essence of the method is to construct an unconditional wage distribution function. A counterfactual wage distribution can then be estimated and compared with the actual wage distribution to see the unexplained wage gap between two groups along wage distribution. Their approach can also estimate the partial effect of change in distribution of one control variable on wage distribution. An extension of the approach can be found in Melly (2006), where she has solved the problem of the crossing of quantile curves.

In recent years, there is a growing trend of using semi- or non-parametric methods to investigate the wage gap between different groups of workers. The problems with linear Oaxaca-Blinder type methods or distribution based approaches are similar. As we briefly discussed in the introduction section of this chapter, the strict assumption over the functional form of the wage equation is implausible and has the potential problem of misspecification. DiNardo et al. (1996) are the first to use a non-parametric decomposition method. Their method requires no assumption on shapes of distribution. In addition, it does not require a conditional independence assumption as in parametric approaches. The authors use a weighted kernel density estimation method to estimate the probability density function of the wage. In addition, they use an empirical reweighting function to construct counterfactual wage distribution. The change in wage distribution across time can then be easily decomposed into one part due to changes in individual characteristics (composition effect) and into another part attributed to changes in wage distribution (wage structure effect). However, the decomposition method is usually computationally complicated (Melly, 2006).

A similar non-parametric approach is employed by Barsky et al. (2002). They have stressed the importance of a common support problem in explaining the wealth gap

between African Americans and Caucasians in the US, which makes the approach interesting. The traditional Oaxaca-Blinder method indicates that only around 20% of the wealth gap between African American and Caucasian families in the US can be explained by their income differences. After focusing on the common support, the proportion of the wealth gap due to work earnings increases to 64%. The common support problem is dealt with by the authors in way to assign zero weight to the wealth of those Caucasian families falling above the maximum of African American families. The main problem with the method is that it cannot capture the effects of other observable variables on the wealth gap.

The common support problem is also emphasized in Frolich (2007) and Nopo (2008). They have proposed non-parametric matching techniques to study the determinants of the wage gap between two groups of workers. The main difference between the two approaches lies in the way they construct the comparable pairs of workers in the two groups of workers they study. The former method uses propensity score matching, while the latter matches those with exactly the same set of individual characteristics. Both have advantages and disadvantages. They not only provide us with information on the effect of individual characteristics on the wage gap but also provide information on the distribution of the unexplained wage gap. Propensity score matching performs better when there is a relatively small sample, but the matching quality is relatively low. The main problem with exact matching is the "curse of dimensionality" where the matched sample size will shrink significantly when we choose more variables to control for.

4.2.2 Chinese empirical studies

Empirical studies in China started from the 1990s as rural to urban migration became common and micro level data for the Chinese labor market became available. The reform of state-owned enterprises since the early 1990s has led to many urban workers being laid off. It was well documented in the literature that there was an environment of protection against urban workers at that time (Yang, 2002).

Meng and Zhang (2001) study the effects of occupation segregation on the wage gap between rural migrants and urban workers in Shanghai. The decomposition method they use follows the one used by Brown et al. (1980). Meng and Zhang use a dataset collected by the Shanghai Academy of Social Science in 1996 and have classified occupations into 5 categories: white collar, wholesale workers, service personnel, manufacturing personnel, and other workers. Their results show that 22% of urban residents who should have been blue collars take white-collar jobs. In contrast, about 6% of rural migrant workers who should have been white collars take blue-collar jobs. This research demonstrated that there are big differences between urban and migrant workers in terms of occupation. Rural migrant workers were concentrated in the manufacturing sector and other sectors, but urban residents were more likely to be in white-collar occupations. Wage differential caused by occupation segregation only accounted for 6% of the whole wage gap, and most of the discrimination was from occupational discrimination.

Instead of considering occupational segregation, Wang (2005) looked at the role of institutions on the wage gap between urban workers and rural migrants. She used data from the China Urban Labor Survey, 2001. Four types of workers based on their firm ownership are considered: self-employed, state-owned staff, non-state-owned staff, and non-state-owned senior staff. This study suggested that, if rural migrants and

urban workers were treated equally, the ratio of rural migrant workers who were self-employed should have decreased by 31.38% and the ratio of migrant workers as state-owned staff should have increased by 28.07%. It means that migrant workers are mostly excluded by the state sector. Moreover, Wang also investigated the sources of the wage gap using the Brown et al. (1980) decomposition method. The results show that 58.73% of the wage gap came from the occupational wage differential of which 26.93% cannot be explained by differences in observable characteristics.

Although the Brown et al. decomposition takes occupational segregation into consideration, it could not present the feature of wage distribution. Based on this weakness, Deng (2007) used a quantile decomposition method to research the causes of the wage differential between migrant and urban workers. This research showed that in the low and middle-income quantile, discrimination was the most important reason leading to the wage gap between migrant and urban workers. Meanwhile, within the top 10% income quantile, the income gap was mostly caused by characteristic effects. Therefore, it is the low-income migrants who suffer from discrimination.

Empirical studies with a mean wage approach using data collected after 2005 suggest that the unexplained part of the wage gap is generally lower than before. Adopting data from the 1% National Population Survey in 2005, Xing (2008) demonstrated that around 90% of the wage gap between urban and migrant workers could be explained by a difference in individual, observable characteristics. Similar results are found in Lee (2012), Xu and Zhao (2014), and Yu and Chen (2012). However, research from Qu (2014) came to different conclusions from the above studies. Qu found that discrimination or an unexplained wage gap increased from 2001 to 2010. One point of note is that, even in those studies that found unexplained wage

gap was a decreasing trend, there was no improvement among low-income migrant workers. Meng (2014) compared the wage gap among areas with different levels of economic development. In the less developed western area, human capital and other job-related factors can still only explain a small part of the wage gap between urban and migrant workers. However, in central and eastern China where migrant workers are in large demand, it seems that much of the wage gap can be explained. A summary of the Chinese empirical studies can be found in Table 4.1.

Although empirical literature in the context of the China's urban labor market suggested that there is a significant wage gap between rural migrants and urban workers, the empirical strategies they used are often parametric estimation. Moreover, the common support problem is ignored in the Chinese empirical studies. As is pointed out by Nopo (2008), failing to account for the common support problem could result in an overestimation of the unexplained wage gap.

Table 4.1: Table of empirical literature on wage gap between rural migrants and urban workers

Literature	Data	Methodology	Results
Meng and Zhang (2001)	Surveys of floating population and urban residents in Shanghai in 1995 and 1996 by Shanghai Academy of Social Science	Brown et al. decomposition method to see the effects of occupation segregation on wage gap	Earning gaps cannot be explained by individual endowments increase from 50% to 110% after considering occupation segregation. The proportion of the contribution of occupation segregation to unexplained earning gap is just 6%. Most of the unexplained gap is caused by disparity within occupations.
Wang (2005)	China Urban Labor Survey in 2001. The survey is conducted in five megacities: Shanghai, Wuhan, Shenyang, Fuzhou, and Xi'an	Brown et al. decomposition method to see the effects of sector segregation on wage gap	Sector segregation leads to concentration of rural migrant workers in non-state-owned enterprises. Occupation segregation contributes 26.93% to the unexplained wage gap.
Deng (2007)	CASS surveys on urban households and temporary residents in 12 provinces in 2002. It contains 6853 urban households and 2000 migrant households	Oaxaca-Blinder technique and Machado and Mata (2005) Quantile regression decomposition technique to decompose wage gap	Oaxaca-Blinder method shows that about 60% of the wage gap cannot be explained by individual characteristics. The unexplained wage gap is largest in low and middle income groups of workers. The wage gap between those on top of wage distribution is mainly caused by differences in human capital factors.

Table 4.1 continued

Literature	Data	Methodology	Results
Xing (2008)	1% national population sample survey in 2005	Oaxaca-Blinder decomposition	90% of the wage gap can be explained by differences in individual characteristics. Education is the main contributor to the observed wage gap.
Lee (2012)	China Urban Labour Survey in 2005. The survey is conducted in 12 cities.	Oaxaca-Blinder decomposition	90% of the wage gap can be explained by differences in individual characteristics.
Xu and Zhao (2014)	Matched Employer-Employee dataset in China in 2012. It is conducted in 350 firms across 10 cities.	Oaxaca-Blinder decomposition to look at both wage gap between rural migrants and urban workers and wage gap between locals and non-locals.	86% of the rural migrants urban workers' wage gap can be explained by differences in individual characteristics.
Yu and Chen (2012)	1993–2009 China Health and Nutrition Survey	Melly (2006) Quantile regression decomposition method with endogenous treatment effect to study the wage gap along the wage distribution and corrects for potential effects of endogenous sector and occupational segregation.	Growing effects of *hukou* on wage gap along wage distribution are noted. The discrimination effects are even worse in 2009. Unexplained wage gap accounts for more than 50% of observed wage gap for low and middle income groups and is still more than 40% for high income groups.
Qu (2014)	China Urban Labour Survey: 2001, 2005, 2010	Use Machado and Mata (2005) Quantile regression decomposition technique to study the wage gap along the wage distribution	"Sticky floor" effect in the lower quantiles of wage distribution. Unexplained wage gap was increasing from 2001–2010.

Table 4.1 continued

Literature	Data	Methodology	Results
Zhang and Wu (2013)	1% national population sample survey in 2005	Brown et al. decomposition method to study the effects of occupation segregation. It contains 38 categories	Occupation segregation contributes to the observed wage gap while within occupation inequality plays a minimum role.
Zhu (2016)	2002, 2007 China Household Income Project	The unconditional quantile regression decomposition method by Firpo, Fortin, and Lemieux (2009) to study the wage gap along the wage distribution and to see the effect of each variable on wage gap along wage distribution	Return to education becomes more similar between two groups of workers. Unexplained wage gap is larger at upper quantiles of wage distribution. Generally, discrimination against rural migrants is intensified.

4.3 Data

The Rural Urban Migration in China (RUMiC) dataset is used to study the wage gap between rural migrants and urban workers. It is a longitudinal survey conducted by the Institute for the Study of Labor, Australian National University, and Beijing Normal University. Currently, two waves (2008, 2009) are now publicly available. The dataset contains three separate surveys: the urban household survey (UHS), the rural household survey and the migrant household survey (MHS). We restrict our analysis to the 2009 wave of UHS and MHS. Both UHS and MHS are conducted in the nine largest migrant-sending and -receiving provinces (out of 31 provinces and autonomous regions) and contain around 5000 households in each sample. The MHS is conducted in 15 cities, while the UHS covers four more cities. The sampling scheme for the UHS uses random samples from annual household income and expenditure surveys conducted by the Chinese National Bureau of Statistics. To obtain a representative sample, the MHS uses a census listing and workplace based sampling frame (Akgüç et al., 2014). Both MHS and UHS are collected through face-to-face interviews. The questions mainly concern the welfare status of the household members; thus, they cover the details of respondents' demographic, economic, and health related information.

To compare the wage gap between rural migrants and urban workers, we keep only those wage earners who are older than 16 years and younger than 65 years. Wage is the main concern in our analysis. The average monthly earnings reported include post-tax wages, bonuses, and allowances. As some Chinese firms provide catering and accommodation to their employees, we also include the benefits from catering and accommodation in the monthly earnings. This is important in the Chinese context as accommodation and catering account for a large proportion of household expenditure

for rural migrants. In addition, we derive the hourly wage from the information on number of hours worked per week. Lastly, similar to (Demurger et al, 2009), we adjust for differences in provincial purchasing power with price deflators estimated by Brandt and Holz (2006).

Table 4.2 presents the descriptive statistics for individual characteristics in the UHS and MHS. We dismissed all observations with missing values and ended up with a sample consisting of 6222 urban workers and 4867 rural migrant workers. The differences between the urban workers and rural migrant workers are all significant at 1% level. According to Table 4.2, 83.62% of urban wage earners are married (it is 53.93% for rural migrants). Rural migrants on average earn just 7.08 yuan per hour. This is less than half of the mean hourly wage for urban workers. However, the urban workers in the sample on an average are approximately 10 years older than the rural migrants and have nine more years of non-agricultural job experience in the same occupation. In addition, among the urban wage earners, approximately 46% have received tertiary education. The percentage for rural migrants is just over 8% for tertiary education. In contrast, the proportion of males and the proportion of workers in coastal developed provinces in the MHS sample (60.55% and 51.67%, respectively) are slightly higher than in the UHS sample (55.93% and 45.74%. respectively).

With respect to the types of firm ownership, we have divided it into four categories. State-owned enterprises refer to those firms either held or partly held by the government. Collective-owned enterprises mainly refer to those firms owned by town and village level communities. Self-employed individual firms are distinguished from private-owned enterprises by their capital requirements and the number of employees they can hire. However, the requirements on the registration of private enterprises have relaxed substantially since 2012 in an attempt to boost innovation and increase urban

employment. Among urban workers, 59.12% of them are employed by state-owned enterprises, and 6.33% of them work for collective-owned enterprises. Just about one-third of them work in the private sector. In contrast, more than 80% of rural migrant wage earners are employed in the private sector. The proportion of them working in state-owned enterprises is only 13.56%.

The classification of occupations follows the Chinese Standard Classification of Occupations 1999 in 1-digit level. In view of the survey questionnaire, we generate eight types of occupations: managers and principals in state agencies, professional technicians, clerks, commercial and service personnel, agriculture workers, manufacturing and transport equipment practitioners, military personnel, and other practitioners. According to Table 4.2, there is also a significant difference in the distribution of occupations between the two groups of workers. Urban wage earners are more equally distributed across occupations while rural migrants are more likely to work as service and commercial personnel and manufacturing/transport personnel. Over 82% of rural migrant wage earners work either as commercial and service personnel or manufacturing/transport equipment practitioners, while the majority of urban workers (about 56%) are in non-blue-collar occupations (principals and managers, professionals, and clerks).

Table 4.2: Descriptive statistics

Variable	Urban		Migrants	
	Mean	Std. Dev.	Mean	Std. Dev.
Hourly Wage (Yuan)	14.93	22.19	7.08	4.11
Age	40.47	9.88	30.43	10.18
Gender (Male = 1)	55.93%	0.5	60.55%	0.49
Marital status (Married = 1)	83.62%	0.37	53.93%	0.5
Education Level:				
Primary	2.23%	0.15	11.73%	0.32
Secondary	41.41%	0.3	69.04%	0.46
Specialized Secondary	10.37%	0.3	11.11%	0.31
Tertiary	45.98%	0.49	8.12%	0.27
Ownership:				
State-owned	59.12%	0.49	13.56%	0.34
Collective-owned	6.33%	0.24	5.05%	0.22
Private-owned	23.82%	0.43	60.34%	0.49
Self-employed	10.72%	0.31	21.04%	0.41
Occupation:				
Managers and Principals	5.69%	0.24	4.36%	0.2
Professional technicians	24.27%	0.43	0.82%	0.09
Clerks	26.23%	0.44	6.39%	0.24
Commercial and service	21.23%	0.41	56.52%	0.5
Agriculture workers	0.68%	0.08	0	0
Manufacturing and transport	15.53%	0.36	31.25%	0.46
Military Personnel	0.63%	0.08	0	0
Other	5.75%	0.23	0.66%	0.08
Coastal Provinces	45.74%	49.82%	51.67%	0.5
Job Experience	13.92	10.91	4.47	4.89
No. of obs.	6222		4867	

To have a better understanding of the source of the mean gap between urban workers and rural migrants, we summarize the average hourly wage by level of education, types of firm ownership, and occupations among two groups in Table 4.3, Table 4.4 and Table 4.5 respectively. It is very easy to see that higher level of education, being employed in the state sector and having non-blue-collar jobs are all associated with a higher hourly wage within each group of workers. It is also indicated by Table 4.3 that the return to education is much higher for urban workers than rural migrants. An urban worker with tertiary education can earn on the average more than double than a rural migrant worker. Similar results can be found when we compare the average wage of

urban and rural migrant workers by type of firm ownership and occupation, shown in Table 4.4 and Table 4.5, respectively.

Table 4.3: Average hourly wage by level of education

Level of education:	Urban		Migrants	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Primary	8.18	7.31	5.42	2.76
Secondary	10.74	16.59	6.99	3.96
Specialized Secondary	12.34	9.99	7.66	4.33
Tertiary	19.61	27.5	9.43	5.31

Table 4.4: Average hourly wage by firm ownership

Type of firm ownership:	Urban		Migrants	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
State-owned	16.56	23.78	7.64	4.6
Collective-owned	13.4	19.84	7.59	3.65
Private-owned	13.9	21.18	7.1	4.23
Self-employed	9.12	13.93	6.53	3.4

Table 4.5: Average hourly wage by occupation

Type of firm ownership:	Urban		Migrants	
	Mean	**Std. Dev.**	**Mean**	**Std. Dev.**
Managers and Principals	22.61	22.17	10.53	5.05
Professional technicians	19.69	30.2	12.2	8.01
Clerks	16.24	23.54	7.92	4.34
Commercial and service	9.73	13.64	6.45	3.83
Agriculture workers	11.51	8.57	0	0
Manufacturing and transport	11.3	12.94	7.44	3.83
Military Personnel	22.48	12.07	0	0
Other	9.83	14.55	6.84	4.63

In summary, the RUMiC wave 2009 dataset shows that in the China urban labour market, the urban workers received on an average a much higher wage rate than the rural migrant workers did. Descriptive statistics indicate that urban workers are more

experienced and have higher levels of education. In the meantime, urban workers are more concentrated in non-blue-collar occupations and state-owned enterprises. These job-related characteristics are observed to be associated with a high hourly wage. However, at this stage, we can hardly determine to what extent the mean wage gap can be explained by the difference in human capital factors and individual job-related characteristics. The next section presents the empirical methodology used to deal with the problem.

4.4 Empirical Strategy

The empirical strategy in this study follows Nopo (2008) to decompose the rural urban wage gap in a non-parametric way. Particularly, a matching approach is employed to address the problem of the difference in the distribution of individual characteristics of rural migrants and urban workers. The non-parametric estimation also imposes no restriction on the functional form of wage formation as in the Oaxaca-Blinder technique. Since the comparison of mean wages among rural and urban workers is only over the common support, no extra assumption on out of common support property is needed. Another advantage of the approach is that it provides us with information over the distribution of the unexplained pay gap.

4.4.1 The model setup

Consider two groups of workers $i = \{u, r\}$. u denotes urban workers and r denotes the group of rural migrant workers. Let $E(w|X, i)$ be the average wage for group i conditional on individual characteristics X and $g^i(x)$ denotes the average wage for individuals in group i with characteristics x. $F^i(.)$ denotes the conditional cumulative distribution function of individual characteristics X for group i and $f^i(.)$ is the associated density function. Therefore, we have,

$$E(w|X,i) = \int_{S^i} g^i(x) dF^i(x) \quad (4.4)$$

Here S^i is the support of the distribution of characteristics for group i workers. The wage gap between rural and urban workers can then be written as,

$$\Delta = E(w|X,u) - E(w|X,r) = \int_{S^u} g^u(x) dF^u(x) - \int_{S^r} g^r(x) dF^r(x) \quad (4.5)$$

The main concern for the matching approach is that support S^u and S^r may not be identical. Based on this idea, Nopo (2008) has decomposed the wage gap into endowment effect and "coefficients" effect over the common support and two components of wage gap due to individuals out of common support. Let S be the common support $S = S^u \cap S^r$. Let $\emptyset^i(S)$ be the probability measure of the set S in $\mathrm{F}^i(.)$ so we have $\emptyset^i(S) = \int_S d\,\mathrm{F}^i(\mathrm{x})$. We then can write the wage gap function Δ as

$$\Delta = \int_S \mathrm{g}^u(\mathrm{x}) d\mathrm{F}^u(\mathrm{x}) + \int_{S^u \cap \overline{S^r}} \mathrm{g}^u(\mathrm{x}) d\mathrm{F}^u(\mathrm{x}) - \left(\int_S \mathrm{g}^r(\mathrm{x}) d\mathrm{F}^r(\mathrm{x}) + \int_{S^r \cap \overline{S^u}} \mathrm{g}^r(\mathrm{x}) d\mathrm{F}^r(\mathrm{x})\right) \quad (4.6)$$

Here $\overline{S^r}$ and $\overline{S^u}$ denote the complement of set S within S^r and S^u respectively. Since $\mathrm{f}^u(.)$ is zero outside the domain S^u and $\mathrm{f}^r(.)$ is zero outside the domain S^r equation (4.4) above can be rewritten as,

$$\Delta = \int_S \mathrm{g}^u(\mathrm{x}) d\mathrm{F}^u(\mathrm{x}) + \int_{\overline{S^r}} \mathrm{g}^u(\mathrm{x}) d\mathrm{F}^u(\mathrm{x}) - \left(\int_S \mathrm{g}^r(\mathrm{x}) d\mathrm{F}^r(\mathrm{x}) + \int_{\overline{S^u}} \mathrm{g}^r(\mathrm{x}) d\mathrm{F}^r(\mathrm{x})\right) \quad (4.7)$$

Nopo (2008) has shown that a simple rearrangement of equation (4.7) will give us

$$\Delta = \left[\int_{\overline{S^r}} \mathrm{g}^u(\mathrm{x}) \frac{d\mathrm{F}^u(\mathrm{x})}{\emptyset^u(\overline{S^r})} - \int_{S^r} \mathrm{g}^u(\mathrm{x}) \frac{d\mathrm{F}^u(\mathrm{x})}{\emptyset^u(S^r)}\right] \emptyset^u(\overline{S^r}) + \left[\int_S \mathrm{g}^u(\mathrm{x}) \frac{d\mathrm{F}^u(\mathrm{x})}{\emptyset^u(S^r)} - \int_S \mathrm{g}^r(\mathrm{x}) \frac{d\mathrm{F}^r(\mathrm{x})}{\emptyset^r(S^u)}\right] + \int_S [\mathrm{g}^u(\mathrm{x}) - \mathrm{g}^r(\mathrm{x})] \frac{d\mathrm{F}^u(\mathrm{x})}{\emptyset^r(S^u)} + [\int_{S^u} \mathrm{g}^r(\mathrm{x}) \frac{d\mathrm{F}^u(\mathrm{x})}{\emptyset^r(S^u)} - \int_{\overline{S^u}} \mathrm{g}^r(\mathrm{x}) \frac{d\mathrm{F}^r(\mathrm{x})}{\emptyset^r(\overline{S^u})}] \emptyset^r(\overline{S^u})] \quad (4.8)$$

The average wage gap between rural and urban workers has been decomposed to four intuitive terms. Following Nopo (2008), we let

$$\Delta^u = \left[\int_{\overline{S^r}} \mathrm{g}^u(\mathrm{x}) \frac{d\mathrm{F}^u(\mathrm{x})}{\emptyset^u(\overline{S^r})} - \int_{S^r} \mathrm{g}^u(\mathrm{x}) \frac{d\mathrm{F}^u(\mathrm{x})}{\emptyset^u(S^r)}\right] \emptyset^u(\overline{S^r}) \quad (4.9)$$

$$\Delta^x = \left[\int_S \mathrm{g}^u(\mathrm{x}) \frac{d\mathrm{F}^u(\mathrm{x})}{\emptyset^u(S^r)} - \int_S \mathrm{g}^u(\mathrm{x}) \frac{d\mathrm{F}^r(\mathrm{x})}{\emptyset^r(S^u)}\right] \quad (4.10)$$

$$\Delta^o = \int_S [\mathrm{g}^u(\mathrm{x}) - \mathrm{g}^r(\mathrm{x})] \frac{d\mathrm{F}^u(\mathrm{x})}{\emptyset^r(S^u)} \quad (4.11)$$

$$\Delta^r = [\int_{S^u} \mathrm{g}^r(\mathrm{x}) \frac{d\mathrm{F}^r(\mathrm{x})}{\emptyset^r(S^u)} - \int_{\overline{S^u}} \mathrm{g}^r(\mathrm{x}) \frac{d\mathrm{F}^r(\mathrm{x})}{\emptyset^r(\overline{S^u})}] \emptyset^r(\overline{S^u}) \quad (4.12)$$

Δ^u can be interpreted as the part of the wage gap due to the difference between those urban workers who are in the common support and those who are not. The first term in the bracket is the average wage for urban workers with characteristics out of the common support and the second term is the average wage for those urban workers who can be matched with rural migrant workers (i.e., those urban workers with a set of individual characteristics in the common support). $\emptyset^u(\overline{S^r})$ is the proportion of urban workers with characteristics outside the common support.

Similarly, Δ^r can be interpreted as the part of the wage gap due to the difference between those rural migrant workers who are in the common support and those who are not. Δ^r can reach zero when the average wage of those rural migrant workers in the common support is equal to the average wage of those migrants out of common support or $\emptyset^r(\overline{S^u}) = 0$ (i.e., combinations of individual characteristics for rural migrants can all be matched with urban workers). $\emptyset^r(\overline{S^u})$ is the proportion of rural migrant workers with characteristics outside the common support.

$\Delta^x + \Delta^o$ is the wage gap partition capturing the average wage gap over the common support. Δ^x can be interpreted as the part of the urban rural migrants' wage gap attributed to the difference in the distribution of individual characteristics over their common support. It is similar to the endowment effect term $(\bar{x}^u - \bar{x}^r)\hat{\beta}^u$ in the

Oaxaca-Blinder wage decomposition method. The expression for Δ^x implies that the urban rural migrants' wage gap can decrease if rural migrant workers have the same distribution of individual characteristics over the common support as urban workers. For example, in the China's urban labor market both rural migrants and urban workers are observed to be working in the state sector. However, the proportion of urban workers in the state sector is believed to be much higher than the proportion of rural migrants. The term Δ^o, according to (4.11), is the partition of the wage gap attributed to the difference in wage formation over the common support. Δ^o is also referred to as the unexplained part of the wage gap. Similar to the term $\bar{x}^r(\hat{\beta}^u - \hat{\beta}^r)$ in the Oaxaca-Blinder decomposition, the unexplained part of the wage gap is often attributed to omitted variables or simply discrimination. To estimate all four components above, a matching process is introduced.

4.4.2 The matching process

The matching process applied in this study is Exact Matching. Although several other matching methods are available (e.g., Propensity Score Matching, etc.), exact matching is considered to be a faster and easier matching method that requires fewer assumptions, and processes more attractive statistical properties for many applications than other existing matching methods (Blackwell et al., 2009). This matching method performs exact matching for discrete variables, and coarsens continuing variables into several groups to perform exact matching.

The implementation of the matching process includes four steps:

Step 1: Choose one rural migrant from the rural migrants' sub-sample.

Step 2: Determine the individual characteristics (age, gender, etc.) we try to match on. Find all the urban workers who have the same combination of individual

characteristics x as the migrant chosen in step 1. If no urban workers can be found, we label the chosen migrant worker as "unmatched" and go back to step 1. If yes, we label those rural migrant workers and urban workers as "matched" and move on to the next step.

Step 3: Construct a synthetic individual whose log hourly wage is the average of all of those urban workers selected in step 2 and match him to the migrant selected in step 1.

Step 4: Put matched synthetic urban workers and rural migrants in a new sample of matched individuals. Then we repeat the 4 steps until all rural migrants are chosen.

The purpose of constructing a sub-sample of synthetic individuals is to obtain the counterfactual wage of rural migrant workers if they have the same distribution of individual characteristics as urban workers. It is an analogy to the Oaxaca-Blinder method where what would a rural migrant worker earn if he has the same wage structure as an urban worker.

After the matching process, each individual in the original sample falls into one of four sub-groups: unmatched rural migrant workers, matched rural migrant workers, unmatched urban workers and matched urban workers. According to (4.9), (4.10), (4.11) and (4.12), Δ^u can be calculated as the average wage difference between unmatched urban workers and matched urban workers times the proportion of unmatched urban workers. Similarly, Δ^r can be calculated as the average wage difference between unmatched rural migrant workers and matched rural migrant workers times the proportion of unmatched rural migrant workers. Δ^x is measured by the difference between the average wage of matched urban workers and the counterfactual average wage of rural migrant workers (which is the average wage of

synthetic individuals). $\Delta^u + \Delta^r + \Delta^x$ constitutes the wage gap part due to the difference in endowments (endowment effect in the Oaxaca-Blinder setup). The unexplained part of the wage gap Δ^o is calculated as the difference between the counterfactual average wage of rural migrant workers and the actual average of matched rural migrant workers (coefficient effect in the Oaxaca-Blinder setup). Δ^o is our main concern. It captures the possible effects of those individual unobservable characteristics or discrimination after comparing the average wages of rural migrants and urban workers over the common support of individual characteristics.

To calculate four components of the wage gap decomposition results, we use 5 sets of individual characteristics to match the two groups of workers. Set 1 contains only demographic information: level of education, age, gender, marital status and level of regional development. Set 2 contains the factors in set 1 and job tenure. Set 3 includes the factors in set 1 and occupation. Set 4 includes factors in set 1 and firm ownership. Set 5 includes all demographic and job-related information. Similar to other matching techniques, the matching method has a problem of dimensionality. There is a trade-off between including more matching variables and maintaining the original sample. As the number of individual characteristics increases, the sample of matched individuals will shrink. This is not plausible especially when the sample size is small.

4.5 Results

4.5.1 Decomposition results

Table 4.6 reports results from both the classical Oaxaca-Blinder technique and the matching approach. Generally, Oaxaca-Blinder decomposition tends to predict a larger unexplained wage gap than the matching approach. As we can see, the raw wage gap between rural migrant workers and urban workers is 27.2% to the mean wage of

rural migrant workers. If we only control for human capital factors, the Oaxaca-Blinder decomposition results shows that only 5.5% out of 27.2% can be explained by differences in individual observables between rural migrants and urban workers. It also shows that almost 21.7% out of 27.2% (which is about 79.78%) is unexplainable. Results of the Oaxaca-Blinder decomposition indicate that a large proportion of the wage gap cannot be explained by individual difference in characteristics. This unexplained wage gap might be due to the omission of other important variables. It can also be attributed to a discrimination effect. To see this, if we include more control variables (as in set 2–5) in the wage determination regression, we see an increase in the explained part of the raw wage gap. Nevertheless, almost half of the wage gap cannot be explained by differences in individual characteristics even when we control for all demographic and job-related information. In contrast, results of the matching approach after controlling only demographic characteristics show that the unexplained part of the relative wage gap after matching is only 10.8% to the average of migrant workers compared with 21.7% by the Oaxaca-Blinder method. The inclusion of job-related characteristics in the matching process does not affect the decomposition results significantly. When matching with demographic characteristics and occupation, the unexplained wage gap after matching has dropped from 10.8% to 9.4% of the average wage for migrant workers. If we match two groups of workers with demographic information and firm ownership, the unexplained wage gap drops from 10.8% to 9.2%. There is a significant change from 10.8% to 8.1% in the decomposition result when we match two groups of workers with all job-related information in addition to demographic information. The wage gap due to the difference in characteristics between those urban workers in the common support and those out of common support has increased from 1.6% to 11.6%. This might be due to the dramatic

change in the size of the common support. As we can see from the table below, the share of urban workers and the share of rural migrant workers shrink as the number of control variables increases. When only demographic information is matched, 91.4% of urban workers and 98.4% of rural migrant workers are in the common support. When job-related information is included, there are only 34.1% of urban workers and 54.8% of rural migrant workers in the matched sample.

Table 4.6: Decomposition results

Controls	**Raw Wage Gap**	**Oaxaca-Blinder Decomposition**		**Decomposition with Matching Method**						
		Explained Wage Gap	Unexplained Wage Gap	Δ	Δ_U	Δ_X	Δ_0	Δ_R	Share of matched urban workers	Share of matched rural migrants
Set 1		5.5%	**21.7%**		1.6%	14.7%	**10.8%**	0%	91.4%	98.6%
Set 2		9.3%	**17.9%**		6.8%	9.0%	**10.8%**	0.5%	86.0%	93.8%
Set 3	27.2%	8.3%	**16.2%**	27.2%	1.2%	16.5%	**9.4%**	0.1%	63.8%	84.4%
Set 4		5.9%	**21.3%**		1.5%	16.3%	**9.2%**	0%	85.6%	94.0%
Set 5		14.9%	**12.3%**		11.6%	8.8%	**8.1%**	−1.3%	34.1%	54.7%

The results from the Oaxaca-Blinder and matching approaches above decompose the mean wage gap between rural migrants and urban workers. They fail to show the wage difference along the entire wage distribution. Figure 4.1a and Figure 4.1b below illustrates the absolute and relative wage gap in different percentiles along the wage distribution between two groups of workers before and after matching. The set of control variables for the matching process is set 5 where all demographic and job-related information is included. The absolute wage gap is simply measured as the difference in the values of log hourly wage between urban workers and rural migrant workers. The relative wage gap is measured as the ratio of absolute wage gap to the average wage of rural migrant workers. According to Figure 4.1a and Figure 4.1b, the

wage gap is enlarging along the wage distribution before and after matching. It shows evidence that it is the upper percentiles of the wage distribution that contribute most to the observed wage gap between rural migrant and urban workers. In addition, both figures shows that, while the patterns remain similar, both the absolute and relative wage gaps decrease after matching. It indicates that part of the wage gap between rural migrants and urban workers can be attributed to the incomparability between the two samples of workers. Failure to recognise the overlapping support of the combinations of individual characteristics between the two groups is very likely to lead to an overestimation of the unexplained wage gap.

Figure 4.1a: Absolute wage gap before and after the matching

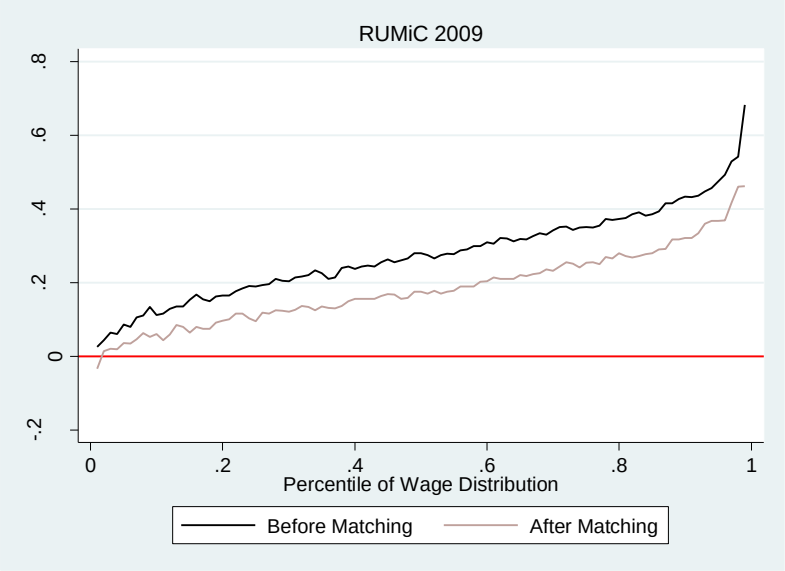


Figure 4.1b: Relative wage gap before and after the matching

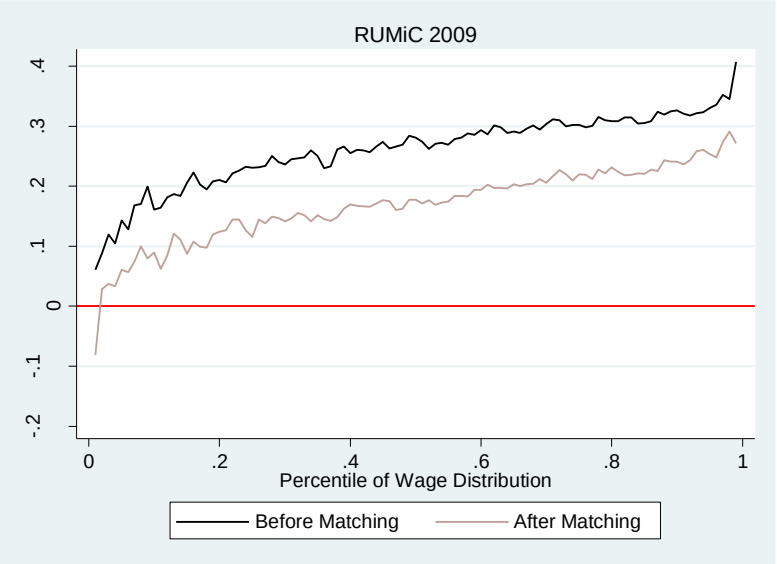
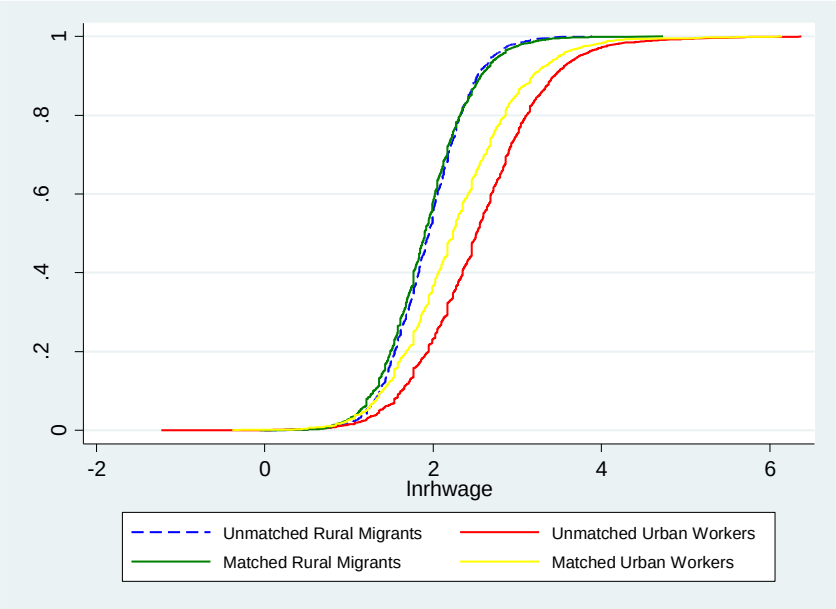


Figure 4.2 illustrates the cumulative distribution of log hourly wage for migrant workers and urban workers in and out of common support in 2009 after controlling for set 5 of variables. According to Figure 4.2, urban workers out of common support earn more than urban workers within common support over the entire distribution. The pattern is different for rural migrant workers. Unmatched migrant workers earn more than matched migrant workers in the lower end of wage distribution and earn less than matched migrant workers in the upper end of wage distribution. But generally the differences in distribution do not seem significant. Nevertheless, Figure 4.2 further demonstrates the concern that not all individuals in the two samples are comparable to each other. If we restrict our attention to those who are comparable, the wage gap between rural migrant workers and urban workers would decrease significantly. Figure 4.2 also implies that the observed wage gap between rural migrants and urban workers is exacerbated because too many high–wage, incomparable urban workers are presented in the sample.

Figure 4.2: Cumulative distribution of wage for four sub-samples



4.5.2 Distribution of the unexplained wage gap

One of the advantages of the matching approach is that it can generate the distribution of the unexplained wage gap: Δ^o. As stated in the last section, it is simply the wage differences between matched rural migrant workers and their matched synthetic urban workers. In this sense, we are able to analyze the distribution of the unexplained wage gap by individual characteristics. Table 4.7 shows the unexplained wage gap and its standard deviation by individual characteristics after controlling for demographic information and job-related information. For further clarification, we plot the mean and confidence intervals of each characteristic with an error-bar chart. The upper bar corresponds to the maximum of 95% confidence interval for the mean unexplained wage gap and the lower bar corresponds to the minimum of 95% confidence interval. Figures 4.3–4.10 are associated plots.

Table 4.7: Mean and standard deviation of unexplained wage gap by individual characteristics

	Relative unexplained wage gap	Std. Dev.
By Marital Status:		
Single	0.0872	0.0056
Married	0.1066	0.0056
By Gender:		
Male	0.1200	0.0045
Female	0.0582	0.0035
By Age:		
18–24 years old	0.0655	0.0089
25–34 years old	0.1194	0.0067
35–49 years old	0.1013	0.0079
50–65 years old	0.1652	0.0304
By Education Level:		
Primary Education	0.0513	0.0103
Secondary Education	0.1072	0.0042
Specialized Secondary Education	0.0554	0.0085
Tertiary Education	0.1175	0.0195
By Region:		
Developing	0.0466	0.0031
Developed	0.1416	0.0034
By Occupation Experience:		
0–2 years	0.0920	0.0072
2–5 years	0.0621	0.0044
5–10 years	0.1197	0.0140
More than 10 years	0.1588	0.0131
By Ownership:		
State-owned	0.0845	0.0104
Collective-owned	0.0772	0.0210
Private-owned	0.0199	0.0060
Self-employed-owned	0.0023	0.0114
By Occupation:		
Managers and Principals	0.1126	
Professional technicians	−0.0253	0.1101
Clerk and Relating personnel	0.0930	0.0285
Commercial and service personnel	0.0964	0.0067
Manufacturing and transporting	0.0525	
Other practitioner	−0.0022	0.0480

According to Figure 4.3, there is clear evidence that the average unexplained migrant urban wage gap between male and female workers is different. In particular, the unexplained wage gap is higher for males than for females. With respect to marital status, there is no clear evidence of the average unexplained wage gap for married individuals being significantly larger than the average unexplained wage gap for singles. The unexplained wage gap is also not significant different across age groups. There is only a weak upward trend in the unexplained wage gap by age group. This might be because the classification of age groups is too general. A similar result is also found in the level of education. According to Figure 4.7, the unexplained wage gap for workers with tertiary education is not significantly different from those with secondary education. However, the unexplained wage gap is more dispersed among those with tertiary education than among those with other levels of education.

With respect to the unexplained wage gap by level of regional development, we find that those who work in the developed areas have a significantly higher average unexplained wage gap between migrants and urban workers than those working in the less developed region. In general, the unexplained wage gap is only about 5% to the average wage of migrants in the developing area. In contrast, in developed coastal areas, the average unexplained wage gap is nearly 14% to the average wage of migrant workers.

Figure 4.8 shows evidence of a U shape relationship between the unexplained wage gap and job experience. The unexplained wage gap is smallest among those with 2-5 years of work experience and biggest among those with more than 10 years of experience. Figure 4.9 shows that most of the unexplained wage gap is from state-owned enterprises and collective owned enterprise. The unexplained wage gap is almost zero in the private sector. It reflects that private sector is more competitive than

state sector. Moreover, migrant workers not only have entry barriers to the state sector but also paid less even when they find jobs in state sector compared to urban workers. The unexplained wage gaps by occupation, according to Figure 4.10, are relatively stable along occupations.

Table 4.8 shows the mean unexplained wage gap between rural migrants and their urban counterparts on the matched sample by some combinations of human capital characteristics. Typically, we show the migrant urban differences for individuals with specific combinations of age, level of education and gender. Type 1 to type 4 are individuals who are males and with secondary education but belong to different age groups. They enable us to see the effect of age on the wage gap between different types of individuals. Wage gap, either in terms of absolute wage gap or relative wage gap, tends to become wider for older males with secondary education. It is the same for females with secondary education if we compare the figures for type 5- type 8 individuals. Comparing type 1 (2, 3, 4) and type 5 (6, 7, 8) provide us information on the gender effect on the wage gap. Table 4.8 indicates that female rural migrants at different ages face less wage penalty than male rural migrants. Comparing type 3, type 9 and type 10 individuals tell us the education effects on the wage gap. Typically, for male middle-aged rural migrants, those with secondary education experience larger 'discrimination'.

Table 4.9 shows the mean unexplained wage gap between rural migrants and their urban counterparts on the matched sample by some combinations of job-related characteristics. We first combine the following characteristics: firm ownership and level of regional development. Then we add occupation to see how the wage gap varies by occupation for different types of individuals. According to table 4.9, no matter what type of firm a rural migrant works in, he/she will in average face larger 'discrimination'

in the developed coastal provinces than in the developing ones. The comparison of type 11 and type 13 individuals indicates that there is no significant difference in the mean wage gap between state-owned enterprises and private-owned enterprises in the developed coastal provinces. In contrast, rural migrants in the developing provinces in average face larger wage penalty in the state-owned enterprises than in the private-owned enterprises. Focusing on the mean wage gap by occupation, comparisons among type 19 to type 21individuals and among type 22 to type 24 individuals indicate that in the private-owned enterprises mean wage gap tends to be larger for office-based jobs. The comparison of type 20 and type 25 individuals indicate that for the commercial and service relating jobs, there is no significant difference in the mean wage gap between state-owned enterprises and private-owned enterprises in the developed coastal provinces.

To sum up, our results indicate that significant wage gaps remain even after controlling for the individual observable characteristics. Focusing on specific persons, our analysis shows that female rural migrants are more likely to be disadvantaged compared to male rural migrants. Migrants working in developed regions face larger unexplained wage gap. Similarly, older migrants face larger 'discrimination'. On the contrary, after controlling for observable characteristics, the mean wage gap tends to be much smaller for young rural migrants. Education appears to have a minimal role on widening the wage gap between rural migrant and urban workers. We also observe a larger wage gap in the state sector and office-based jobs.

Figure 4.3: Confidence intervals for the unexplained wage gap by gender

Figure 4.4: Confidence intervals for the unexplained wage gap by marital status

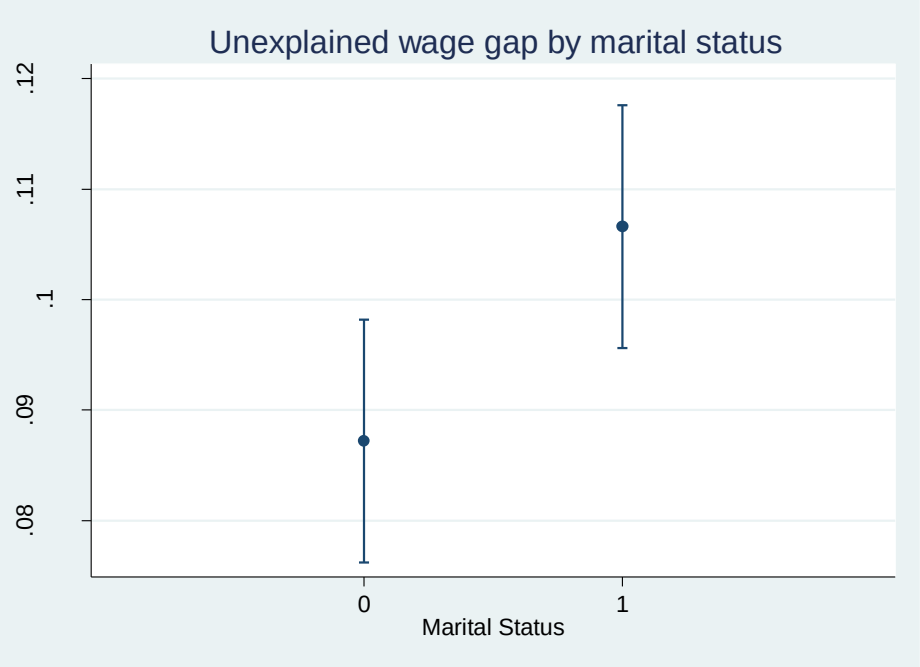


Figure 4.5: Confidence intervals for the unexplained wage gap by age

Figure 4.6: Confidence intervals for the unexplained wage gap by development level

Figure 4.7: Confidence intervals for the unexplained wage gap by education level

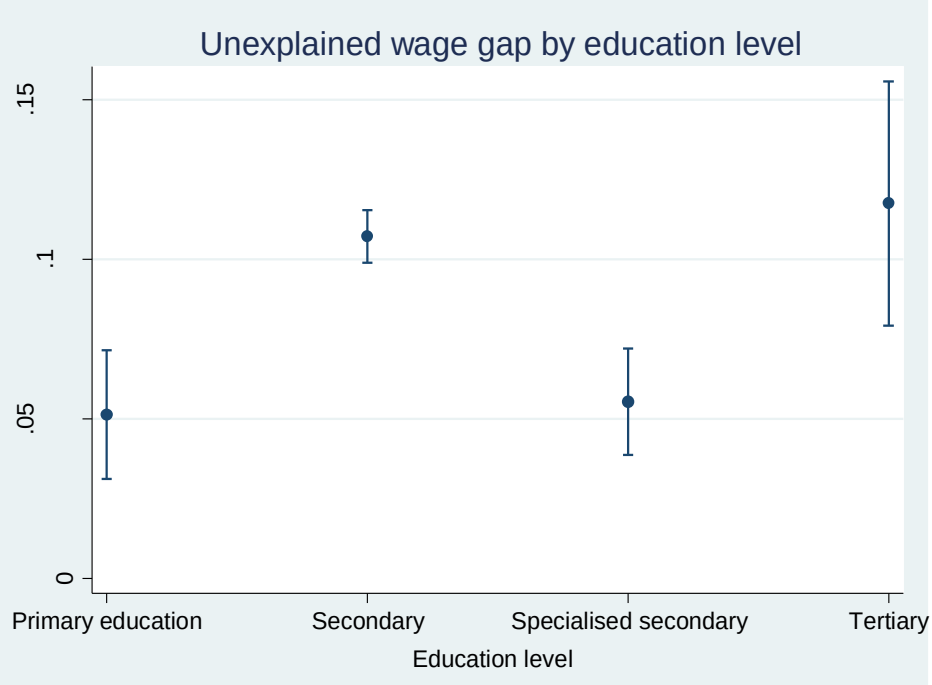


Figure 4.8: Confidence intervals for the unexplained wage gap by job tenure

Figure 4.9: Confidence intervals for the unexplained wage gap by firm ownership

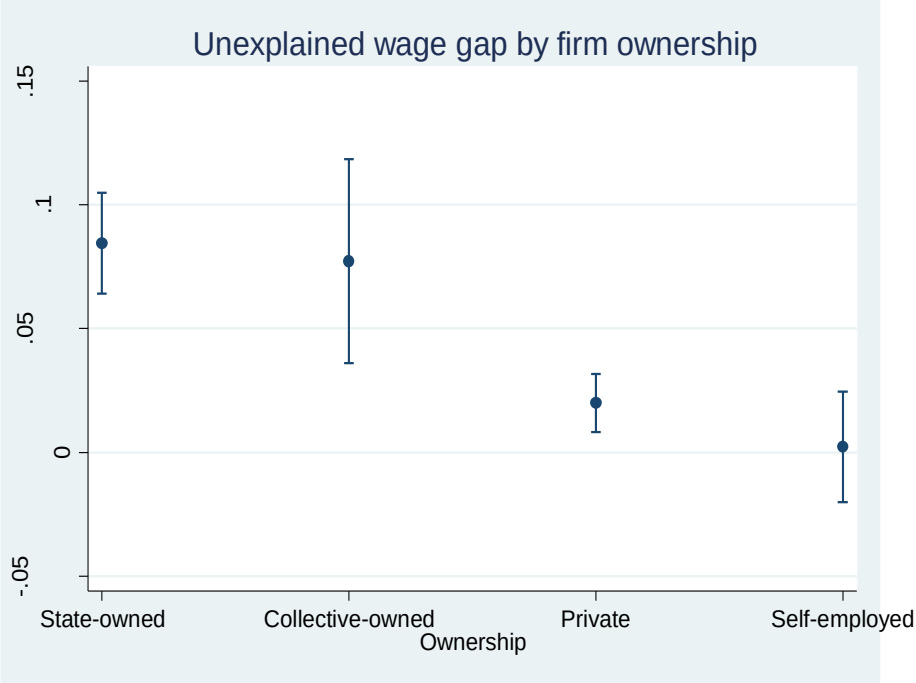


Figure 4.10: Confidence intervals for the unexplained wage gap by occupation

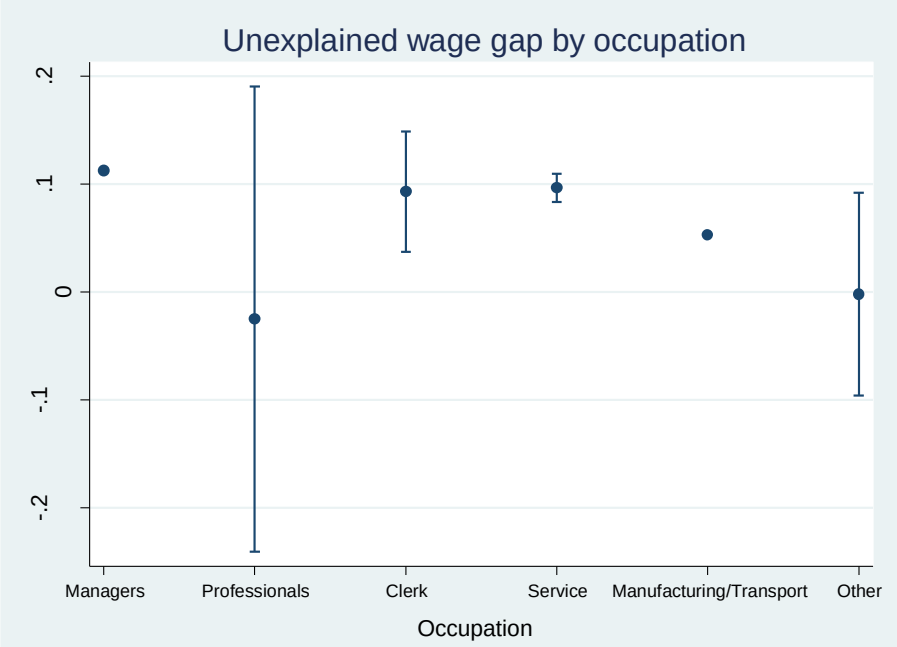


Table 4.8: Unexplained wage gap by some personal human capital characteristics

		Absolute wage gap	Relative wage gap (in % of migrant wage)	No. of obs
By human capital:				
type 1	age 18-24, secondary education, male	0.05	0.03	402
type 2	age 25-34, secondary education, male	0.18	0.09	313
type 3	age 35-49, secondary education, male	0.36	0.18	517
type 4	age more than 50, secondary education, male	0.5	0.30	92
type 5	age 18-24, secondary education, female	-0.12	-0.07	181
type 6	age 25-34, secondary education, female	0.15	0.08	209
type 7	age 35-49, secondary education, female	0.26	0.16	317
type 8	age more than 50, secondary education, female	0.33	0.22	20
type 9	age 35-49, primary education, male	0.14	0.08	28
type 10	age 35-49, tertiary education, male	0.2	0.07	14

Table 4.9: Unexplained wage gap by some personal job-related characteristics

		Absolute wage gap	Relative wage gap (in % of migrant wage)	No. of obs
By job-related characteristics:				
type 11	state-owned, developed regions	0.49	0.23	211
type 12	collective-owned, developed regions	0.3	0.15	33
type 13	private-owned, developed regions	0.46	0.22	866
type 14	self-employed, developed regions	0.14	0.07	117
type 15	state-owned, developing regions	0.39	0.20	161
type 16	collective-owned, developing regions	0.23	0.13	19
type 17	private-owned, developing regions	0.21	0.12	847
type 18	self-employed, developing regions	-0.09	-0.05	412
type 19	Clerk, private-owned, developed regions	0.46	0.21	53
type 20	Commercial and service, private-owned, developed regions	0.3	0.15	540
type 21	Manufacturing and transport, private-owned, developed regions	0.2	0.09	260
type 22	Clerk, private-owned, developing regions	0.36	0.19	54
type 23	Commercial and service, private-owned, developing regions	0.2	0.11	562
type 24	Manufacturing and transport, private-owned, developing regions	0.07	0.04	216
type 25	Commercial and service, state-owned, developed regions	0.22	0.11	123

4.6 Conclusion

This chapter uses the 2009 RUMiC dataset to study the wage gap between rural migrants and urban workers in the China's urban labour market. We employ a matching approach developed by Nopo (2008) to tackle the common support problem. The common support problem needs to be tackled because those rural migrants should be compared with comparable urban workers. In the China's urban labor market, urban workers are more likely to have combinations of individual characteristics that rural migrants don't have and be paid a higher wage. In this study, our results show that after controlling for only individual demographic characteristics, about 98.6% of rural migrants can be matched with urban workers, but only 91.4% of urban workers can be matched with rural migrants. In addition, the cumulative distribution functions of those in and out of the common support indicate that those urban workers out of common support earn more than those within common support along the wage distribution.

The common support problem is often ignored in traditional wage decomposition analysis. It results in an overestimation of the unexplainable part of the wage gap. In this study, compared with 21.7% out of 27.2% by the Oaxaca-Blinder approach, the matching approach shows that the unexplained wage gap between rural migrants and urban workers is only 10.8% to the average wage of migrant workers after controlling all demographic characteristics. The figures can be further reduced when we include more control variables in the matching process.

Our results show that the unexplained wage gap is larger at higher percentiles of wage distribution. We look at the distribution of the unexplained wage gap by individual characteristics. There is clear evidence that the unexplained wage gap is larger among male workers than female workers, and is larger among workers in

developed coastal provinces than workers in central and western areas. If we control for sector segregation and distributions of other characteristics are equal between rural and urban groups, almost all of the unexplained wage gap is from the state-sector. It indicates that state-sector plays a key part in generating the unobserved wage gap within the urban labour market.

Chapter 5: Conclusion to the thesis

The thesis considers the economic consequences of the recent reform of labour laws and the reform of the household registration system in China. The labour laws reform aims to enhance the labour regulations in the China's labour market and increase the job security of workers. As EPL are governmental interventions to the free labour market, they are associated with possible unintended effects such as the informalization of labour force and rising unemployment. The household registration system reform aims to break the rural urban barriers to places of residence, reduce the discrimination against rural migrants and ensure the equal access to social benefits. One typical question with the reform is that to what extent the incomes of rural migrants will increase if they are treated equally as their urban counterparts. I explore these two topics in the thesis. In this chapter, I will provide a summary of each chapter of the thesis, the discussion of the findings, contributions and limitations, and the challenges for future research.

5.1 Summary of the findings

The second chapter studies the effects of EPL on labour market outcomes in a job search and matching model. This model is featured with an informal sector. The informal sector is assumed to be a marginal and competitive sector. Workers in the sector can find a job instantaneously and earn their marginal products. The informal sector is also assumed to be beyond the ambit of EPL. In contrast, the formal sector is characterized by search frictions and is subject to EPL. In terms of the linkage between the formal and informal sectors, one crucial assumption in this study is that workers in the informal sector cannot find jobs directly in the formal sector. Rather, they need to be unemployed in the formal sector in order to find a formal job.

The comparative statics indicate that rising costs of laying off workers unambiguously decrease the labour market's tightness and a firm's reservation productivity. Both job creation and job destruction are eschewed. The model also predicts that given a Cobb–Douglas-form job matching function, there is a U-shaped relationship between layoff costs and the size of the informal sector, and an inverse U-shaped relationship between layoff costs and the wage rate in the formal and informal sectors. When layoff costs are low, rising lay-off costs increase the wage rate in the formal and informal sectors. However, it makes the prospect of working in the formal sector better than that in the informal sector. There is a movement of workers from the informal sector to the formal sector. As layoff costs pass a certain threshold, both formal and informal wages fall with rising layoff costs. In addition, as layoff costs increase, workers who are seeking jobs in the formal sector would find it more profitable to work in the informal sector. Consequently, there is a movement of workers from the formal sector to the informal sector. A numerical study is also conducted in this chapter. The calibration results are generally consistent with the model predictions.

The third chapter empirically examine the effect of 2008 CLCL on the formal–informal divide in the context of China's urban labour market. In this study, instead of using an indicator for EPL strictness, we use a range of indicators for the enforcement of EPL and the judiciary orientation in China's urban labour market. These indicators include the labour inspection rate, the incidence of labour dispute, the court efficiency, and the share of pro-worker resolutions by labour dispute arbitration agencies. Panel data discrete choice models are estimated to predict individuals' probabilities of being in each employment status. The results show that there is weak evidence for an association between EPL enforcement and the judiciary

orientation indicators and labour force participation, and for the association between these indicators and employment status choices. The results indicate that workers from provinces with high incidence of labour disputes are associated with higher probability of formal employment and lower probability of informal employment.

The fourth chapter considers another important issue of the China's urban labour market: the wage gap between urban workers and rural-to-urban migrants. The chapter is conducted in the setting that there is persistent wage gap between rural migrant and urban workers in China's urban labour market. In this chapter, we deal with the common support problem. The main argument of the empirical strategy we employ is that the comparison of wages between two groups of workers should only be within the common support (i.e. compare those comparable). The decomposition results show that the size of the unexplained wage gap compared with the mean wage gap between urban workers and rural migrants decreases significantly from nearly 50% to 29.7% if we compare comparable individuals. In addition, results indicate that labour market segmentation also contributes to the unexplained wage gap between urban workers and urban migrant workers in China. The size of the unexplained wage gap as a share of the mean wage of rural migrant workers decreases from 10.8% to 9.4% when we control for occupation in the matching process. We also see a reduction in the size of the unexplained wage gap from 10.8% to 9.2% when we control for firm ownership. It suggests that both occupation segregation and sector segregation contribute to the observed wage gap between rural and urban workers. In addition, the results on the distribution of the unexplained wage gap show that male migrants face a larger unexplained wage gap than female migrants. Male migrants are more disadvantageous than female migrants. Last, migrants are also more disadvantaged in state-owned enterprises than they are in the private sector.

5.2 Discussion of the findings, contributions and limitations

The informal sector, especially in the developing countries, is often associated with unskilled jobs, bad work conditions and unregulated activities. It is in the interests of governments to reduce its size in their economies. Although the net effect is ambiguous, the theoretical model developed in the first chapter indicates that in an economy with segmented labour markets, the labour regulations targeting at the formal sector could also have effects on the informal sector. If the EPL in formal sector becomes stricter, the enhanced job security in the formal sector attracts more informal sector workers. On the other hand, workers may find it more profitable to work in the informal sector as firms become more cautious in job hiring. The EPL, in this sense, is a double-edged sword. Governmental interventions in the labour market should consider the possible unintended effects of the interventions. It is likely that policies aiming at reducing informality may finally increase it.

The main contribution of this study is that we develop a more tractable model to study the effects of EPL on the mobility of workers between formal sector and informal sector. The model is also associated with limitations. Firstly, only one type of policy (EPL) is considered. It ignores the interactions between EPL and other labour market regulations such as minimum wage policies. The labour market outcomes are a result of joint effects of all labour regulations. The partial analysis of the policy may not be consistent with the empirical findings. Another limitation of the study is that it fails to take the informal employment in the formal sector into considerations. Informal employment in the formal sector contributes a large proportion to the informality in the labour market. A model of informality should consider all sources of it.

In chapter 3, we contribute to the literature by examining the effects of the CLCL on the formal-informal divide in China's urban labour market. As we are unable to extricate the pure effects of EPL change from other unobserved factors, we employ a strategy by looking at the effects of the EPL enforcement and the judiciary orientation. The empirical findings provide weak evidence to the hypothesis of an association between the enforcement of the CLCL, the judiciary orientation and decisions on labour market participation and employment status choices. The research is associated with some limitations. First, the indicators used in this study lacks variation. Due to the data availability, we aggregate the indicators at the provincial level. There are only 9 provinces in the dataset, so we only have 36 variations (4 waves) across more than 10,000 observations. Second, the data used in this study covers a short time span from 2004 to 2011. The changes in the variation of EPL enforcement and the judiciary orientation may take longer period of time to take effects. Third, there is possible endogeneity within the indicators. Higher rate of labour inspection could be a result of lower level of compliance in that province, so there may be a problem of reversed causality.

The results from chapter 4 show that the observed wage gap between rural migrants and urban workers can largely be reduced if we compare those comparable individuals. The previous studies over the wage gap tend to overestimate the discrimination effects. Nevertheless, there is clear evidence that rural migrant workers are not equally paid as urban workers in the China's urban labor market. Since rural and urban workers are classified by *hukou* system, the results emphasize the need to reform the *hukou* system in China. In addition, policies should also target the entry barriers and inequality in specific sectors such as state-owned enterprises. Compared with urban workers, rural migrants are less likely to be employed by state-owned enterprises. Even if the entry

barrier vanishes, they still have the largest unexplained wage gap with their urban counterparts in comparison to working in other sectors. The unexplained wage gap can largely be reduced if equal employment and equal pay are ensured in the state sector.

The main contribution of the chapter 4 is that we use a non-parametric matching method to explore the wage gap between rural migrants and urban workers. It not only deals with the common support problem and specification problem but also enables us to see the distribution of unexplained wage gap. The main limitation of the study is the dimensionality problem. As we match the two samples with more characteristics, the matched sample size reduces significantly.

5.3 Challenges for future research

The model developed in chapter 2 provides us with a starting point for further research. Several elements can be added into the model. First, workers in our model are assumed to be ex-ante identical. Future research can introduce heterogeneous groups of workers in the model. For example, if a group of workers is discriminated against the other group in terms of wage, it is interesting to examine the effects of EPL on the employment probability of the discriminated workers in the formal sector. Second, other policy parameters (such as unemployment benefits, minimum wages, and tax) can be introduced into the model to see the interactions between these policy parameters. This is of great policy implications as labour market outcomes are affected by various policies. A thorough understanding of the dynamics of labour market should take it into consideration.

Although we have found weak evidence of an association between CLCL enforcement, the judiciary orientation and individual's employment decisions, this

chapter provides us an angle for further research. Future research can explore the effects of the enforcement of labour regulations or the judiciary orientation on labour market outcomes with provincial aggregate data that covers consecutive years. Efforts can also be devoted to find better indicators that are not correlated to the compliance of labour regulations.

The findings from chapter 4 indicate that rural migrant workers are treated unequally in the China's urban labour market. Together with the labour laws reform, the current reform on the *hukou* system offer us an opportunity to see how these reforms affect the labour market situations of rural migrants.

Appendix A

$W_f(x)$ and $W_f(x)$ are monotonically increasing in *x.* To see this, recall that joint surplus from a job match is:

$$S_f(x) = \mathrm{J}_f(x) + W_f(x) - V + F - U. \quad \text{(A.1)}$$

Wage bargaining solution gives us:

$$W_f(x) - U = \beta S_f(x) \quad \text{(A.2)}$$

$$\mathrm{J}_f(x) - V + F = (1-\beta) S_f(x) \quad \text{(A.3)}$$

With equations (2.2) (2.3) (2.4):

$$r\mathrm{J}_f(x) = x - w_f(x) + \lambda \int_0^1 max\left[\mathrm{J}_f(s), V - F\right] dG(s) - \lambda \mathrm{J}_f(x) \quad \text{(2.2)}$$

$$rU = b + \theta q(\theta)[W_f(1) - U] \quad \text{(2.3)}$$

$$rW_f(x) = w_f(x) + \lambda \int_0^1 max\left[W_f(s), U\right] dG(s) - \lambda W_f(x) \quad \text{(2.4)}$$

We add up equations (2) and (4) and then subtract equation (3). We have:

$$\mathrm{r}[\mathrm{J}_f(x) + W_f(x) - V + F - U] = x + b + rF + \lambda \int_0^1 max\left[\mathrm{J}_f(s), V - F\right] dG(s) -$$

$$\lambda[\mathrm{J}_f(x) + W_f(x)] + \lambda \int_0^1 max\left[W_f(s), U\right] dG(s) + \theta q(\theta)[W_f(1) - U] \quad \text{(A.4)}$$

(A.4) can be rewritten as:

$$(r+\lambda) S_f(x) = x - b + rF + \lambda \int_0^1 max\left[\mathrm{J}_f(s) - V + F, 0\right] dG(s) +$$

$$\lambda \int_0^1 max\left[W_f(s) - U, 0\right] dG(s) + \theta q(\theta) \beta S_f(1) = x - b + rF +$$

$$\lambda \int_0^1 max\left[S_f(s), 0\right] dG(s) + \theta q(\theta) \beta S_f(1) \quad \text{(A.5)}$$

It is easy to see from (A.5) that $S_f(x)$ is monotonically increasing in *x*. According to (A.2) and (A.3), both $W_f(x)$ and $\mathrm{J}_f(x)$ are increasing in *x*.

Reference

Abraham, K. G. and Houseman, S. N. (1994). Does employment protection inhibit labor market flexibility? Lessons from Germany, France, and Belgium. In Blank, R. M. (Eds): *Social protection versus economic flexibility: Is there a trade-off?* London: the University of Chicago Press.

Addisson, J. T. and Texeira, P. (2003). The economics of employment protection. *Journal of Labor Research*, 24(1), 85-127.

Addison, J.T. and Teixeira, P. (2005). What have we learned about the employment effects of severance pay? Further iterations of Lazear et al. *Empirica*, *32*(3-4), 345-368.

Akgüç, M., Giulietti, C. and Zimmermann, K. F. (2014). The RUMiC longitudinal survey: Fostering research on labor markets in China. *IZA Journal of Labor & Development*, 3(1), 1-14.

Albrecht, J., Navarro, L. and Vroman, S. (2009). The effects of labour market policies in an economy with an informal sector. *Economic Journal*,119(539): 1105-1129.

Almeida, R. and Carneiro, P. (2012). Enforcement of labor regulation and informality. *American Economic Journal: Applied Economics*, 4(3), 64-89.

Altonji, J. G. and Blank, R. M. (1999). Race and gender in the labor market. *Handbook of labor economics*, 3, 3143-3259.

Appleton, S., Hoddinott, J. and Krishnan, P. (1999). The gender wage gap in three African countries. *Economic Development and Cultural Change, 47*(2), 289-312.

Appleton, S., Knight, J., Song, L. and Xia, Q., (2004). Contrasting paradigms: Segmentation and competitiveness in the formation of the Chinese labour market. *Journal of Chinese Economic and Business Studies, 2*(3),185-205.

Appleton, S., Song, L. and Xia, Q. (2005). Has China crossed the river? The evolution of wage structure in urban China during reform and retrenchment. *Journal of Comparative Economics,* 33(4), 644-663.

Arrow, K. J. (1972). Some mathematical models of race discrimination in the labor market. Rand Publication.

Arrow, K. J. (1973) The theory of discrimination. In O. Ashenfelter, and A. Rees, (Eds). *Discrimination in labour markets*, Princeton: Princeton University Press.

Barsky, R., et al. (2002). Accounting for the black–white wealth gap: a nonparametric approach. *Journal of the American Statistical Association,* 97(459), 663-673.

Bassanini, A. and Duval, R. (2006) Employment patterns in OECD countries: Reassessing the role of policies and institutions", OECD Social, Employment and Migration Working Paper 35, OECD, Paris.

Becker, G. S. (1957). *The economics of discrimination*. Chicago: University of Chicago Press.

Bentolila, S. and Bertola, G. (1990). Firing costs and labour demand: How bad is eurosclerosis? *The Review of Economic Studies*, 57(3), 381–402.

Bertola, G. and Garibaldi, P. (2000). Wages and the size of firms in dynamic matching models. *CEPR Discussion Papers 2576*, C.E.P.R. Discussion Papers.

Bertola, G. (1992). Labor turnover costs and average labor demand. *Journal of Labor Economic*s, 10, 389-411.

Bertola, G. (1999). Microeconomic perspectives on aggregate labor markets. In: O. Ashenfelter and D. Card (Eds). *Handbook of Labor Economics*. Oxford: North-Holland.

Bertola, G., Boeri, T. and Cazes, S. (2000). Employment protection in industrialized countries: The case for new indicators. *International Labour Review*, *139*(1), 57-72.

Bertola, G., Blau, F. and Kahn, L. (2007). Labor market institutions and demographic employment patterns. *Journal of Population Economics*, 20, 833-867.

Besley, T. and Burgess, R. (2004). Can labor regulation hinder economic performance? Evidence from India. *Quarterly Journal of Economics* 119 (1), 91–134.

Black, D. A. (1995). Discrimination in an equilibrium search model. *Journal of labor Economics*, 13(2), 309-334.

Blinder, A. S. (1973). Wage discrimination: Reduced form and structural estimates. *Journal of Human resources*, 8(4), 436-455.

Boeri, T. and Jimeno, J. F. (2005). The effects of employment protection: Learning from variable enforcement. *European Economic Review*, 49(8), 2057-2077.

Boeri, T. and Van Ours, J. (2013). *The economics of imperfect labor markets*. Princeton: Princeton University Press.

Bosch, M. (2007). Job creation and job destruction in the presence of informal labour markets. Mimeo, London School of Economics.

Bosch, M., Goñi-Pacchioni, E. and Maloney, W. (2012). Trade liberalization, labor reforms and formal–informal employment dynamics. *Labour Economics*, 19(5), 653-667.

Botero, J., Djankov, S., La Porta, R., and Lopez-de-Silanes, F. (2004). The regulation of labor. *Quarterly Journal of Economics*, 119(4), 1339-1382.

Brandt, L. and Holz, C. A. (2006). Spatial price differences in China: Estimates and implications. *Economic development and cultural change*, 55(1), 43-86.

Brown, R. C. (2009). *Understanding labor and employment law in China*. Cambridge: Cambridge University Press.

Brown, R. S., Moon, M. and Zoloth, B. S. (1980). Incorporating occupational attainment in studies of male-female earnings differentials. *Journal of Human Resources*, 15(1), 3-28.

Burgess, S., Knetter, M. and Michelacci, C. (2000). Employment and output adjustment in the OECD: a disaggregate analysis of the role of job security provisions. *Economica*, *67*(267), 419-435.

Cahuc, P. and Zylberberg, A. (2004). *Labor Economics*, Cambridge: The MIT Press.

Cazes, S. and Nesporova, A. (2003). *Labour Markets in Transition: Balancing flexibility and security in Central and Eastern Europe.* Geneva: ILO.

Chamberlain, G. (1984). Panel data. In Z. Griliches and M. D. Intriligator, (Eds). *Handbook of econometrics*, (*2),*1247-1318.

Chan, K.W. and Zhang, L. (1999). The *hukou* system and rural-urban migration in China: Processes and changes. *The China Quarterly*, 160, 818-855.

Cheng, Z., Nielsen, I. and Smyth, R. (2014). Access to social insurance in urban China: A comparative study of rural-urban and urban-urban migrants in Beijing. *Habitat International*, 41, 243-252.

China Law Society. (2003). *Law Yearbook of China*. Beijing: Law Yearbook of China Press.

China National Bureau of Statistics. (2016). Investigative report on the monitoring of the rural migrant workers in 2015. [Online]. Available at: http://www.stats.gov.cn/tjsj/zxfb/201604/t20160428_1349713.html. [Accessed 05 August 2016].

China National Bureau of Statistics. (2005). *China Labour Statistical Yearbook* in 2005. Beijing: China Statistics Press.

China National Bureau of Statistics. (2007). *China Labour Statistical Yearbook* in 2007. Beijing: China Statistics Press.

China National Bureau of Statistics. (2010). *China Labour Statistical Yearbook* in 2010. Beijing: China Statistics Press.

China National Bureau of Statistics. (2012). *China Labour Statistical Yearbook* in 2012. Beijing: China Statistics Press.

China National Bureau of Statistics. (2015). *China Labour Statistical Yearbook* in 2015. Beijing: China Statistics Press.

China National People's Congress Standing Committee (2005). A report on the inspection of the implementation of Labor Law. [Online]. Available at: http://www.npc.gov.cn/wxzl/gongbao/2005-12/29/content_5343899.htm [Accessed 09 August 2014].

Cooke, F. L. (2008). The changing dynamics of employment relations in China: An evaluation of the rising level of labour disputes. *Journal of Industrial Relations*, *50*(1), 111-138.

Cooke, F. L. (2011). Labour market regulations and informal employment in China: To what extent are workers protected? *Journal of Chinese human resources management*, *2*(2), 100-116.

Cooney, S. (2007). China's labour law, compliance and flaws in implementing institutions. *The Journal of Industrial Relations*, 49(5), 673-686.

Cooney, S., Biddulph, S., Li, K. and Zhu, Y. (2007). China's new Labour Contract Law: Responding to the growing complexity of labour relations in the PRC. *UNSW Law Journal*, 30(3), 786-801.

Cotton, J. (1988). On the decomposition of wage differentials. *The Review of Economics and Statistics*, 70(2), 236-243.

Cui, F., Ge, Y. and Jing, F. (2013). The Effects of the Labor Contract Law on the Chinese Labor Market. *Journal of Empirical Legal Studies*, 10(3), 462-483.

Deakin, S. (2016). The contribution of labour law to economic development and growth. *CBR Working Paper* No.478, University of Cambridge.

Demurger, S., et al. (2009). Migrants as second-class workers in urban China? A decomposition analysis. *Journal of Comparative Economics*, 37(4), 610-628.

Deng, Q. (2007). Earnings differential between urban residents and rural migrants: Evidence from Oaxaca-Blinder and quantile regression decompositions. *Chinese Journal of Population Science*, (2), 8-16.

DiNardo, J. E. and Pischke, J. S. (1996). The returns to computer use revisited: Have pencils changed the wage structure too? *NBER working paper* 5606, National Bureau of Economic Research.

Ding, D. Z., Lan, G. and Warner, M. (2001). A new form of Chinese human resource management? Personnel and labour- management relations in Chinese township and village enterprises: A case-study approach. *Industrial Relations Journal*, 32(4), 328-343.

Fellal, G. (2000). Efficiency wage and efficient redundancy pay. *European Economic Review*, *44*(8), 1473-1490.

Fields, G. (1975). Rural-urban migration, urban unemployment and underemployment, and job search activity in LDCs. *Journal of Development Economics*, 2(2), 165–187.

Freeman, R.B. (2007). Labor market institutions around the world. *NBER Working Paper* , no.13242, National Bureau of Economic Research.

Frölich, M. (2007). Propensity score matching without conditional independence assumption—with an application to the gender wage gap in the United Kingdom. *The Econometrics Journal*, 10(2), 359-407.

Gallagher, M., Giles, J., Park, A. and Wang, M. (2013). China's 2008 Labor Contract Law: Implementation and Implications for China's Workers. *World Bank Policy Research Working Paper*, no. 6542.

Gallagher, M.E. and Dong, B., (2011). Legislating harmony: Labor law reform in contemporary China. In S. Kuruvilla, C. K. Lee and M. E. Gallagher, (Eds). *From iron rice bowl to informalization: Markets, workers, and the state in a changing China*. Cornell: IRL Press.

Galli, R. and Kucera, D. (2003). Informal employment in Latin America: Movements over business cycles and the effects on worker rights. *Institute of International Labour Studies Discussion Paper,* no. 145. Geneva: ILO.

Garibaldi, P., (1998). Job flow dynamics and firing restrictions. *European Economic Review*, 42(2), 245-275.

Gimpelson, V., Kapelyushnikov, R., and Lukyanova, A. (2010). Employment protection legislation in Russia: Regional enforcement and labor market outcomes. *Comparative Economic Studies*, 52(4), 611-36.

Greenfield, G. and Pringle, T. (2002). The challenge of wage arrears in China. ILO Labor Education.

Guo, J., Jiang, L. and Lu, L. (2011). Decomposition methods for wage differentials: A survey. *China Economic Quarterly*, 10(2), 363-412.

Hamermesh, D. S. (1989). Labour demand and the structure of adjustment Costs. *American Economic Review, 79 (4): 674-89.*

Hamermesh, D. S. (1993). Labour demand and the source of adjustment costs. *NBER Working Papers,* no.4394, National Bureau of Economic Research.

Harris, J. R. and Todaro, M. P. (1970). Migration, unemployment and development: A two-sector analysis. *American Economic Review*. 60(1), 126–142.

Heckman, J. and Pages, C. (2000). The Cost of Job Security Regulation: Evidence from Latin American Labor Markets. *NBER Working Papers,* no.7773, National Bureau of Economic Research.

Hussmanns, R., 2004. Defining and measuring informal employment. *Bureau of Statistics Paper, ILO, Geneva, February.* [Online]. Available at: http://www.ilo.org/public/english/bureau/stat/download/papers/meas.pdf [Accessed 15 June 2015].

International Labour Organization (ILO). (2016). Informal sector and informal employment. [Online]. Available at: http://www.ilo.org/ilostat/faces/help_home/data_by_subject?_adf.ctrl-state=1a0h15yar_239&_afrLoop=57965190648553#! [Accessed 01 August 2016]

Josephs, H. K. (2009). Measuring progress under China's Labor Law: Goals, processes, outcomes. *Comparative Labor Law & Policy Journal*, 30(2), 373-294.

Juhn, C., Murphy, K. M. and Pierce, B. (1991). Accounting for the slowdown in black-white wage convergence. In M. Kosters (Eds). *Workers and their wages: Changing patterns in the United States.* Washington DC: American Enterprise Institute.

Juhn, C., Murphy, K. M. and Pierce, B. (1993). Wage inequality and the rise in returns to skill. *Journal of Political Economy,* 101(3), 410-442.

Kahn, L. M. (1991). Customer discrimination and affirmative action. *Economic Inquiry,* 29(3), 555-571.

Kan, K. and Lin, Y-L. (2011). The effects of employment protection on the labor turnover: Empirical evidence from Taiwan. *Economic Inquiry,* 49(2), 398–433.

Khan, S. and Tamer, E. (2010). Irregular identification, support conditions, and inverse weight estimation. *Econometrica,* 78(6), 2021-2042.

Knight, J. and Song, L. (1999). Employment constraints and sub-optimality in Chinese enterprises. *Oxford Economic Papers,* 51(2), 284-299.

Knight, J. and Yueh, L. (2004). Job mobility of residents and migrants in urban China. *Journal of Comparative Economics,* 32(4), 637-660.

Knight, J., Song, L. and Huaibin, J. (1999). Chinese rural migrants in urban enterprises: three perspectives. *The Journal of Development Studies, 35*(3), 73-104.

Kugler, A. (2000). The impact of firing costs on turnover and unemployment: evidence from the Columbian labour market reform, *Inter-American Development Bank Research Network working pape*r, no. R-393.

Kugler, A. D. and Pica, G. (2008). Effects of employment protection on worker and job flows: Evidence from the 1990 Italian reform. *Labour Economics, 15*(1), 78-95.

Kugler, A. D. and Saint- Paul, G. (2004). How do firing costs affect worker flows in a world with adverse selection? *Journal of Labor Economics*, 22(3), 553-584.

Kugler, A. D. and Giovanni, P. (2005). Effects of employment protection on worker and job flows: Evidence from the 1990 Italian reform. *CEPR Discussion Papers,* no. 5256, C.E.P.R. Discussion Papers.

Lazear, E. P. (1990). Job security provisions and employment. *Quarterly Journal of Economics*, 105(3), 699-726.

Lechner, M. (2001). A note on the common support problem in applied evaluation studies. *Univ. of St. Gallen Economics, Disc. Paper*, 1.

Lee, L. (2012). Decomposing wage differentials between migrant workers and urban workers in urban China's labor markets. *China Economic Review*, 23(2), 461-470.

Li, X. and Freeman, R.B. (2015). How does China's new labour contract law affect floating workers? *British Journal of Industrial Relations*, *53*(4), 711-735.

Liang, Z., Appleton, S. and Song, L., 2016. Informal employment in china: Trends, patterns and determinants of entry. *IZA Discussion Paper*, no. 10139.

Lindbeck, A. and Snower, D.J. (2001). Insiders versus outsiders. *Journal of Economic Perspectives*, 15(1), 165–188.

Liu, K. and Tan, S. (2003). *Corporate Social Responsibility in China*. Beijing: Shehui Kexue Wenjian Chubanshe.

Liu, Y. and Liu, B. (2014) Employment protection, sticky costs and counter strategies. Economic Research Journal, 5, 63-76

Lu, F. (2012). Trend of migrant's wage: 1979-2010. *Social Science in China*. 7, 47-67.

Machado, J. A. and Mata, J. (2005). Counterfactual decomposition of changes in wage distributions using quantile regression. *Journal of applied Econometrics*, 20(4), 445-465.

Márquez, G. and Pagés, C. (1998). Ties that bind: Employment protection and labor market outcomes in Latin America. Mimeo. Inter-American Development Bank. Washington DC.

Melly, B. (2006). Estimation of counterfactual distributions using quantile regression. *Review of Labor Economics,* 68(4), 543-572.

Meng, F. (2014). Multi-level segmentation and rural migrants urban workers wage gap. *Population & Economics,* (2), 76-85.

Meng, X. (1998). Male–female wage determination and gender wage discrimination in China's rural industrial sector. *Labour Economics*, 5(1), 67-89.

Meng, X. and Zhang, J. (2001). The two-tier labor market in urban China: occupational segregation and wage differentials between urban residents and rural migrants in Shanghai. *Journal of comparative Economics*, 29(3), 485-504.

Mincer, J. (1970). The distribution of labor incomes: a survey with special reference to the human capital approach. *Journal of Economic Literature*, 8(1), 1-26.

Montenegro, C.E. and Pagés, C. (2004). Who benefits from labor market regulations? Chile, 1960–1998. In J. J. Heckman and C. Pagés, (Eds). *Law and Employment: Lessons from Latin America and the Caribbean*. London: University of Chicago Press.

Mortensen, D.T. and Pissarides, C.A. (1994). Job creation and job destruction in the theory of unemployment. *The Review of Economic Studies, 61*(3), 397-415.

Mundlak, Y. (1978). On the pooling of time series and cross section data. *Econometrica,* 46(1), 69-85.

Neumark, D. (1988). Employers' discriminatory behavior and the estimation of wage discrimination. *Journal of Human Resources,* 23(2), 279-295.

Nickell, S. J. and Nunziata, L. (2000). Employment patterns in OECD countries. *CEP Discussion Paper*, no. 448, London School of Economics.

Ñopo, H. (2008). Matching as a tool to decompose wage gaps. *The Review of Economics and Statistics,* 90(2), 290-299.

Oaxaca, R. (1973). Male-female wage differentials in urban labor markets. *International Economic Review*, 14(3), 693-709.

Organization for Economic Cooperation and Development (OECD). (1994) *The OECD jobs study, evidence and explanations, part I: labor market trends and underlying forces of change*. Paris: OECD.

Organization for Economic Cooperation and Development (OECD). (1994). *The OECD jobs study, evidence and explorations, part II*. Paris: OECD.

OECD (2004). *The OECD Employment Outlook*. Paris: OECD.

Park, A., Wu, Y. and Du, Y. (2012). Informal employment in urban China: Measurement and Implications. *World Bank Working Paper*, no. *77737*.

Park, A. and Cai, F. (2011) The informalization of the Chinese labour market. In S. Kuruvilla, M. Gallagher and C.K. Lee, (Eds). *From iron rice bowl to informalization: Markets, state and workers in a changing China*, Ithaca NY, ILR Press.

Phelps, E. S. (1972). The statistical theory of racism and sexism. *The American Economic Review*, 659-661.

Piore, M. and Doeringer, P. (1971). *Internal labor markets and manpower analysis*. Lexington, Mass: Heat.

Pissarides, C. A. (2000). *Equilibrium unemployment theory*. MIT press.

Qu, X. (2014). Trends in wage gaps between urban workers and rural migrants: "Glass ceiling" or "Sticky floor"? *Journal of Finance and Economics*, 40(6), 109-120.

Rabe-Hesketh, S., Skrondal, A. and Pickles, A. (2005). Maximum likelihood estimation of limited and discrete dependent variable models with nested random effects. *Journal of Econometrics*, *128*(2), 301-323.

Reimers, C. W. (1983). Labor market discrimination against Hispanic and black men. *The Review of Economics and Statistics*, 570-579.

Remington, T.F. and Cui, X.W. (2015). The impact of the 2008 Labor Contract Law on labor disputes in China. *Journal of East Asian Studies*, *15*(2), 271-299.

Ribo1, A. and Vilalta-Bufi, M. (2012). Is the matching function Cobb-Douglas? *Working Papers in Economics*, no. *272*, Universitat de Barcelona. Espai de Recerca en Economia.

Schivardi, F. and Torrini, R. (2008). Identifying the effects of firing restrictions through size-contingent differences in regulation. *Labour Economics, 15*(3), 482-511.

Schneider, F and Enste, D. H. (2000). Shadow economies: size, causes and consequences. *Journal of Economic Literature,* 38(1), 77-114.

Shapiro, C. and Stiglitz, J. E. (1984). Equilibrium unemployment as a worker discipline device. *American Economic Review* 74(3), 433-444.

Skedinger, P. (2006). Minimum wages and employment in Swedish hotels and restaurants. *Labour Economics*, 13(2), 259-290.

Solinger, D. J. (1999). *Contesting citizenship in urban China: Peasant migrants, the state, and the logic of the market.* Oakland: University of California Press.

Song, Y. (2014). What should economists know about the current Chinese *hukou* system? *China Economic Review*, *29*, 200-212.

Sun, R. (2010). Dynamic labour demand and employment protection legislations in china: evidence from panel data. *Nankai Economic Research,* (1), 66-78

Taylor, B., Chang, K. and Li, Q. (2003). *Industrial relations in China*. Cheltenham: Edward Elgar Publishing.

Wang, H., Guo, F. and Cheng, Z. (2015). A distributional analysis of wage discrimination against migrant workers in China's urban labour market. *Urban Studies*, 52(13), 2383-2403.

Wang, J., Cooke, F.L. and Lin, Z. (2016). Informal employment in China: recent development and human resource implications. *Asia Pacific Journal of Human Resources*, 54(3), 292-311.

Wang, M. (2005). Employment opportunities and wage gaps in the urban labor market: A study of the employment and wages of migrant labourers. *Social Science in China,* (5), 109-120.

Williams, C.C. and Lansky, M. (2013). Informal employment in developed and developing economies: Perspectives and policy responses. *International Labour Review*, *152*(3-4), 355-380.

Wooldridge, J. (2015). *Introductory econometrics: A modern approach*. Nelson Education.

Xing, C. (2008). Wage gap between rural migrants and urban workers. *Management World,* (5), 55-64.

Xu, F. and Zhao, Z. (2014). Research on the effects of *hukou* system and job related information on wage gap. *Journal of Renmin University of China,* (3), 10, 19-28

Yang, Y. (2002). *The Employment in the transition period of China*. Beijing: China Labour and Social Protection Press.

Yao, X. and Tan, L. (2005). An analysis of urban household income and married women labour market participation. *Economic Research Journal*, 7, 18-27.

Yu, X. and Chen, X. (2012). Empirical Research on the Effect of the Household Registration System Evolvement on Labour Market Segmentation in China: From Dual Perspectives of Employment Opportunities and Wage Gap. *Economic Research Journal*, 12, 97-110.

Zenou, Y. (2008), Job search and mobility in developing countries. Theory and policy implications. *Journal of Development Economics*, 86(2), 336-355.

Zhang, B., Zhai, F.Y., Du, S.F. and Popkin, B.M. (2014). The China health and nutrition survey, 1989–2011. *Obesity Reviews*, *15*(S1), 2-7.

Zhang, Z. and Wu, X. (2013). Occupational segregation and earnings attainment of rural migrants in urban China. *Michigan Population Studies Center Research Report*, no. 13-809.

Zheng, Y.L. (2009). It's not what is on paper, but what is in practice: China's new labor contract law and the enforcement problem. *Washington University Global Studies Law Review*, 8(3), 595-617.

Zhu, R. (2015). Wage differentials between urban residents and rural migrants in urban China during 2002–2007: A distributional analysis. *China Economic Review*, 37, 2-14.

Zimmerman, J., 2008. Labour law: trends and practices in China. [online]. Available at: http://www.fljs.org/sites/www.fljs.org/files/publications/Zimmerman.pdf [Accessed 13 September 2014]