

Essays on Economics of South Korea

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Declaration of authorship

I, Ui Yoshida, hereby declare that this thesis and the work presented in it is entirely my own. Where I have consulted the work of others, this is always clearly stated.

Signed: _U. Yoshida_____

Date: _18th September 2020_____

Abstract

This thesis consists of four chapters. The first chapter utilises fixed effects estimation on a panel of all sixteen first-tier administrative divisions in South Korea¹ to explore the effects of regional economic composition, and informal employment types, on tax revenue mobilization. Korea has a well-documented low tax burden (tax collected as a proportion of GDP) for an OECD country, yet no study has empirically examined the determinants of tax capacity in Korea. Another atypical feature of Korea is its high informal employment and self-employment rate, and contribution of personal and social services to GDP, the sector with the highest potential for informal activity. Despite these anomalies, no study thus far has quantified the impacts that these may have on the country's tax capacity. This chapter contributes to the study of tax revenue determinants by not only looking at Korea in a single context, but by also using the aforementioned more precise measures informal activity on tax capacity, in addition to the typical measure usually used which is agricultural share of GDP. I use fixed-effects estimation on the panel of regions, combining regional and individual-level data, and find heterogeneous effects of regional sectoral economic activity, and employment types, on regional tax capacity. The statistical significance of the negative impact of informal employment on tax capacity is stronger than that of self-employment. Informal employment in the personal and social services sector has the largest negative effect on tax revenues.

The second chapter describes the background of a reform intended to increase the protection level of certain irregular workers in Korea (fixed-term and dispatched contracts), namely the 2007 Act on the Protection of Irregular Workers. This reform is the basis for the third and fourth chapters. Irregular workers refer to workers who cannot expect stable employment with employers and experience poorer working conditions in terms of wages and employment protection coverage, than their regular counterparts. Amidst the growing polarization of the Korean labour market following the 1997 Asian Financial Crisis, the Korean government implemented this reform in 2007 in an attempt to address the prevalence of irregular work agreements through converting irregular contracts into regular contracts. Before 2007, there were no restrictions on the use of irregular contracts, meaning workers could be employed on these contracts indefinitely. However, under the reform, an irregular contract should be either converted into a regular contract or terminated within two years of being signed. The reform also prohibits differential treatment against irregular workers in terms of working conditions, due to their employment status, in comparison to regular workers carrying out similar or the same work.

The third chapter examines the impact of the 2007 irregular employment protection legislation (EPL) on irregular and regular employment in Korea. I use a panel of individuals and a difference-in-difference framework to identify the effect of the reform on the probability of transitioning from irregular employment to regular employment, the probability of remaining irregular, or the probability of becoming unemployed. I find the reform increases the probability of transitioning from irregular to regular employment, and this is mainly driven by conversion into regular employment within the same job. They are also less likely to move into a new irregular job. I also find differences between skill-level (high vs low) and type of workplace of respondent (private vs public employer). In addition to transitions, I examine the wage growth for workers who switch from irregular to regular employment, and find that private sector workers experience an initial wage increase, but public sector workers experience a decrease. Regularization of jobs mostly occurs in the industrial sector, but of the workers who do move into regular employment, retail workers experience the biggest improvement in wage.

In the fourth chapter, I identify how the 2007 irregular EPL affects the workforce composition and financial performance of Korean firms. Using a panel of firms, I again apply a difference-in-difference framework and exploit the fact that the

¹ South Korea, Korea, and Korea Rep. all refer to the same country.

impact of the reform is assumedly larger for firms that initially used these protected irregular workers intensively. The results show that firms lower their total employment levels and adjust the composition of the workforce by reducing the use of protected irregular contracts, and increasing the use of unprotected irregular contracts and regular contracts. In unionized firms, the shift towards these less financially burdensome workers is larger but towards regular workers is smaller. I also explore how the results differ between economic sectors and type of workplace. In addition, I examine the effect of the reform on the wages and employment protection coverage of irregular workers and find differences between irregular workers that have a direct employment relationship with the firm and those who do not. There is also no evidence that the reform negatively affected firm profitability.

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Thesis introduction

This thesis studies the effect of informal employment on tax capacity over a rapid development process in Korea, and the effects of a policy introduced by the Korean government intended to protect irregular workers, amid a growing polarization of the labour market between regular and irregular workers. Korea has moved from a poor agrarian economy in the 1960s to an OECD member in 1996 and thus a rich country in a single generation. Yet, as the country developed economically, it is only until recently that Korea has begun to experience a tax profile similar to those of other comparably developed economies. In addition, Korea also has a high self-employment rate, informal employment rate, and contribution of personal and social services to GDP. In addition, its low levels of social spending, and a dualistic labour market between regular and irregular workers for an OECD country makes it stand out. These are some of the main reasons social cohesion is a cause for concern in Korea.

The first chapter utilises fixed effects estimation on a panel of all sixteen first-tier administrative divisions to explore the effects of regional economic composition, and informal employment types, on tax revenue mobilization. The second chapter describes the background of a labour reform implemented in 2007, namely, the Act on the Protection of Irregular Workers. This reform aimed to address the growing prevalence of irregular workers in Korea following the 1997 Asian financial crisis. The third chapter studies the effect of the policy on transitions and wages at the worker level, using a difference-in-difference framework on a panel of individuals. For the fourth chapter, I again apply a difference-in-difference framework on a panel of firms to compare the change in outcomes for firms with varying degrees of use of irregular contracts protected by the reform, before and after the reform was implemented in 2007.

In the first chapter, I look at the effect of regional economic variation on tax capacity in Korea. Despite the fact that Korea has a well-documented low tax burden (tax collected as a proportion of GDP) for an OECD country, no study has looked at the determinants of tax capacity in Korea in a single country context. Korea also has a high informal employment and self-employment rate, and contribution of personal and social services to GDP, the sector with the highest potential for informal activity. Yet, no study thus far has quantified the impacts that these may have on a country's tax capacity. This chapter contributes to the study of tax revenue determinants by not only looking at Korea in a single context, but by also using the aforementioned more precise measures informal activity on tax capacity, in addition to the typical measure usually used which is agricultural share of GDP.

Using regional administrative tax collection data, and data on regional economic activity and demographics, I aim to exploit the effect of regional variation in Korea on tax capacity over a period of high economic growth (i.e. 1998- 2016). The existing literature has often focused on exogenous changes in total tax revenues but the many types of taxes available to governments are unlikely to all have the same impact on the economy and therefore should not be summarized in a single tax measure. The tax data allows me to look at two more homogenous tax categories, PIT and CIT. The OECD database defines PIT (personal income tax) as taxes levied on net income (gross income minus allowable tax relief), and any capital gains of individuals. Likewise, CIT (corporate income tax) is defined as taxes on net profits (gross income minus allowable tax relief), and any capital gains of enterprises. This is important to distinguish since personal income tax collection as a share of GDP is far below the OECD average, while CIT collection is higher than the OECD average due to the profitability of the corporate sector. In addition, different sectors of the economy and employment types in these sectors may have differential effects on either type of these income tax revenues. The high degree of centralization in government policy means local governments lack the power to respond to local tax needs. Therefore, the effect of institutions is held constant between regions, and I exploit regional economic variation to measure the effect on tax capacity. I use fixed-effects

estimation on a panel of all sixteen regions, and find heterogeneous effects of regional sectoral economic activity, and employment types.

The second chapter describes the background of a reform intended to increase the protection level of certain irregular workers in Korea (fixed-term and dispatched contracts), namely the 2007 Act on the Protection of Irregular Workers. This policy provides a quasi-natural event, and serves as the basis for the third and fourth chapters. Irregular workers refer to workers who cannot expect stable employment with employers and experience poorer working conditions in terms of wages and employment protection coverage, than their regular counterparts. Given that the policy clearly defines what kind of workers who are affected, this allows me to causally identify the effect of the policy on individual-level outcomes in chapter 3 and firm-level outcomes in chapter 4. Amidst the growing polarization of the Korean labour market following the 1997 Asian Financial Crisis, the Korean government implemented this reform in 2007 in an attempt to address the prevalence of irregular work agreements through converting irregular contracts into regular contracts. Before 2007, there were no restrictions on the use of irregular contracts, meaning workers could theoretically be employed on these contracts indefinitely through repeatedly renewing these contracts. However, under the reform, an irregular contract should be either converted into a regular contract or terminated within two years of being signed. The reform also prohibits differential treatment against irregular workers in terms of working conditions due to their employment status, in comparison to regular workers carrying out similar or the same work.

In the third chapter, I assess the effect of the 2007 irregular employment reform in Korea at the worker level. Despite the significance of the policy in Korea, there is only one other study that examines the impact of the reform at the worker level (Yoo & Kang, 2012). The gap in the empirical literature may be the result of recent research largely focusing on the reduction of EPL for irregular workers that occurred in the late 1990s in European countries where regulations regarding irregular contracts were relaxed. In contrast to the European reforms, the Korean reform was designed to increase the protection of irregular workers, providing an opportunity for empirical analysis in this relatively unexplored kind of reform.

I employ a linear probability model with a difference-in-difference framework to identify the effect of the policy on employment status. The panel dataset allows me to identify the transitions between employment status within individuals, which is not possible when using repeated cross-sectional data, as done in Yoo & Kang (2012). I find that the policy increased the probability of transitioning from irregular employment to regular employment, and decreased the probability of remaining in irregular employment. Therefore, on aggregate, the policy seems to have achieved its intended effect. Perhaps as would be expected, low-skilled workers experienced an increase in probability of both conversion to regular employment, and entering unemployment. The reform makes irregular workers potentially more legally and financially costly upon conversion to regular status. Regularization of jobs mostly occurs within the industrial sector. The industrial sector is the largest employer in terms of number of employees in terms of number of employees in the workplace. So, industrial firms may be easier for the relevant authorities to monitor due to their large size.

In addition to examining the transition probabilities, I also examine the effect on wage growth for workers who make the transition from irregular to regular employment. It may be the case that converted workers are officially regular by employment status, but then this should be accompanied by an improvement in wages. I find that workers in private firms experience a wage increase upon transitioning from irregular to regular employment, whereas public sector workers experience a decrease. Given that regular government sector workers experience the highest wages and tenure of all regular workers, it may be the case that they are willing to accept an initial cut in the first year of regular of regular work in return

for the benefits of regular work as a public sector worker. The sectoral results show that of the workers who do regularize, workers in retail experience the biggest improvement in wages when regularizing within the same job. This sector also pays the lowest regular wage, but newly regular workers still benefit from the reform.

In the fourth chapter, I examine how firms responded to the reform, in terms of workforce composition, working conditions for irregular workers, and labour productivity. There is only one other study that also examines the impact of this reform at the firm-level. Baek & Park (2018) show that overall, firms adjust the composition of the workforce by substituting irregular contracts protected by the reform with unprotected irregular contracts, supporting the evasion hypothesis suggested by Yoo & Kang (2012). In unionized firms, the shift towards these less financially burdensome workers is larger but towards regular workers is smaller. However, they do not explore any further whether differences exist between economic sectors and type of workplace (private vs public). I find that the result of a decrease in total employment level is largely driven by the retail sector. Firms in retail also experience the most substitution of protected irregular workers with atypical irregular contracts not covered by the reform. Private sector firms, perhaps aiming to protect profits, also experience more substitution with unprotected contracts, and reduced their total employment levels. On the other hand, public sector firms did not increase their use of unprotected workers and did not downsize their workforce.

This chapter also contributes by being the first to study the effect of the reform on the wages and social insurance coverage of irregular workers. I find that wages of directly hired irregular workers are not negatively affected by a high initial share of protected contracts. However, indirectly hired irregular workers, who do not have a direct employment relationship with the firm from a legal perspective, experience a decrease in wages. In addition, they also experience a decrease in probability of receiving social insurance coverage from the firm. Finally, I examine whether the reform for irregular workers impacted firm outcomes beyond the employment effects. Given that the policy potentially makes hiring protected irregular contracts more costly due to potential conversion to regular contracts, I also examine the effect of the reform on financial performance. Firms in the industrial sector appear to make labour cost savings in response to the reform, and increase profits and productivity. On the other hand, firms in retail experienced an increase in labour cost per worker. Private sector firms mitigate potential negative impacts of the reform by adjusting their capital levels, whereas public sector firms experience increases in labour cost per worker.

CHAPTER 1 Tax Revenue Mobilization and Economic Development. Evidence from South Korea.

1.1. Introduction

Revenue mobilization can be taken for granted in industrialized countries. A key question in development economics is how states can create well-functioning markets and improve living standards via its institutions. To do so, industrialized nations have developed their fiscal capacities, and the patterns of taxation (tax sources) have changed over time. Besley and Persson (2014) use cross-country analysis to find that rich countries, and not rich but high tax countries rely most on income taxes, middle-income on consumption taxes like VAT, whilst poorer ones depend most on tariffs from international trade, such that, typically, poorer countries collect taxes of 10%~20% of GDP, richer countries around 40%, and the OECD average is mid-30s. Relying on international trade taxes has become problematic for poorer countries, who run substantial fiscal deficits, as the world has undergone a process of trade liberalisation. Baunsgaard and Keen (2010) have shown that while rich and middle income countries can find ways to replace the foregone tax income, the ability of the least developed countries to maintain their levels of tax revenue has been compromised. In part, this is because the capacity of countries to tax individuals on their income and consumption is usually correlated with the modernisation of the economy, in particular its degree of formalization and tax compliance.

This study aims to assess the impact of economic development and informal activity on tax revenue mobilization by looking at the experience of a newly industrialized country, namely Korea, over the period 1998-2015. Throughout the 1980s until the mid-1990s, Korea's GDP by PPP per capita was still only a fraction of other industrialized nations, despite all the growth in the post-war period. In the 1980s, GDP per capita was \$3,700 measured in 2010 US dollars. Since then, it has maintained substantial market-oriented economic growth, to the extent that GDP per capita was \$25,000 in 2015. Therefore, this period of growth makes it an interesting time span to cover. The novelty of this paper comes from examining tax capacity over a rapid development process and it is the first to study Korea specifically, despite the intriguing pattern of the tax profile not resembling more closely those of other industrialized nations. Exploiting regional variation in economic structure and demographics, I aim to identify their effect on tax collection. Another distinguishing feature of Korea among the OECD nations is the high level of informal wage employment and self-employment. I have data on both of these statistics and take them into account in the analysis. Self-employment has usually been used a proxy for informal employment (Jensen, 2015). This study is the first to empirically quantify the impact that informal wage employment has on tax revenue mobilization. I use a novel regional-level panel dataset combining regional tax data from annual tax yearbooks with archival materials from the KOSIS website to identify the effect of economic development and sectoral economic composition on tax collection.

I estimate taxable capacity based on demographic and economic characteristics using a novel regional-level panel of Korea's 16 first-tier administrative regions. This dataset combines regional tax data from annual tax yearbooks with archival materials from the KOSIS website, and regional employment data derived from the survey dataset (KLIPS) to identify the effect of economic development and sectoral economic composition on tax collection. The narrower purpose of the study is to interact the sectoral employment type shares typically associated with informality (self-employment, and informal wage employment), with sectoral activity (GDP) shares, to understand how these employment types affect taxable capacity. Therefore, the coefficients of interest are the interaction terms, but they should be interpreted as associations

rather than causal due to the endogeneity and measurement error. Another narrow purpose is disaggregating services into business services and other services, of which the latter is usually seen as less productive. When estimating the typical tax equation without the interactions, other services reduces taxable capacity as may be expected. However, the interactions of other services with different employment types is not robust. The broader purpose is to suggest to future research that different types of employment should be considered in estimating taxable capacity. My results, which should be interpreted cautiously, suggest that with the exception of self-employment in agriculture, self-employment in total services and business services have a positive effect on taxable capacity as the GDP share in these sectors increase. The opposite is true for informal employment, as when the GDP share increases, higher informal employment shares negatively affects tax revenues.

Country-level data from the Groningen Growth & Development Centre shows that Korea's employment shares between sectors is different to that of other industrialized nations, such that the contribution of the personal services sector, often associated with low productivity and informal employment, is 18.3% from 1995 to 2010, compared to 5.4% in the UK for example. One of the contributions of this paper is the use of clearly defined proxies of informal employment to identify their effect on tax revenue collection, which I derived from the KLIPS (Korean Labour & Income Panel Study) microdata. Informal workers are defined as wage employees not covered by the national pension programme, and the self-employed. In addition, the vast majority, if not all studies that examine tax revenue determinants for a single country, do not consider regional economic variation. Therefore, this study identifies how regional variation in economic structure may affect the capacity of a country to generate additional revenues. I find that informal wage employment as a share of total employment, and self-employment in agriculture as a share of agricultural employment reduces tax collection. Informal employment in services reduces tax revenues by the largest magnitude and this is driven by the effect of personal and other services. Informal employment in manufacturing also reduces tax capacity. The study could potentially have lent itself to constructing forecasts of the future structure of the economy, but the precision of out of sample predictions is limited as there are only 19 time periods per region (16 regions and 19 years yields 304 observations in the panel).

Using the KLIPS microdata from Table 1.6, I find informal wage workers earn 10.2% less but the self-employed earn 4% more respectively than formal wage workers. Given that informal wage workers earn lower wages, it can be expected to negatively impact the tax base, in turn making it more difficult for the state to fund public services. Korea is among the lowest ranked OECD countries in terms of tax revenue as a percent of GDP, due in part to the low personal income tax collection. The low personal income tax collection may in turn be due to the high share of informal wage employment in Korea. I use survey data from the Korean Labour & Income Panel Study to identify the composition of the labour force, which can be classed in the data into formal, informal, and self-employed workers.

Despite the very high and fast growth, structural change in terms of formalization may still be difficult, and in turn may affect state capacity. This has several implications for developing countries. La Porta & Shleifer (2014) find that the informal economy makes up around half of the total economy in the poorest countries. The informal sector also has lower productivity compared to the formal sector which may result in a lower taxable CIT base, because informal firms are usually smaller, inefficient, and run by entrepreneurs with low education. A key reason for informality is to escape taxes and regulation, but informal firms are often not productive enough to thrive in the formal sector. Lowering registration costs does not pull informal firms into the formal sector. Informal firms are also unlikely to provide their workers with social insurance coverage, contributing to an undeveloped welfare system. In addition, informal firms seem to be trapped

in informality and rarely transition to formality, and continue to exist without further growth or improvements in productivity. Finally, as countries become more developed, the formal economy begins to dominate and the informal economy shrinks.

The outline of the rest of the chapter is as follows. Section 1.2 is the literature review. Section 1.3 provides background on Korea's tax capacity in an OECD context. Section 1.4 discusses the data. Section 1.5 and 1.6 provide the wage and tax equation results respectively. Section 1.7 concludes.

1.2. Literature Review

The factors that affect revenues (conventionally measured as the ratio of tax revenues to GDP) has been the subject of much debate and hence, increasingly attention is returning to this field of literature. The standard approach in the literature is to model the revenue to GDP ratio as determined by variables chosen to proxy for the tax base and structure of an economy (Bird et al, 2008; Le et al, 2012; Teera & Hudson, 2014; Mahdavi, 2008; Morrissey, 2016; Rodriguez, 2018). The literature broadly suggests that the proxy indicators most commonly used are (i) sectoral composition of economy activity; (ii) GDP per capita; and (iii) demographic factors such as educational attainment. Other variables include measures of the informal economy, and institutional factors such as political stability.

Tax collection is hindered by a large agricultural share of GDP and small shares of industry or manufacturing. A large agricultural sector, especially in developing countries, is difficult to tax due to subsistence consumption and underreporting (Agbeyegbe et al, 2006; Rodriguez, 2018). Whilst it may also be politically infeasible to tax the agricultural sector, on the other hand, a large agricultural sector may also reduce the demand for public goods and services, which tend to be relatively urban-based. In contrast, a large industrial sector is easier to monitor and tax, as it captures economic development and a larger formal (and hence taxable) sector. This paper also relates to the literature on structural transformation, which shows that sectoral composition of economic activity is a crucial factor for economic development, which in turn determines fiscal capacity for a country. Duarte & Restuccia (2010) study the role of structural transformation in aggregate productivity and find that productivity catch-up in the industrial sector explains about 50% of the gains in in aggregate productivity across countries, whereas low productivity in services and the lack of catch-up explain all the experiences of slowdown, stagnation, and decline observed across countries. McMillan et al. (2014), empirically show that structural change, i.e. the transfer of labour and other inputs to higher productivity activity, drives economic growth. They show how structural transformation had been growth-enhancing in Asia because labour has transferred from low productivity agriculture to higher productivity sectors, notably manufacturing. However, they also find that Korea in particular, resembles more closely Latin American countries in that high-productivity manufacturing sectors have shrunk in favour of relatively lower-productivity services activities.

Consequently, structural and economic change between regions is important to also take into account, if we are to understand how employment shares affect tax capacity. For instance, data from the GGDC shows that Korea experienced a steady increase in the employment share in personal, community, and social services, but the corresponding GDP share fell substantially over the same period, indicating an increase in the share of workers in this sector of falling productivity. Currently, no other study has also used employment types within sector as a predictor of revenue collection. As the importance of an economic sector (share of GDP) changes, the composition of employment (informal and self-employed) within that sector may also change, in turn affecting tax revenue mobilization.

GDP per capita (proxy for economic development) is also one of the main controls used in tax revenue equations and perhaps surprisingly, results are somewhat mixed and the variable is often insignificant. However, overall, most studies find positive effects on tax revenue, in line with the expectation that the capacity to collect and pay taxes increases with development, with exceptions including Bird et al (2008), Tait et al (1979), Le et al (2008), and Morrissey et al (2014, 2016). Higher economic development is expected to increase tax revenues as the formal sector of the economy also increases. Additionally, economic development and GDP per capita favour state capacity to collect taxes, and are related to greater tax bases (Besley & Persson, 2009).

Higher levels of education generate more sophisticated production methods and economic activities that can create more tax revenues, probably due to its role in increasing taxpayer morale. This socioeconomic variable is associated with a greater recognition of public intervention and hence greater awareness of the benefits of taxes (Rodriguez, 2018; OECD, 2013).

Political factors such as corruption have also been included into the recent literature due to increasing data availability, but have yielded inconsistent findings. When corruption is commonplace, citizens may decide to evade taxes more easily, not only because the economic cost of doing so would be lower, but also because they would not recognise the use given to public funds (Rodriguez, 2018). This suggests a negative association between corruption and tax revenue (Bird et al, 2008; Le et al, 2012; Tanzi & Davoodi, 2000). Democracies therefore boost tax revenues via citizen empowerment and improved tax morale, which is more likely when the government is seen as representative and accountable (Mulligan et al, 2004; Profeta et al, 2013). However, Gupta (2007) tests for government and political stability, law and order, and democracy, but fails to find robust results.

Various sources of tax revenue also affect the share of central government revenue in GDP. Gupta (2007) finds that countries who rely more on indirect (taxes on goods and services) experience lower tax capacity. Since most of these consumption taxes are indirect and hence regressive, they may exacerbate inequality in income distribution and reduce the tax base. Conversely, greater reliance on direct taxes (taxes on personal and corporate income) appears to have a positive impact on tax capacity. To the extent that direct taxes are more progressive, they reduce income dispersion and generate higher revenues. In developing countries, income taxes raise relatively little overall, with their nominal progressivity often offset by high personal exemptions. Moving from a heavy reliance on consumption to income taxes appears desirable, as demonstrated by the tendency for wealthier and institutionally stronger countries to follow this pattern. Particularly in developing countries with substantial informal sectors, reducing administrative costs of collection, minimizing evasion, maximizing the tax base, and limiting distortions between sectors are the general strategies for an effective policy of revenue mobilization (Tanzi & Zee, 2000). Besley and Persson (2014) find that as countries move from collecting public revenues of around 10% of national income towards collecting around 40%, the tax bases typically shift from trade and excise taxes towards income taxes in supporting the redistributive functions of the state. They state that structural characteristics of an economy influence the ability to tax, and the standard economic approach to taxation and development focuses on how economic change influences the evolution of the tax system. In this approach, changes to the tax system reflect structural change. For example, a large informal sector implies a declining tax net. On the other hand, a declining informal sector widens the tax net, and the growth of larger firms creates a vehicle for compliance, and expansion of the financial sector encourages transparent accounting procedures which facilitate taxation.

The existing literature has often focused on exogenous changes in total tax revenues., finding that tax increases lead to reductions in real GDP and private investment (Barro & Redlick, 2011; Blanchard & Perotti, 2002). In a seminal paper, Romer & Romer (2010) separate legislated tax changes into those taken for reasons related to prospective economic conditions and those taken for more exogenous reasons, such as presidential speeches and Congressional reports. Addressing a budget deficit and promoting long-run growth are stated as unrelated to other factors influencing output, and hence policy actions taken because of them can be used to estimate the effects of tax changes on output. Again, changes in output following these exogenous changes indicates that tax increases are highly contractionary. However, the many types of taxes available to governments are unlikely to all have the same impact on the economy and therefore should not be summarized in a single tax measure (Mertens & Raven, 2013). As a result, they look at two more homogenous tax categories, PIT and CIT, and show that cuts in personal and income taxes both positively affect real GDP per capita but have a differential effect on revenues. They examine the dynamic effects of changes in tax policy in the United States and applied it to WWII data, and found that cuts in personal and corporate income taxes both positively affect real GDP per capita, while cuts in personal income tax lower revenues but cuts in corporate taxes had no significant impact. I follow their approach and look at these tax categories using The Statistical Yearbook of National Tax which has data on PIT and CIT revenues by region. Therefore, this allows me to identify how variation in structural change and economic development between regions in Korea affects total revenues, PIT revenues and CIT revenues.

This paper is also related to the literature on changes in employment structure over economic development. Much of the recent evidence focuses on the stylized fact that self-employment declines over increasing levels of GDP per capita (Banerjee and Duflo, 2007; Gollin, 2008; La Porta & Shleifer, 2014). Studies of structural transformation exploit both cross and within country patterns, but focus on sectoral changes, with the exception of McNaig & Pavcnik (2015), who show that structural transformation in Vietnam was accompanied by transitioning out of household businesses. In addition, my approach is similar to that of Jensen (2015), who looks empirically at how tax capacity changes when the structure of the economy changes, i.e. from self-employment to wage employment. He finds that within a country, employee share increases as the country develops. This is consistent with a model where a high employee share is a necessary condition for taxation, and where the rise in income covered by information trails through increases in employee shares drives expansion of the income tax base. I also control for the effect of different employment types by proxying informality with self-employment and informal employment, following the approach of Elgin & Ovyat (2013). As data for informal employment is usually very limited, self-employment is a widely used proxy for informal employment (Elgin & Ovyat, 2013; Jensen, 2015). Therefore, my paper complements the literature on informality and economic development (La Porter & Shleifer, 2014), using the association between regional employment types and tax revenues over time. According to 2005 OECD data, Korea's transition to a salaried economy is still incomplete. In 2005, the proportion of wage and salary workers among all workers was 66.4% compared to the OECD average of 82.9%. In countries with lower levels of self-employment and undeclared work, lower paid workers typically prefer employee status to self-employment partly because tax compliance is much simpler for employees. This approach reduces tax compliance costs in an economy as a whole, therefore implying that effective tax systems promote a long-term transition to a salaried economy, where the remaining self-employed are mainly in two categories: (i) employers, who have relatively high earnings; and other self-employed, who need to work for different employers or customers throughout the year and hence cannot easily work as employees, due to the nature of their business. In Korea, the proportion of self-employed workers has scarcely fallen since 1997

(possibly due to a shortage of regular wage jobs), but any strategy for ensuring higher tax compliance rates among the self-employed will likely aim to reduce this proportion (Grubb, Lee, & Tergeist, 2007).

In summary, there is a wide body of empirical literature from cross-country studies that attempt to identify the determinants of tax revenue. Unsurprisingly, empirical research has produced mixed findings because of the sensitivity of results to the set of countries and the sample periods (Besley & Persson, 2014). The findings from cross-country studies are somewhat limited; in that usually robust results only confirm that tax/GDP ratios are related to proxies of the tax base such as GDP shares of agriculture, industry, and international trade in the economy (Morrissey, 2016). In addition to the usual determinants, Gupta (2007) has shown the impact of foreign aid and foreign debt on revenue mobilization, using a large set of developing countries. His results found that although foreign aid increases revenue significantly, debt does not. Corruption is a negative determinant, and political and economic stability are positive factors, but only across certain specifications. On the other hand, countries that rely more on direct taxes like income, profits, and capital gains perform better, and structural factors were found to be significant across all income groups. Baunsgaard & Keen (2010), study the impact trade liberalization has had on the ability of countries to generate revenues foregone from trade liberalization, and using a panel of countries, find that high-income countries have managed to offset reductions in in trade revenues by increasing their domestic tax revenues by more than a dollar for each dollar of trade tax revenue, whereas middle-income countries recover 45-60 cents of additional tax revenue for each dollar of tax trade revenue, and low-income countries on average recovered no more than 30 cents of each lost dollar. These studies have guided the choice of explanatory variables that I use in my analysis. I revisit the literature in a number of ways. Using a richer set of tax base indicators based on income tax composition (personal income and corporate income revenues), I allow for the effect of regional variation on tax capacity of the most important direct tax sources. In addition, I consider corresponding employment shares by sector, as an alternative to GDP shares as a determinant of revenues, as well as shares of employment types by region. This gives a richer characterisation of tax performance by economic structure.

I revisit the literature in a number of ways. First, I distinguish between PIT and CIT. Existing literature has often focused on total tax revenues, but many types of taxes available to the government means that they are unlikely to have the same impact on the economy. Therefore, it may be unsuitable to summarize tax revenues in a single measure. The tax data allows me to look at these two homogenous tax categories. This is important to distinguish since personal income tax collection as a share of GDP is far below the OECD average, while CIT collection is higher than the OECD average due to the profitability of the corporate sector. The PIT collection may be particularly low because of high informal and self-employment, therefore I aim to quantify their impact on these income taxes. Second, I use detailed regional economic data in order to identify the effect of economic development, and sectoral composition of regional economies, on tax capacity, holding the effect of institutions constant between regions due to the centralized government. The regional data contains detailed GDP compositions of each region by year, and data on demographics. Third, I account for informality directly in two ways, neither of which have been considered in the tax capacity literature. I disaggregate the services sector into business services, and personal services, the latter which may be expected to have a larger negative impact on tax capacity. In addition, I employ regional informal and self-employment rates as controls in the tax equation. Both these forms of employment may be expected to reduce the tax base, given their association with tax evasion. However, I find that only informal employment has a negative effect on tax revenue mobilization, while self-employment does not, despite its association with tax evasion and informality, especially in developing countries.

1.3. Background and Context

In this section, I compare the tax burden in Korea compared to the OECD. Figure 1.1 graphs the overall tax burden (tax revenue as a % of GDP) for Korea and selected OECD countries, and shows that the burden is considerably smaller than the OECD average, at 25% compared to 34% as of 2015. This may be due to several factors. These include the relatively small public sector, underdeveloped social safety net, and high estimated informal economy size compared to high income OECD countries (Ceriani, 2005). Figure 1.1 shows that most of the increase in the tax burden happened during the 1990s, resulting from increasing social contributions and growth in personal incomes.

PIT (personal income tax) and CIT (corporate income tax) structures and other factors that may explain the difference in tax revenues between Korea and other OECD countries. The OECD database defines personal income tax as taxes levied on net income (gross income minus allowable tax relief), and any capital gains of individuals. Likewise, tax on corporate profits is defined as taxes on net profits (gross income minus allowable tax relief), and any capital gains of enterprises. As seen in Figure 2 below, Korea clearly exhibits low collection of PIT revenues as a share of GDP, but the collection of CIT revenues as a share of GDP has been higher than the OECD average since the early 2000s.

Tax collection in Korea is also characterized by a relatively high, although decreasing, dependence on indirect taxation. Since the mid-1980s, the importance of direct and indirect taxation as revenue sources has reversed, such that the tax composition started to resemble one of developed economies where direct taxes are more important than indirect taxes. Direct tax (personal and corporate income tax) revenues grew from 27% of total revenues in 1985 to 55% in 2010, while consumption taxes fell from 47% to 28%. Despite the increasing importance of direct taxes, the revenues collected from personal income taxes is still narrow, with PIT revenues comprising 4.32% of GDP in 2015, compared to the OECD average of 8.44% in 2015.

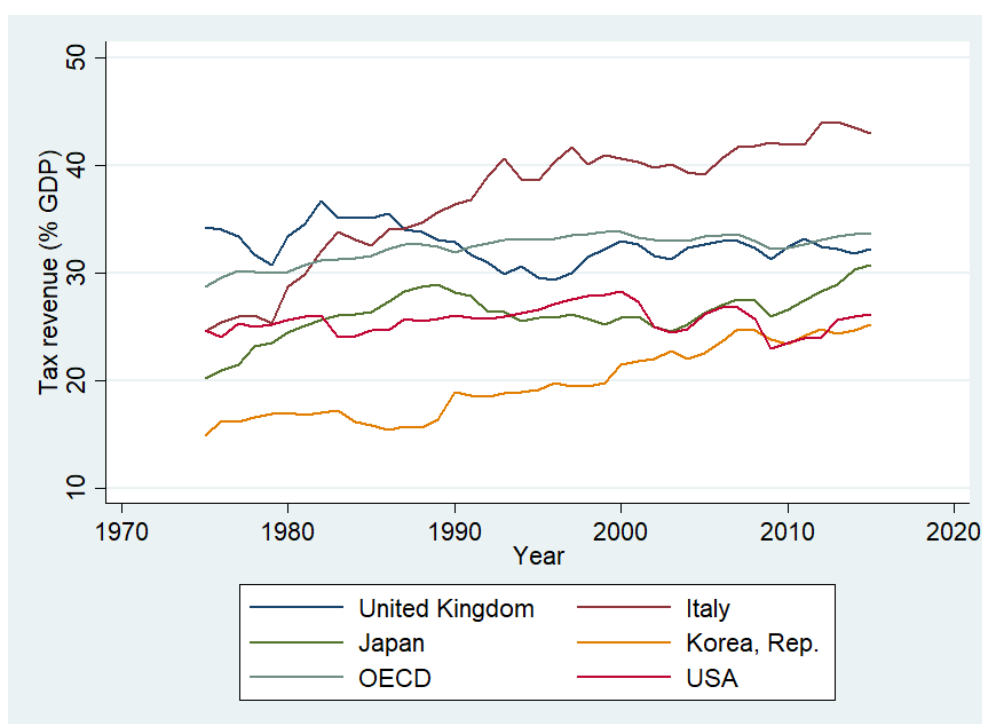


Figure 1. 1. Tax revenue as a share of GDP. Source: OECD Database

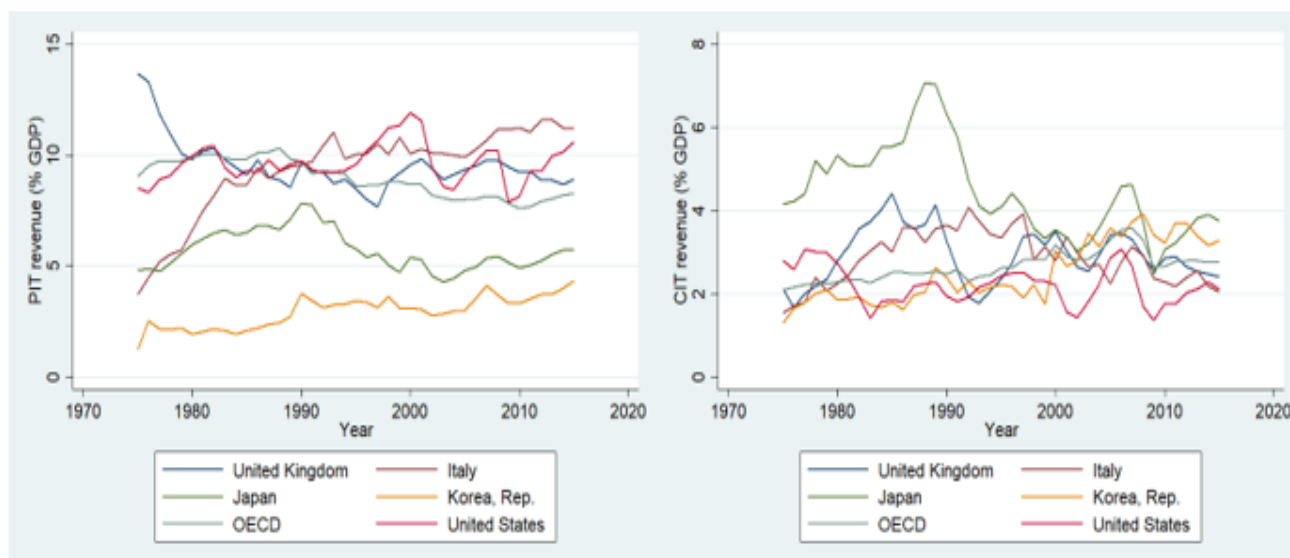


Figure 1. 2. PIT and CIT revenues as a share of GDP. Source: OECD Database

Why should Korea be looked at in particular? It moved from a poor agrarian economy in the early 1960s to grow at more than 8% annually, on average, until the late 1980s, thus becoming a rich country and an OECD member in 1996. In addition, the sustained economic growth has been accompanied with a 67% increase in the tax burden from around 15% in 1975 to 25% in 2015, as seen in Figure 1.1. This suggests that all the growth from the 1960s to the 80s, has since been followed by a significant change in fiscal capacity. Korea became a newly industrialized country in the post-war period, yet, as the country developed economically, it is only until recently that it has begun to experience a tax profile more similar to those of other comparably developed countries. However, Korea's current overall tax burden, i.e. tax revenues as a share of GDP is still significantly lower than the OECD average, and lower than its GDP per capita levels would imply otherwise, as seen in Table 1.1 row 5. In the 5-year period averages, Korea consistently ranks in amongst the OECD countries with the lowest tax revenue to GDP ratio. This is despite collecting a high share of GDP in CIT revenues than the OECD average, due to the growth of the corporate sector, as seen in Table 1.1 row 2. It is not because Korea imposes heavier taxes on the corporate tax base, but because the tax base itself is very large despite the generous tax breaks offered to corporations (Jeong, 2015).

There may be several possibilities why Korea collects a large amount of CIT revenue despite the relatively modest corporate tax rates. Firstly, deductions, exemptions, and credits in the corporate tax code may be more generous in other OECD countries compared to Korea. Secondly, the financing structure of companies may differ, and since the turn of the millennium debt levels of Korean companies have been significantly reduced. In 1995, the high debt levels of Korean companies were associated with low shares of CIT as a percentage of GDP. However, debt levels cannot be the only reason for the differences in CIT revenues as a percentage of GDP, since the corporate tax rates in OECD countries have also been recently reduced. CIT revenues have rapidly increased since 1999, mainly due to the increased tax base through increased profitability in the corporate sector. Korea's tax base of the corporate tax income was 3.3% of GDP in 1981 but substantially increased to 18.33% in 2012. While the tax base of the corporate sector has increased in other OECD countries, Korea has experienced the largest increase over this period.

Table 1. 1. Comparison of 5-year averages of tax revenues, statutory rates, and informal economy indicators

	2000 - 2004		2005 - 2009		2010 - 2014	
	Korea	OECD	Korea	OECD	Korea	OECD
PIT revenues (% GDP)	2.9 (33)	7.7	3.6 (32)	7.6	3.6 (30)	7.7
CIT revenues (% GDP)	3.0 (14)	2.6	3.6 (8)	3.3	3.4 (7)	2.8
Goods and Services revenues (% GDP)	8.3 (32)	10.8	7.7 (32)	10.5	7.6 (30)	10.6
Social Security contribution (% GDP)	4.2 (31)	8.6	5.1 (30)	8.6	6.1 (28)	8.9
Tax revenues (% GDP)	21.9 (33)	34.5	23.9 (32)	34.4	24.2 (33)	34.2
Income revenues (PIT+CIT) (% revenues)	26.9	29.8	30.1	31.6	28.9	30.7
Highest statutory PIT rate (%)	37.6 (27)	42.7	35 (26)	39.9	36.8 (24)	39.74
Highest statutory CIT rate (%)	27.4 (23)	28.5	24.4 (20)	24.68	22 (20)	23.35
Size of informal economy (%)	27.0 (3)	17.6	24.86 (3)	16.09	21.27 (8)	15.5
Self-employment rate (%)	35.7 (4)	18	31.81 (4)	17.05	27.89 (4)	16.74

Note: Numbers in parentheses indicate the rank of Korea relative to all 35 OECD countries. Source: Various OECD databases, apart from estimate of size of informal economy (IMF).

Table 1.1 row 2 shows that between 2000 to 2014 inclusive, CIT revenues as a share of GDP are consistently higher than the OECD average. This can be due to a disproportionately large share of CIT being paid from a small number of large firms. The relatively high compliance among the larger firms is a factor in why there is less erosion in the CIT base than the PIT base. Table 1.2 shows that in 2000, only 568 or 0.3% of the total number of firms account for nearly three-quarters (72.7%) of all CIT revenues. On the other hand, only 3.4% of corporate taxes comes from firms in the lower bracket. The high concentration of CIT from a small number of large firms may be due to a combination of high concentration of economic activities among these firms and their relatively high compliance (Jun, 2009). Larger businesses find it more difficult to bypass the services of financial institutions, but at the same time they are also more dependent on the financial sector, therefore their profits are more likely to be exposed to tax authorities through financial transaction records. Therefore, the low overall tax burden may partially result from the low PIT revenue.

What distinguishes Korea from other countries in terms of personal income tax burden is not only because of the low statutory rates but because the Korean PIT is characterized mainly by large tax relief measures, one of the legacies from the industrialization period. As standard tax reliefs, employment income deductions were offered to every household with decreasing rates for the high-income households while other numerous allowances based on household composition, tax credits, and national pension deductions are also offered. These tax reliefs are introduced to fully deduct the expenses from their income which households spent while earning income. Additionally, households can deduct from their income expenses such as insurance premiums, medical and educational expenses. The resulting issue of this tax relief system is that it lowers the effective tax rates across all households, with the value of tax reliefs increasing for higher tax brackets because the deducted expenses targeted are more commonly used by higher-income individuals (Jeong, 2015). These measures have been implemented partly as a savings incentive, and partly as a means for maintaining horizontal equity between wage employees and the self-employed.

An OECD (2009) report on reforming tax in Korea states that greater revenue from the PIT system may be necessary to cope with the cost of population ageing. Because of the pro-growth effect of low PIT rates, additional revenue should be generated by base broadening rather than by raising rates. One possibility is increasing further the share of the self-employed who pay tax, which rose from less than 40% in 1997 to 63% in 2006 as a result of a number of measures that enhanced the transparency of the income of small businesses (OECD, 2009). Additional steps, including more audits and strengthened penalties for tax evasion, would further boost the proportion. It is also important to reverse the decline in the share of employees paying income tax from 60% in 1997 to 50% in 2006.

Table 1.1 row 6 also shows that around 30% of tax revenue comes from income (direct) revenues for both Korea and the OECD average. The remaining majority of tax revenues come from goods and services, social security contributions, and property taxes. So, whilst the shares coming from direct and indirect taxes is similar for Korea and other OECD countries, the composition between PIT and CIT is very different, i.e, low PIT and high CIT shares. This study aims to exploit regional economic variation to identify the determinants of the income tax revenues.

Table 1. 2. Distribution of CIT by tax base size

2000			2005		
Tax base (million won)	Taxpayers (number of firms) (%)	Taxes paid (billion won) (%)	Tax base (million won)	Taxpayers (number of firms) (%)	Taxes paid (billion won) (%)
Low bracket [16%]	173,788 (86.5%)	485 (3.4%)	[13%]	274,165 (82.3%)	547 (2.1%)
Deficit	67,892 (33.8%)	85 (0.6%)	Deficit	109,982 (33.0%)	12 (0.1%)
0-10	52,846 (26.3%)	81 (0.6%)	0-10	52,925 (15.9%)	22 (0.1%)
10-100	53,050 (26.4%)	319 (2.2%)	10-100	111,256 (33.4%)	513 (1.9%)
High bracket [28%]	27,176 (13.5%)	14,087 (96.6%)	[25%]	59,148 (17.7%)	26,169 (97.9%)
100-1,000	23,120 (11.5%)	1,272 (8.7%)	100-1,000	49,921 (15.0%)	2,198 (8.2%)
1,000-10,000	3,488 (1.7%)	2,222 (15.2%)	1,000-10,000	7,872 (2.3%)	3,874 (14.5%)
10,000+	568 (0.3%)	10,593 (72.7%)	10,000+	1,344 (0.4%)	20,097 (75.2%)
Total	200,964 (100%)	14,572 (100%)	Total	333,313 (100%)	26,716 (100%)

Source: 2000 & 2005 Statistical Yearbook of National Tax.

Differences in revenues may also be driven by the informal sector. Assuming the PIT intake is constrained by tax evasion or underreporting incomes, the role of income taxation in Korea can be strengthened as tax administration becomes more effective. While this can be a general assessment of the current status of personal income taxation in Korea, it is dubious to assume whether the income tax administration in Korea is really as inefficient as in developing countries. Every citizen in Korea can be identified with an identification number, and the information network of financial flow in Korea is as advanced as other industrialized nations. Therefore, the government has the technology to access, if not have complete access, to the income, financial assets, and real estates of individuals (Kim, 2005). In addition, there are the penalties for non-compliance, which include being unable to receive tax benefits such as deductions and tax credits. Non-filing (underreporting) results in a fine of 20% (10%) of the calculated tax amount, as well as a penalty on underpayment or non-payment of 0.03% of the unpaid amount multiplied by the number of days past the due date. (National Tax Service 2015). While data on tax fulfilment does not exist, Korea is notable for its large informal economy and self-employment rate for a high-income country.

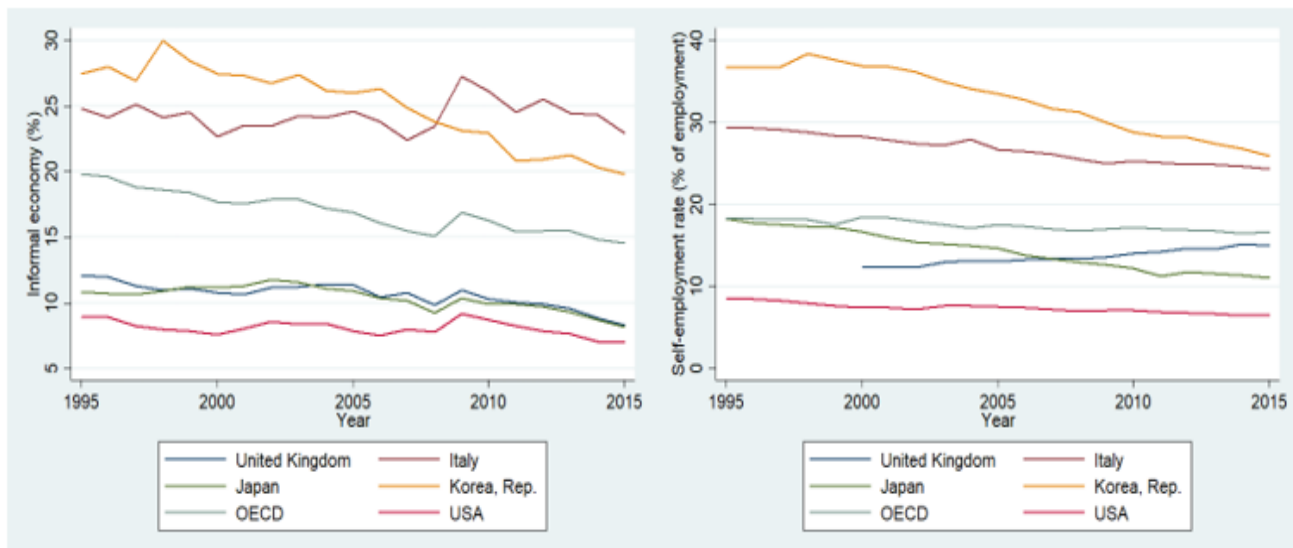


Figure 1. 3. Informal economy (% GDP), and self-employment rates. Source: IMF, OECD database.

Self-employment rates and informal economy estimates are typically highest in countries with lower income per capita, but Korea is clearly one exception, as can be seen in Table 1 rows 9 and 10, with rates far above the OECD average. (The only other exception is Italy, with a high informal economy size estimate and self-employment rate due to a high percentage of craftsmen and shopkeepers (OECD, 2014)). As seen in Figure 2, Korea exhibits the highest self-employment rate and one of the highest informal economy estimates for a high-income country.

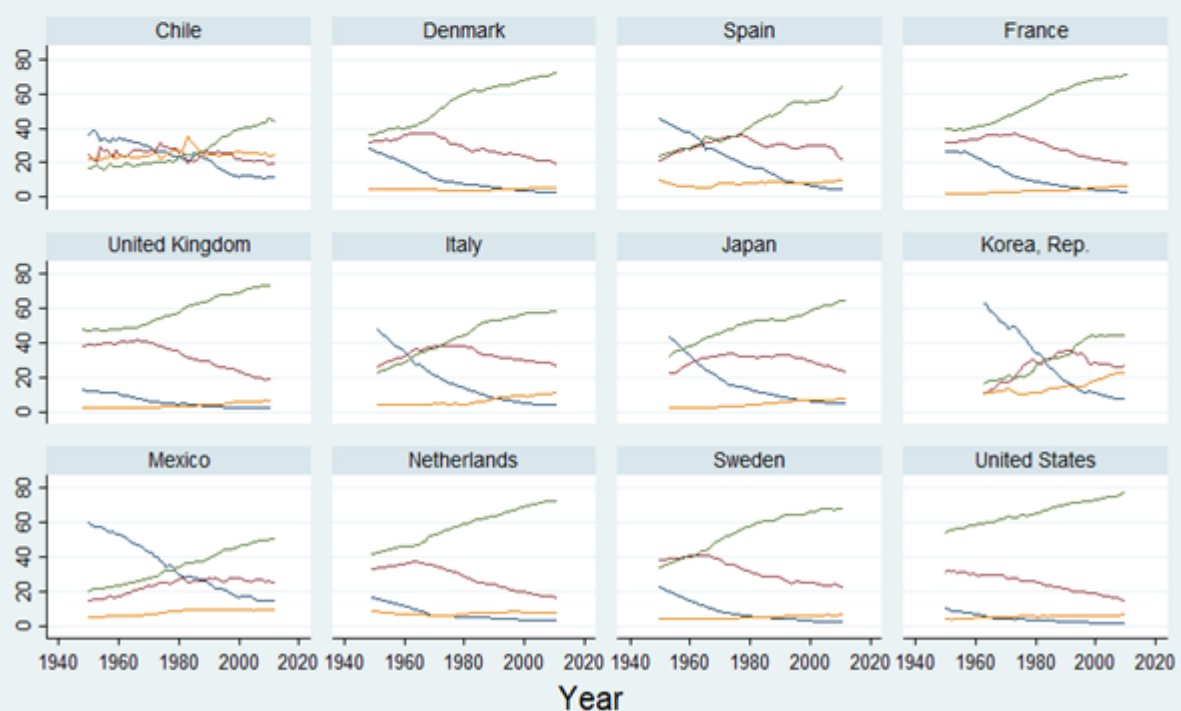
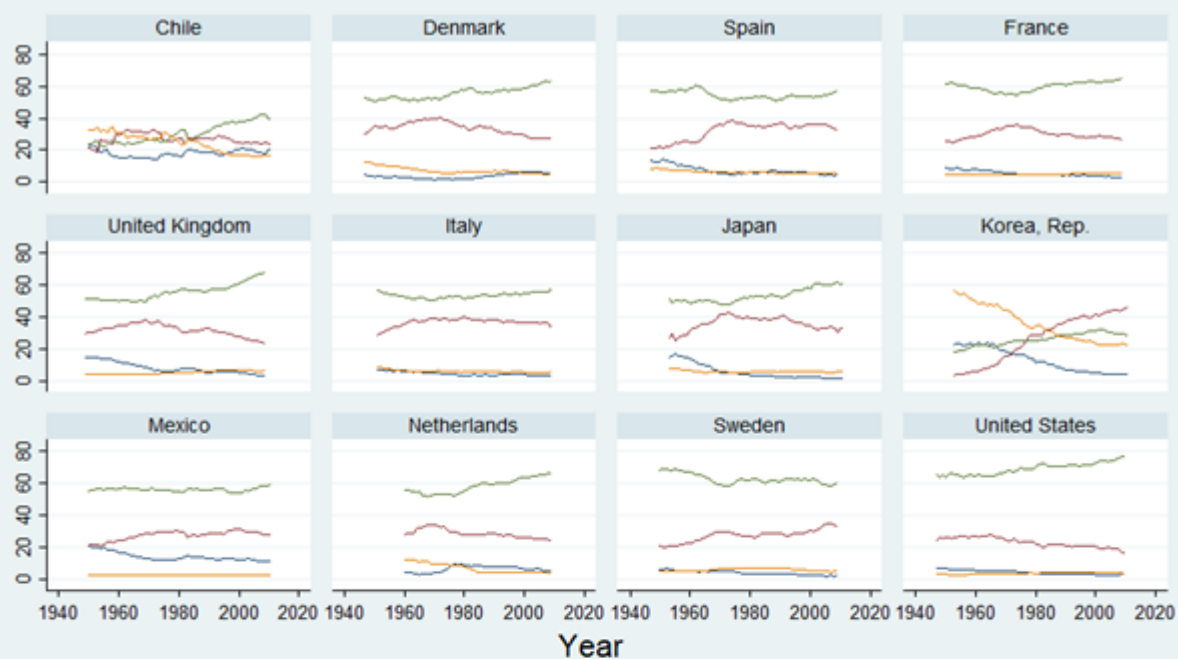
Workers whose only source of income is wage and salary are not required to file tax returns, therefore opportunities for evasion in the formal sector are very limited. Despite this, the estimated size of the shadow economy in Korea is non-negligible by OECD standards, and such underground economic activities encourage tax dodging. The informal economy includes activities hidden from official authorities to avoid paying taxes and all social security contributions. Informal activity could be captured for example by informal wage employment, of which there are several possible definitions, and self-employment. Using data from the IMF (2014), as seen in Table 1 row 9 shows that over 2000 to 2014, the estimated size of Korea's informal economy averaged around 25%, compared to the OECD average of 17%. Only Turkey and Mexico averaged higher over 2000 to 2009 than Korea (26%), with figures of 31% and 30% respectively.

The importance of the personal, community, and social services sector (other services) in Korea is also shown by the Groningen Growth and Development 10 sector database in Figures 5 and 6, which provides annual GDP and employment statistics for 42 countries. After reducing the selection of countries to all the OECD countries in the database, of which there are 12, the data shows that the sectoral change in Korea's economy is somewhat different to those of the other OECD countries. The importance of the industrial sector as a share of GDP is increasing from the 1950s to 2010, whereas it stagnates or declines for the other countries, as their economies move towards business services activities. However, over this period Korea also experienced the largest employment gain in "other services" (public services and personal services), which allows for a high level of informality and is generally one of the least productive sectors (McMillan et al., 2014). Table 1.3 shows that Korea is clearly an outlier in terms of personal and social services. The GDP share of other services in Korea is the largest among the OECD and the employment share is the second highest, lower than only Chile.

Table 1. 3. GDP and employment shares by country (1995-2010)

	% GDP				% employment			
	Agriculture	Industry	Services	Other Services	Agriculture	Industry	Services	Other Services
Chile	18.9	25.6	37.8	17.7	13.7	22.8	38.5	25.0
Denmark	5.8	29.1	59.1	6.0	3.8	23.2	67.8	5.2
Spain	5.5	35.1	53.9	5.5	6.9	28.5	55.9	8.7
France	3.8	28.2	62.5	5.5	4.3	22.5	67.6	5.6
United Kingdom	4.8	27.7	61.0	6.4	2.4	22.8	69.4	5.4
Italy	3.6	36.4	54.5	5.5	5.3	29.6	55.7	9.4
Japan	1.9	34.8	57.6	5.7	6.2	28.5	58.6	6.7
Korea, Rep.	5.0	41.4	29.8	23.8	10.7	29.5	41.5	18.3
Mexico	12.1	29.1	56.2	2.6	17.9	26.6	46.0	9.5
Netherlands	6.7	26.2	62.8	4.3	3.7	19.6	68.7	8.0
Sweden	2.6	30.3	61.3	5.8	3.2	24.6	65.9	6.3
United States	3.1	19.7	73.0	4.2	2.2	18.2	73.3	6.3

Source: My own calculations using GGDC 10 sector database.



Graphs by Country

Figure 1. 4. GDP and employment shares by country. Source: GGDC 10 sector database.

1.3.1. Major Challenges Facing Korea's Tax System

The relatively low tax burden may be indicative of a relatively small government sector, as well as the result of policy choice, because an adequate social safety net is still lacking compared to those existing in many other OECD countries (OECD, 2009; Ceriani, 2005). Figure 1.5 shows the budget deficit numbers as a % of GDP for OECD countries, and Korea is not running a small budget deficit. Although they run a budget surplus, the government finances are likely to deteriorate due to population ageing (fastest among the OECD), low fertility rate (lowest among the OECD), and poverty rates among the older generation.

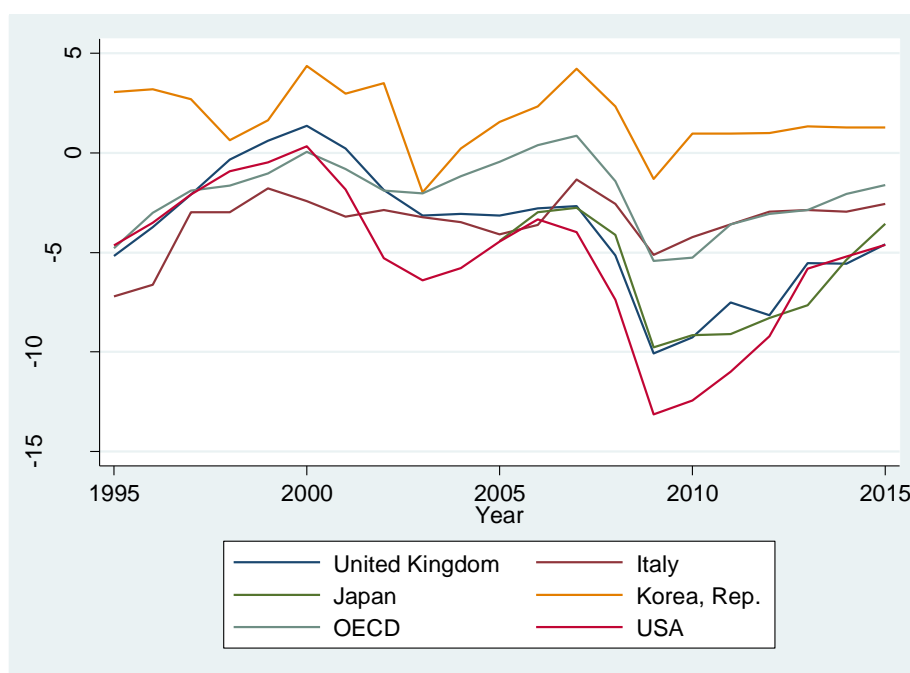


Figure 1. 5. Government deficit (% GDP). Source: OECD database

One challenge that Korea faces is supporting economic growth and meeting the long-run need for greater revenues despite the rapid population ageing. Korea's tax burden is one of the lowest in the OECD area, due to its relatively low level of income per capita and young population. A low tax burden also typically means fewer resources available for the central government to support economic activity among the population, a situation that often leads to difficulties with welfare policies in particular. As the income level converges to the OECD average and as rapid population ageing makes it one of the oldest countries in the OECD, it will place upward pressure on government expenditure and make it difficult to maintain such a low share of taxes in GDP.

Korea's low tax intake has several implications. Public social spending is low due to the small size of the government sector. As of 2019, Korea spends only 12.2% of its GDP on welfare spending, compared to the OECD average of 20%. Only Turkey (12%), Chile (11.4%), and Mexico (7.5%) exhibited lower public spending. This may be explained by the Korean traditional reliance on family members and the private sector to provide such services. Low levels of social spending and taxation mean that Korea's tax system is the least effective among OECD countries in reducing inequality (OECD, 2011). Korea also has the fastest ageing population and the lowest fertility rate among OECD countries as of 2016, with a rate of 1.24, compared to OECD average, EU28 average, and Japan of 1.7, 1.56, and 1.39 respectively. In addition,

Korea has the highest elderly relative poverty rate among the OECD countries, at nearly 50%, compared to Japan and OECD average of 17.4% and 12.3%. Welfare spending as a share of GDP is around 10%, much lower than the OECD average of 22%. The low rate of tax revenue collection is a factor in Korea's inability to provide a robust social safety net or welfare system, and so to finance these social welfare contributions would require an increase in revenues.

Another challenge facing Korea's tax system regards coping with the widening income inequality and rising relative poverty. In addition to the rapid ageing, the wage gap between regular and non-regular workers is contributing to Korea having the highest income inequality in the Asia-Pacific region. Korea has experienced a significant increase in income inequality since the 1997 Asian financial crisis. One factor is the expanding share of irregular workers, who are paid significantly less than regular workers; they now make up around one third of employment. Greater inequality has contributed to a rise in the rate of relative poverty to 14.6% in the mid-2000s, the sixth highest in the OECD area. High relative poverty also reflects the small impact of the public sector: the tax and social welfare systems reduced the relative poverty rate by less than 3 percentage points in Korea, from 17.5% to 14.6% in the mid-2000s. In contrast, the average reduction in OECD countries was 16 percentage points, lowering the relative poverty rate to an average of 10.6%. Reversing these trends would require greater use of the tax system, together with more social welfare spending, as in other OECD countries. However, strengthening the redistributive function of the tax system should be weighed against any negative impact on work incentives which would reduce potential growth. The aim is addressing income inequality and poverty while minimizing the negative impact on growth (OECD, 2009).

The rapid economic growth in the beginning of the 21st century continued to be accompanied by a rise in income inequality, suggesting that the government prioritises growth over redistribution, or that the redistribution system is inefficient. According to 2006 OECD data, Korea's relative poverty rate (proportion of people living on less than half the median income) was 14.4%, the ninth-highest in the OECD. Additionally, the poorest 20% pay 5% of taxes, higher than the 4% OECD average, and the low levels of social spending and taxation mean that Korea's tax system is the least effective among OECD countries in reducing inequality (OECD, 2011). A Hyundai Research Institute report (2018) stated that Korea ranked in the lowest category among all OECD member countries for the income redistribution effects its tax and fiscal policies has had. Korea's now declining but previously heavy dependence on indirect taxing (Kwack & Lee, 1992) has been subject to criticism for being a source of the regressive nature of the overall tax burden, compared to direct taxation on incomes. In developing countries, their tax structure is dominated by indirect taxes. On the other hand, in the OECD, the tax system is more focused on direct taxation, which has been shown to be more effective for welfare and equity improvements. Therefore, increasing the importance of direct taxes is one possible way to support the expansion of welfare programmes.

Another reason for the low tax burden may be that tax policy is not a major political issue in Korea, because political parties do not base their positions towards fiscal policies (Kim, 2005). Income inequality has been regarded a minor issue in many East Asian nations because of the political belief during the economic boom "growth first, distribution later" (Heshmati & Rudolf, 2013). Tax rates and government policies are centralized, and even though there was a drive towards decentralization in the mid-1990s, the lack of importance in distinction between central and local governments means local governments still do not decide on taxes or policies that are region-specific. Therefore, the fact that tax policies are set at the national level means the effect of institutions is held constant across regions, and this allows me to identify regional tax collecting ability. Kwack & Lee (1992) state that the distinction between central and local government has relatively little meaning in Korea, and consequently there is a large degree of overlap in division of responsibilities across these

government levels. Although the country is administratively divided into six special cities and nine provinces, the heads at all levels of local government are directly appointed by the central government. Local autonomy was briefly in effect before the military coup d'état in 1961 but has not been reintroduced. Thus, Korea's local governments have acted merely as agents carrying out the decisions of the central government. They have neither their own kinds of tax nor the power to change tax rates in response to the needs of local residents. Regarding the main local government responsibilities, their functions are also not clearly defined by law (OECD, 2016). The Local Autonomy Act states that the central government can use its own power and control over any local government function (e.g., administrative and management functions, economic development through promotion of industry, agriculture and trade).

1.4. Data Sources

1.4.1. Aggregated data – KOSIS, Statistical Yearbook of National Tax, & KLIPS

This project uses a novel subnational level dataset that combines archival materials from the KOSIS website (Korean Statistical Information Service), and tax revenue data from annual editions of the Statistical Yearbook of National Tax. The GDP data for all 16 regional units (9 provinces and 7 cities) of Korea is obtained from the KOSIS, and is converted to constant 2010 prices, and million Korean won. This dataset contains the composition of each region's GDP by economic activity, and spans from 1998 to 2016, annually. The sectors, as appropriate for this study, are aggregated into the four sectors; agriculture, manufacturing, business services, and other services. The definitions of sectors are given below in Table 1.4. I split services into two types, because "other services" contributes to a large proportion of GDP for an OECD country, as the GGDC data showed in Table 1.3. This sector is also one of the least productive (Rodrik & McMillan, 2011), and therefore may be expected to negatively impact tax revenue mobilization.

Table 1. 4. Economic sectors and definitions

Sector	Definitions
Agriculture	Agriculture, forestry, fishing, and mining.
Manufacturing	Manufacturing, construction, and public utilities.
Business services	Retail services include wholesale and retail trade, accommodation and food services. Business services include finance and insurance, and real estate.
Other services	Other community, social, and personal service activities. Arts, sports, and recreation related services. Membership organizations, waste management, remediation. Private households with employed persons.

Note. Economic sectors aggregated to 4 sectors. Sectors defined using the 2007 Korean Statistical Industrial Classifications code.

Other variables include regional GDP per capita, and the employment to working age population ratio. As for the annual regional total tax, PIT, and CIT revenue figures, they were obtained from the Statistical Yearbook of National Tax. I collected this data from 19 annual yearbooks separately and so created a subnational level panel dataset covering all 16 first-tier administrative divisions. The annual revenue figures from the annual editions of the Statistical Yearbook of National Tax are in nominal terms as the books for a given year are released in January of the following year. These figures were converted to a real measure that is chained to 2010 values by dividing the nominal values with the CPI, to match with the GDP figures, and to avoid bias caused by inflation. I use CPI rather than GDP deflator because it falls on the expenditure, rather than production side of GDP, and is therefore the most commonly used measure of inflation. In addition, CPI is more reflective of a cost of living index since tax revenues have the effect of reducing personal income, or increasing the cost of living. Regional employment data is derived from the Korean Labour Income Panel Studies (KLIPS).

Table 1. 5. Summary statistics on key aggregated variables

VARIABLES	Obs	Mean	Std. deviation	Period	Data source
Income tax revenue (% GDP)	304	4.01	3.28	1998-2016	KOSIS & Yearbook of National Tax
PIT revenue (% GDP)	304	2.33	1.56	1998-2016	KOSIS & Yearbook of National Tax
CIT revenue (% GDP)	304	1.68	1.85	1998-2016	KOSIS & Yearbook of National Tax
GDP per capita (million won)	304	23.26	10.1	1998-2016	KOSIS
Employed to 15-64 population ratio	304	66.77	5.96	1998-2016	KOSIS
Attained university education or higher	304	66.49	8.25	1998-2016	KOSIS
Agriculture (% GDP)	304	3.28	4.42	1998-2016	KOSIS
Industry (% GDP)	304	42.99	17.80	1998-2016	KOSIS
All Services (% GDP)	304	53.73	17.64	1998-2016	KOSIS
Services (% GDP)	304	43.69	16.88	1998-2016	KOSIS
Other services (% GDP)	304	10.04	1.59	1998-2016	KOSIS
Informal (% employment)	304	29.74	6.83	1998-2016	KLIPS
Self-employed (% employment)	304	30.39	7.71	1998-2016	KLIPS
Agriculture (% informal)	304	11.59	10.00	1998-2016	KLIPS
Agriculture (% self-employed)	304	83.46	12.74	1998-2016	KLIPS
Manufacturing (% informal)	304	25.00	8.67	1998-2016	KLIPS
Manufacturing (% self-employed)	304	16.36	5.60	1998-2016	KLIPS
All services (% informal)	304	36.16	7.96	1998-2016	KLIPS
All services (% self-employed)	304	30.32	5.78	1998-2016	KLIPS
Business services (% informal)	304	36.72	8.56	1998-2016	KLIPS
Business services (% self-employed)	304	28.26	5.89	1998-2016	KLIPS
Other services (% informal)	304	31.98	11.94	1998-2016	KLIPS
Other services (% self-employed)	304	44.18	15.35	1998-2016	KLIPS

In addition to the structural variables that many studies in the literature employ as broad proxies for the tax base such as GDP per capita, economic industry composition, and education levels, I include variables that I derive from the microdata that are more specifically related to informal activity, none of which have been included in any previous study regarding tax capacity. Informal employment is defined as the self-employed, and wage workers not contributing to the national pension scheme. I create time series of these variables from the KLIPS microdata, since the KLIPS survey identifies region at the same level as KOSIS and the Yearbook of National Tax. These are included as additional variables to accompany the variables from KOSIS and the Yearbook of Tax.

The outcome of interest is income tax revenues as a share of regional GDP. Typically, local income of non-residents is taxed, while remittances from abroad are not and therefore, revenues as a share of GDP produces the most accurate measure of fiscal capacity and is hence the most commonly used tax collection indicator in the literature. GDP per capita measures the level of development and economic activity of a region. Capacity to pay and collect taxes should increase with the level of development (Chelliah, 1971).

The sectoral composition of GDP is often used as a determinant of tax revenue because certain sectors should be easier to tax than others. Therefore, variables that reflect the share of different industries in the regional economy capture differences in the ability to tax components of the economy. The aggregated sectors are defined using the 2007 KSIC (Korean Statistical Industrial Classifications) code. Table 1.4 displays the economic sectors and their definitions. The agricultural sector is expected to have a negative effect on revenues, especially if they comprise of subsistence workers, and sell their products in informal markets (Stotsky & WoldeMarian, 1997). In addition, since many public sector activities are urban based, a declining share of agriculture in GDP tends to be linked to an increase in demand for public expenditures and thus put pressure to raise tax revenue (Tanzi, 1992).

The manufacturing sector is defined by manufacturing, construction, and public utility industries. A positive relationship between this sector and tax revenues would be expected, as enterprises in this sector are typically easier to tax than agricultural activities since business owners typically keep transaction records and these industries generate larger taxable income. Manufacturing firms find it more difficult to bypass services of financial institutions. They generally tend to hold

less cash relative to assets than smaller firms; and to the extent that they are more dependent on the financial sector, their profits are more likely to be exposed to tax authorities through financial transaction records. The services sector includes non-tangible services such as hospitality, transport, storage and communications, business, real estate and finance services, government services, and personal and social services. Finance industries create more value-added and so income tax revenues would be expected to be higher where these industries are. It is also now the largest employer in Korea in terms of employment share. On the other hand, personal and social services has the lowest proportion of formal employment after agriculture. As a result, one may expect this sector to negatively affect tax revenue mobilization.

To test the impact of demographics on tax collection, I use the employment to working age population (15-64) ratio as a predictor of tax collection, taken from KOSIS. Employed persons defined by KOSIS include those “working for one hour or longer in a temporary, irregular, or self-employed positions for the purpose of earning income”. The higher the proportion of workers, the higher should be the proportion of workers paying income taxes.

The educational attainment variable represents the share of people who have completed tertiary education or higher. Korea has the highest secondary education gross enrollment ratio in the world (UNESCO, 2010), therefore there is not much difference in secondary education enrolment ratio among regions (97% have completed at least upper secondary education). Hence, the completion rate of tertiary education is used as a measure of human capital (Heo, 2015). Factors such as education affect taxation in diverse ways. For instance, higher education levels are related positively to tax morale because high-educated people can recognize more easily the importance of government’s intervention, or because a higher level of education should enable citizens to better understand and comply with tax codes, to have a better access to formal jobs and, (or) have greater conscience of the responsibility or obligation to pay taxes (Rodriguez, 2018; OECD, 2013; Torgler & Schaltegger, 2005). Nevertheless, educated people, especially who are involved in economic-administrative and legal careers, may be aware about loopholes that favour tax evasion and elusion. Empirical results show that the first effect outweighs the second one and hence education boosts tax revenue, especially from income taxes, which are reported deliberately (Rodriguez, 2018).

1.4.2. Microdata - KLIPS

The data used for the analysis of the wage gap between formal and informal employment, and the effect of business registration on incomes of the self-employed is from the Korean Labour and Income Panel Study (KLIPS). The KLIPS is an annual longitudinal survey of nationally representative households in Korea and their individual members, aged 15 or older. The study started in 1998, amid the unprecedented Asian financial crises and slowing economic growth, with 5,000 households and 13,783 individuals. All members of a given sampled household are observed in the data. It is conducted by the government-sponsored research institute, the Korean Labour Institute (KLI), and is currently the only Korean domestic household panel survey on labour-related issues.

KLIPS is a nationally representative longitudinal survey of labour market and income activities of urban Korean households, modelled after the National Longitudinal Surveys (NLS) and the Panel Study of Income Dynamics (PSID) in the U.S. The KLIPS data does not provide information on fulfilment of taxpaying duties, only the self-reported incomes. Therefore, this study defines informality on the basis of if a worker is not subscribed to the national pension scheme. KLIPS has consistently collected information on workers’ subscription to various social security programs, asking the following question on individual worker’s subscription to social security programs in the same wording in of its surveys: “Are you

covered by the following social insurance programs through your (main) job?” Respondents are required to provide information on whether or not they subscribe through their main job to the national pension scheme, workplace-based health insurance, employment insurance, and industrial accident insurance. Certain sectors are more likely to be covered by industrial accident insurance than others, for instance construction and manufacturing, but more sectors are likely to be covered by the national pension program. For this reason, lack of national pension scheme subscription is the measure of informal wage employment.

Table 1. 6. Summary statistics of KLIPS data (1998-2016)

VARIABLES	Formal sector	Informal sector	Self-employment
Age	38.7	44.5	50.5
Male	42.5%	25.2%	32.3%
Female	38.4%	39.6%	22%
Married	38.9%	28.4%	32.7%
Lower secondary or below	18.3%	38.4%	43.3%
Upper secondary or college	45.4%	28.2%	26.4%
University or above	52.8%	27.5%	19.7%
Months of job tenure	71	62	125
Job income (10,000 won)	219	146	228
Weekly work hours	45.8	46.6	-
Agriculture	5.0%	11.6%	83.4%
Manufacturing	58.6%	25.0%	16.4%
All services	33.5%	36.2%	30.3%

Table 1.6 provides information on the worker characteristics by employment types, and displays the employment type distribution in each worker characteristic. As expected, the higher the educational attainment of a worker, the more likely they are to work in the formal sector. Without considering the personal characteristics of workers in each sector, wage workers in the formal sector receive a monthly average post-tax wage of 2.19 million won, while informal workers only earn an average of 1.46 million won, which is about two thirds of the wage level of formal workers. However, self-employed workers also earn a comparable amount per month to formal workers at 2.28 million won per month, despite the fact that other observables such as educational attainment takes the distribution that might be expected, i.e., over 40% of workers who only attained lower secondary education or below are self-employed. This opposes the notion that self-employment and informal wage employment are substitutable in terms of informal employment types, and thus leads to the analysis from section 1.6 onwards where both employment types are considered in the taxable capacity estimates.

The bottom three rows display the distribution of employment types in each industry. Informal employment is most prevalent in the services sector. In addition, the prevalence of smaller firms in wholesale and retail trade, hotels and restaurants, and other services may explain the prevalence of irregular employment in these industries. The manufacturing sector has a quarter of its workforce in informal employment, but almost 60% in formal employment. Some industries, such as construction, experience large seasonal fluctuations in output, or make more use of subcontracted labour, therefore informal employment arrangements are more common in this industry.

A caveat of the KLIPS data is that despite being nationally representative of urban households, rural households are under-represented. As the regional employment data used in the analysis is derived from the KLIPS, a concern is that the calculated share of employment, particularly in agriculture may not be accurate. I provide a comparison of employment shares in each sector and region as derived from the KLIPS with official statistical employment data from the Korean Yearbook of Labour Statistics (YLS), as show in Table 1.7. Calculating average sectoral shares of employment by region over time, I find that the KLIPS figures of agricultural share of employment is larger than the YLS figures for ten regions, with a share of almost 20% for Gyeongbuk and Jeonbuk, and shares over 20% for Chungnam, Jeonnam, and Jeju. The

average share of regional agricultural employment in the KLIPS is much larger at 10.1% compared to 3.87% from the YLS. These high percentages are because they are derived from the micro-level KLIPS dataset, following 5,000 Korean households (13,783 individuals) over time, whereas the aggregate data from the YLS covers workers in the tens of thousands in each region each year, which should mean more accurate average sectoral employment shares. As the number of workers in a sector by region is lower in the KLIPS than the YLS, then the share of employment status (i.e. whether a worker is a “formal wage worker”, “informal wage worker”, or “self-employed”) within a sector may not be fully representative. The high agricultural employment shares by region in the KLIPS relative to the YLS figures may be driven by the sample size and hence result in an over-estimate the effect of agricultural employment on tax collection. Therefore, the regression results should be interpreted with caution due to the relatively low sample size. Ultimately, I use the KLIPS data in my analysis since the survey data identifies the employment status of a worker by sector and by region, whereas the employment status of worker by region is not identified in the macro-level data from the YLS.

Table 1. 7. Comparison of sectoral employment shares between KLIPS and YLS

KLIPS (YLS) sectoral employment share by region [1998-2016]						
Region	Agriculture %		Industry %		Services %	
Busan	1.79	(3.54)	40.68	(30.74)	57.53	(65.72)
Chungbuk	9.56	(3.71)	35.39	(45.64)	55.05	(50.65)
Chungnam	22.69	(4.04)	30.47	(48.08)	46.84	(47.88)
Daegu	3.31	(3.08)	41	(34.52)	55.69	(62.4)
Daejeon	2.92	(3.1)	34.63	(22.3)	62.45	(74.6)
Gangwon	10.02	(6.29)	25.45	(24.98)	64.53	(68.73)
Gyeongbuk	19.43	(3.11)	33.96	(31.22)	46.61	(65.67)
Gyeongnam	9.87	(3.67)	38.32	(50.09)	51.81	(46.24)
Gwangju	5.46	(3.24)	30.61	(44.62)	63.93	(52.14)
Gyeonggi	3.51	(3.52)	38.61	(52.72)	57.88	(43.76)
Incheon	2.02	(3.18)	44.24	(45.96)	53.74	(50.86)
Jeonbuk	17	(4.01)	27.89	(32.83)	55.11	(63.16)
Jeonnam	29.43	(5.81)	19.93	(16.02)	50.64	(78.17)
Jeju	21.28	(5.34)	26.15	(35.48)	52.57	(59.18)
Seoul	0.39	(3.07)	33.04	(23.45)	66.57	(73.48)
Ulsan	2.84	(3.14)	50.56	(54.12)	46.6	(42.74)
Average	10.1	(3.87)	34.43	(37.05)	55.47	(59.09)

Note: Larger KLIPS/YLS shares in bold. YLS shares in parentheses

1.5. Wage Results based on KLIPS Data

I use the individual level panel data from the KLIPS, to briefly identify the effect of employment type on incomes. These are formal wage, informal wage, and self-employment. The panel structure of the data allows me to control for the correlation between unobserved worker characteristics and selection into employment types (i.e. formal, informal, or self-employed). For instance, if workers with higher innate ability generally prefer formal work, the wage gap estimated by OLS will be biased. To account for this endogeneity caused by the correlation between worker characteristics and employment type, I use an individual fixed effects model with the panel data. Table 1.7 column (1) reports the OLS estimates of employment type on income, and column (2) presents the FE estimates, where it is only possible to identify the effect on incomes of workers who switch between employment types.

The estimation is done using Equation (1).

$$w_{it} = \beta_0 + \beta_1 E_{it} + \beta_2 X_{it} + \delta_t + \alpha_i + \varepsilon_{it} \quad (1)$$

In Equation (5), w_{it} denotes the monthly log wage of worker i at year t , E_{it} is the dummy variable for employment type; formal, informal, or self-employed. Workers are defined as formal if they contribute towards the national pension

programme. X_{it} is the vector of observable worker characteristics, δ_t is the time dummy, α_i represents unobservable worker characteristics which are assumed to be correlated with the dummy for employment type E_{it} , and ε_{it} is the residual.

The demeaned fixed effects model (Equation (6)) eliminates the unobserved time-invariant fixed effect variable α_i , and is used to alleviate the endogeneity issue otherwise in analysis on cross-sectional data.

$$\overline{w_{it}} = \beta_1 \overline{E_{it}} + \beta_2 \overline{X_{it}} + \overline{\delta_t} + \overline{\varepsilon_{it}} \quad (2)$$

The dependent variable $\overline{w_{it}}$ is the log monthly wage of individual i at time t minus the individual's average wage throughout the time period covered in the dataset. The independent variables and error term are derived in the same way. The individual fixed effect α_i is now eliminated, so the coefficients β_i estimated with the fixed effects are unbiased assuming the error term ε_{it} is uncorrelated with any of the independent variables.

Table 1. 8. Estimation of the wage effect of informality and self-employment

VARIABLES	(1) OLS	(2) FE
Informal wage (no national pension coverage)	-0.170*** (0.003)	-0.105*** (0.0057)
Self-employed	-0.0161** (0.0063)	-0.0843*** (0.0138)
Upper secondary or college	0.188*** (0.0056)	-0.0020 (0.0625)
University or above	0.349*** (0.0068)	0.0208 (0.0694)
Female	-0.412*** (0.0040)	
Observations	101,279	101,279
Number of individuals		14,316
R-squared	0.533	0.339
Industry FE	YES	YES
Occupation FE	YES	YES
Year FE	YES	YES

Note. Omitted categories are formal wage employment, lower secondary or below, and male. Standard errors robust in OLS and clustered at individual level in FE. ***p<0.01, **p<0.5, *p<0.1.

Table 1.8 displays the wage gap estimated by OLS and fixed effects. Both specifications include year dummies, and industry and occupation fixed effects, meaning I am comparing workers in similar industries and occupations. The KLIPS data does not provide information on fulfilment of taxpaying duties, only the self-reported incomes. Therefore, informality is defined by wage employees who do not contribute to the national pension scheme, or self-employed workers. The variable of interest is the categorical variable for employment type, where formal employment is the reference category. When all other observable worker characteristics are controlled for, the OLS estimates of the monthly income of informal workers and self-employed workers are 17% and 1.6% lower respectively than formal workers. The fixed effects results suggest that informal wage workers earn 10.5% less than formal wage workers. However, going from OLS to fixed effects increases the self-employment wage penalty to 8.4%, suggesting that workers with higher earnings potential tend to become self-employed. Inspection of the KLIPS dataset shows that this is indeed the case. Table 1.6 shows the self-employed report a monthly post-tax income of 2.28 million won, (£1415/month), whereas formal workers covered by the national pension scheme report a post-tax income of 2.18 million won (£1355/month). Despite the other observables being generally consistent with traits of self-employment, i.e., lower levels of educational attainment, the average reported pay is higher for self-employed than formal wage workers. The analysis in Tables 1.12 and 1.13 also shows that self-employment in total services and business services respectively has a positive effect on taxable capacity as the GDP share of services and total services increases, which contradicts the notion that self-employment constrains taxable capacity.

Income tax from formal wage employees is withheld from employers and paid to the government directly, which makes it difficult for wage employees to evade or underpay income taxes. The self-employed have more opportunities for informality than wage employees, because they are typically covered by fewer regulations and are more likely to receive cash payments which may not be reported. Therefore, when filing for tax returns, the self-employed may have an incentive to underreport turnovers and therefore taxable income at the personal level. At the country level, the high share of informal and self-employed workers combined in the workforce (around 50%), along with the overall weak performance of personal income tax revenues, are both atypical for an industrialized country.

Next, I aim to verify the existence of a dual labour market in Korea based on the criteria of national pension coverage. In the Korean labour market, the term “dual labour market” typically refers to the existence of non-standard work arrangements, with the consensus that workers with standard work arrangements have the primary labour market characteristics while those with atypical work arrangements have the secondary labour market characteristics. The dual labour market hypothesis states that the labour market can be divided into the primary sector which provides high wages and better working conditions and the secondary sector which provides lower wages and poorer working conditions (Doeringer & Piore, 1971). Succinctly, labour market duality exists if some institutional barrier separates workers into the two groups. Chung & Jung (2016) test the existence of separate wage functions in different labour markets, as proposed by Dickens & Lang (1985) and Heckman & Hotz (1986), using Korean labour market data from the KLIPS. They found evidence in favour of the dual labour market hypothesis through segmenting the labour market into low and high-wage groups and thus identifying two wage equations, where the cutoff point is set to 1.63 million won/month (£1,050/month), the minimum living cost for a family of four in 2014, according to the Ministry of Health and Welfare.

As Dickens and Lang (1985) assert, “the key issue is whether there are qualified individuals who would like to work in the primary sector but cannot find a job there” Thus, there are two separated labor markets, one rewarding human capital and the other not rewarding it. Chung and Jung (2016) correct the bias resulting from dividing the sample into two groups (low and high-wage workers), by estimating the two wage equations using Heckman’s sample selection bias correction on the KLIPS data. Following Dickens and Lang (1985), and Heckman and Hotz (1986), they do not control for working environments such as firm size, sector, union membership, health insurance coverage and other non-pecuniary benefits. Since higher wages are associated with better non-pecuniary benefits, controlling for these factors is equivalent to controlling the characteristics of primary and secondary markets, contradicting the assumption that worker characteristics affect worker outcomes. In recognition of the possibility that market segmentation is due to industry segmentation and other institutional differences, work condition variables are not controlled for. Their wage equation estimations revealed differences in coefficients on schooling between each group, such that the high wage group is more rewarded in terms of schooling.

The most widely accepted method of proving the presence of a dual labour market is to see whether workers with “identical” observable characteristics are compensated differently according to the sector in which they work (Dickens & Lang, 1985). For instance, educational attainment is one of the most important variables in the wage equation. If compensation for educational attainment is systematically different (expected to be higher) in the formal sector, this can suggest that the criteria of national pension coverage does divide the labour market into two sectors. When the labour market has a dual structure and resources with identical characteristics receive discriminatory compensation according to which sector they work in, this suggests that human resources are being used inefficiently.

Again, the dependent variable is log monthly wage. The reference employment category is informal wage employment since self-employed workers do not receive national pension coverage. The coefficients of interest are the interactions between formal wage employment and education level, as it shows how return to education differs depending on the segment of the labour market (formal or informal). Table 1.7 column (2) shows that the fixed effects estimates of parameters of time-invariant regressors, like education level, are identified poorly. However, the interaction between formal employment and university education attainment is significant in both the OLS and fixed-effects specifications. In sum, this suggests that at least for workers educated to university level or above, there are differences in wages between the two markets. Given that the results from the micro data suggest a duality of the labour market between formal and informal employment, informality may be expected to have an effect on the macro-level, in this case, regional tax capacity.

Table 1. 9. Estimation of the wage effect of informal wage employment and education

VARIABLES	(1) OLS	(2) FE
Formal wage (national pension coverage)	0.1047*** (0.0108)	0.0913*** (0.0117)
Upper secondary or college	0.2073*** (0.0155)	-0.0381 (0.0764)
University or above	0.3073*** (0.0198)	-0.0497 (0.0828)
Formal * Upper secondary or college	0.01796 (0.0124)	0.0137 (0.0136)
Formal * University or above	0.0795*** (0.0157)	0.0701*** (0.0172)
Unionized	0.0739*** (0.0051)	0.0492*** (0.0054)
Female	-0.3815*** (0.0084)	
Observations	77,596	77,596
Number of individuals		12,446
R-squared	0.476	0.481
Industry FE	YES	YES
Occupation FE	YES	YES
Year FE	YES	YES

Note. Omitted categories are informal wage employment, lower secondary or below, non-unionized, and male. Standard errors robust in OLS and clustered at individual level in FE. ***p<0.01, **p<0.05, *p<0.1.

Given that Korea is characterized by the non-negligible size of the informal economy and low personal income tax burden (personal income tax as a % of GDP), if informal employment is a constraint on tax capacity because of underreporting and (or) lower incomes than formal workers, then workers in the informal sector should earn statistically significantly less than formal workers. Based on the results, given that informal and self-employed workers earn lower wages, then the tax base is expected to be lower. Moreover, it is expected that informality is also associated with tax evasion, however, it is not possible to document using KLIPS data, as respondents are not surveyed on taxpaying fulfilment.

1.6. Tax Equation Results based on Aggregate Data

To estimate the effect of sectoral GDP shares, economic development, and demographics on tax collection, I start with the regional-level panel data which spans annually from 1998 to 2016. I estimate the revenue equation with fixed effects using Equation (3) in Table 1.10 columns (1), (4), and (7).

$$Y_{it} = \beta_0 + \beta_1 GDP_{percapita_{it}} + \beta_2 Employment_{popnratio_{it}} + \beta_3 Tertiary_{eduration_{it}} + \beta_4 \dots \beta_5 X_{shareGDP_{it}} + \delta_t + \varepsilon_{it}, (3)$$

The outcome variable is either total income tax revenues as a share of regional GDP, PIT, or CIT as a share of GDP, in region i at time t . $GDP_{percapita_{it}}$ is logged regional GDP per capita. $Employment_{popnratio_{it}}$ is the ratio of employed to the working age population (age 15-64). $X_{shareGDP_{it}}$ and are the vectors of the economic sectors as a share of GDP. These sectors are agriculture, services, and industry. The regressor *industry share* is omitted due to multicollinearity with the other two sectors, since GDP shares sum to 100. The use of fixed effects eliminates omitted variable bias caused by any unobserved time-invariant heterogeneity between regions, and hence control for region-specific time-invariant factors. The year fixed effects δ_t capture the influence of aggregate time series trends; so that they account for trend effects common to all regions. The predictors are likely to be affected by these trends that affect all regions similarly, so estimators that don't account for such trends would confound these trends with the effects of changing predictors. The error term ε_{it} is clustered at the region level to account for heteroskedasticity and correlation of the residuals within region.

The taxable capacity of a region is defined as the ratio of regional tax revenue collected to regional GDP, as standard in the literature. The explanatory variables include regional GDP per capita. However, it is possible that published regional GDP is measured with error, since it is based on finite samples and imperfect source data. In addition, macroeconomic variables like Korean regional GDP are frequently revised on the KOSIS website (Korean Statistical Information Service), which must mean earlier estimates were subject to error. Consequently, regional GDP per capita may be correlated with the error term in Equation (3), and measurement error in regional GDP may cause the following problems for analysis of taxable capacity. Despite this, GDP is still the most commonly used measure of economic development in the literature, and one of the key controls in tax revenue equations for developing countries where the reliability of data must be lower than the OECD. In my case, fixed effects models are more sensitive to measurement error than estimations from OLS because all of the variance in fixed-effects models is time-variant, and therefore, only stems from measurement error (Angrist & Pischke, 2009). This limitation of fixed effects models leads them to be more susceptible to measurement error, causing the coefficients being biased towards zero (i.e., suffer from attenuation bias). As a result, fixed effects models provide relatively conservative coefficients, increasing susceptibility to Type II errors, making it harder to reject any test that the coefficient is zero and hence detect effects which actually exist. Fixed effects controls for the time-invariant omitted variables (average differences across regions in any observable or unobservable predictors), reducing to an extent the issue of omitted variable bias. However, the omitted time-variant predictors will bias the estimates. Endogeneity caused by measurement error and omitted variables means the results must be interpreted with caution and read as identifying statistical relationships, rather than any causal link, even if they are theoretically plausible.

Using data derived from the KLIPS, self-employment and informal employment comprise of around 30% of total employment each. This high prevalence of self-employment and informal jobs must presumably make regional measurements of GDP error-ridden in a way that is correlated with the regressors, namely self-employment and informal employment as a percentage of employment. This makes it difficult to estimate Equation (3), and the extensions that follow. The main issue with the survey data is that persons engaged in small-scale or casual self-employment activities may not report in statistical surveys that they are self-employed, or employed at all, thus missing information on national pension coverage. If a worker reports that they are not working even though they are there are, it understates the total number of workers in Korea and as a result of this lower denominator, overstates the ratio of informal workers and the self-employed

to total workers, again inducing measurement error in the explanatory variable and the aforementioned issue of attenuation bias. Informal sector statistics may also be affected by errors in classifying certain groups of employed persons by status in employment, such as outworkers, subcontractors, free-lancers or other workers whose activity is at the borderline between self-employment and wage employment (Husmanns, 2004). Even though workers can still intentionally or unintentionally misreport whether or not they are covered by the mandatory nation pension scheme, labour market status, (such as social security coverage), is still one of the most important determinants and proxies for informality (Elgyn & Ovy, 2013; Husmanns, 2004; Jensen, 2015). Unfortunately, this means the measurement error is still present.

Table 1.10 displays the fixed-effects regression results of the revenue equation on all the regions of Korea. Columns (1) to (3) show total income tax revenues as a share of GDP (ITGDP) separated by summation of PIT and CIT revenues as a share of GRDP (PITGDP and CITGDP respectively). Columns (4) to (6) use PIT revenue share of GDP as the dependent variable, and columns (7) and (9) use CIT revenue share of GDP as the dependent variable. Therefore, the coefficient in column (1) is the sum of (4) and (7). I exclude indirect tax revenues from the analysis as 20% of the indirect revenue figures in my dataset taken from the Statistical Yearbook of National Tax are negative, but the book provides no explanation of what these negative numbers represent (e.g., rebates). As a result, in 20% of the observations, total (direct and indirect) revenues are distorted by the negative indirect figures, and the ratio of indirect to total taxes is negative. All specifications include year fixed effects, and only GDP per capita is log transformed.

Table 1. 10. Estimates of the tax equation with services aggregated

VARIABLES	ITGDP			PITGDP			CITGDP		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ln GDP per capita	0.632 (0.562)	0.613 (0.791)	0.541 (0.573)	0.0377 (0.467)	0.0216 (0.469)	0.0167 (0.783)	0.594 (0.785)	0.591 (0.565)	0.524 (0.453)
Employed (% 15-64)	0.154*** (0.0357)	0.154*** (0.0359)	0.183*** (0.0357)	0.0738*** (0.0212)	0.0712*** (0.0213)	0.0976*** (0.0207)	0.0805*** (0.0255)	0.0823*** (0.0257)	0.0849*** (0.0262)
Tertiary edu attainment (%)	0.0467** (0.0231)	0.0447* (0.0247)	0.0383* (0.0227)	0.0366*** (0.0137)	0.0304** (0.0147)	0.0296** (0.0132)	0.0100 (0.0165)	0.0143 (0.0177)	0.00869 (0.0166)
Agriculture (% GDP)	-0.233* (0.119)	-0.230* (0.120)	-0.285** (0.117)	-0.170** (0.0708)	-0.160** (0.0713)	-0.214*** (0.0679)	-0.0627 (0.0852)	-0.0698 (0.0859)	-0.0710 (0.0859)
All services (% GDP)	0.106*** (0.0344)	0.108*** (0.0355)	0.0879** (0.0340)	0.0691*** (0.0205)	0.0753*** (0.0211)	0.0537*** (0.0197)	0.0371 (0.0246)	0.0328 (0.0254)	0.0342 (0.0249)
Self-employed (% employment)		-0.00430 (0.0195)			-0.0139 (0.0115)			0.00965 (0.0139)	
Informal (% employment)			-0.0382*** (0.0103)			-0.0322*** (0.00595)			-0.00602 (0.00753)
Observations	304	304	304	304	304	304	304	304	304
R-squared	0.417	0.417	0.445	0.337	0.341	0.402	0.266	0.267	0.268
Adj R-squared	0.374	0.372	0.402	0.288	0.290	0.355	0.210	0.211	0.212
Number of regions	16	16	16	16	16	16	16	16	16
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Cluster SE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Constant estimates but not reported. Industrial sector share of GDP omitted. Cluster-robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1.

The effects of GDP per capita are also somewhat mixed but broadly consistent with the literature. The larger an economy, the better off should its citizens be, the higher the expected revenue from taxation, and the demand for public services. In addition, it is also often taken as a proxy for administration and compliance capacity. After controlling for education and other determinants of tax capacity, the positive effect of GDP per capita loses its statistical significance which is in line with the findings of Tait et al (1979), Le et al (2008), Morrissey et al (2014), and Morrissey (2016). This is possibly driven by correlation with the included regressors. The educational attainment level, which is correlated with GDP per capita and the dependent variable, likely captures a variety of factors associated with a higher level of development that also support

a higher tax capacity. In addition, a direct effect of higher education levels may be to raise tax morale (Rodriguez, 2018). The reference GDP category is the manufacturing share of GDP. Table 1.9 Column (1) shows that a 1% point shift in GDP share from manufacturing to agriculture reduces total income tax collected as a share of GDP by 0.23% points. A 1% point shift in GDP share from manufacturing to services on the other hand, increases total income tax share by 0.11% points. Columns (4) to (6) show that the change in the dependent variable is driven mostly by personal income tax. Composition of economic activity has no effect on CIT revenues, as seen in columns (7) to (9). The literature generally uses the ratio of all tax revenues (direct and indirect) to GDP as the dependent variable, whereas I use total income (direct) taxes as my most aggregated tax revenue measure for the numerator, in columns (1) to (3). The coefficients on sectoral GDP shares are consistent with the literature, where compared to manufacturing, agriculture and services have negative and positive associations with revenue mobilization respectively.

Columns (2), (5), and (8) run the same specification as Equation (1) but include self-employment as a share of total employment as an additional regressor. As the data for informal employment is usually limited, self-employment is the most commonly used proxy for informal employment in the literature. This gives us Equation (4).

$$Y_{it} = \beta_0 + \beta_1 GDP_{percapita_{it}} + \beta_2 Employment_{popnratio_{it}} + \beta_3 Tertiary_{educratio_{it}} + \beta_4 \dots X_{shareGDP_{it}} + \beta_6 Self-employment_{ratio_{it}} + \delta_t + \varepsilon_{it}, \quad (4)$$

The coefficients on GDP shares of agriculture and services remain similar in sign and magnitude with the addition of the ratio of self-employment to total employment. However, the coefficient on self-employment as a share of total employment is insignificant. This suggests that overall self-employment is not a constraint on revenue mobilization, however there may be differences in the effect of self-employment within sector. This is explored further in Table 1.11 and Table 1.12. As an alternative measure of informality, I also use informal wage employment as a share of total employment. This variable is derived from the KLIPS data, as the survey also identifies the region of the respondent at the provincial and city level, therefore allowing me to construct a variable of informal employment share. Informality is defined as wage employees who do not contribute to the national pension scheme.

Columns (3), (6), and (9) run the same specification as Equation (4) but include informal employment as a share of total employment instead of the self-employment share. This gives us Equation (5).

$$Y_{it} = \beta_0 + \beta_1 GDP_{percapita_{it}} + \beta_2 Employment_{popnratio_{it}} + \beta_3 Tertiary_{educratio_{it}} + \beta_4 \dots X_{shareGDP_{it}} + \beta_6 Informalemployment_{ratio_{it}} + \delta_t + \varepsilon_{it}, \quad (5)$$

Column (3) shows that all informal employment as a share of total employment is negatively associated with revenue mobilization. A 1% point increase in the share of informal employment reduces income tax revenue as a share of GDP by 0.038% points. Column (6) suggests that 0.032% points is driven by the reduction in PIT revenues. Table 1.5 shows that around 30% of Korea's workforce is informal. Informal working conditions are associated with tax evasion and lower social insurance coverage, resulting in reduced tax and social security revenues (OECD, 2011). Column (9) shows that informal employment has no impact on CIT revenues. As might have been expected, the majority of the negative effect of informal employment on income tax revenue is driven by its effect on personal income tax revenue.

Table 1.5 shows that self-employment makes up a similar share of total employment, but has no negative effect on tax capacity, as seen in column (2). However the sum of informal wage and self-employment reduces total income tax revenue

as a share of GDP by 0.038% points. This suggests why it is important to look at alternative definitions of informal employment if the data allows. Kim (2005) states that it is questionable whether income tax administration in Korea is in fact as inefficient as in developing countries. Every citizen can be identified by an identification number, and the government has access to income, financial assets, and real estate information of individuals. Therefore, it must be the case that a reduced tax collection is partially driven by a large informal sector, or because of lack of strict enforcement of tax administration.

1.6.1. New Services Sector

Table 1. 11. Estimates of the tax equation with services split

VARIABLES	ITGDP			PITGDP			CITGDP		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Ln GDP per capita	0.759 (0.761)	0.745 (0.766)	0.783 (0.764)	0.129 (0.420)	0.155 (0.423)	0.281 (0.413)	0.630 (0.563)	0.591 (0.567)	0.532 (0.576)
Employed (% 15-64)	0.172*** (0.0348)	0.173*** (0.0351)	0.194*** (0.0349)	0.0916*** (0.0192)	0.0903*** (0.0194)	0.110*** (0.0189)	0.0803*** (0.0258)	0.0823*** (0.0259)	0.0845*** (0.0263)
Tertiary edu attainment (%)	0.0403* (0.0224)	0.0418* (0.0239)	0.0338 (0.0221)	0.0302** (0.0124)	0.0275** (0.0132)	0.0250** (0.0120)	0.0101 (0.0166)	0.0143 (0.0177)	0.00885 (0.0167)
Agriculture (% GDP)	-0.282** (0.116)	-0.284** (0.117)	-0.321*** (0.115)	-0.220*** (0.0640)	-0.215*** (0.0646)	-0.252*** (0.0619)	-0.0621 (0.0857)	-0.0697 (0.0865)	-0.0697 (0.0863)
Business services (% GDP)	0.166*** (0.0359)	0.164*** (0.0367)	0.144*** (0.0359)	0.129*** (0.0199)	0.132*** (0.0203)	0.112*** (0.0194)	0.0363 (0.0266)	0.0327 (0.0271)	0.0321 (0.0271)
Other services (% GDP)	-0.692*** (0.184)	-0.697*** (0.186)	-0.625*** (0.182)	-0.740*** (0.102)	-0.732*** (0.103)	-0.686*** (0.0986)	0.0478 (0.136)	0.0349 (0.138)	0.0607 (0.137)
Self-employed (% employment)		0.00343 (0.0189)			-0.00619 (0.0105)			0.00963 (0.0140)	
Informal (% employment)			-0.0325*** (0.0101)			-0.0263*** (0.00547)			-0.00623 (0.00762)
Observations	304	304	304	304	304	304	304	304	304
R-squared	0.456	0.456	0.476	0.466	0.466	0.508	0.266	0.267	0.268
Adj R-squared	0.414	0.412	0.433	0.424	0.424	0.468	0.209	0.207	0.208
Number of regions	16	16	16	16	16	16	16	16	16
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES
Cluster SE	YES	YES	YES	YES	YES	YES	YES	YES	YES

Notes: Constant estimates but not reported. Industrial sector share of GDP omitted. Cluster-robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Next, I examine the effect of economic development, demographics, and sectoral composition of GDP on tax capacity when splitting services into two sectors. Services comprises of retail trade, finance, business, and public services. Other services include social and personal service activities, and activities of private households. The reason for the split is the large contribution “other services” sector to GDP for an OECD country, as the GGDC data showed. This sector is also one of the least productive for economic growth (McMillan et al., 2014), and as a result it may be expected to negatively impact tax revenue mobilization. The equations estimated are the same as Equations (3), (4), and (5), except “All services” has been split into “Business services” and “Other services”. The estimation results are displayed in Table 1.11 above. Table 1.11 shows that the coefficients on agriculture and informal employment keep their sign, significance, and similar magnitude upon including an additional sectoral GDP share. Column (1) shows that a 1% point shift in GDP share from manufacturing to agriculture (business services) decreases (increases) the total income tax share of GDP by 0.28% (0.17%) points. However, other services, often associated with informal activity and lower productivity, has a negative impact on tax revenues, decreasing total income tax revenue share of GDP by 0.69% points. Columns (4) to (6) show that the majority of the impact of other services on total income tax revenue is driven by the reduction in PIT revenue.

1.6.2. Interacting GDP (services aggregated) with Self-Employment and Informal Employment

Table 1. 12. Estimates of the tax equation with GDP (services aggregated) shares interacted with employment type

VARIABLES	Self-Emp			Informal wage		
	ITGDP (1)	PITGDP (2)	CITGDP (3)	ITGDP (4)	PITGDP (5)	CITGDP (6)
Ln GDP per capita	0.863 (0.546)	0.582 (0.794)	0.281 (0.835)	1.467* (0.861)	0.802 (0.557)	0.667 (0.834)
Employed (% 15-64)	0.255 (0.183)	-0.242** (0.119)	0.496*** (0.174)	0.107 (0.180)	-0.278** (0.116)	0.385** (0.174)
Tertiary edu attainment (%)	0.110 (0.104)	0.0779 (0.0679)	0.0319 (0.0989)	0.0844 (0.104)	0.0853 (0.0672)	-0.000939 (0.101)
Agriculture (% GDP)	0.941 (0.963)	0.297 (0.629)	0.644 (0.915)	-0.564 (0.514)	-0.163 (0.333)	-0.401 (0.499)
Agriculture (% Employment type)	0.0524* (0.0274)	0.00248 (0.0179)	0.0499* (0.0260)	-0.0873*** (0.0320)	-0.0218 (0.0207)	-0.0656** (0.0310)
Agri (% GDP) * Agri (% Employment type)	-0.0169** (0.00832)	-0.00519 (0.00543)	-0.0117 (0.00791)	0.0256*** (0.00913)	0.00721 (0.00591)	0.0184** (0.00886)
All services (% GDP)	-0.334 (0.205)	0.220 (0.134)	-0.554*** (0.195)	-0.138 (0.199)	0.204 (0.129)	-0.341* (0.193)
All services (% Employment type)	-0.570*** (0.165)	-0.0310 (0.108)	-0.539*** (0.157)	0.283** (0.133)	0.235*** (0.0863)	0.0487 (0.129)
All serv (% GDP) * All serv (% Employment type)	0.00972*** (0.00293)	0.000489 (0.00191)	0.00923*** (0.00279)	-0.00573*** (0.00236)	-0.00420*** (0.00153)	-0.00153 (0.00229)
Manufacturing (% Employment type)	-0.0876 (0.178)	-0.178 (0.116)	0.0905 (0.170)	0.187 (0.122)	0.146* (0.0793)	0.0418 (0.119)
Manuf (% GDP) * Manuf (% Employment type)	0.00145 (0.00412)	0.00591** (0.00269)	-0.00446 (0.00392)	-0.00398 (0.00283)	-0.00365** (0.00183)	-0.000329 (0.00275)
Observations	304	304	304	304	304	304
R-squared	0.666	0.617	0.534	0.664	0.621	0.511
Adj R-squared	0.607	0.549	0.451	0.604	0.553	0.424
Number of regions	16	16	16	16	16	16
Year FE	YES	YES	YES	YES	YES	YES
Cluster SE	YES	YES	YES	YES	YES	YES

Notes: Constant estimated but not reported. Manufacturing sector share of GDP omitted. Cluster-robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1.

I consider if self-employment between sectors may have an impact on tax capacity. In addition to the sectoral GDP shares in the tax regression, I include interactions of each sectoral GDP share with the share of informal or self-employment in the same sector. The interaction shows the effect of a one unit (% point) increase in both GDP share and employment share above and beyond the sum of both individual effects. Therefore, I estimate the effect of informality (usually proxied by agricultural share of GDP) on tax revenue differently to the literature by interacting one of the most commonly used determinants of tax revenue (economic composition of GDP), with employment shares within sector. This gives an indication on the effect of the employment type on tax capacity as the GDP share of a given sector increases.

Equation (6) used to estimate the results in Table 1.12 column (1) to (3).

$$Y_{it} = \beta_0 + \beta_1 GDP_{percapita_{it}} + \beta_2 Employment_{popnratio_{it}} + \beta_3 Tertiary_{educratio_{it}} + \beta_4 AgrGDP_{it} + \beta_5 Self-emptAgr_{it} + \beta_6 AgrGDP_{it} * Self-emptAgr_{it} + \dots + \beta_{11} ManufGDP_{it} * Self-emptManuf_{it} + \delta_t + \varepsilon_{it}, \quad (6)$$

In the presence of the interaction term, the interpretation of the agriculture share of GDP is as follows. The insignificant coefficient (0.94) means the effect of agricultural GDP share is zero when the share of self-employment in agriculture as share of all employment in agriculture is zero. Likewise, the effect of self-employment in agriculture is 0.05% points when the share of agriculture in GDP is zero. Therefore, the effect of self-employment in agriculture as a share of all agricultural employment is given by the sum of the coefficients on agricultural self-employment share and the interaction term. This gives 0.05 – 0.0017**AgrGDP*. As agricultural GDP share increases, the positive effect of self-employment in agriculture

on revenues becomes smaller. The negative interaction term suggests that increasing either the GDP share in agriculture, or self-employment in agriculture among all agricultural employment, will have a negative effect on tax revenues. This effect is estimated to be around -0.0017% points.

The effect of self-employment in total services on total income tax revenue is given by $-0.57 + 0.0097 \cdot \text{AllservGDP}$. As the manufacturing share of GDP falls by 1% point and total services share of GDP increases by 1% point, the effect of self-employment in total services on total income tax revenues becomes positive (less negative). In sum, self-employment has negative impact on tax revenues in agriculture but a positive impact in the total services sector. The effect of the services sector on revenue mobilization is driven by the effect on CIT revenues, as seen in column (3), where the coefficients on the GDP share, self-employment share, and the interaction term are significant. In sum, as agricultural GDP share increases, agricultural self-employment has a negative effect on total income tax revenues. As the total services GDP share increases, self-employment in total services has a positive effect on total income tax revenues, and this is driven by the effect on CIT revenues.

The majority of the existing literature has used total tax revenue as an outcome measure, but there are many types of taxes available to a government which are unlikely to have the same effect on an economy. Indeed, the results show that self-employment and informal employment by sector have differing effects on different revenues (i.e. PIT and CIT). I find that for agriculture, self-employment negatively affects total income tax revenue and informal employment positively affects total income tax revenue, but this is driven by their effect on PIT revenues. Self-employment (informal employment) in manufacturing has a positive (negative) effect on PIT (CIT) revenues. In total services, self-employment has a positive effect on total income tax revenues and CIT revenues, whereas informal employment negatively affects total income tax and PIT revenues.

Next, I interact sectoral GDP share with sectoral informal wage employment share, displaying the results in Table 1.12 columns (4) to (6). Tables 1.10 and 1.11 showed that while aggregated self-employment had no statistically significant effect on revenues, aggregated informal employment as a share of total wage employment reduced total income tax revenues as a share of GDP in the range of 0.038% to 0.032% points.

Equation (7) is used to estimate the results in Table 1.12 columns (4) to (6). It is identical to Equation (6), but self-employment within each sector is replaced by informal employment within each sector.

$$Y_{it} = \beta_0 + \beta_1 \text{GDPpercapita}_{it} + \beta_2 \text{Employmentpopnratio}_{it} + \beta_3 \text{Tertiaryeduratio}_{it} + \beta_4 \text{AgrGDP}_{it} + \beta_5 \text{Informal-emptAgr}_{it} + \beta_6 \text{AgrGDP}_{it} * \text{Informal-emptAgr}_{it} + \dots + \beta_{11} \text{ManufGDP}_{it} * \text{Informal-emptManuf}_{it} + \delta_t + \varepsilon_{it}, \quad (7)$$

Self-employment is often the most common proxy of informal employment, since data for informal employment is usually very limited. Since the KLIPS contains information on the national pension coverage of respondents, I define an informal worker as a worker that does not contribute to the national pension scheme, and the informal employment rate as workers who do not contribute to the pension scheme as a proportion of the workforce. In Table 1.12, columns (4) to (6), I interact the sectoral GDP shares with sectoral informal employment shares instead. A different measure of informal employment should have differing effects on tax revenue mobilization. For example, Table 1.5 showed that 83% of agricultural employment is self-employment, and 11% is informal. Table 1.12 column (1) showed that an increase in agricultural share of GDP is associated with a negative impact of agricultural self-employment on tax capacity.

Table 1.12 column (4) shows that in contrast to column (1), the interaction term coefficient of 0.026 in the agricultural sector is positive. As agricultural GDP share increases, the negative effect of informal employment in agriculture on revenues becomes less negative and eventually positive. The positive interaction term suggests that increasing either the GDP share in agriculture, or self-employment in agriculture among all agricultural employment, will increase total income tax revenues, by around 0.026% points. Column (1) suggests that the high self-employment rate in agriculture reduces tax capacity, whereas column (4) suggests the significantly lower informal employment rate has a positive effect on tax capacity.

For total services, the coefficients on informal employment and the interaction term in Table 1.12 column (4) are the opposite sign to the coefficients in column (1). The negative interaction coefficient suggests that as the GDP share of the total services sector increases, the positive effect of informal employment in total services becomes less positive and eventually negative. If the total services share of GDP increases by 1% point, informal employment in services reduces total income tax revenues by 0.0057% points. As the total services share of GDP increases, informal employment in this sector reduces PIT revenue by 0.0042% points. In total services, self-employment is a positive determinant of total income tax and CIT revenues. On the other hand, informal employment is a negative determinant of total income tax and PIT revenues.

In manufacturing, self-employment (informal employment) has a positive (negative) effect on PIT revenues. The positive (negative) interaction coefficient suggests that as the GDP share of manufacturing increases, self-employment (informal employment) in manufacturing increases (reduces) PIT revenues.

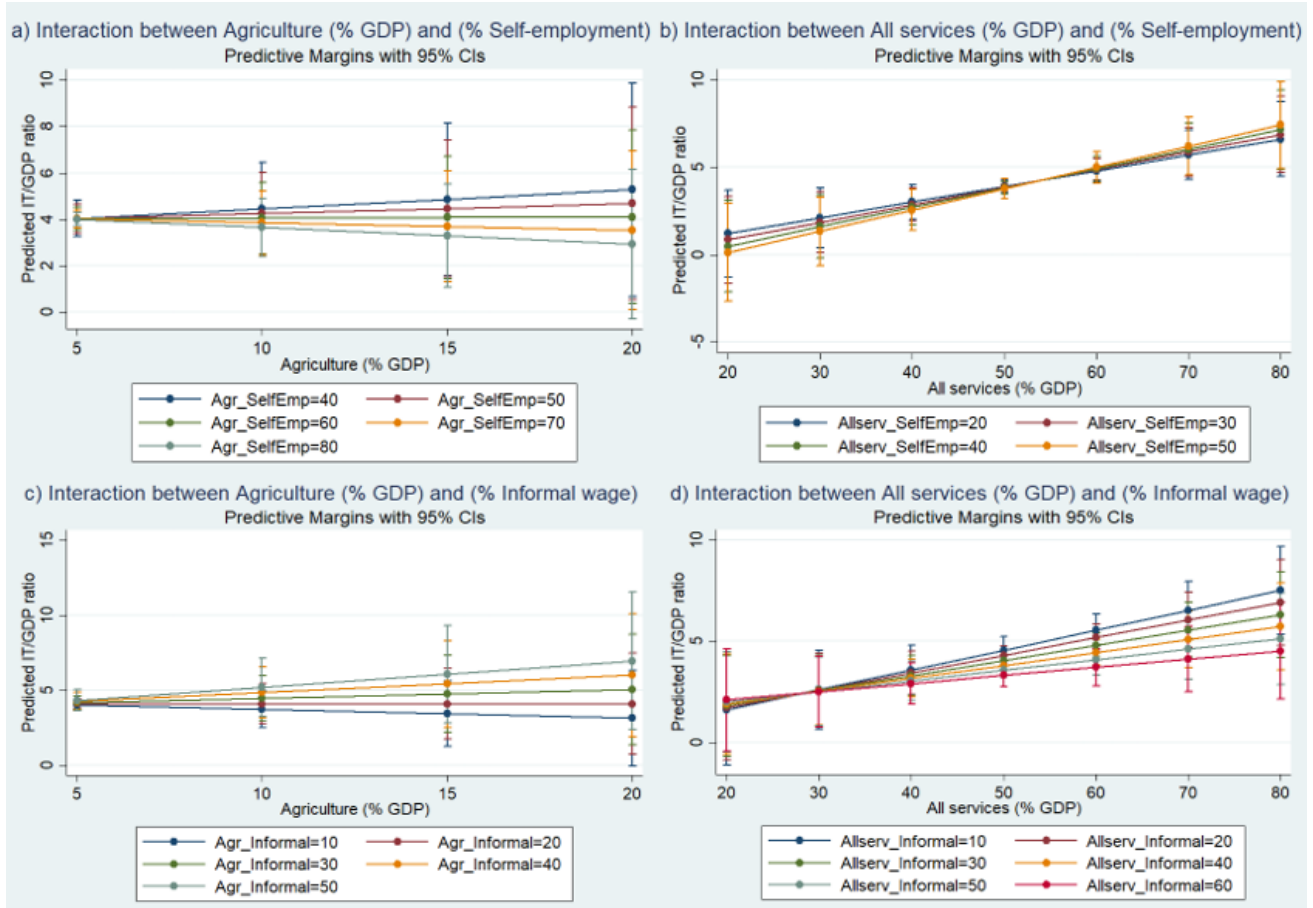


Figure 1. 6. Graphical presentations of Table 1.12 columns (1) and (4) interaction terms

I also present the estimated effects graphically for ease of interpretation. Fig 1.6 panels (a) and (b) graph the interaction terms for agriculture and total services using self-employment in Table 1.12 column (1). Panels (c) and (d) graph the interaction terms for agriculture and total services using informal wage employment in Table 1.12 column (4). These are the significant interaction terms in specifications (1) and (4), which displayed the highest adjusted R-squareds, indicating the best fit of the empirical specification. The range of the following variables: sectoral GDP share, sectoral self-employment, and informal employment, is determined by the minimum and maximum of the respective variables.

Panel (a) graphs the interaction term between agricultural GDP share and share of agricultural self-employment among total agricultural employment. As agricultural GDP share increases, the confidence intervals widen, suggesting that increasing agricultural GDP share is not a robust predictor of the ratio of total income taxes to GDP. Panel (a) shows that the effect of agricultural GDP share is almost zero when share of agricultural self-employment among total agricultural employment is 60%. As the self-employment share increases, the effect of GDP becomes more negative. Panel (c) graphs the interaction term using informal wage employment in agriculture, and that the effect of agricultural GDP share is almost zero when share of agricultural informal wage employment among total agricultural employment is 20%. As the informal employment share increases, in contrast, the effect of GDP becomes more positive.

Panel (b) graphs the interaction term between total services GDP share and share of self-employment in total services among total employment in total services. At lower levels of GDP, higher proportions of self-employment among total employment has a negative effect on the ratio of total income tax revenues to GDP. However, at higher levels of GDP,

higher proportions of self-employment among total employment has a positive effect. The graph suggests that as GDP share in total services exceeds around 55%, increasing the proportion of self-employment in total services increases the ratio of total income taxes to GDP. Panel (d) graphs the interaction term using informal wage employment in total services. At higher shares in total services of GDP, higher shares of informal employment in total services has a negative effect on tax revenue mobilization. The wider range of predicted lines suggests that changing the share of informal employment will have a larger impact on tax revenues than will self-employment.

1.6.3. Interacting GDP (services split) with Self-Employment and Informal Employment

Table 1. 13. Estimates of the tax equation with GDP (services split) shares interacted with employment type

VARIABLES a1 and b1 SE // INF	ITGDP (1)	Self-Emp PITGDP (2)	CITGDP (3)	ITGDP (4)	Informal wage PITGDP (5)	CITGDP (6)
Ln GDP per capita	0.927* (0.520)	0.754** (0.333)	0.173 (0.489)	1.477*** (0.515)	0.643* (0.341)	0.833* (0.502)
Employed (% 15-64)	0.217 (0.181)	-0.287** (0.116)	0.504*** (0.170)	0.154 (0.177)	-0.238** (0.117)	0.392** (0.173)
Tertiary edu attainment (%)	0.0985 (0.132)	0.0503 (0.0843)	0.0482 (0.124)	0.132 (0.122)	0.0808 (0.0806)	0.0512 (0.119)
Agriculture (% GDP)	1.061 (0.969)	0.373 (0.594)	0.687 (0.933)	-0.499 (0.524)	-0.184 (0.320)	-0.316 (0.513)
Agriculture (% Employment type)	0.0414 (0.0272)	0.00308 (0.0167)	0.0383 (0.0262)	-0.0785** (0.0320)	-0.0284 (0.0195)	-0.0500 (0.0313)
Agri (% GDP) * Agri (% Employment type)	-0.0183** (0.00845)	-0.00601 (0.00517)	-0.0123 (0.00813)	0.0281*** (0.00912)	0.00839 (0.00557)	0.0197** (0.00892)
Business services (% GDP)	-0.386 (0.277)	0.464*** (0.177)	-0.850*** (0.261)	0.183 (0.226)	0.142 (0.149)	0.0410 (0.220)
Business services (% Employment type)	-1.215*** (0.370)	0.286 (0.237)	-1.500*** (0.349)	0.800*** (0.221)	0.236 (0.146)	0.563*** (0.215)
Bus serv (% GDP) * Bus serv (% Employment type)	0.0238*** (0.00764)	-0.00570 (0.00489)	0.0295*** (0.00719)	-0.0157*** (0.00447)	-0.00449 (0.00296)	-0.0112** (0.00435)
Other services (% GDP)	-0.135 (0.488)	-0.573* (0.313)	0.439 (0.459)	-0.809** (0.403)	-0.329 (0.267)	-0.481 (0.393)
Other services (% Employment type)	-0.0161 (0.0696)	-0.117*** (0.0445)	0.101 (0.0655)	-0.0374 (0.0616)	-0.0228 (0.0408)	-0.0145 (0.0600)
Oth serv (% GDP) * Other serv (% Employment type)	0.00517 (0.0105)	0.0194*** (0.00674)	-0.0142 (0.00991)	0.00377 (0.00895)	0.00453 (0.00592)	-0.000762 (0.00871)
Manufacturing (% Employment type)	-0.161 (0.182)	-0.163 (0.111)	0.00127 (0.175)	0.130 (0.123)	0.104 (0.0752)	0.0261 (0.120)
Manuf (% GDP) * Manuf (% Employment type)	0.00291 (0.00421)	0.00493* (0.00258)	-0.00202 (0.00406)	-0.00364 (0.00287)	-0.00332* (0.00175)	-0.000326 (0.00280)
Observations	292	292	292	292	292	292
R-squared	0.666	0.631	0.545	0.672	0.613	0.522
Adj R-squared	0.601	0.560	0.457	0.609	0.538	0.430
Number of regions	16	16	16	16	16	16
Year FE	YES	YES	YES	YES	YES	YES
Cluster SE	NO	NO	NO	NO	NO	NO

Notes: Constant estimates but not reported. Manufacturing sector share of GDP omitted. Cluster-robust standard errors in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 1.13 runs the same specification as in Table 1.12, but with total services disaggregated into business services and other services. The interaction term coefficients in agricultural and manufacturing are quantitatively similar to those in Table 1.12. The coefficients on other services, and industrial sector are all insignificant in column (1), suggesting the effect of self-employment in these sectors on total income tax revenue is zero. Tables 1.10 and 1.11 also showed that the effect of aggregate self-employment on tax revenues was insignificant. Overall, the results suggest that in Korea, self-employment is only a negative determinant of tax revenue in the agricultural sector.

When total services is split into business services and the potentially less productive other services, other services has no effect on tax revenue mobilization, bar in column (2). This suggests the positive (negative) effect of self-employment (informal employment) in total services on total income tax, is driven by business services. Theory would predict that other services would have a negative effect if the sector acts as a constraint on tax revenue mobilization, but the insignificant results may be largely due to low statistical power because of the sample size, and measurement error using data derived from KLIPS. As shown in columns (1) and (4), when the GDP share of business services increases, self-employment (informal employment) in business services increases (decreases) impact on total income tax revenues.

In sum, the results show that self-employment has a negative impact on total income tax revenues only in agriculture. This may have been unexpected given that self-employment is commonly used as a proxy for informal employment. As agricultural share of GDP increases, self-employment in agriculture reduces the total income tax revenue from between 0.0169% points (Table 1.12 column (1)) to 0.0183% points (Table 1.13 column (1)). However, self-employment in total services (business services) increases total income tax revenues by 0.0097% points (0.0238% points), and this is driven by the increase in CIT revenue of 0.0092% points (0.0295% points).

On the other hand, informal wage employment seems to have the opposite impact on tax capacity. Informal employment (self-employment) in manufacturing has negative (positive) impacts on PIT revenues, as shown in columns (2) and (5). In contrast to self-employment in total services, informal employment in total services negatively impacts on total income tax collection, and the magnitude of the negative effect of informal employment is biggest in this sector, as shown in Table 1.12 column (4). When total services is disaggregated into business services and other services, informal employment in business services has a negative effect on total income tax revenues and CIT revenues, as shown in Table 1.13 columns (4) and (6). Informal employment in other services has no effect on tax revenue mobilization.

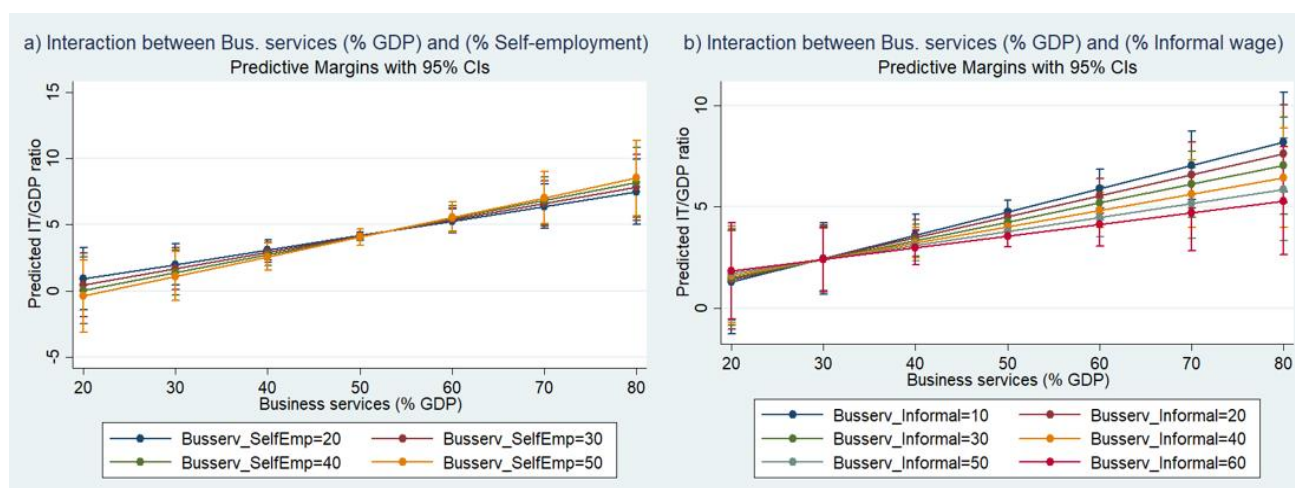


Figure 1. 7. Graphical representations of Table 1.13 columns (1) and (4) interaction terms for business services

Figure 1.7 displays the interaction terms in Table 1.13 when total services is disaggregated into business services and other services. I excluded the graphs for agriculture since they were illustratively similar. Panels (a) and (b) graph the interaction terms for business services using self-employment in Table 1.13 column (1), and informal employment in Table 1.13 column (4) respectively. Panel (a) shows when examining business services in isolation, the interaction between GDP share and self-employment is also similar to Figure 1.6 Panel (b). At higher GDP shares (exceeding about 55%), higher

proportions of self-employment have a positive effect on income tax revenue mobilization, but the difference between the impact of 20% and 50% of self-employment on revenues is small. Panel (b) again shows a similar result to Figure 1.6 Panel (d). Changes in the informal employment rate may have a larger impact on tax revenues than changes in self-employment, suggesting that informal employment acts as a bigger constraint on taxable capacity.

Tables 1.12 and 1.13 provide suggestive evidence that in Korea, self-employment and informal wage employment do not have the same effect on taxable capacity (reduction), as may have been expected. This may be an artefact of the measurement error or low statistical power, or because self-employment does not have the negative effect on taxable capacity in Korea as it would be expected for other (in particular, developing) countries. The KLIPS data showed that self-employed workers in fact reported comparable post-tax incomes to formal workers, which contradicts the notion that the self-employed underreport incomes. Therefore, self-employment would not be a constraint on tax revenue mobilization. However, it must be noted that the KLIPS only surveys urban households, and self-employed workers in urban areas may be fundamentally different to those in rural areas. The results should thus be interpreted with caution, and would be improved by a larger sample size (longer time period) to increase statistical power, and by using a more representative survey which also takes into account rural areas.

1.7. Conclusion

To conclude, given the demographic challenges that Korea faces, such as the ageing population, low fertility rate, and high elderly poverty rate, Korea will likely require an increase in government revenues. One possible way is to reduce self-employment in agriculture. However, given that agriculture only contributes to 3.3% of GDP, it is more likely to government will divert their efforts to the other sectors of the economy. Despite the possibility that the self-employed can theoretically evade taxes through noncompliance, the results show that self-employment only has a negative impact on tax capacity in the agricultural sector. From the KLIPS data I used contribution to the national pension scheme to define informality, as informality refers to those who are employed without some or all of the normal legal requirements associated with being an employee.

Given the tax burden and share of income tax as GDP is the lowest among OECD countries, there should be more room for revenue mobilization and hence a redistributive role of tax policy in Korea. However, it may be politically challenging given the traditional view of “growth first, distribution later”. Korea ranked in the lowest category among all OECD member countries for the income redistribution effects its tax and fiscal policies has had (Hyundai Research Institute, 2018). The speed at which this happens may also depend on public opinion. Given that the attitude of citizens towards the public sector is deeply rooted in the centralization era, it will again take time before decentralization enhances citizens’ awareness of fiscal policies and contributes to mobilizing tax revenues. In addition, tax revenue must be boosted in a way that limits any negative impact on growth on income inequality and relative poverty. For direct taxes such as PIT and CIT, the objective should therefore be to broaden the tax bases. There will be strong resistance to raising personal income tax rates unless tax evasion issues of the self-employed are addressed. However, the results suggest that informal employment affects more sectors of the economy than self-employment, and therefore policies should be targeted at reducing informal wage employment.

A possible way to disincentivize informal employment could be achieved through the reinforcement of labour inspections, for instance, through increased coordination between the tax, employment, and social security bodies. Given that the

information network of financial flow in Korea is as advanced as other industrialized nations, the relevant authorities can track the salaries that employers declare when calculating taxable corporate or personal income and compare this with the salaries on which social insurance contributions have been paid, thus possibly encouraging compliance. However, measures would need to be in place to reduce the burden from compliance both for employees and employers. Reforms to the tax and benefit system could encourage formal employment whilst simultaneously making Korean society more equal. This study should complement a detailed analysis of Korea's tax structure and system, which can consider the country's public spending requirements, given that local governments cannot respond to local needs due to high degree of centralization in government policy. It is likely that introducing fundamental changes in a tax structure of any country will face public resistance and this will be especially challenging due to political weakness, like that seen in Korea. Therefore, tax revenue reforms must be implemented in such a way that accounts for Korea's tax capacity, regional economic characteristics, and the political willingness of the central government.

CHAPTER 2 The 2007 Act on the Protection of Irregular Workers.

Chapters 3 and 4 of this thesis will examine the effect of the 2007 Act on the Protection of Irregular Workers, on individual-level and firm-level outcomes. This Act aimed at reducing the labour condition differentials between regular and irregular workers where they are engaged in similar work tasks, and to limit the use of irregular employment contracts. Article 8 Clause 1 of the Act on Protection of Fixed-Term Employees states the following. “An employer shall not give discriminatory treatment against fixed-term employees on the ground of their employment status compared with other workers engaged in the same or similar jobs under a labour contract with a fixed term in the business or workplace concerned.” Article 2 Clause 3 defines “discriminatory treatment” as “unfavourable treatment in terms of wages and other working conditions without any justifiable reason”. Prior to the reform there was no limit on repeated renewals of fixed-term labour contracts, but now the consecutive employment length is not to exceed two years. An employer who wants to keep an irregular hire for more than two years is then obliged to offer a permanent contract (Lee, 2010).

I analyse the effect of the reform on the probability of transitioning from irregular to regular employment, and wage outcomes using Korean individual-level panel data in Chapter 3. In Chapter 4, I make use of Korean firm-level panel data to examine the effect of the policy on the composition of employment in firms, and financial performance indicators. Regular workers are defined as workers with indefinite employment contracts with no specified end date (also known as open-ended contracts). On the other hand, irregular workers often have a fixed termination date and thus lower job security. Regular workers have the benefit of the security of tenure as they cannot be subject to a definite employment termination day unless they reach the mandatory retirement age, and are also protected against unjust termination. None of these guarantees are given to irregular employees (Korea Portal, 2015).

The outline of chapter 2 is as follows. Section 2.1 describes the overall picture of irregular employment in Korea. Section 2.2 is the literature review, and section 2.3 provides the institutional background of the reform. Chapters 3 and 4 follow.

2.1. Introduction

The prevalence of irregular employment in many OECD countries during the past few decades has triggered considerable interest on the relationship between employment protection and labour market performance. Strict employment protection is often cited as a reason for high unemployment rates in Europe because of a reluctance of firms to hire due to high firing costs (Bertola 1990; Cahuc & Postel-Vinay 2002). As a result, reforms in recent years have been directed at relaxing restrictions on the use of irregular contracts, presumably with the aim of maintaining protection for workers in permanent jobs, while giving firms an incentive to create irregular jobs which may become permanent. According to OECD data, Figure 2.1 below shows that Korea is an outlier in terms of the proportion of workers in irregular contracts among all wage workers. In 2005, the proportion of irregular workers among all wage workers in Korea was 27.9%, compared to the OECD average of 11.2%.

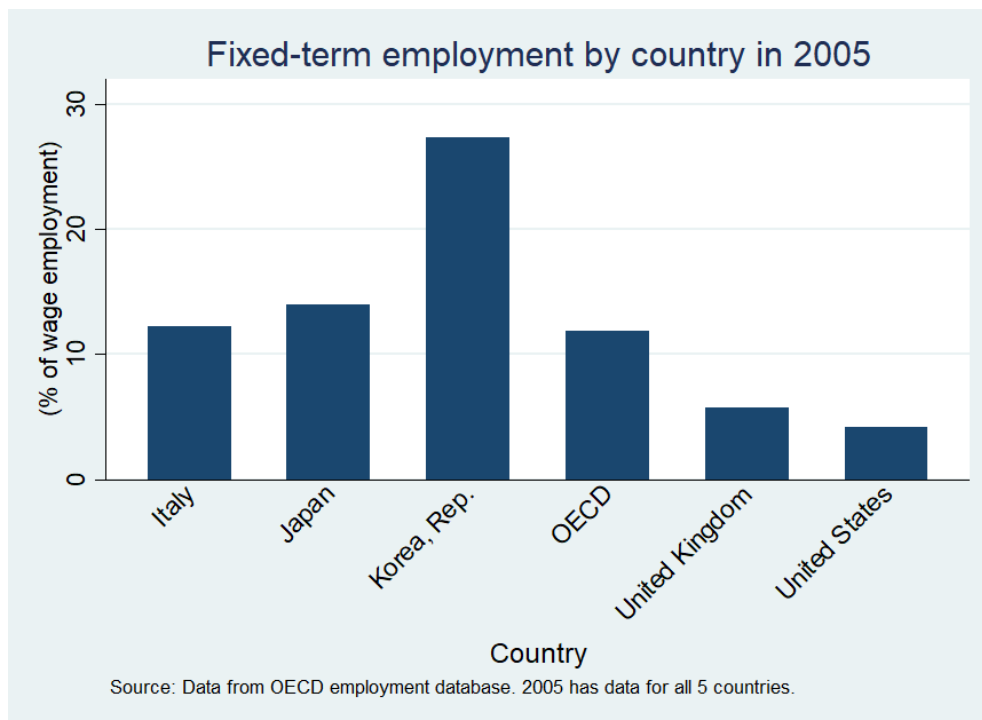


Figure 2. 1. Fixed-term employment as a share of wage employment in selected OECD countries.

Irregular employment arrangements may have some beneficial effects. They may increase employment levels by enhancing employment flexibility for firms, and some workers may have a preference for irregular work because it allows them to combine work with leisure activities (Grubb, Lee, & Tergiest, 2007). Irregular jobs often also serve as a stepping stone towards permanent jobs.

Given that irregular employment is associated with lower pay, job security and poorer working conditions than regular employment, an increase in irregular employment is possibly problematic as it reinforces the segregation of the labour market. Stronger employment protection for irregular workers has both its proponents and critics. One of the reasons the protection of irregular workers is an ongoing topic is due to the mixed evidence that irregular contracts can lead to permanent employment, especially in Europe, which provides strict protection to its permanent workers (Eichhorst, 2014).

On the one hand, fixed-term contracts can create employment opportunities for labour market entrants and reduce unemployment. It can also serve as a stepping stone to more stable permanent employment under specific conditions, or if combined with training. However, the liberalization of fixed-term contracts may simply discourage firms to hire permanent workers and result in a segmented labour market. Gagliarducci (2005) uses Italian panel data and finds that repeated multiple fixed-term contracts are detrimental to the transition into permanent employment, implying that temporary workers can become trapped in this cycle.

Amuedo-Dorantes (2000) investigates the impact of fixed-term contracts in Spain, which has one of the highest rates of fixed-term contracts in the EU, but low rates of conversion into permanent employment, suggesting segmentation of the labour market. The negative consequences include lower investment in human capital, larger wage dispersion, and lower mobility.

Boockmann & Hagen (2008) find that in the German context, fixed-term contracts as entry, or later jobs, have no negative impact on subsequent job stability, but can help identify matches between workers and jobs. The hypothesis that fixed-term workers remain trapped in this form of employment seems to matter less in Germany. Overall, findings from the literature suggest the effects of fixed-term contracts are ambiguous, and that their role depends on the alternative channels of employment, flexibility, and the larger constitutional environment. Stronger employment protection is often argued in favour for to discourage the increase in number of irregular employment contracts (OECD, 2014). In contrast, increased protection of irregular workers may inadvertently contribute to high unemployment rates, because the firing costs of these workers is now increased.

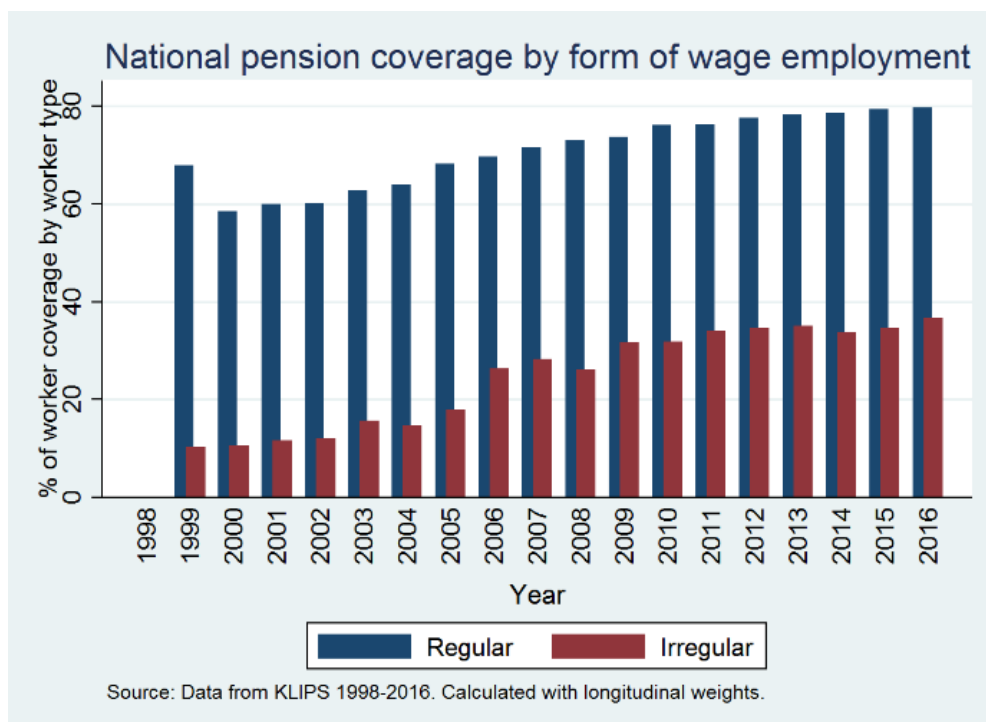


Figure 2. 2. Share of regular and irregular workers covered by the national pension scheme in Korea.

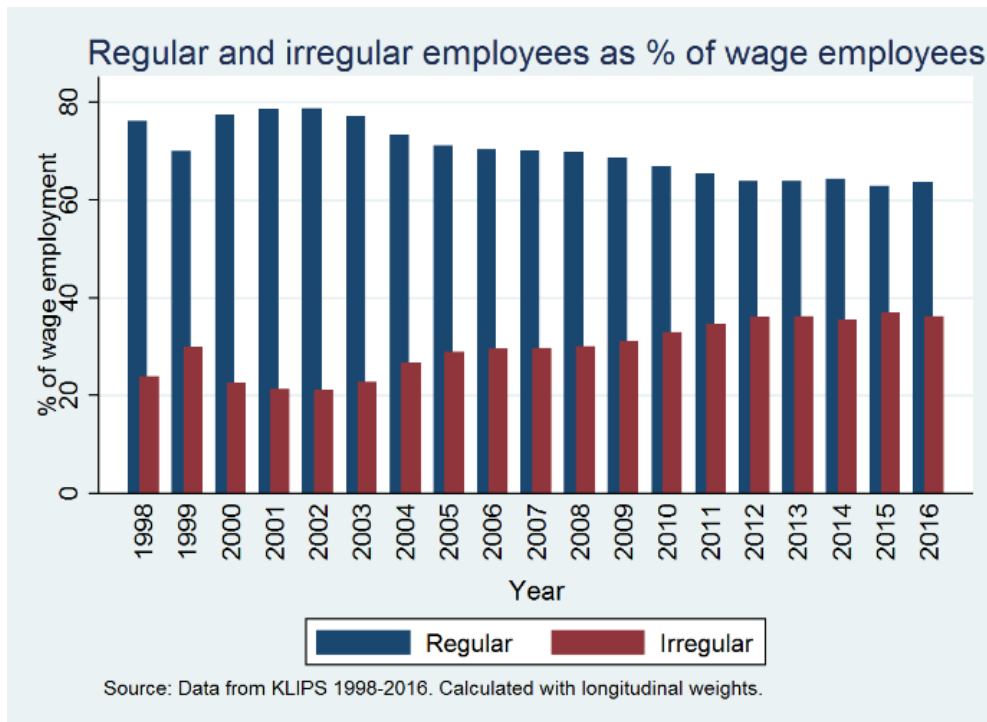


Figure 2. 3. Regular and irregular workers as a share of wage workers (excluding self-employed).

Wage workers in Korea are divided into two categories, namely regular and irregular workers. Generally, regular workers are more likely to receive the fullest benefits and employment protection afforded by Korea’s labour laws, whereas irregular workers are not. Unlike regular workers, irregular workers are not granted the four major insurances; national pension, industrial accident compensation insurance, employment insurance, and national health insurance. Moreover, irregular workers in Korea often refers to workers who cannot expect stable (permanent) employment with their current employer as they are usually subject to a predetermined employment termination date, and have less employment protection than regular workers. For instance, as seen in Figure 2.2, the extent of national pension coverage is much lower for irregular workers than regular workers. As of 2016, only around 37% of irregular workers contributed to the national pension scheme, and the figure is almost 80% for regular workers. The number of irregular workers in Korea has increased rapidly after the Asian crisis of 1997, and since the new millennium there was growing social concern over labour polarization and irregular labour issues.

The observable gross and net tax annual wage variables in the KLIPS data are used to derive the proportion of gross wage that goes towards tax contributions (gross minus net, divided by gross). The data shows a statistically significant difference between the tax contribution rates of the two worker types (1.7% for irregular compared to 4.1% for regular workers). As expected, the average gross wage of irregular workers is less than regular workers (12.3 million won to 23.4 million won yields a ratio of irregular to regular wage of 53.8%), but the ratio of net wages is also identical at 53.6% (11.6 million won to 21.7 million won). These wage differentials motivate the wage analysis in Chapter 3 where I examine the net wage growth of workers who transition from irregular work into regular work between their last year of irregular work and first year of regular work. I estimate the effect of transitioning on the change in wage growth in the post-policy period by interacting the post-treatment dummy variable with the irregular to regular transition dummy, where the reference category is irregular to irregular transitions. I find that workers experience a 6.7% increase in wage following conversion in the same

job compared to an irregular worker who remains in an irregular work, whereas workers who move to a new regular job experience an 8.9% wage decrease upon switching. I also run the same regression splitting the sample between skill-level, sector, and type of workplace, with differing results.

Figure 2.3 shows that since 1998, the share of irregular employment among all wage workers has increased substantially from 22% to 37%. The East Asian financial crisis hit Korea in 1997, but it only took two years for GDP growth rates to reach pre-crisis GDP growth rates. However, the recovery was accompanied by a significant change in the composition of the labour force. The crisis triggered the need for increased labour market flexibility, and reforms expanded the firms' ability to employ new workers without giving them the full benefits packages, resulting in the creation of the irregular working sector. Since irregular hires are cheaper to employ, their numbers have increased substantially since the crisis. In 1998 employment flexibility was enhanced by the decision to allow irregular work agencies under the Employee Dispatch Act. Under this law, dispatching agencies are permitted to hire out workers to firms (Kim, 2014; OECD, 2000). The act also maintained flexibility on the use of fixed-term contracts, meaning no restrictions on repeated contract renewals. Employing regular workers entitles them to full company employee benefits, which in turn leads to a higher degree of wage-related expenses. Data from the Ministry of Labour in 2005 in Table 2.1 shows that wages (direct labour costs) make around 80% of total labour costs. The high share of direct labour costs among total labour costs in Korea relative to many OECD countries means wages play a more important role in hiring than mandatory non-labour costs. Subsequently, firms are incentivised to hire irregular workers over regular workers (Grubb, Lee, & Tergeist, 2007). The share of non-labour costs increases with firm size, due to the increasing share of employee training costs and severance pay.

Table 2. 1. Composition of monthly labour costs by firm size in Korea, 2005

	Total	< 100 workers	100-299 workers	300> workers
Total monthly labour costs (000 KRW)	2979	2462	2623	3854
Direct labour costs	80.0%	81.0%	79.9%	79.1%
Indirect labour costs	20.0%	19.0%	20.1%	20.9%
Severance pay	7.3%	6.1%	7.9%	8.0%
Mandatory benefits	6.5%	6.7%	6.5%	6.4%
Non-mandatory benefits	5.2%	5.6%	5.0%	5.0%
Education and training costs	0.6%	0.2%	0.4%	1.0%
Other indirect costs	0.4%	0.4%	0.3%	0.5%

Source: Grubb, Lee, & Tergeist (2007). Survey on Labour Cost, 2005, Korean Ministry of Labour.

It is necessary to regard the possible influence that this increase of migrant labour may have had on the increasing prevalence of irregular workers in Korea. Figures 2.2 and 2.3 display an increase in the number and share of irregular workers from 2003/2004, coinciding with the influx of migrant workers who were permitted access into the Korean labour market following the introduction of the Employment Permit System (EPS) from 2004 onwards.

Since the late 1980s, Korea became an importing nation of migrant labour to address the domestic labour shortages. In 1993, the Korean government introduced the Industrial Trainee Program (abolished in 2007) in response to these shortages. Foreign workers could be hired as industrial trainees for a period of one year, with possibility of a further extension of one year, in manufacturing firms with less than 300 employees (Korea Labour Institute, 2005). Despite the trainee program serving as a key pillar of low-skilled foreign labour policy, it was subject to criticism as workers were classified as trainees as opposed to employees to protect Korean workers, meaning they were not legally entitled to protection under Korean labour laws and therefore vulnerable to illegal employment practices (Korean Labour Institute, 2005; OECD, 2019). Since 1995, industrial trainees were eligible for two of the four “major insurances”, industrial accident compensation insurance

and national health insurance. However, they were not covered by the national pension scheme or employment insurance. Furthermore, recruitment fees incurred in origin countries meant trainees were often indebted and hence pressured to accept illegal employment practices and violate their visa conditions. Due to these issues, the program could not increase the number of trainees despite the increased demand for foreign labour, leading to an increase in undocumented workers (Korea Labour Institute, 2005; ILO, 2006).

As a result of the problems associated with employing migrant labour as trainees, Korea introduced the EPS in 2004, under which foreign low-skilled labour can be imported as employees and granted the same labour rights as domestic workers, as opposed to trainees. The EPS was designed to provide workers at the lowest possible wage level to specific types of firms in certain sectors of the economy which experience low productivity and quality jobs (OECD, 2019). Following the introduction of the EPS, the Korean government abolished the Industrial Trainee Program in 2007. Under the EPS, employers with fewer than 300 employees in manufacturing, construction, agriculture and livestock industry, and six areas of the service industry (restaurants, business support services, social welfare services, cleaning, nursing, and housekeeping) may employ foreign workers after obtaining an employment permit for a period of up to three years. The following 8 countries were chosen as candidates of sending countries under the EPS: China, Mongolia, Philippines, Vietnam, Indonesia, Thailand, Sri Lanka, and Kazakhstan. The program has since expanded to 16 countries. From the introduction of the system until 2015, over 540,000 workers have worked under the EPS. Four countries (Vietnam, Thailand, Indonesia, and the Philippines) accounted for over 55% of the workforce, with over 80% of EPS workers involved in manufacturing. The remaining 15%, 4%, and 1% work in agriculture, construction, and services respectively (World Bank, 2015).

Unfortunately, the KLIPS data does not refer to the nationality of respondents, asking only which city or province in Korea they were born and live in, otherwise the only other response category is “overseas”. However, the sample of possible migrant workers in my worker dataset is negligible, with the number of respondents in each wave answering they were born overseas only in the single digits. Further research using firm-level data with information on migrant labour should explore whether migrant workers and irregular Korean workers have a substitutive or complementary relationship. A substitutive relationship may be indicative of labour cost considerations. On the other hand, a complementary relationship (where the employment of irregular Korean workers is unaffected) could mean migrant labour works in sectors in which irregular Korean workers avoid, and that employment of migrant labour depends on other factors outside of labour cost cutting.

2.2. Institutional Background of the 2007 Reform

Before the crisis, it was quite difficult for firms in Korea to terminate existing employment contracts even for economic reasons, but given that economic growth had been increasing rapidly since the early 1980s, strict employment protection was not considered as necessarily a serious problem. However, as economic growth slowed down in the mid-1990s, reforms regarding the existing employment protection regulations were called for (Yoo & Kang, 2012). Figure 3 shows that between 1998 and 2016, irregular employment as a share of wage employment has almost doubled from over 20% to around 37%.

Irregular workers existed in Korea before the crisis, but the crisis triggered the need for a more flexible labour market. The subsequent reforms implemented by the new democratic government (Kim Dae-jung administration, 1998-2003), under International Monetary Fund guidelines as a condition of the financial bailout program made irregular workers a fixture in

the labour market. The reforms included expanding a corporations' ability to employ new workers without providing them the full benefits package required under labour laws, resulting in the prevalence of irregular employment in Korea.

Given the disparity in working conditions between regular and irregular workers, the Economic and Social Development Commission in Korea began discussing legislation for protecting irregular workers with government representatives, employers, unions, and the public since 2001. The bill was then submitted to the National Assembly in 2004, however the actual laws intended to protect irregular workers could not be passed until late 2006. Business representatives strongly opposed the introduction of any regulation to restrict employers' discretion to employ at will and induce additional labour costs to employers. The original drafted bills were also met with considerable opposition from union representatives, to the extent that the bills were modified by reducing the government's original provisions on the use of irregular contracts by limiting the maximum irregular employment period from three years to two. In particular, the unions argued for the principle of "equal pay for work of equal value" and wanted temporary contracts to be allowed only for reasonable causes such as ability, types of tasks, and performance (Eun & Lee, 2009). The law soon after came into effect from mid-2007. This arguably sudden development provides a quasi-natural experiment setting, which affords an opportunity to study the effects of employment protection on the employment levels and share of irregular workers for each firm. New irregular contracts signed in July 2007 and onwards are subject to the new regulation of two-year maximum duration, while contracts signed earlier are regarded as signed on July 2007.

Before the law came into effect in 2007, fixed-term contracts were a major form of irregular employment in Korea, since firms could employ workers on irregular contracts indefinitely, and there were few restrictions on their use. Several reasons explain the rise in irregular employment as a share of wage employment (i.e. excluding the self-employed). One argument is that firms experiencing the competitive pressures of globalized markets and technological change need to hire low-cost labour and to manage workforces flexibly to continue business. EPL of regular workers was deemed too strict, while that of non-regular segments of the workforce had been de-regularized, and employing non-regular workers was increasingly becoming a means of adjusting to competitive pressures (ILO, 2010). According to a 2002 report from the Korean Labour Institute, which collects data on changes in human resource management practices, Korean firms increasingly hire under irregular contracts (Ahn, 2004). The main reasons cited were "more employment flexibility" and "lower labour costs". Moreover, manufacturing firms and large businesses gave primacy to workforce flexibility, while non-manufacturing firms and small and medium businesses stressed the role of labour costs.

Table 2. 2. Satisfaction of wages and job stability by form of employment

Pre-reform (<2007)					
(A)	Regular	Irregular	(B)	Regular	Irregular
Satisfaction of wages	work	work	Satisfaction of job stability	work	work
Very satisfied	0.7%	0.4%	Very satisfied	2.9%	0.5%
Satisfied	16.4%	8.5%	Satisfied	36.8%	12.6%
Neutral	45.2%	36.3%	Neutral	46.1%	40.9%
Dissatisfied	33.4%	45.4%	Dissatisfied	12.6%	37.5%
Very dissatisfied	4.3%	9.4%	Very dissatisfied	1.6%	8.5%
Post-reform (>2007)					
Very satisfied	0.8%	0.2%	Very satisfied	3.0%	0.4%
Satisfied	24.6%	13.5%	Satisfied	52.4%	18.9%
Neutral	52.2%	50.6%	Neutral	39.8%	57.1%
Dissatisfied	21.1%	33.0%	Dissatisfied	4.5%	22.1%
Very dissatisfied	1.3%	2.7%	Very dissatisfied	0.3%	1.5%

Source: KLIPS (1998-2016).

The law restricts the maximum duration of employing temporary workers to two years, i.e. irregular contracts must either be terminated before the irregular worker reaches the two-year tenure requirement only, or, be converted to permanent employee status after the two-year period. So, under this new law, firms are legally obliged to convert irregular workers into regular workers if they have been employed at one workplace for at least two years, i.e. they would now be entitled to full company employee benefits. Therefore, the reform is intended to convert irregular and dispatched workers to regular workers because their employment protection is increased after two years of employment, provided the contract is not terminated before the two years have passed. The reform also prohibits “discriminatory treatment” against irregular workers, unless for “justifiable reasons such as ability, types of tasks, and performance” (Baek & Park, 2018). Another purpose of this new policy was to reduce discrimination and exploitation of irregular employees, amid an increasing polarization of the labour market. Table 2.5 reports the satisfaction of wage and job stability in Panels A and B respectively by type of employment from 1998 to 2006 (pre-reform), and 2007 onwards (post-reform). Before the reform, 54.8% of the time, irregular workers are either dissatisfied or very dissatisfied with their wages, compared to 37.7% of the time for regular workers. In terms of job stability, 46% of the time irregular workers are dissatisfied or very dissatisfied with job stability, compared to only 14.2% for regular workers.

In the post-reform period, the share of irregular workers who are at least satisfied with their wage has increased from 8.9% in the pre-reform period to 13.7%, and the share dissatisfied or very dissatisfied with their wage falls from 54.8% to 35.7%. The share of irregular workers who are at least satisfied with job stability has increased from 13.1% to 19.3%, and the share dissatisfied or very dissatisfied with job stability has halved from 46% to 23.6%. Overall, the dissatisfaction of wages and job stability in irregular work has reduced. This suggests that despite the increasing share of irregular work among total wage employment, the policy on average was effective in one of its goals of improving the working conditions of irregular work, as stated in Article 8 Clause 1 of the Act on Protection of Fixed-Term Employees.

Importantly, there are different types of irregular workers in Korea. Fixed-term contract workers are those whose labour contracts last for a predetermined period. Temporary agency workers, also known as dispatched workers, are employed by temporary work agencies but work under the supervision of the user company. These two types of employment contracts are “protected” by the reform, such that the maximum duration of the contract is restricted to two years. Other types of temporary contracts are not protected. These are made up of part-time workers, subcontracted workers, casual (on-call) workers, and independent contractors. Irregular workers can also be directly hired by the firm or indirectly through a subcontracting company or dispatch agency. In contrast to directly hired labour, there is no substantial employment relationship between an indirectly hired worker and the user firm. Therefore, wage and social security liability will fall with the latter two bodies and not the firm. This also saves costs for firms since any risk of labour dispute is transferred to the subcontracting company or the agency, and therefore leaves dispatched workers in a more vulnerable position than direct hires. The coverage of the rules on prohibiting discrimination against irregular workers are given below in Table 2.6. Definitions of different employment contracts in Korea are given in Table 4.3 in chapter 4.

Table 2. 3. Coverage of irregular contracts under the reform

Protected		Unprotected			
Direct	Indirect	Direct	Indirect		
Fixed-term	Dispatched	Part-time	Sub-contracted	Casual	Special contractor

Source: Workplace Panel Survey Questionnaire.

This empirical setting is in contrast to the reduction of employment protection for irregular workers that occurred from 1996 to 2001 in nine European countries, where regulations regarding the frequency of fixed-term contracts were relaxed (Kahn, 2010). He shows that reforms that make it easier to hire fixed-term workers raises the likelihood that workers will be employed in these types of jobs. In addition, this effect is especially felt the higher the regional unemployment rate. He found no evidence that the overall size of employment increased. The European reforms intended to maintain the protection level of permanent workers, while incentivising firms to create temporary jobs which may eventually become permanent. However, such policies may instead simply encourage firms to substitute new temporary for new permanent jobs. Employers can be induced to fire irregular workers even if they are productive, since otherwise they would become permanently employed insiders, with higher firing costs. If this is so, the overall exit rate from jobs may increase, leading to higher turnover and higher equilibrium unemployment than before, thus undermining the advantages gained through increased flexibility for the firms (Blanchard & Landier, 2002; Cahuc & Postel-Vinay, 2002). Nevertheless, because temporary jobs pay lower wages, and may be less satisfying than permanent jobs, then reforms that encourage the creation of temporary jobs may not reduce unemployment (Booth et al. 2002; Kahn, 2007). So, like the effects of easing employment protection with regards to overall employment levels, the effect of increasing employment protection for irregular workers is also not theoretically clear because it is likely to affect the level of irregular and regular employment in offsetting ways. From 2007, the new law increased the cost of hiring irregular workers relative to regular workers. Therefore, one would expect the demand for irregular workers to decrease given the potential cost of having to convert these workers to regular contracts, and given the substitutability between these two workers in production. For this reason, the effect of the 2007 EPL on overall employment levels and workforce composition at the firm level warrants an empirical analysis.

2.3. Description of the 2007 Reform

As seen below in Table 2.2, irregular employment is associated with lower pay, job security and poorer working conditions than regular employment, an increase in irregular employment is possibly problematic socially and economically as it reinforces the segregation of the labour market. The increase in irregular employment may reflect an increase in employment opportunities in general, however, they may also imply considerable employment and income insecurity, and even the risk of alternating between short-term jobs and unemployment or inactivity. Furthermore, growth of irregular employment may lead to reduced investment by firms in their workers' human capital and increase wage and income dispersion (Grubb, Lee, & Tergeist, 2007). Irregular workers increasingly became a political issue, and consequently the Korean government legislated for the prohibition of discrimination against irregular workers in 2006, which was enforced in 2007. The law states that employers cannot discriminate against irregular workers due to their employment status, compared to regular workers doing the same or similar tasks.

Table 2. 4. Comparison of worker conditions by employment type

Pre-reform (1998-2006)	Regular work	Irregular work	Difference
Monthly wage (10,000)	152.9 (96.9)	88.0 (55.5)	64.9***
Unionized	25.9%	6.9%	19.0%***
Monthly tenure	65.3 (77.6)	29.8 (50.9)	35.5***
National pension	64.4%	15.1%	49.3%***
Health insurance	74.1%	17.3%	56.8%***
Accident compensation insurance	64.1%	18.7%	45.4%***
Unemployment insurance	67.6%	17.5%	50.1%***

Source: KLIPS data (1998-2006). Standard deviations in parentheses.

Table 2.5 Panel A shows the transition probabilities between every possible economic state for all working age respondents. Regular workers in year t have 86% probability of remaining in regular work at year $t+1$, and only 4% chance of moving into irregular employment, demonstrating the benefit of regular employment in terms of job security. Additionally, irregular workers are the most likely of all workers to end up in unemployment or inactivity, with 15% probability, compared to around 7% each for regular and self-employed. This lends evidence to the claim that irregular workers who usually have fixed-term contracts, experience less stable employment conditions. Unemployed people are also almost as likely to end up in regular employment as irregular employment, with probabilities of 23% and 20% respectively.

Panel B displays the transition probabilities for the younger respondents aged under 25. Panel C displays the transition probabilities for older respondents aged between 55 to 64, who are approaching or past the official retirement age of 60. Younger people in irregular work have 36% probability of becoming economically inactive, but they are also more likely to be attending education, which explains the high probability compared to the 13% probability for the corresponding transition in Panel A and C. Younger irregular workers who have a longer career ahead of them have 15% probability of transitioning to regular employment, compared to 4% for older workers. It may not make sense for employers to make irregular employees regular when they are close to or past the retirement age. Younger workers are also only 42% likely to remain in irregular work, compared to 79% for older workers. In terms of moving out of unemployment, younger and older unemployed have similar probabilities of moving into either form of wage employment (regular and irregular), at around 35%. However, the distribution of form of wage employment at $t+1$ differs by age group. Younger unemployed people are 21% (15%) likely to enter regular (irregular) work. In contrast, older unemployed people are 10% (23%) likely to enter regular (irregular) employment.

Table 2. 5. Transition probabilities of survey respondents

Panel A		<65					
		T+1 state					
T state		Regular	Irregular	Self-employed	Inactive	Unemployed	Total
	Regular	85.81%	4.02%	2.30%	6.15%	1.71%	48,330
	Irregular	9.67%	71.91%	2.79%	13.15%	2.47%	22,125
	Self-Employed	2.55%	2.41%	88.05%	6.12%	0.88%	25,685
	Inactive	5.48%	5.91%	2.09%	84.41%	2.11%	74,375
	Unemployed	22.92%	19.70%	5.49%	38.25%	13.65%	4,411
		49,359	23,740	26,141	71,920	3,766	174,926
		28.22%	13.57%	14.94%	41.11%	2.15%	100%
Panel B		<25					
		T+1 state					
T state		Regular	Irregular	Self-employed	Inactive	Unemployed	Total
	Regular	72.65%	6.98%	0.70%	15.55%	4.11%	1,704
	Irregular	15.11%	42.20%	1.64%	36.21%	4.85%	1,403
	Self-Employed	4.77%	7.95%	42.05%	31.82%	3.41%	88
	Inactive	4.66%	5.32%	0.25%	87.72%	2.05%	22,030
	Unemployed	20.75%	14.97%	0.51%	51.36%	12.41%	558
		2,611	1,979	130	20,427	666	25,813
		10.12%	7.67%	0.50%	79.13%	2.58%	100%
Panel C		55 - 64					
		T+1 state					
T state		Regular	Irregular	Self-Employed	Inactive	Unemployed	Total
	Regular	77.33%	7.94%	2.17%	10.79%	1.77%	3,503
	Irregular	3.93%	78.94%	1.88%	13.12%	2.12%	4,146
	Self-Employed	0.58%	1.80%	90.76%	6.43%	0.43%	5,877
	Inactive	1.26%	4.22%	2.12%	91.39%	1.01%	12,500
	Unemployed	10.17%	23.40%	4.73%	51.06%	10.64%	423
		3,106	4,284	5,773	12,940	346	26,499
		11.74%	16.20%	21.83%	48.92%	1.31%	100%

Source: KLIPS (1998-2016).

Figure 2.4 shows that younger and older non-regular workers make up a larger share of all young and old wage workers than do the middle aged, such that the age distribution of share of irregular employment takes a U-shape. The elderly in Korea often engage in irregular work because employers appear reluctant to retain older regular workers beyond a certain age, often as low as 55. It is common practice among firms in Korea to set a mandatory age of retirement below the official retirement age of 60, which is the recommended age under the Aged Employment Promotion Act (IBM, 2008). Wages and benefits such as retirement allowance increase steeply with tenure (IMF, 2018), pushing the elderly to work in irregular jobs. In addition, Korea's pension scheme was only introduced relatively recently (1988), compared to other democratic countries. As a result, the pension scheme has not reached full maturity, forcing the elderly to continue working. Half of the population aged 65 and over live in relative poverty, compared to an OECD average of 13%. Young workers are also disproportionately affected by irregular work. This may be due to the fact they are more willing to engage in irregular work simply because they lack the necessary experience to obtain a permanent position, or because they are likely to be in education at the same time. On the demand side, there is higher uncertainty regarding skills and productivity of younger workers.

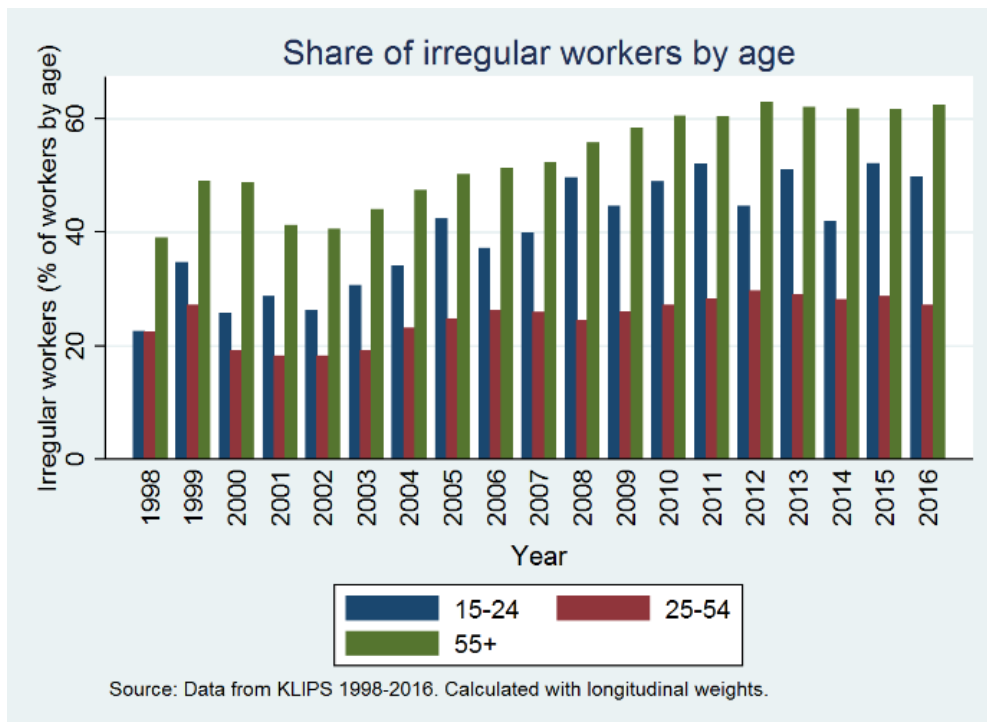


Figure 2. 4. Irregular workers as a share of all wage workers by age group.

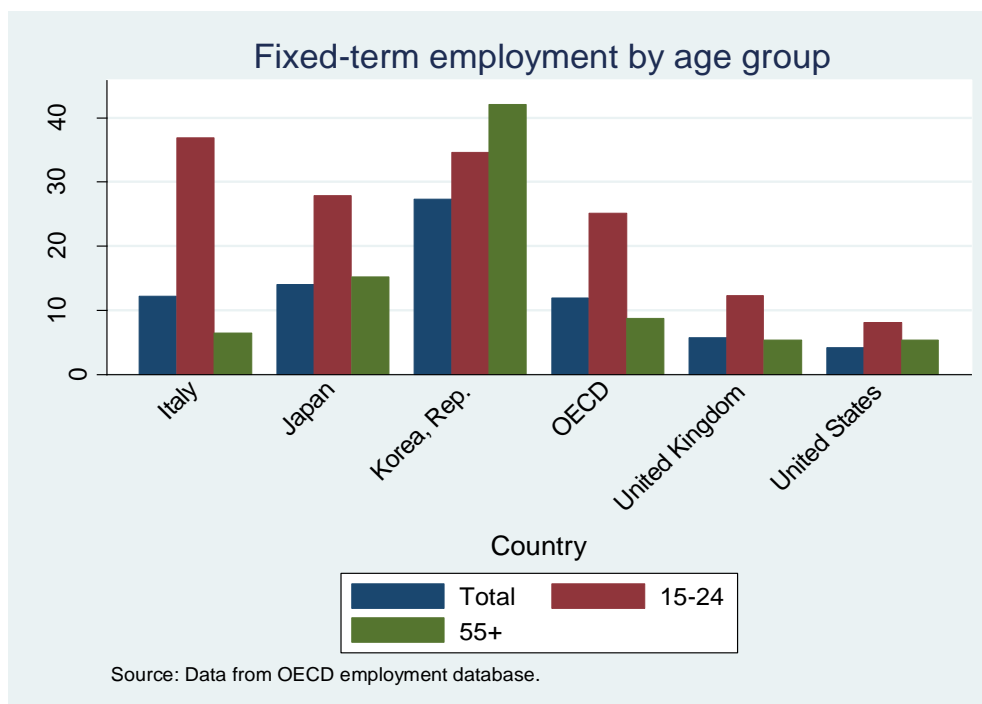


Figure 2. 5. Incidence of fixed-term work among age groups in selected OECD countries.

Figure 2.5 aims to provide context of the prevalence of fixed-term work among age groups in Korea compared to the OECD. It shows that in Korea, the share of all workers in fixed-term work among all workers, and the share of older fixed-term workers as a proportion of all older wage workers appear to be an outlier. Table 2.4 shows the distribution of wage employment by age groups. Column (1) shows that 28% of the youngest workers are in irregular employment, and this may be because they are more willing to engage in irregular work because of inexperience, or they are in education at the same time. As the age group gets older from 25 to 35 year olds, the share in irregular wage employment also increases. Only in this age group is the proportion of irregular employment among wage employment less than 25%. This prevalence of irregular workers among wage workers partly led to the introduction of the irregular worker protection law in 2007.

Figure 2.5 also shows that over time, the proportion of younger workers in irregular employment among all younger workers in wage employment has increased over time. Table 2.4 shows the average transition probabilities between states, and Table 2.4 shows the distribution of wage employment by age group. However, neither of these take into account the form of employment of the first job, and therefore do not consider the fact that younger people may be more likely to initially enter into irregular work. Table 2.5 uses data from the prospective work history dataset, and shows that for all working age people, the distribution of wage employment in the first wage job is similar in both the pre-reform and post-reform period. However, looking at the younger workers, the probability of an irregular first wage job is 11 percentage points higher in the post-reform period. Therefore, the overall increase in irregular wage employment as a proportion of wage employment may be explained by two factors. Firstly, older workers are likely to be engaged in irregular work because the lack of a fully matured pension system forces them to work beyond the mandatory retirement age. Secondly, younger workers seem to be more willing to accept irregular work in the post-reform period, and this may be because certain irregular jobs now have the potential to become permanent, whereas before the reform, there was no limit on the employment duration or renewals of the irregular contract.

Table 2. 6. Distribution of wage employment by age group

	(1) 15-24	(2) 25-35	(3) 35-45	(4) 45-55	(5) 55-64
Regular	72%	84%	74%	0.68	0.57
Irregular	28%	16%	26%	0.32	0.43
N	4,021	11,570	10,069	6,661	2,797

Source: KLIPS (1998-2006).

Table 2. 7. Distribution of wage employment in first job

	Pre-reform		Post-reform	
	15-24	<65	15-24	<65
Regular in first job	58.7%	77.9%	47.7%	76.8%
Irregular in first job	41.3%	22.1%	52.3%	23.2%
N	3,423	13,677	2,324	14,070

Source: KLIPS retrospective work history data.

I examine the impact of the 2007 irregular employment reform in Korea using panel data at the individual and firm level, both provided by the Korean Labour Institute. For the microdata, I use 19 waves (years) from 1998 to 2016 from the KLIPS (Korean Labour & Income Panel Study). For the firm-level data, I use 5 waves (every 2 years) of biennial data from the Workplace Panel Survey (WPS) from 2005 to 2013. This reform imposed a new regulation on non-regular contracts by shortening the maximum duration of non-regular employment contracts from an unspecified length to two years. So, under the new law, an irregular contract should be either converted into a regular permanent contract or dismissed with no costs within two years of the contract being signed. Another aim of the law is reducing the discrepancy in labour conditions between irregular and regular workers in terms of wage, and social insurance coverage, for similar and the same kind of work. The relevant laws to protect irregular workers were passed in December 2006, and came into effect from July 2007. This arguably sudden exogenous shock provides us with a quasi-natural experiment setting, and therefore an opportunity to study the effects of employment protection on the employment status of workers.

The 2007 Korean reform is an interesting case study for exploring the employment consequences of EPL for another reason. As a way of fighting labour market rigidities and avoiding the practical and political difficulties that come with changing (especially reducing) the protection level of permanent workers, recent policies have often relied on fixed-term contracts that are subject to lower dismissal costs when aiming to change the overall employment protection level in a country. Therefore, consequences of varying the protection level of fixed-term workers on the labour market are likely to be a more relevant policy issue than consequences of changing protection for regular workers. Existing literature specifically on within-country variation on the protection level of fixed-term workers is rare, and the case of Korea offers an opportunity to do so. Moreover, previous empirical studies have examined the impacts of employment protection when a country reduces the overall protection level by introducing temporary contracts in the labour market. In contrast, the Korean reform aimed to increase protection for irregular workers, whilst leaving the protection level of regular workers almost unchanged.

CHAPTER 3 Temporary Employment Protection Legislation. Microdata Evidence from South Korea.

In Chapter 3, I examine the impact of the Korean 2007 employment reform on transition probabilities and wages using individual-level panel data. To the best of my knowledge, this is the first study to look at the impact of this particular reform using individual-level panel data. Utilising a panel allows me to examine individual transitions between employment states, so I can see if the reform was successful in moving irregular workers into regular work, and also if it increased flows into unemployment or cycles between different irregular jobs. In this paper, I apply a difference-in-difference framework on the KLIPS panel data using fixed-effects estimation with a linear probability model to analyse the effect of the 2007 reform on the probability of employment. There exists one potential caveat of inferring that any changes in employment probability are due to the policy alone. As the reform was introduced in mid-2007, some part of the post-reform period coincides with the beginning of the global financial crisis that started from the end of 2007. This is partially taken into account with the assumption that the recession equally affects workers equally younger and older than the age cutoff. The reform does not apply to irregular workers aged older than 55, allowing me to construct clear treated and control groups. Therefore, in an approach similar to that of Yoo & Kang (2012), I define treatment and control groups around the age-55 cutoff, but with larger age windows for the purpose of sample size, where the workers are aged 46 to 55, and 56 to 64 respectively. The outline of the rest of the chapter is as follows. Section 3.1 motivates the research question with reference to the literature. Section 3.2 describes the data. Section 3.3 compares the characteristics of irregular and regular workers. Section 3.4 provides the wage equation results. Section 3.5 provides the empirical models and the transition results. Section 3.6 present the wage growth results. Section 3.7 concludes.

3.1. Introduction

There is continued interest in the relationship between employment protection and labour market performance. The impacts of EPL on labour market flows are theoretically clear and empirically established (Kugler, 2007). However, the impacts of legislation on overall employment and unemployment levels are much less conclusive both theoretically and empirically (Bentolila & Bertola, 1990; Bertola, 1990, 1992; Pissarides, 2001; Blanchard & Landier, 2002; Cahuc & Postel-Vinay, 2002). The volume of overall employment (stock variables) is affected by the relative magnitudes of hiring and firing (flow variables). If theory predicts that introducing EPL reduces firing more (less) than it reduces hiring, then overall employment is expected to increase (decrease). The varying theories predict various magnitudes of the changes in hiring and firing, such that the impact of EPL on overall employment is not theoretically robust. Therefore, this issue lends itself to empirical analysis.

There is a large body of theoretical and empirical literature that examines the effects of permanent employment protection on the labour market. Theoretical models suggest that easing the creation of temporary jobs increases their relative incidence, however the impact on the size of total employment in the labour market is ambiguous.

Theoretical Models

The ambiguity comes from the opposing forces of the reduced cost of offering employment on one hand, and a higher exit rate from employment on the other hand (Blanchard & Landier 2002; Cahuc & Postel-Vinay 2002). Blanchard and Landier (2002) use data for French workers to find these perverse effects of allowing firms to hire on fixed-term contracts. The

reforms led to a higher turnover in fixed-term jobs without a significant reduction in unemployment duration, instead leading to higher unemployment. Cahuc and Postel-Vinay (2002) employ a matching model and show that while introducing temporary jobs increases both job creation and job destruction, it is eventually likely to raise unemployment and to reduce labour market efficiency as long as there are high firing costs for permanent workers.

Lowering of firing costs from permanent jobs also has theoretically ambiguous effects on employment and permanent employment: on the one hand, again such reforms lower the cost of offering permanent jobs; on the other hand, they make it easier to fire workers from permanent jobs, lowering employment and the relative incidence of permanent jobs. The effects of a less stringent employment protection implies that employee turnover is increased, since flows both into and out of firms are larger, with one consequence being that average job durations and tenures are shorter than in countries with greater employment protection. Bertola et al (1999) find the net effect on employment and unemployment to be theoretically indeterminate, depending on which of the two flows dominate.

Much work in the macroeconomics of EPL is built on matching models with rents split by Nash bargaining, implying differing wages for insiders and outsiders because of differing outside options, with only insiders protected by firing costs. Reducing firing costs from permanent jobs also has theoretically ambiguous effects on total and permanent employment. Garibaldi & Violante (2005) find again that the impact is ambiguous. Whilst the cost of offering permanent employment is now lower, on the other hand it is also easier to fire these permanent workers, lowering total employment and the relative incidence of permanent jobs. They show the impact of severance payments depends on the wage rigidity. If entry wages are not responsive to EPL (possibly due to minimum wages), severance payments may increase unemployment, whereas if entry wages are flexible, EPL decreases unemployment even in the presence of rigid insider wages (possibly due to union bargaining). Guell (2000) use an efficiency wage framework where work effort can only be imperfectly monitored to show that severance payments increase insider wages in equilibrium. The transfer reduces the opportunity cost of unemployment and thus the punishment for shirking. Consequently, demand for labour falls and firms increase wages to restore the incentive to work.

Empirical Models

On the empirical side, several authors have estimated the impact of recent reforms in employment protection systems in Europe or Latin America, with most analyses focusing on a specific country. In some of these cases, reforms were targeted at subgroups in the labour force, providing researchers with a natural experiment in which outcomes can be compared across subgroups. For example, the Spanish reforms of 1997 reduced dismissal costs for permanent jobs for workers under 30 years old and for those over 45 years old but not for those ages 30–44. Kugler et al., (2005) found that reduced payroll taxes and dismissal costs increased employment of young workers on permanent contracts, but had no effect for older workers. There are also positive effects on transitions from unemployment and temporary employment for young and older workers. By contrast, transitions from permanent employment to non-employment increased for older workers, suggesting the overall impact of the reform on dismissals was small. Similarly, in Colombia in 1990, dismissal costs were lowered for jobs in the formal sector but not for the informal sector. Kugler (1999) finds a net decrease in unemployment due to increase in hazard rates into and out of unemployment in the formal sector relative to the informal sector. Going in the opposite direction (i.e., increasing employment protection), the UK in 1999 reduced the probation period during which workers may not sue for unfair dismissal from two years to one year. Marinescu (2007) develops a model assuming that firms learn about match quality over time. The model predicts that after the reform, firms recruit workers more carefully, such that the hazard of firing workers between one and two years tenure decreases relative to beyond two years. Consistent

with higher match quality, low tenure workers were more likely to receive training post reform, but the reform had no significant impact on unemployment duration, wages, or employment.

Similarly to the theoretical predictions, studies on the impact of an increase in employment protection on total employment is an ongoing topic of debate among economists, resulting in a large body of empirical evidence from industrialized countries. The following works study the long-term impacts of the presence of irregular contracts on the labour market. Given that reducing the protection level of permanent workers will often be faced with heavy political opposition, many countries introduced temporary contracts subject to lower dismissal costs to counter against the rigidities of the labour market. The rationale is that liberalizing part of the labour market enhances overall flexibility, but Blanchard & Landier (2002); Nunziata & Staffolani (2007), all find that introducing temporary contracts in the labour market raises the number of workers in irregular jobs, whereas it reduces the probability of workers finding themselves in permanent work. This is because the conversion rate from temporary to permanent employment is now lower, or there is a reduction in workers moving directly into permanent jobs. Subsequently, the total effect may not necessarily be an increase in the size of total employment. Blanchard & Landier (2002) use a dynamic model and argue that a partial reform of employment protection that allows firms to hire workers on temporary contracts may result in increased, rather than reduced unemployment. Even if unemployment comes down, workers may be worse off, going through many spells of unemployment and fixed duration jobs, before finding regular work. While increasing turnover rates of entry-level jobs, the reform also decreases by a larger amount the rate of promotion of temporary workers into permanent positions. Using a dynamic labour demand model, Nunziata & Staffolani (2007) examine how changes in the protection level of temporary and permanent jobs affect the levels of total, temporary, and permanent employment. While a marginal change in the protection level of temporary employment increases temporary employment, on the other hand it reduces permanent employment, leaving an ambiguous net change on total employment.

Whilst the aforementioned studies deal with the long-term impact of introducing irregular contracts into the labour market, Boeri & Garibaldi (2007) examine only the short-term impacts. They argue that an immediate consequence of a reform such as this is an increase in total employment in because it instantly enhances labour market flexibility and increases irregular employment, as destruction of permanent jobs happens in the longer run. Booth et al (2002) use data on the labour market for 14 EU countries in the 1980s and 1990s, to examine the relationships between a country's degree of employment protection strictness for irregular and regular employment and a share of irregular workers among all workers. They find a strong positive correlation between stringent protection of permanent employment and the incidence of temporary employment, but a weak association between protection of temporary employment and the incidence of temporary employment. Blanchard & Wolfers (2000), Heckman & Pages-Serra (2000), and Nickell (1997) find that employment protection regulations have effects on employment adjustment, worker turnover, employment, or unemployment, while Baccaro & Rei (2007), and Garibaldi & Violante (2005), find no evidence of such effects. They exploit variation in the stringency of employment protection between countries to identify their effects. The mixed results in these OECD studies are generally representative of the state of research among these studies that use cross-country aggregate data.

As a result of the varied findings based on aggregate data, this makes it more difficult to argue in support of the existence of a robust relationship between employment protection and total employment or unemployment. The clearest results appear to be that flows into and out of employment and unemployment diminish, and young workers are worst affected. In general, the main issue of cross-country studies is the low variation in employment protection within countries, as well as endogeneity from reverse causation, due to the possibility that the state of the labour market may affect employment

protection. Despite these drawbacks of cross-country studies with aggregated data, they can account for general equilibrium effects, whereas it is more difficult for equilibrium effects to be derived in studies using disaggregated data.

A number of studies explore the effects of EPL with regards to temporary employment, which has been the most common kind of employment protection reform in European countries. Bentolila & Dolado (1994) find that a relaxation in the regulations concerning temporary employment results in higher wages for permanent workers in Spain and several other European countries, where regulations for permanent workers have been particularly stringent. Boeri & Garibaldi (2007) also study the effect of liberalization of temporary employment contracts in Italy, with their results suggesting employment temporarily increased following a reduction in protection of temporary employment. Autor (2003) uses U.S. data and finds that temporary help agencies rapidly increased their share of outsourced labour following an increase in the level of permanent employment protection in some states.

Earlier studies have investigated the employment consequences of EPL using cross-country data (Bertola, 1990; Lazear, 1990; Booth et al., 2002). However, the ability to disentangle the impact of the legislation from that of other determinants on a country's overall employment is limited. For example, countries that have strict EPL tend to have other institutional arrangements that are also likely to affect employment (e.g., favourable unemployment insurances, minimum wages, and taxes). Unless analysis nets out these observable and unobservable confounding determinants, the estimates are subject to bias. To overcome these difficulties, more recent research exploits within-country variation in the degree of employment protection to estimate the impact of EPL (Kugler et al., 2003; Autor et al., 2006; Kugler & Pica, 2008; Marinescu, 2009; Kahn, 2010).

Contribution to Literature

I complement the within-country literature by studying the effect of a recent Korean labour reform, intended to protect irregular (fixed-term) workers, on employment transition probability and also wages (neither are looked at by Yoo & Kang (2012)). Implemented in 2007, the reform imposed a new regulation on irregular contracts by reducing the maximum duration of employing irregular workers from an indefinite period to two years maximum, leaving the protection level of regular (permanent) workers unchanged. Therefore, an irregular contract should be either converted into a regular contract or dismissed with no costs within two years after signing. Discussions on increasing protection for irregular workers first began since 2001, with the relevant laws finally passing in November 2006 and put into effect in July 2007, only eight months afterwards. This arguably sudden development provides a quasi-natural experiment, which provides me the opportunity to study the effect of the reform on employment transition and wages.

To the best of my knowledge, Yoo & Kang (2012), is the only other study to quantify the effect of the 2007 labour market reform at the worker-level. They use Korean monthly cross-sectional microdata from the Economically Active Population Survey over March 2007 to December 2009. Using difference-in-differences estimation with a linear probability model based on the policy-designed age-55 cutoff, they find the reform exerts a negative impact on both irregular and total employment at first, but that the effects fade away after two years, thus taking a U-shape in the post-reform period. However, the impact on regular employment is positive two years after the reform. In the short-run at least, increasing employment protection for irregular workers comes at the cost of reduced levels of employment. I take a different approach in Chapter 3, using an annual individual-level panel dataset for 1998 to 2016, namely from the KLIPS (Korean Labour & Income Panel Study). The KLIPS is the only longitudinal Korean survey of the labour market, and income activities of

households and individuals residing in urban areas. As the survey follows individuals over time, it is possible to track their form of employment after the implementation of the employment protection, and thus to see whether the policy affects the transition probabilities of workers between economic activity states.

3.2. KLIPS Data

The data used for the analysis at the individual level is from the Korean Labour and Income Panel Study (KLIPS). The KLIPS is an annual longitudinal survey of nationally representative households in Korea and their individual members, aged 15 and older. The study started in 1998 with 5,000 households and 13,783 individuals, and all members of a given sampled household are observed in the data. It is conducted by the government-sponsored research institute, the Korean Labour Institute (KLI), and is currently the only Korean domestic panel survey on labour-related issues, making it a useful data source for microeconomic analysis of labour market activities and transitions between economic activity states, and provides users of the data with an empirical foundation for analysing the dynamic aspects of the Korean labour market. The other existing Korean micro-level surveys on economic and labour market activities are all cross-sectional surveys of populations. Therefore, this limits in-depth analytic studies of labour force supply and mobility, including schooling and school-to-work transition of youth, job mobility and labour market transition processes, unemployment experiences, job training and education, working conditions and welfare, childcare and female labour force participation, income and consumption, health and retirement. Hence, KLIPS was introduced with the objective of filling in these data gaps in academic and policy studies of economic and labour market activities of individuals and households.

Merging the individual and household datasets and appending all 19 currently available survey waves (1998-2016) results in an unbalanced panel dataset of over 240,000 observations and over 23,800 individuals. KLIPS is a nationally representative longitudinal survey of labour market and income activities of urban Korean households, modelled after the National Longitudinal Surveys (NLS) and the Panel Study of Income Dynamics (PSID) in the U.S. The data satisfies international standards, with a retention rate of 76% of the original sample after 10 years, compared to 78% in the US PSID and 77% in the BHPS. Therefore, this reduces concerns of potential biases caused by sample attrition. Another benefit of the KLIPS dataset is that if an original household member leaves the household and moves into another household, such that they form a branched household, they are still tracked and surveyed. The sample is an equal probability sample of households from seven metropolitan cities and urban areas in eight provinces. However, one of the limitations of KLIPS is that it is not fully representative since it only includes urban households and not rural households.

The KLIPS data is overall a useful resource for the purpose of this paper, due to the rich variety of information such as household demographics, marital status, extent of education, labour market mobility, form of employment, union membership, industry and occupation, income, work hours, the extent of social insurance coverage in their main job, and job history. In the survey, salaried individuals subjectively declare their employment status in the job from regular, temporary, and daily work. Those who choose temporary or daily work are classed as irregular workers, while those who choose regular work are regular workers. The panel structure of the survey allows me to control for time-invariant unobservable heterogeneity (individual effects), and therefore permits more accurate understanding of the economic outcomes of individuals in response to changes in the environment such as government policies, like the 2007 Irregular Workers Protection Law. In addition, panel data is helpful for estimating the impact of such reforms since it also allows me to control for composition effects such as period-specific, and cohort effects. For instance, groups in the labour force that typically work disproportionately in irregular work may be increasing their labour force share at the same time as

reforms being enacted. If so, then comparisons of the incidence of irregular work before and after reforms may confound these compositional effects with the true effects of the reforms (Kahn, 2010).

3.3. Comparison of Worker Characteristics

Table 3.1 summarizes the various characteristics of workers in regular and non-regular wage employment. When examining the most representative working conditions, such as working hours and wages, it can be seen that irregular workers only earn around 60% of the wage level of regular workers, with an average monthly wage of 0.88 million won compared to 1.52 million won, not controlling for factors that can explain the gap. Moreover, the average working hours per week of an irregular employee is 47.8 hours compared to 49.8 for regular workers. Both types of workers also work similar average weekly overtime hours, although the difference is only statistically significant at the 10% level. Overtime pay as a percentage of monthly pay is higher for irregular (17.11%) than regular workers (11.7%), which is expected given the higher average monthly wage of regular workers.

Table 3. 1. Comparison of worker characteristics

Pre-reform (1998-2006)	Regular work	Irregular work	Difference
Monthly wage (10,000 won)	152.9 (96.9)	88.0 (55.5)	64.9***
Monthly overtime wage	17.9 (16.1)	15.1 (14.7)	2.8***
Weekly work hours	49.7 (12.2)	47.8 (17.4)	1.9***
Weekly overtime work hours	8.5 (6.9)	7.8 (8.0)	0.7*
Male	64.4%	50.0%	14.4%***
Unionized	25.9%	6.9%	19.0%***
Monthly tenure	65.3 (77.6)	29.8 (50.9)	35.5***
National pension	64.4%	15.1%	49.3%***
Health insurance	74.1%	17.3%	56.8%***
Accident compensation insurance	64.1%	18.7%	45.4%***
Unemployment insurance	67.6%	17.5%	50.1%***
Lower secondary or below	16.3%	41.6%	-25.3%***
Upper secondary or college	53.2%	44.7%	8.5%***
University or above	30.4%	13.5%	16.9%***

Source: KLIPS data (1998-2016). Standard deviations in parentheses. The null hypothesis is that the difference in means is equal to zero. *** p<0.01, ** p<0.05, * p<0.1.

As for gender, men and women account for irregular employment equally, however men comprise the larger proportion of regular employment at 64%. There are several possible reasons why women appear to be affected disproportionately by irregular work. Korea's female labour force participation rate is low at around 50%, compared to 61% in the OECD (OECD, 2006), as women tend to leave the labour force after childbearing. This is due to low flexibility of regular employment, which often demands an uninterrupted employment relationship when childcare is mostly shouldered by women. If they return to work after raising children, they can often only obtain irregular employment, but it may be also be voluntary as irregular work provides more time to take care of children (IMF, 2018). The data also shows that workers in regular employment, who do not have a predetermined end date to employment, have more months of tenure than do irregular workers, with an average tenure of 65 months in the current workplace compared to 30. In the regular sector, the unionization rate at 26% is much higher than the overall unionization rate of 10% in the Korean labour market, and this is also very much higher than the unionization rate of 7% in the informal sector. By OECD standards, union density overall in Korea is low compared to the OECD average of 20% in 2011, with only Turkey having a lower membership rate at 6%.

Not only do irregular workers earn lower wages than regular workers despite the similar work hours, they are also often subject to insecure work conditions and receive limited social benefits and statutory protection. Table 3.1 shows that employment protection coverage of the four major insurance schemes is much lower for irregular workers than regular workers. For instance, 64% of regular workers contribute to the national pension scheme, whereas this figure is only 15% for irregular workers. For these reasons, irregular jobs are generally classified as “bad jobs” (Kalleberg et al, 2000). The level of irregular work in Korea is an anomaly compared to most other OECD countries. For example, in 2006 the percentage of irregular workers out of wage and salary workers was 25.3% in Korea compared to the OECD average of 12.2%, exceeded only by Poland (27.3%) and Spain (34%).

Educational attainment has been categorized into three tiers. Lower secondary or below, where lower secondary school (ages 12-15) is the last stage of compulsory education. Students can then either continue to upper secondary school for another three years if they wish to attend university or go to a vocational or technical college for two years. The last category is university graduate or above. First, the largest proportion of regular workers attained upper secondary or college education, at 53%. University graduates account for 30% of regular employment, followed by 16% who only attained up to lower secondary education or below. Meanwhile, 41% of irregular workers have only completed up to lower secondary education, and only 13% of irregular workers are university graduates. There is a substantial difference between regular and irregular employment in terms of job matching according to the level of attained education.

Figures 3.1 and 3.2 provide information on the regularity of work in the different industries and occupations, classified using the 2007 KSIC and KSCO codes (Korean Statistical Industrial and Occupations Classification). Figure 3.1 displays the extent of regular employment in each industry. Irregular employment is more prevalent in agriculture, construction, and, hotels and restaurants. This may be because some industries, such as construction, experience large seasonal fluctuations in output, therefore irregular contracts may be more common. In addition, the presence of often labour-intensive and smaller firms in hotels and restaurants may explain the prevalence of irregular employment in these industries, and/or it may be because these industries, like construction, also tend to experience seasonal fluctuations in output. The degree of regular work in each occupation is summarized in Figure 3.2. Between 80% to 90% of workers in high-skilled occupations; such as managers, professionals and clerks, as well as machinery operators (medium), work more in regular employment, while services, sales workers, and those in skilled trades, agricultural and elementary occupations tend much more to be in irregular employment.

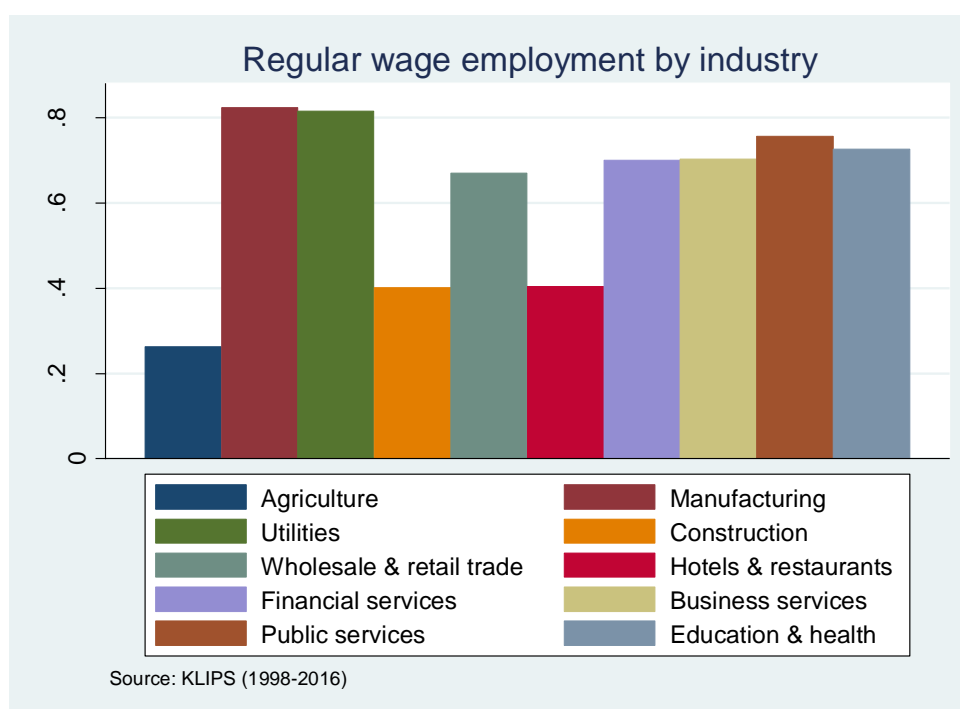


Figure 3. 1. Proportion of regular wage employment within industry

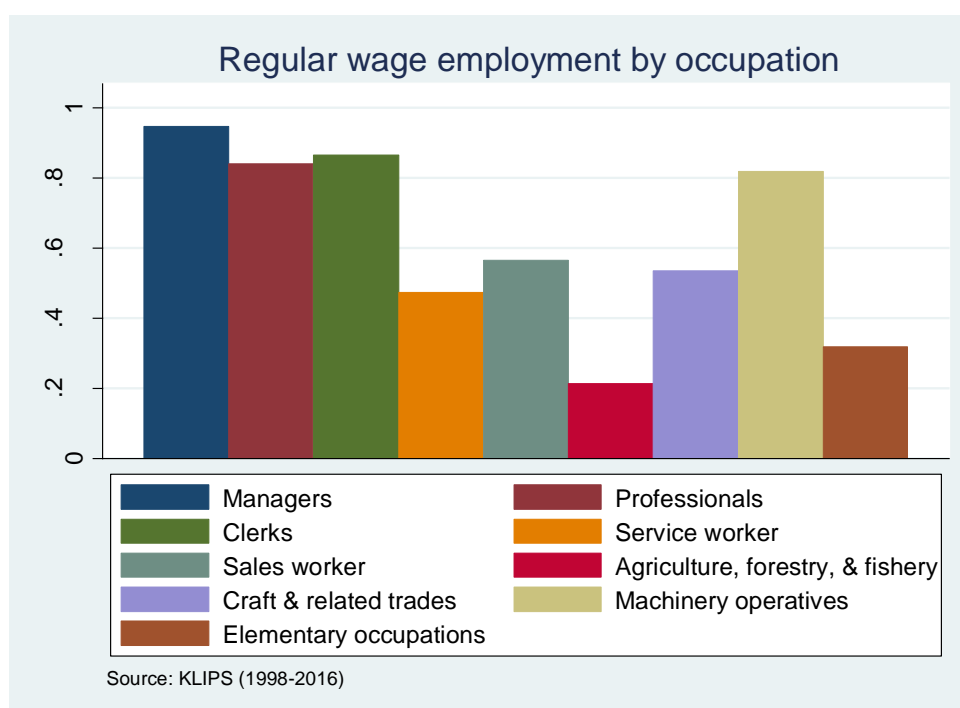


Figure 3. 2. Proportion of regular wage employment within occupation

Figure 3.3 gives a picture of the sectoral composition of employment in Korea and shows the wage employment by sector over time. On the left Y axis is the number of wage employed in each sector, and the right Y axis is the % of wage employed among all wage employed by sector. The industrial sector is the largest employer in terms of numbers and also as a share

of the wage employed. However, the share of wage employed in this sector among all wage employed has fallen from 50% in 1998 to 41% In 2016. The number of employed in retail trade and hospitality; and finance, business, and education services has doubled over the 19 years. The proportion of wage employed in retail trade and hospitality has remained almost constant at around 18% throughout the period. The proportion of wage employed in financial and business services has increased from 28% to 35% in 19 years.

Figure 3.4 shows irregular employment as a proportion of wage employment within sector. On average, irregular employment as a share of total wage employment has almost doubled from 22% to 37%. Regarding the industrial sector, the number employed has slowly increased over time, and with it so has the proportion of irregular work in the sector, from 23% to 30%. According to the Labour Ministry in 2016, industrial and retail industry firms are more prone to hire irregular workers, including indirectly through outsourcing. Retail trade and hospitality has the largest proportion of irregular employment among all wage employment, and the proportion in financial services, and public services has also increased over time. Since 2007, the year the reform was enforced, the proportion of irregular wage employment in the industrial sector has remained almost constant at around 30%. Due to these differences across sectors, I run the analysis separately by industry, as well as for the whole labour market. The increasing share of irregular employment within sector since the early 2000s highlights overall the country's issue with low job security and low job quality. Moon Jae-in (president of Korea since 2017) has since placed a top priority on creating “high-quality” jobs and reducing the share of irregular jobs.

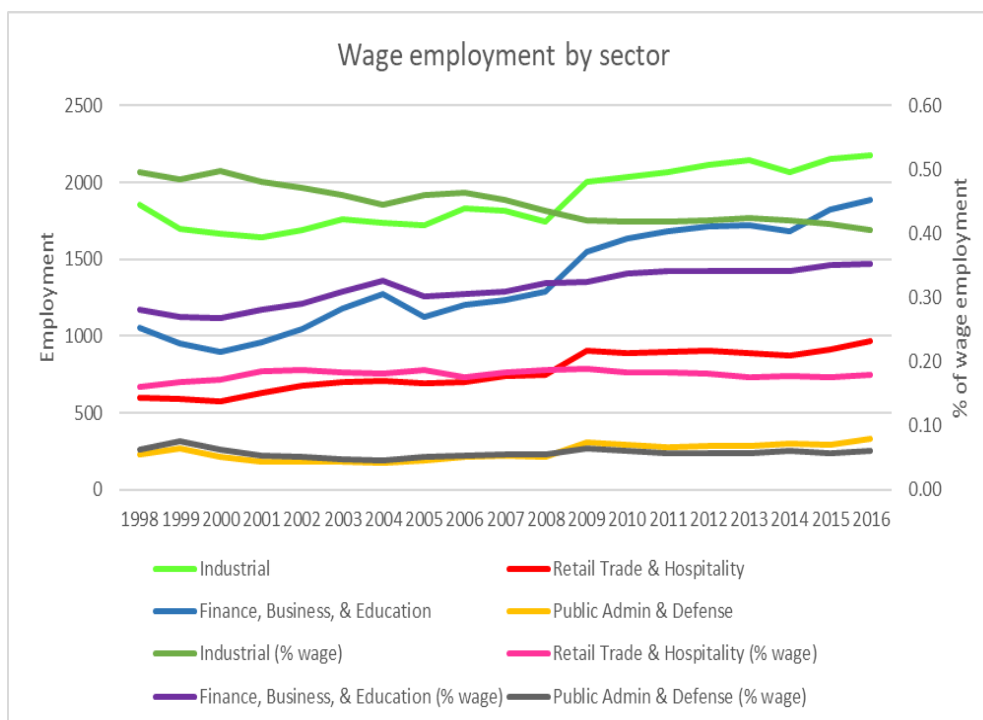


Figure 3. 3. Wage employment numbers and shares, by sector. Data from KLIPS.

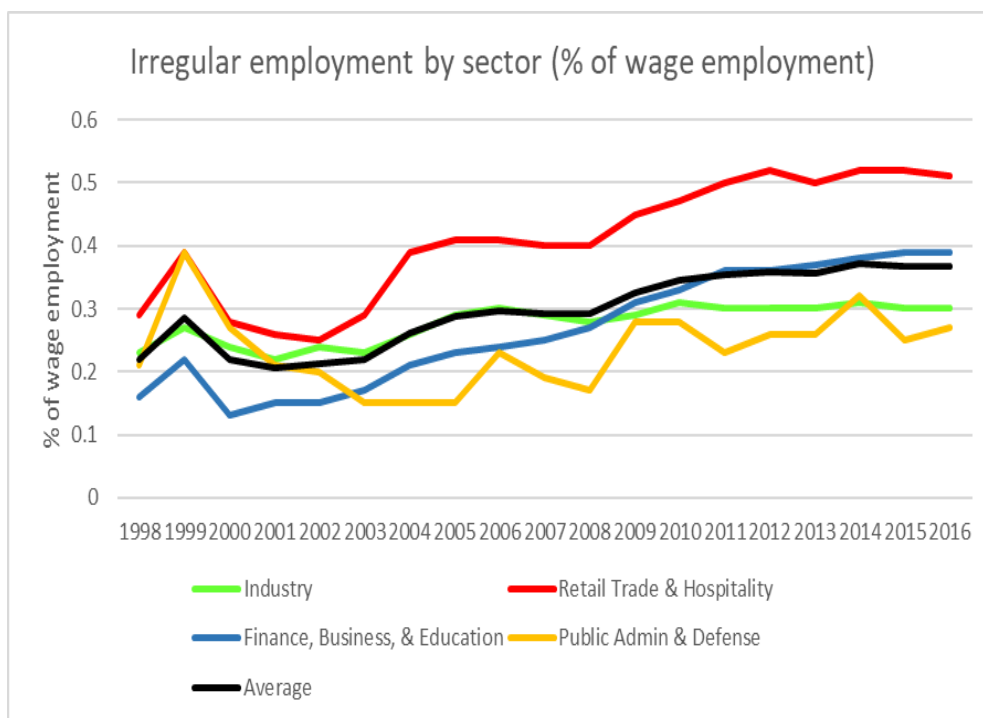


Figure 3. 4. Irregular wage employment as a share of wage employment within sector. Data from KLIPS.

Table 3.2 displays the distribution of workers always in regular or always in irregular work by industry. Manufacturing makes up 30% of workers that are always in a regular position for all the years they are surveyed. The heavily unionized and regulated nature of the industry may mean that irregular contracts are not so prevalent in manufacturing. This is followed by education, health, and social services, which make up 17% of workers that are always regular. On the other hand, construction makes up almost 70% of workers always in irregular employment, by far the biggest share. A 2004 International Labour Organization report discussed the extreme employment instability construction workers in Korea faced. These workers already living with precarious employment conditions were the group most severely impacted by insecurity after the Asian financial crisis of 1997/98 and subsequent IMF bailout. In general, Korean unemployment insurance does not apply to workers on short term contracts, which are commonplace in construction, and so, many temporary and daily hire construction workers are excluded from employment insurance. Many construction projects have pre-determined completion dates which means workers are likely to be offered an irregular contract. The fact that construction is also more prone to seasonal fluctuations in output may explain the prevalence of irregular contracts in this industry. Wholesale retail trade, and hospitality services are also cyclical industries, and combined make up almost 9% of workers who are always in irregular employment.

Table 3. 2. Industry distribution of workers always in regular and always in irregular employment

Industry	Always regular	Always irregular
Agriculture	0.06%	0%
Manufacturing	30.47%	6.80%
Electricity, transport & telecoms	11%	3.17%
Construction	5.01%	69.84%
Wholesale & retail trade	5.90%	4.54%
Hotels & restaurants	0.67%	4.31%
Finance, insurance, & real estate	8.98%	0%
Business services	6.44%	0.68%
Public services	11.32%	0.91%
Education, health, social services	16.60%	3.63%
Other services	3.54%	6.12%

Source: KLIPS (1998-2006).

3.4. Panel Analysis of the Wage Equation

In this subsection, I demonstrate that the large wage differentials between regular and irregular workers shown in Table 3.1 persists through the estimation of wage equations in Table 3.3. These wage equations are intended to be viewed as supporting evidence to motivate the main research question, namely, does the EPL help convert irregular workers into regular workers with permanent contracts, who have significantly higher wages.

When estimating the coefficients of a wage equation with cross-sectional techniques, this analysis does not control for individual specific characteristics. Cross-sectional, in contrast to panel analysis, does not consider the relationship between unobserved characteristics and wage. Therefore, an empirical analysis of the wage gap between regular and irregular wage employment requires being able to control for the correlation between unobserved worker characteristics and form of employment. Fixed effects provide the advantage of controlling for unobserved and time-invariant worker heterogeneity, and this unobserved heterogeneity can possible lead to selection into regular or irregular work. If unobserved worker characteristics are systematically related to whether workers engage in regular or irregular employment, then the OLS estimates from cross-section analysis will be biased. For instance, if higher productivity or skill workers generally select into the more secure, regular employment, then the wage gap estimated by cross-section analysis would be overestimated. To take into account this endogeneity caused by correlation between unobservables and form of employment selection, I use the fixed effects model on the panel dataset. I begin with the following wage equation.

$$Y_{it} = \beta_0 + \beta_1 R_{it} + \beta_2 X_{it} + \delta_t + \alpha_i + \varepsilon_{it} \quad (1)$$

In Equation (1), the dependent variable Y_{it} represents the monthly log wage of worker i at time t . R_{it} is the dummy for regular or irregular employment of a worker, X_{it} is the vector of remaining observable worker characteristics, δ_t is the time dummy, α_i represents unobservable time-invariant worker characteristics which may be correlated with the dummy for regular employment R_{it} , and ε_{it} is the residual. The time dummy controls for time varying but individual constant unobserved effects, for instance, changing macroeconomic conditions that affect overall wages of individuals.

I employ the demeaned fixed effects model to eliminate the unobserved time-invariant fixed effect variable α_i , and alleviate the endogeneity issue otherwise in analysis on cross-sectional data.

$$\bar{Y}_{it} = \beta_1 \bar{R}_{it} + \beta_2 \bar{X}_{it} + \bar{\delta}_t + \bar{\varepsilon}_{it} \quad (2)$$

The dependent variable \bar{Y}_{it} is the monthly wage of individual i at time t minus the individual's average wage throughout the time period that they are covered in the dataset. The independent variables and error term are derived in the same way.

The individual fixed effect α_i is now eliminated, so the coefficients β_i estimated with the fixed effects are unbiased assuming the error term ε_{it} is uncorrelated with any of the independent variables.

Table 3.3 presents the wage differential estimated by OLS and fixed effects. Specifications (1) and (2) use OLS, while (3) and (4) use fixed effects, with specifications (2) and (4) including an interaction term between gender and regular wage employment, to identify if the effect of wage employment type (regular or irregular) differs by gender. Moreover, the labour market for women in Korea is markedly different than other OECD countries. Compared with other OECD countries, there are major gender gaps in earnings and labour market participation. Women in Korea only earn around 63% of men, and only 56% of Korean women are employed and many women withdraw from work when they have children. When women leave work temporarily or permanently, as is common in Korea, these career interruptions can also contribute to gender gaps. Workplace culture and social expectations can still pressure women to withdraw from the labour force, and it can be difficult for mothers returning to (re-)enter well-paid regular employment and resume their careers (OECD, 2017). Since 2000, Korea has ranked in last place of all OECD countries for the gender pay gap, with a gender wage gap of 35% compared to the OECD average of 13%. As a result, the gender pay gap is often called the worst among industrialized nations.

In the fixed effects model, it controls for unobservable worker characteristics as the potential correlation between these characteristics and the dummy for regular employment is considered. Before looking at the coefficient for regular employment, with the exception of age and tenure, the estimates for other explanatory variables such as unionization, marital status, education, and household status shows the effect of these variables on wages are weaker when estimated with fixed effects compared to the OLS results. Fixed effects poorly estimates variables that have little variation within individuals, such as marital status and educational attainment especially for older worker who will have completed their education, hence the insignificant estimates, as seen in specifications (3) and (4). It is possible that unobserved factors such as productivity and innate ability are correlated with the likelihood of working in regular employment. When such correlations are not accounted for, it results in an upward bias in the OLS estimates of the explanatory variables.

The coefficients of interest here are the irregularity of work in bold, obtained after controlling for all observable characteristics and for any macroeconomic shocks absorbed by the year dummies. Comparing the OLS estimate in column (1) with the fixed effects estimate in column (3) shows that the wage gap estimated with fixed effects is around half as big, at 16%, than that estimated through OLS, yielding an estimate of 30%. Despite the upward bias of the cross-sectional analysis, it is still clear that there is a wage differential between regular and irregular employment. Women earn almost 30% less than men, as seen in column (1), while the effect of time-invariant variables such as gender cannot be estimated in fixed effects models. Specifications (2) and (4) take into account the idea that regular employment may impact wages of men and women differently. The OLS estimates in column (2) suggest that regular male workers earn 24.9% more than irregular male workers. The effect of a regular job for females is $19\% + 4.4\% = 23.4\%$. That is, women get about 4.4% higher premium in a regular job than men do, as denoted by the coefficient in the interaction term. The fixed effects estimates of regular work (10.7%) and the interaction term (2.7%) in column (4) are around half the size of the OLS estimates in (2), although the interaction loses its significance in the column (4). Additionally, the fixed effects coefficient on full-time work (25.9%) is smaller than the OLS estimate of 38.9%.

Table 3. 3. Estimation of the wage effect of irregularity of employment

Log monthly wage VARIABLES	(1) OLS	(2) OLS	(3) FE	(4) FE
Regular	0.212*** (0.006)	0.190*** (0.009)	0.121*** (0.009)	0.107*** (0.012)
Female	-0.283*** (0.006)	-0.315*** (0.012)		
Regular * Female		0.044*** (0.012)		0.027 (0.018)
Full-time	0.393*** (0.012)	0.389*** (0.012)	0.261*** (0.019)	0.259*** (0.019)
Age	0.054*** (0.001)	0.055*** (0.001)	0.154*** (0.004)	0.154*** (0.004)
Age ²	-0.001*** (2.13e-05)	-0.001*** (2.13e-05)	-0.001*** (5.41e-05)	-0.001*** (5.42e-05)
Tenure in months	0.002*** (8.72e-05)	0.002*** (8.72e-05)	0.001*** (0.000)	0.001*** (0.000)
Tenure in months ²	-1.82e-06*** (2.73e-07)	-1.81e-06*** (2.73e-07)	2.90e-06*** (6.10e-07)	2.89e-06*** (6.10e-07)
Unionization	0.142*** (0.005)	0.143*** (0.005)	0.053*** (0.007)	0.053*** (0.007)
Married	0.057*** (0.006)	0.057*** (0.006)	0.009 (0.012)	0.009 (0.012)
Upper secondary or above	0.149*** (0.007)	0.149*** (0.007)	0.036 (0.078)	0.036 (0.078)
University or above	0.301*** (0.009)	0.302*** (0.009)	0.041 (0.088)	0.041 (0.087)
Head of household	0.119*** (0.006)	0.119*** (0.006)	0.049*** (0.013)	0.049*** (0.013)
Observations	30,753	30,753	30,753	30,753
Number of individuals			8,008	8,008
R-squared	0.632	0.632	0.434	0.434
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Occupation FE	YES	YES	YES	YES

Data from KLIPS (1998-2006). Standard errors in parentheses are robust in OLS specifications and clustered at individual level in fixed effects specifications. *** p<0.01, ** p<0.05, * p<0.1.

3.5. Transition Outcomes

3.5.1. Empirical Framework

Identification of the effect of the labour reform requires comparing the change in employment outcomes for workers affected by the reform with the change for those not affected by the reform. i.e. are treated workers more likely to become regular wage workers than control workers? The restriction on the duration of fixed-term contracts applies to all fixed-term workers with one exception. The restriction does not apply to workers aged older than 55. Section 3.6 discusses the suitability of the control group, and section 3.7 looks at the common trend assumption.

Using the KLIPS survey, I employ a linear probability model with fixed effects, taking into account the panel structure of the dataset to estimate the following difference-in-difference regression:

$$Y_{it} = \beta_0 + \beta_1 D_{it} + \beta_2 Post_t + \beta_3 D_{it} Post_t + \beta_4 X_{it} + \varepsilon_{it} \quad (3)$$

Where Y_{it} is a binary variable and indicates various outcome variables of a worker i at time $t+1$. The dependent variable represents movements from irregular employment at t , to every possible following state at $t+1$. For example, the variable “Irregular to Regular” takes 0 (1) if the worker is irregular at t and, is not (is) in regular work at $t+1$, and makes no

distinction between remaining with the current employer or moving to a new employer. The tenure and job class variables allow me to identify whether workers stay in their current job or have started in a new job since the last survey year.

The following 8 possible states at $t+1$ are:

- Regular in either the same job (same employer), or a new job (new employer)
- Regular, but in the same job
- Regular, but in a new job
- Irregular in either the same job, or a new job
- Irregular, but in the same job
- Irregular, but in a new job
- Self-employment
- Non-employment

D_{it} is an indicator for whether a worker is between 46 and 55 (treated), these workers being subject to the maximum irregular contract duration requirement. Workers aged 56 to 64 are the control group. $Post_t$ is a dummy variable to indicate when the treatment started. Survey dates from 1998 to June 2007 will take a value of 0, and surveys taken from July 2007 to 2016 will take a value of 1. β_3 is the coefficient of interest. It is interpreted as the difference-in-difference estimator and captures the causal effect of the employment protection on several outcome variables Y_{it} . X_{it} is the vector of worker characteristics; monthly tenure, household status, educational attainment status, marital status, and job industry. τ_t is the year fixed effects, and ε_{it} is the error term, clustered at the individual level.

The focus of the following sections are on the transition probabilities from Irregular employment to all employment types. As the reform intended to increase the protection of irregular workers then this group is most likely to be affected. However, it is still important to consider the extent to which the reform impacts on the transition probabilities of other employment types, as it could be expected that transition probabilities from these other types are also affected by the reform. For instance, prior to the reform, self-employed workers and the non-employed may have been deterred from entering waged employment as it was difficult to obtain the “good jobs” in the regular employment sector. Table 3.4 presents transitions between the 4 employment types before I focus the analysis on irregular worker transitions. However, ultimately only the movements from irregular workers are statistically significant. The insignificant coefficients on movements from self-employment and non-employment to either regular or irregular employment may result from the aforementioned fact the reform was targeted primarily at workers on irregular work contracts. The reform also intended to leave the protection level of regular workers unchanged, and they experienced no significant change in probability of transitioning to any kind of employment.

Table 3. 4. Main interaction term coefficients for all employment types

	Regular (t+1)	Irregular (t+1)	Self-Employed (t+1)	Non-Employment (t+1)
Regular (t)	0.0415 (0.0254) N = 12,512	-0.0216 (0.0153) N = 12,512	0.0016 (0.0086) N = 12,512	-0.0214 (0.0204) N = 12,512
Irregular (t)	0.0488** (0.0194) N = 9,461	-0.0565* (0.0334) N = 9,461	0.0127 (0.0112) N = 9,461	-0.0060 (0.0288) N = 9,461
Self-Employed (t)	0.0100 (0.0097) N = 8,019	-0.0031 (0.0112) N = 8,019	-0.0067 (0.0237) N = 8,019	-0.0002 (0.0209) N = 8,019
Non-Employment (t)	0.0333 (0.0263) N = 1,851	0.0137 (0.0144) N = 1,851	0.0434 (0.0434) N = 1,851	-0.0267 (0.0375) N = 1,851

Source: KLIPS (1998-2016)

3.5.2. The Effect of Employment Protection Legislation on Employment

Table 3.5 below presents the transitions difference-in-difference regression results from irregular employment to every possible state, where the treatment and control group are workers aged 46-55 and 56-65 respectively. The former group is subject to the 2-year maximum duration, while the regulation does not apply to the latter group. Only the interaction term between post and the treatment dummy is reported.

Table 3.5 column (1) provides the result regarding the impact of the EPL on transitioning from irregular to any regular wage employment, such that no distinction is made between becoming regular in the same job or starting a new regular job with a new employer. The coefficient suggests that in the post reform period, relative to control workers, treated workers are 4.9% more likely to transition to regular wage employment. Column (2) shows that the probability of moving to a regular job is largely driven by transitions to regular employment status in the same job, with a coefficient of 3.4%. Column (4) shows that, even if at the 10% level, the probability of remaining in an irregular wage position was 5.7% lower for treated workers than control workers, and column (6) shows that the probability of moving to a new irregular job is 4.8% lower. The estimates in columns (7) and (8) suggests that there is no effect on movements from irregular employment into self-employment, or unemployment or inactivity. Overall, these results suggest that on average, the policy achieved its intended aim of moving irregular workers into regular employment. However, this result may be driven by, or hiding several factors, such as heterogeneity between industries, type of workplace, and skill-level. These will be explored in the following sections.

Table 3. 5. LPM results for transitions from irregular wage employment to every possible state

VARIABLES	(1) I to R	(2) I to same R	(3) I to new R	(4) I to I	(5) I to same I	(6) I to new I	(7) I to self-empt	(8) I to non-empt
After*Treated	0.0488** (0.0194)	0.0339** (0.0164)	0.0149 (0.0120)	-0.0565* (0.0334)	-0.0086 (0.0369)	-0.0478** (0.0217)	0.0127 (0.0112)	-0.0060 (0.0288)
Observations	9,461	9,461	9,461	9,461	9,461	9,461	9,461	9,461
Number of individuals	2,520	2,520	2,520	2,520	2,520	2,520	2,520	2,520
R-squared	0.051	0.057	0.016	0.035	0.045	0.024	0.007	0.025

Other explanatory variables are the post and treatment dummies, monthly tenure, household head status, educational attainment status, marital status, job industry, occupation, and year fixed effects. Standard errors are clustered at individual level in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

As a robustness check for Table 3.5, the age windows are restricted to the lower bound age of 49 in the treatment group and upper bound age of 61 in the control group. The results are quantitatively similar and displayed in Table A.3.1 in the chapter 3 appendix. The closer the ages of the treatment and control groups to each other, the more similar they are to each other.

3.5.3. Differences in sectors

Table 3.7 displays the LPM results of transitioning from irregular wage employment to all possible states denoted by Panels A to D, by 4 sectors (including fifth column for construction separately). As a robustness check for Tables 3.7, 3.8, and 3.9, the age windows are restricted until the lower bound age of 49 in the treatment group and upper bound age of 61 in the control group. The results are displayed in the chapter 3 appendix.

Column (1) Panel A suggests that treated workers in the industrial sector are 8.2% more likely to transition into regular employment of any kind, and the estimate in column (1) Panel B suggests these movements are largely driven from transitions to regular employment status in the same job, with a coefficient of 5.8%. Mechanically, the coefficient on transitions to new regular employment is 2.4%, shown by Panel C, but this coefficient is not robust to narrowing the age window of the control and treatment groups. At least in this industry, firms in manufacturing and (or) construction may in general be easier to observe to see if they are complying with the new employment law due to the scales of production. The KLIPS data shows that the number of employees in industrial workplaces is also the largest, with an average of 130. In addition, prior to the reform, construction workers faced considerable employment instability in terms of tenure and low national pension coverage. They were the most affected by job insecurity after the 1997/1998 Asian financial crisis and subsequent IMF bailout. However, the result from Panel D shows that for treated workers the probability of remaining in the same irregular position is 8.1% lower. Overall, the results suggest that treated workers in the industrial sector are 8.2% more likely to find themselves in regular work and 8.1% less likely to remain in irregular work, than the control workers.

Column (3) displays the estimates for workers in wholesale and retail trade, and food and accommodation services. Panel D shows that treated irregular workers are 24.5% less likely to remain in irregular work than the control workers, but movements into other states are statistically insignificant. The coefficient of -13.2% of moving to a new irregular job in Panel F is significant at the 10% level but the significance does not hold when restricting the age window. The decrease in probability of remaining in irregular employment may be due to the following. Again, like the industrial sector, in wholesale and retail, legislation may be easier to enforce in this sector than others because of the economic significance of this sector. Country-level data on employment shares by industry from the Groningen Growth & Development Centre shows that in Korea, from the early 1990s through to 2010, employment in the trade services sector averaged around a quarter of all employment. On the other hand, this sector comprises of a large number of small employers, with the average number of employees in retail at 18, according to KLIPS data. This may make it more financially difficult for retail firms to regularize jobs.

Column (4) displays the estimates for workers in financial and business services, education and healthcare. Panel F shows that these workers are 11.7% less likely to move to a new irregular job, but movements into the remaining states are all statistically insignificant. To the extent that firms in the financial sector and professional services make use of financial intermediaries, and practice proper bookkeeping and maintenance of payroll records, the hiring of employees should be easier for the relevant authorities to observe. The estimates for workers in public administration and defence in column (4)

are insignificant, which may be due to sample size. Overall, the results suggest that firms in the industrial sector may be more compliant with the reform, as companies are not permitted to rehire the same worker again on another irregular contract, supported by the fact that the Panel A and B coefficients are only positive and significant in this sector.

In sum, most regularization occurs in the industrial sector. This is despite the fact that the probability of remaining in the same sector when making the transition from irregular to regular employment is similar for all sectors, with the exception of public services, which has a small sample size. One might expect the probability of regularization to be higher for workers who remain in the same industry, but I do not observe much movement across sectors, as seen in Table 3.6. Irregular workers are around 86% likely to remain in the same sector when transitioning to regular work. Therefore, regularization in the industrial sector may be driven by the size of the workplace in terms of number of employees. Of note is the fact that Table 3.2 shows that 70% of construction workers are always defined as irregular workers. Therefore, construction is a sector of interest as the potential bite of the reform would be largest in this sector, and is included as an extra sector in Table 3.6. Similar to the industrial and utilities sector as a whole, construction workers are more likely to transition to regular work and less likely to remain in irregular employment.

Table 3. 6. Movement from irregular to regular employment across sectors

T+1 sector Regular										
T sector Irregular	Industry	89.06%	Retail	5.08%	Finance	5.86%	Public services	0.00%	Total	256
	Retail	8.44%	83.77%	7.14%	0.65%	154				
	Finance	8.27%	4.51%	86.47%	0.75%	133				
	Public services	5.56%	22.22%	22.22%	50%	18				
	Total	253	152	145	11	561				
	45.10%	27.09%	25.85%	1.96%	100%					

Source: KLIPS data, using sample used in analysis.

Table 3. 7. LPM transition results, by sector

Panel A: I2R	Industrial & utilities sector	Construction sector	Wholesale & retail trade, & hospitality	Finance, business, education, & health	Public Administration & Defence
VARIABLES	46-55 56-64	46-55 56-64	46-55 56-64	46-55 56-64	46-55 56-64
After * Treated	0.0824*** (0.0243)	0.0394** (0.0160)	0.0276 (0.0822)	0.0367 (0.0545)	0.0139 (0.0525)
R-squared	0.048	0.052	0.047	0.123	0.099
Panel B: I2R same job	(1)	(2)	(3)	(4)	(5)
After * Treated	0.0576*** (0.0217)	0.0240* (0.0136)	-0.0194 (0.0592)	0.0373 (0.0473)	0.0240 (0.0203)
R-squared	0.042	0.045	0.082	0.130	0.129
Panel C: I2R new job	(1)	(2)	(3)	(4)	(5)
After * Treated	0.0248** (0.0123)	0.0154* (0.0092)	0.0470 (0.0564)	-0.0005 (0.0313)	-0.0101 (0.0503)
R-squared	0.019	0.024	0.028	0.059	0.082
Panel D: I2I	(1)	(2)	(3)	(4)	(5)
After * Treated	-0.0811* (0.0441)	-0.0373* (0.0199)	-0.245** (0.116)	-0.0829 (0.0772)	-0.0559 (0.196)
R-squared	0.037	0.046	0.074	0.095	0.162
Observations	4,020	2,332	1,957	1,876	396
Number of individuals	1,068	529	681	662	185

Other control variables are the post and treatment dummies, monthly tenure, household head status, educational attainment status, marital status, job industry, occupation, and year fixed effects. Standard errors are clustered at individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

3.5.4. Private vs Government Employers

It is also worth considering the workplace of the respondent, to identify whether the likelihood of transitioning into different states depends on if they work for a private firm or government employer, namely, government-related firms (government-financed or public corporations), and the government or government branch (government officials or civil servants). Since the 1997 Asian financial crisis, hiring irregular workers in the public sector became common practice. The Kim Dae-Jung administration (1998-2003) at the time pushed heavily for public sector reforms and the privatization of public enterprise according to International Monetary Fund guidelines (Hyankoreh, 2017). Since the government passes the law, the regulation may be more strongly complied with in the public sector. On the other hand, whether a worker is given a regular contract may also depend on the cost of conversion to employers, which would entail a much higher degree of wage-related expenses.

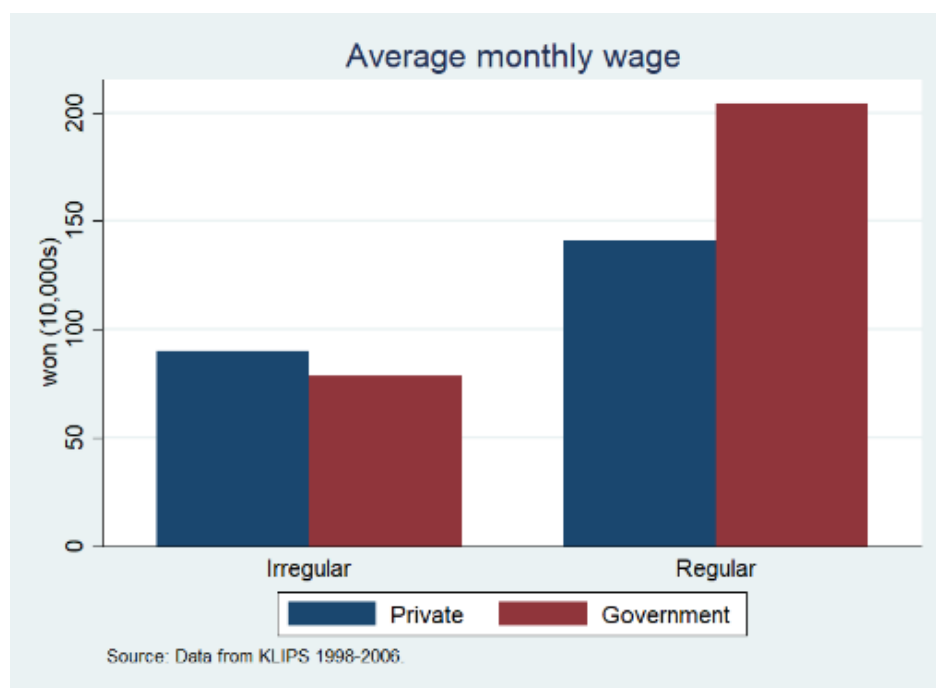


Figure 3. 5. Average monthly pay of wage employed by type of workplace and form of employment

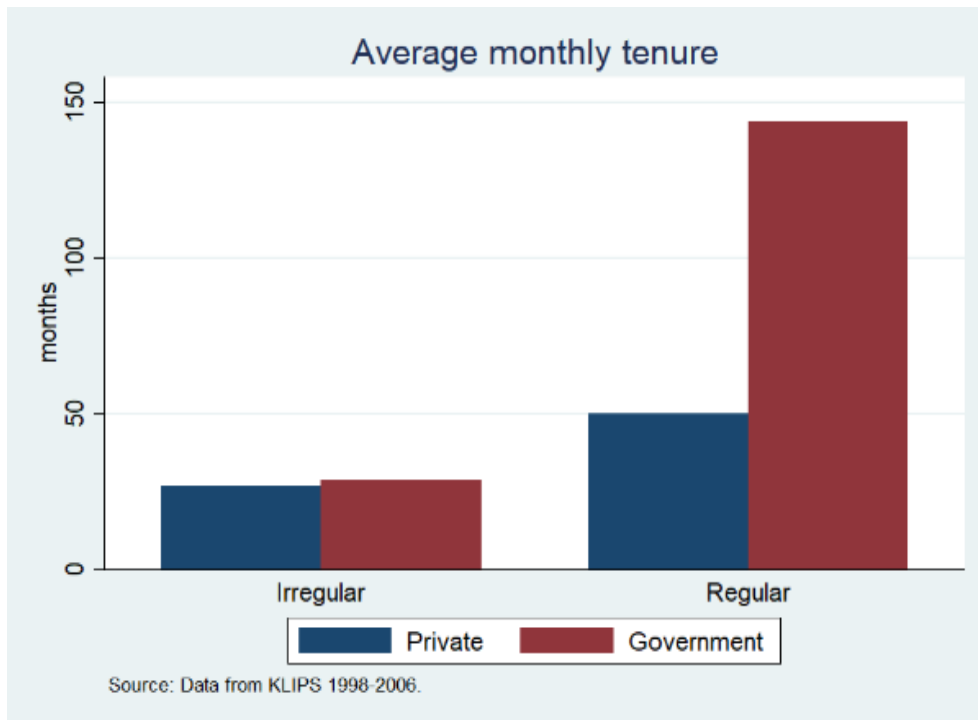


Figure 3. 6. Average monthly tenure of wage employed by type of workplace and form of employment

Figure 3.5 shows that irregular workers in a government workplace experience the lowest wages of all irregular workers, at around 770,000 won per month (£500 per month) compared to 900,000 won (£585 per month) for irregular private sector workers. Regular public sector workers earn around two and a half times as much as irregular public sector workers at 2 million won (£1,300), and regular private sector workers earn 1.4 million won (£910) per month. Figure 3.6 shows that irregular public sector and private sector workers have 27 and 29 months of tenure respectively, while regular public sector and private sector workers experience 50 and 140 months of consecutive service with their current employer.

Overall, regular public sector workers experience the highest wages and security of tenure of all workplaces, and therefore illustrates the desirability of regular employment in the public sector. Additional reasons for the desirability of regular public sector work from the worker perspective include the fierce competition for jobs at the large family-owned conglomerates and the income disparity between these large firms and medium to small sized firms, as well as the preference for the stability of a government job over the risk of working in the private sector in a slowing economy. The Seoul Youth Guarantee Centre reports that applications to civil service exams tripled from 1995 to 2015. As of 2015, family-owned conglomerates generated half of the revenue in Korea but only provided 20% of the jobs in the country. Moreover, starting salaries at these large corporations average around £30,000 and workers receive higher coverage of workplace benefits, compared to approximately £20,000 for smaller firms despite working similar hours, and with poorer benefits coverage. Regular public sector workers are usually guaranteed high wages until retirement because of the seniority-based pay system, so the cost of conversion may be the highest for public sector employers out of all the workplaces. Despite the cost, if the public sector employers are compliant with the new employment law then the difference-in-difference coefficient on transitions into regular employment should be positive.

Table 3.8 displays the LPM results by workplace. Column (1) Panel A shows that treated private sector workers are 7.6% more likely to end up in a regular wage position than control private workers, and this is largely driven by movements into

regular status employment in the same job, with a coefficient of 5.7% in Panel B. Movements into a new regular job are insignificant. The coefficient in Panel D suggests that treated private sector workers are 13.5% less likely to be in an irregular position the following year. The probability of 6.4% of remaining in the same irregular job next year is negative but insignificant, while Panel F suggests that workers are 7.1% less likely to move to another irregular position with a new employer, achieving one of the policy aims in reducing the probability of cycling between new irregular jobs. The Panel G estimate shows that treated workers are in fact 2.4% more likely to find themselves in self-employment, and finally, movements into non-employment are insignificant. Overall, the probability of transitioning into regular (irregular) employment increasing by 7.6% (falling by 13.5%) suggests that the policy was successful in the private sector.

Column (2) displays the estimates for workers in the public sector. Possibly due to the sample size, none of the point estimates are statistically significant. However, the coefficient of 3% on transitions to a new regular job with a new public sector employer in Panel C become significant in the range of 1.8% to 2.8% when restricting the age window. This suggests that while irregular public sector workers are not converted in their current jobs, they still experience an increase in probability of moving into a regular position. Movements to all other states remain insignificant.

The workplace results for the private sector are mostly consistent with the sector results in Table 3.6 column (1). I.e. private sector regularization seems to be driven mostly from the industrial sector. According to the KLIPS data, The industrial sector has 5% of its workers in public workplaces with an average of 130 employees in a workplace. The retail sector has 2% of its workers in the public sector and only 18 workers on average. 98% of workers in public administration and defence sector are in the public sector with 38 employees in a workplace. 30% of workers in education, finance, and business are in the public sector, with 60 employees per workplace. Regularization may be easier for the relevant authorities to monitor or enforce in the industrial sector because of the larger scale of production for example.

The goal of the policy is for workers to move from irregular to regular employment, so it seems that private and public sector workers on average benefit from the reform, but the result for transition to new regular job for public sector workers should perhaps be treated with caution due to the comparatively smaller number of individuals. Therefore at least in the private sector, the policy seemed to achieve its intended effect.

Table 3. 8. LPM transition results, by workplace

	Workplace	
Panel A: I2R	(Private)	(Government)
VARIABLES	46-55 56-64	46-55 56-64
After * Treated	0.0763*** (0.0292)	0.0233 (0.0577)
R-squared	0.063	0.206
Panel B: I2R same job	(1)	(2)
After * Treated	0.0571** (0.0260)	-0.00745 (0.0543)
R-squared	0.074	0.145
Panel C: I2R new job	(1)	(2)
After * Treated	0.0192 (0.0171)	0.0307 ^a (0.0187)
R-squared	0.014	0.257
Panel D: I2I	(1)	(2)
After * Treated	-0.135*** (0.0435)	-0.0121 (0.0576)
R-squared	0.042	0.204
Observations	6,421	738
Number of individuals	1,966	283

^a Estimates become significant when restricting the age window. Other control variables are monthly tenure, household head status, marital status, industry, and year dummies. Standard errors are clustered at individual level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

3.5.5. Low-Skilled vs High-Skilled Occupations

The effectiveness of the policy on converting irregular to regular workers may also depend on the skill level of the occupation (defined using the international standard classification of occupations by the ILO) and on the preferences of the employer. For instance, it may be expected that firms would prefer to terminate the contract of low skill workers after the maximum employment duration expires and simply replace them with a new irregular hire rather than grant the worker a permanent contract, as the cost of dismissing an irregular worker is lower than that of a regular worker. In addition, low skill workers are more easily substitutable as the supply of these workers is higher, so it may be unnecessarily costly to convert a low-skilled irregular hire into a regular hire. On the other hand, the cost of converting low skill irregular workers to permanent workers may be lower than for high skill jobs, at least in terms of wage. Figure 3.7 shows that the earnings differential between regular and irregular workers is disproportionately larger for high-skill workers than for low-skill workers. Regular high-skill workers earn over 75% more per month compared to irregular high-skilled, compared to regular low-skill workers earning 15% (40%) more than irregular low-skilled for the control (treated) group. As expected, low skill jobs make up a higher proportion of irregular jobs than in regular jobs, seen in Figure 3.8. For the control group, 52% (42%) of irregular (regular) jobs are low-skilled, and for the treatment group, 37% (14%) of irregular (regular) jobs are low-skilled. So, if the policy is effective, it would be expected to benefit low-skilled workers more than high-skilled workers, and lead to an increase in probability of transitions to regular employment.

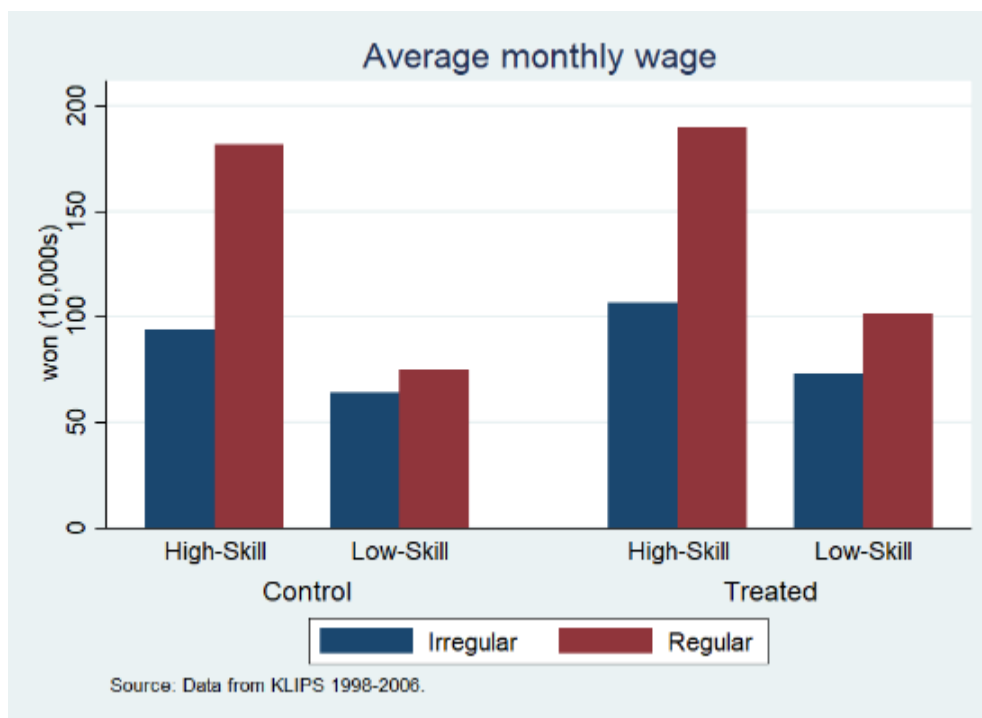


Figure 3. 7. Average monthly pay of wage employed by form of employment and skill-level.

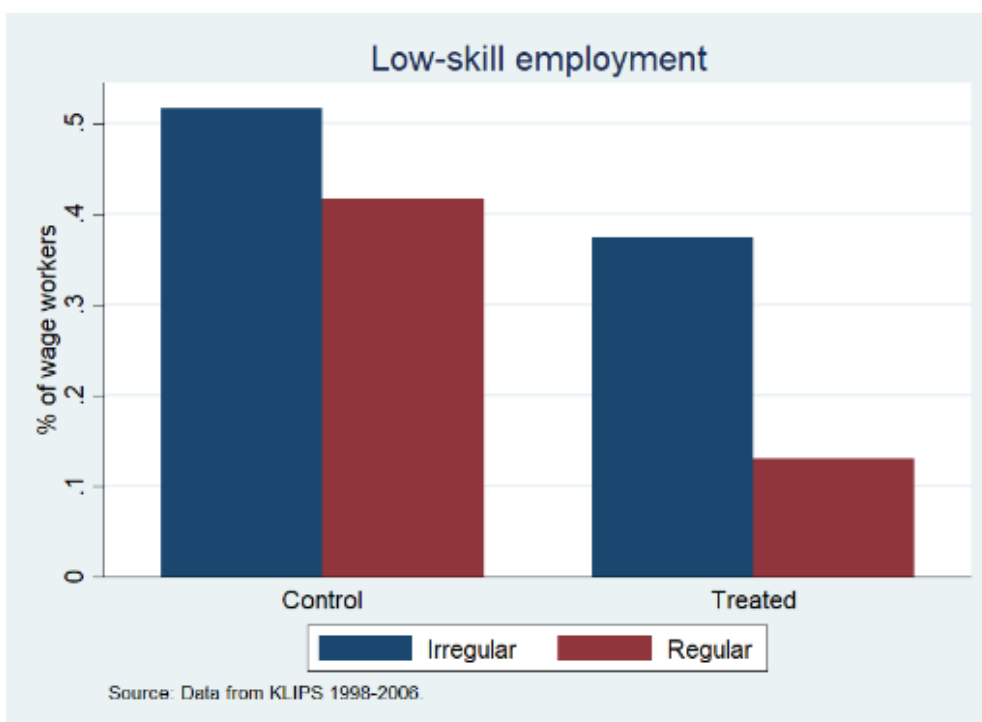


Figure 3. 8. Low-skilled employment as a share of irregular and regular employment.

Table 3.9 displays the LPM results for workers by all workplaces and only in private firms. Columns (1) and (3) show the estimates for low-skilled workers, and (2) and (4) for high-skilled workers. Column (1) Panel A suggests that overall, treated low-skilled workers are 8.2% more likely to transition to regular employment than control low-skilled workers, and this is mostly driven by movements into regular status in the same job, with a coefficient of 6.9%, in Panel B. Panel D

shows that treated low-skilled workers are 16.7% less likely to remain in an irregular status job, and the Panel F coefficient of -6.6% on transitions to a new irregular job (insignificant but expected sign) becomes significant in the range of -9.7% to -10.2% when restricting the age window. So, low-skilled workers are 8.2% more likely to transition to regular status employment and 16.7% less likely to remain in irregular employment. In addition, the Panel H coefficient of 6.5% on movements into unemployment or inactivity becomes significant in the range of 8.6% to 11.2% when restricting the age window. Therefore, while low-skilled workers are more likely to become regular than irregular, at the same time they are also more at risk of becoming unemployed. Firms may simply choose to terminate the contract before the maximum duration of irregular employment, and thus the legal obligation to convert, is reached. In column (2), all the estimates for high-skilled workers are the same sign as for low-skilled workers but are insignificant, suggesting that overall, high-skilled irregulars are not affected by the reform.

Columns (3) and (4) display the results by skill-level for private firm workers. In column (3), the coefficients in Panels A (9.6%), B (8.6%), D (-21.2%), and F (-12.8%) are the same sign and larger in magnitude than in the corresponding panels in column (1). Again, these estimates suggest that low-skilled private sector workers are affected positively by the reform, at least in terms of employment status. Column (4) displays the estimates for high-skilled workers in a private firm. The positive significance of movements to a new regular job in Panel C does not hold when restricting the age window. Movements into the same regular and any regular job are also positive but insignificant. Panel D suggests that high-skilled irregular workers are 11% less likely to remain in an irregular status job, which is the expected sign if the policy was effective.

Table 3. 9. LPM transition results, by skill-level, and for private firm workers

	All workplaces		Private firm	
	(LS)	(HS)	(LS)	(HS)
VARIABLES	46-55 56-64	46-55 56-64	46-55 56-64	46-55 56-64
After * Treated	0.0820*** (0.0302)	0.0391 (0.0294)	0.0963*** (0.0377)	0.0646 (0.0393)
R-squared	0.076	0.055	0.104	0.065
Panel B: I2R same job	(1)	(2)	(3)	(4)
After * Treated	0.0693*** (0.0264)	0.0216 (0.0252)	0.0859** (0.0356)	0.0331 (0.0357)
R-squared	0.066	0.061	0.100	0.077
Panel C: I2R new job	(1)	(2)	(3)	(4)
After * Treated	0.0128 (0.0178)	0.0175 (0.0137)	0.0105 (0.0205)	0.0315** (0.0147)
R-squared	0.036	0.021	0.038	0.018
Panel D: I2I	(1)	(2)	(3)	(4)
After * Treated	-0.167*** (0.0571)	-0.0390 (0.0459)	-0.212*** (0.0644)	-0.110** (0.0560)
R-squared	0.058	0.053	0.082	0.057
Observations	2,924	5,325	2,151	4,270
Number of individuals	946	1,566	768	1,387

^{a,b} Estimates become significant when restricting the age window. Other control variables are monthly tenure, household head status, marital status, industry, and year dummies. Standard errors are clustered at individual level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

3.5.6. Test for Suitability of Control Group

Regarding the empirical analysis there is one potential caveat of treating workers aged 56 and over as the control group. It is plausible that the control group may be affected by the policy via the substitution channel. Since irregular workers aged 56 and over are not subject to the policy regulation, an employer could theoretically simply substitute younger (treated) irregular workers who are subject to the policy with older irregular workers, who have lower hiring costs since their

contracts are not required to be converted into a regular contract after the two-year period has passed. If the control group is also affected by the policy, such that they are more likely to find themselves in irregular employment in the post-policy period, then the coefficients on the “post” dummy for transitions into irregular employment should be positive and significant. Therefore, the following regressions use only observations in the control group, i.e. 56-64 years of age.

$$Y_{it} = \beta_0 + \beta_1 Post_t + \beta_2 X_{it} + \varepsilon_{it} \quad (4)$$

Equation (4) uses the “post-policy” dummy as an explanatory variable without the year dummies τ_t used in equation (3). The coefficient of interest is the “post-policy” dummy as a test for whether there is a difference in the average transition rates before and after the reform for the control group, and to control for the 2007 employment reform as a specific shock. For the control group to be valid it requires that the coefficients of the “post” dummy on movements to irregular employment not be positive and significant. Table 3.11 column (1) displays the coefficient on “post” in Equation (4). The results appear to show that older workers are not affected by the policy in terms of becoming more likely to enter irregular work as a result of firms substituting them in for younger workers, and are therefore able to be used as a suitable control group. Older irregular workers are also no more or less likely to become regularised in the post-reform period.

In addition, there may be another less concerning caveat. The control group includes people older than the official retirement age of 60 in Korea. Despite the official retirement age of 60, older workers retire on average at around 67 years of age, much higher than the OECD average, according to the OECD. The KLIPS data shows around 60% of observations of respondents aged 60 to 64 in the pre-policy period are still in irregular or regular wage, or self-employment. Therefore, this reduces concerns of an inadequately sized control group.

The validity of the difference-in-difference strategy requires that prior to the treatment, the difference between outcomes of the treatment and control group is constant over time. If this requirement is satisfied, difference-in-difference removes biases in post-intervention period comparisons between the treatment and control group that could be the result from permanent differences between those groups. As shown in Table 3.10, there are some differences in observables between the treatment and control groups. For instance, treated workers are on average more educated, with 32.8% attaining at least upper secondary or college, compared to 21.5% of control workers. If these differences across the groups are not accounted for in the regression, then the estimation may wrongly attribute some of these effects to the difference-in-difference estimator. The first eight variables are the transitions from irregular employment to every possible state. These are the raw averages and do not control for observables. Staying in irregular employment, moving into new irregular employment, and non-employment are different between the two groups, but at the 10% level. The other five transitions are not statistically significantly different between control and treated workers.

Table 3. 10. Summary Statistics by treatment

Pre-reform (1998-2006)	Control workers	Treated workers	Difference
Irregular to Regular	11.1%	12.5%	-1.4%
Irregular to same Regular	7.7%	8.7%	-1.0%
Irregular to new Regular	3.4%	3.8%	-0.4%
Irregular to Irregular	65.2%	68.5%	-3.3% *
Irregular to same Irregular	58.5%	59.8%	-1.3%
Irregular to new Irregular	6.7%	8.7%	-2.0% *
Irregular to Self-Employed	2.8%	3.5%	-0.7%
Irregular to Non-Employed	18.1%	15.3%	2.8% *
Monthly wage (10,000 won)	78.3	94.0	-15.7***
Weekly work hours (hours)	49.9	49.4	0.5
Monthly tenure (months)	44.5	41.5	3
Low-skilled	51.7%	37.5%	14.2%***
Male	59.5%	51.4%	8.1%***
Married	75.1%	80.1%	-5.0%**
Lower secondary or below	78.5%	67.2%	11.3%***
Upper secondary or college	17.9%	29.5%	-11.6%***
University or above	3.6%	3.3%	0.3%
Unionized	3.8%	5.5%	-1.7%**
City location	55.9%	59.8%	-3.8%**

Source: KLIPS data (1998-2016). The null hypothesis is that the difference in means is equal to zero. *** p<0.01, ** p<0.05, * p<0.1.

Table 3. 11. LPM results of substitution channel and pre-reform common trend

Dependent variable	Post dummy coefficient (Standard error) [R-squared]	Placebo ₂₀₀₂₋₂₀₀₆ * Treated (Standard error) [R-squared]
Irregular to Regular	-0.0534 (0.0337) [0.014]	-0.011 (0.053) [0.081]
Irregular to Same Regular	-0.0275 (0.025) [0.018]	0.006 (0.044) [0.068]
Irregular to New Regular	-0.0258 (0.024) [0.011]	-0.017 (0.031) [0.040]
Irregular to Irregular	0.006 (0.045) [0.036]	0.075 (0.072) [0.078]
Observations	3,162	2,148
Number of individuals	1,098	956

Column 1: Coefficients on the post-dummy on transitioning from irregular employment to various states for control group workers. Other explanatory variables are age and its square, monthly tenure, household head status, educational attainment status, marital status, industry, occupation, and city fixed effects.

Column 2: Difference-in-difference regression results transitioning from irregular employment to various states. Treated and control groups are workers aged 46-55 and 56-64 respectively. Other explanatory variables are the post and treatment dummies, monthly tenure, household head status, educational attainment status, marital status, industry, skill, city, and year fixed effects

*** p<0.01, ** p<0.05, * p<0.1.

3.5.7. Test of Common Trend Assumption

In order to obtain statistical evidence on the common trend assumption and control for the possible confounding effect of observable characteristics, I estimate the following difference-in-difference equation, where the coefficient of interest is β_3 and required to be insignificant.

$$Y_{it} = \beta_0 + \beta_1 D_{it} + \beta_2 Placebo_t + \beta_3 D_{it} Placebo_t + \beta_4 X_{it} + \tau_t + \epsilon_{it} \quad (5)$$

I test the validity of the common trend assumption using only pre-treatment data (survey taken between 1998–2006). The test is carried out by estimating a placebo experiment that artificially moves the policy year to 2002, the mid-way point of the pre-treatment period. The assumption is that in absence of the policy, treated and control workers would have followed the same trend. So, it requires a parallel trend in outcomes during the first and second halves of the pre-reform period. Placebo years take 0 for $t \geq 1998$ and $t \leq 2001$, and 1 for $t \geq 2002$ and $t \leq 2006$. If the difference-in-difference coefficients are insignificant, it buttresses the argument of the existence of an ex-ante divergent trend of future treated workers compared to control workers. The results in Table 3.11 column (2) above shows that this is indeed the case.

3.6. Wage Outcomes

3.6.1. The Effect of Transitions on Wage Growth

The next step is to identify if transitioning into regular employment does in fact translate into “better” labour market outcomes such as wages through for example, wage growth. One possible approach is comparing the wage growth of workers who transition from irregular work at $t-1$ to regular work at t , with workers that remain in irregular employment only, between periods. Of the workers that are converted, this would usually entail a far higher degree of wage-related expenses for the employer, therefore many employers may prefer to not offer irregular workers regular contracts. Therefore, if there is a negative, or no significant effect of transitioning on wage growth, then the policy cannot be said to have been successful in terms of changing how newly converted regular workers are treated in the workplace in terms of wages, at least only in the first year of regular work

Table 3.12 displays the wage growth regression results comparing wage growth of workers upon switching from an irregular to regular wage position to workers who stay in irregular positions, over the period of the dataset but without taking the reform into account. I.e. the dependent variable in the wage regression, log wage, is replaced by wage growth and the dummy for regularity of work is replaced by the transition dummy. Wage growth is calculated by the difference between log of wage at year t and $t-1$, where there are consecutive years of wage information. The coefficient of interest is the transition dummy indicating if a transition is made. The dummy takes 0 if a worker is in irregular employment in both year t and year $t-1$, whereas it takes 1 at t only if they transition from irregular at $t-1$ to regular at t .

Column (1) show that the growth of wages of workers who transition from irregular to any regular employment and into regular employment is 9%, and this increase highly statistically significant. Column (1) suggests on average, workers who make the transition experience higher wage growth of about 10% between the last year of irregular work and the first year of regular work, than the average for those who remained in irregular work. Column (2) runs the same regression but splitting transitions into regular employment by conversion in the same job, becoming regular with a new employer, or moving to another irregular job with a new employer, giving a categorical variable of four transitions. The reference

transition is staying in the same irregular job. Before the policy was implemented, irregular workers in theory could be employed on irregular contracts indefinitely, so therefore it was possible for their irregular contracts to be repeatedly renewed. As a result, I included the transition variable of movements from irregular to a new irregular job. Column (2) shows that workers who move to a new regular job experience a 18% wage increase upon switching, compared to the 3.7% increase for workers who transitioned in the same job. This may reflect that irrespective of the policy, more able workers are more likely to leave for a different job or be poached by other firms, and other workers accept a smaller wage increase in return for a regular employment contract. Column (2) also shows that workers who transition to a new irregular job earn 4.8% more upon switching than workers who stay in the same irregular job. However, this transition loses its statistical significance in the following tables.

Table 3. 12. Wage growth results for transitions from irregular to regular and new irregular employment

Reference: I2I same	(1)	(2)
VARIABLES	Δ wage	Δ wage
I2R	0.101*** (0.0165)	
I2R same		0.0369** (0.0187)
I2R new		0.180*** (0.0254)
I2I new		0.0484*** (0.0163)
Observations	13,124	14,504
R-squared	4,139	4,313
Number of individuals	0.017	0.019

Other control variables are age and its squared, monthly tenure, household head status, marital status, educational attainment dummies. Standard errors are clustered at individual level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

3.6.2. Wage growth by age group

The following tables display the estimates of the effect of the 2007 reform on wage growth. Tables 3.13 and 3.14 show the wage growth results, by age group. The coefficient of interest is the interaction term between the post dummy and transition dummy. Workers aged 55 and under are subject to the policy, whereas workers aged 56 and over are not covered by the policy. As expected, transitioning has no effect on wages for the unaffected older workers, shown in Table 3.13 columns (3) and (4). Table 3.13 column (2) shows that younger workers who transition to regular employment within the same job with their current employer experience a wage increase of around 7% upon the switch compared to workers who stay in irregular work, even if at the 10% level. This suggests that firms that converted their irregular workers did indeed increase their pay in their first year of regular employment. Column (2) suggest that due to the reform, workers who move to a new regular job experience a wage decrease of around 9%, again at the 10% level. The wage penalty may be the result of firms being uncertain about the quality of a new worker, or, the workers bargaining power being reduced. Workers who are employed on regular contracts in their first year at a new employer may be forced to accept the initial wage decrease in return for the security of a permanent job, because the outside options are either moving to a new irregular job where there is a possibility of the contract being terminated before the maximum duration has passed, or unemployment.

Table 3.14 runs the same estimation but instead with the reference category as remaining in the same irregular job. The results are quantitatively similar, except the interaction between post and transitioning to a new regular job loses its statistical significance in column (2). Overall, Tables 3.13 and 3.14 suggest that the wages of workers who are converted to regular contracts increase between 6.7% and 6.8%. Column (2) in Tables 3.13 suggests that newly regular workers experience a wage decrease of around 8.9%. Given that the policy's main goal is to convert irregular workers within their current job, the converted workers appear to also experience an improvement in wages that should come with the status of regular employment. Overall, the insignificant coefficients on the *After* dummy suggest that the change in wage upon switching from irregular to regular employment does increase after the reform. However, while wages of workers regularised within their job increases, they decrease for workers who move to new regular employment elsewhere. Irregular workers who do not become regular within their current job may be more willing to accept an initial paycut for the stability of regular work.

Table 3. 13. Wage growth results for transitions from irregular to various forms of regular employment, by age group

	<55 years		56-64 years	
Reference: I2I	(1)	(2)	(3)	(4)
VARIABLES	Δ wage	Δ wage	Δ wage	Δ wage
After * I2R	0.00567 (0.0345)		0.0364 (0.114)	
After * I2R same		0.0667* (0.0393)		-0.114 (0.156)
After * I2R new		-0.0891* (0.0539)		0.231 (0.160)
Observations	11,756	11,756	2,549	2,549
R-squared	0.019	3,749	0.031	898
Number of individuals	3,749	0.023	898	0.033

Other control variables are age and its squared, monthly tenure, household head status, marital status, educational attainment, industry, and year dummies. Standard errors are clustered at individual level in parentheses.
***p<0.01, **p<0.05, *p<0.1.

Table 3. 14. Wage growth results for transitions from irregular to regular and new irregular employment for younger workers

	<55 years	
Reference: I2I same	(1)	(2)
VARIABLES	Δ wage	Δ wage
After * I2R	-0.0005 (0.0353)	
After * I2R same		0.0682* (0.0398)
After * I2R new		-0.0790 (0.0542)
After * I2I new		0.0359 (0.0375)
Observations	10,593	11,756
R-squared	0.020	3,749
Number of individuals	3,591	0.025

Note: Output omitted for workers aged 56-64 due to insignificant results.

Other control variables are age and its squared, monthly tenure, household head status, marital status, educational attainment, industry, and year dummies. Standard errors are clustered at individual level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

3.6.3. Wage Growth by Skill-Level

Tables 3.15 and 3.16 examine the effect of the policy on wage growth of workers who transition by skill level. The wages of those moving into low-skilled regular employment are not affected. As seen in Table 3.9 the policy was beneficial for low-skilled workers in terms of conversion to regular employment, but the low skill nature of the work means that the wage change upon switching from irregular to regular is not significantly different, compared to the wage growth between consecutive years of irregular employment in low-skilled work. The interaction coefficients in Table 3.15 column (2) shows that in the post-reform period, high-skilled workers experience a wage decrease of 15.8%. Table 3.16 column (2) shows a decrease of 15.3% when the reference category is staying in the same irregular job. This does not mean it is more beneficial for high-skilled irregular workers to remain irregular as opposed to transitioning to regular work with a new employer. Rather, there is a fall in wage between the last year of high-skilled work and the first year of regular employment with a new employer, compared to the wage growth between consecutive years of high-skilled irregular work. The firm may not need to offer a high starting salary as they may not have sufficient information about the ability of a new regular employee, who was in irregular employment with a different employer in the previous year, therefore workers may be willing to accept a wage cut when moving to a new regular job, in return for the security of a regular job and the higher potential earning salary of high-skilled regular work. The LPM transition results in Table 3.9 Panel B suggest that the policy helped low-skilled workers move to regular jobs, but the positively significant coefficients for high-skilled workers on transitions from irregular to new regular employment in Tables 3.15 and 3.16 shows that high-skilled workers who switch benefit more in terms of wage growth than do low-skilled workers.

Table 3. 15. Wage growth results for transitions from irregular to regular employment, by skill-level

Reference: I2I VARIABLES	<55 years			
	High-skilled		Low-skilled	
	(1) Δ wage	(2) Δ wage	(3) Δ wage	(4) Δ wage
After * I2R	-0.0203 (0.0392)		0.0481 (0.0939)	
After * I2R same		0.0611 (0.0442)		0.0265 (0.107)
After * I2R new		-0.158** (0.0618)		0.0872 (0.154)
Observations	9,340	9,340	2,416	2,416
R-squared	0.022	0.028	0.033	0.034
Number of individuals	3,205	3,205	846	846

Other control variables are age and its squared, monthly tenure, household head status, marital status, educational attainment, industry, and year dummies. Standard errors are clustered at individual level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 3. 16. Wage growth results for transitions from irregular to regular and new irregular employment, by skill-level

	High-skilled	
Reference: I2I same	(1)	(5)
VARIABLES	Δ wage	Δ wage
After * I2R	-0.0316 (0.0400)	
After * I2R same		0.0581 (0.0448)
After * I2R new		-0.153** (0.0618)
After * I2I new		-0.00199 (0.0441)
Observations	8,432	9,340
R-squared	0.024	0.031
Number of individuals	3,058	3,205

Note: Output omitted for low-skilled workers due to insignificant results.

Other control variables are age and its squared, monthly tenure, household head status, marital status, educational attainment, industry, and year dummies. Standard errors are clustered at individual level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

3.6.4. Wage Growth by Private vs Government Employers

Next, I present the impact of the policy on wages by workplace of the worker, in Tables 3.17 and 3.18. The two workplaces are private firms, and government-related firms or branches. The coefficient on “After*I2R same” in Table 3.17 column (2) shows that workers who transition in the same job in private firms experience a wage increase of 12.7%. In contrast, column (4) show that workers in public sector workplaces experience a wage cut of 28.7%. Figures 3.6 and 3.7 show that regular public sector workers experience the highest wages and longest tenure among all workers, as regular public sector jobs are seen as jobs for life. Therefore, newly regular public sector workers in the same job are taking a cut in the first year of regular work, in exchange for regular status employment. Column (3) also shows there is a wage penalty of 36.3% even if only significant at the 10% level, but this is not robust to the alternative reference transition category of irregular to irregular in the same job, as seen in Table 3.18 column (3).

The coefficients on “After*I2R new” for private firm workers in Table 3.17 column (2) is negative as expected, with a coefficient of -9.9%. This result suggests irregular workers moving into new regular jobs with new employers in the post-reform period are taking a cut in return for the tenure and earnings potential of regular jobs. The effect is insignificant for public sector workers, shown in column (4).

Overall, conversion to regular employment in the same job is beneficial in terms of wage for private at least in first year of transitioning, but there is a penalty for public sector workers. However, this does not necessarily mean public sector workers experience higher wages if they stay in irregular work. Newly regular public sector workers may be more inclined to accept a wage cut in at least the first year of regular work, because potential salary and security of tenure are highest for regular public sector workers among all workers, as shown in the data. Tables 3.17 and 3.18 suggest that private sector employers are indeed complying with the reform in terms of improvement in wages, when converting irregular workers to irregular contracts in the same job. In addition, irregular workers moving into new regular jobs experienced a wage cut as expected.

Table 3. 17. Wage growth results for transitions from irregular to regular employment, by workplace

<55 years				
	Private firm		Public firm	
Reference: I2I	(1)	(2)	(3)	(4)
VARIABLES	Δ wage	Δ wage	Δ wage	Δ wage
After * I2R	0.0275 (0.0374)		-0.363* (0.204)	
After * I2R same		0.127*** (0.0453)		-0.287** (0.134)
After * I2R new		-0.0991* (0.0552)		-0.480 (0.718)
Observations	9,259	9,259	974	974
R-squared	0.025	0.030	0.144	0.158
Number of individuals	3,306	3,306	413	413

Other control variables are age and its squared, monthly tenure, household head status, marital status, educational attainment, industry, and year dummies. Standard errors are clustered at individual level in parentheses.

***p<0.01, **p<0.05, *p<0.1.

Table 3. 18. Wage growth results for transitions from irregular to regular and new irregular employment, by workplace

<55 years				
	Private firm		Public Firm	
Reference: I2I same	(1)	(2)	(3)	(4)
VARIABLES	Δ wage	Δ wage	Δ wage	Δ wage
After * I2R	0.00864 (0.0390)		-0.162 (0.133)	
After * I2R same		0.125*** (0.0461)		-0.289** (0.133)
After * I2R new		-0.0963* (0.0557)		-0.459 (0.713)
After * I2I new		0.0007 (0.0408)		0.117 (0.199)
Observations	8,297	9,259	885	974
R-squared	0.025	0.031	0.092	0.160
Number of individuals	3,149	3,306	380	413

Other control variables are age and its squared, monthly tenure, household head status, marital status, educational attainment, industry, and year dummies. Standard errors are clustered at individual level in parentheses.

***p<0.01, **p<0.05, *p<0.1.

3.6.5. Wage Growth by Sector

Tables 3.19 and 3.20 examine the effect of the reform on wage growth by sector. Tables 3.19 and 3.20 Panel A shows that workers in the industrial sector experience no change in wage growth upon the first year of switching to regular work. Table 3.19 Panel B column (2) shows that workers in retail and hospitality services earn 13.4% more in the first year of regular work in the same job when transitions are split by movements to new, or same regular job. The coefficient of 14.4% in Table 3.20 Panel B column (2) suggests that the positive effect on wages of transitioning in this sector is a robust result.

Panel C shows that workers in financial, business, education, and health services do not experience a significant wage change upon transitioning. According to the KLIPS data, in the pre-reform period, regular workers in this sector earn the second highest wages of all regular workers, at 1.7 million won (£1,100) per month. Only regular workers in public administration and defence earned more, with 1.9 million (£1,250) per month. Additionally, 42% of observations in government workplaces belong to the financial, business, education, and health services sector. This may explain why the

negative but insignificant effect of the reform on wages are consistent with the results split by workplace in Tables 3.17 and 3.18, where government workplace workers experience a paycut in the first year of regular work with the same employer.

Finally, Table 3.19 Panel D column (1) shows that workers in public administration and defence experience a cut of 31.6% in the first year of regular work in either the same job or in a new job. This is robust to the alternative reference category with a coefficient of -30.1% in Table 3.20 Panel D column (1). The results in Table 3.19 Panel D column (2) and Table 3.20 Panel D column (2) are similar, suggesting that workers public administration and defence experience a wage cut between 25.5% to 26.9% upon conversion to regular status in the same job. Those who move to a new regular with a new employer experience a cut of between 42.3% to 43.5%. Only workers in this sector take a pay cut when moving from irregular to regular work. Overall, these workers accept an initial pay cut when moving from a risky job to a secure job. The other robust result appears to be in the retail sector. As irregular workers in retail move into regular jobs, workers experience an increase in wage upon transitioning.

In sum, Table 3.7 Panels A and B showed that the industrial sector is the most likely to create regular jobs from irregular jobs. Given that the number of employees in industrial workplaces is also the largest of the four sectors, with an average of 130 employees, this may mean industrial firms are either more compliant of the reform, or they are easier for the relevant authorities to monitor. However, regularization in the industrial sector does not lead to an increase in wage upon switching as shown below in Panel A of Tables 3.19 and Table 3.20. Positive wage growth appears to be more robust in retail. The wage growth upon switching ranges from 13.4% to 14.4% according to Panel B in the 2 tables. The KLIPS data shows that regular workers in retail earn the lowest wage of all sectors at 1.7 million won per month, compared to the second lowest regular wage of 2.2 million won per month for industrial sector work. Therefore, these low paid workers experience the largest relative benefit of the reform, suggesting that transition is beneficial in retail.

Table 3. 19. Wage growth results for transitions from irregular to regular employment, by sector

<55 years				
Reference: I2I	Panel A		Panel B	
	Industrial & utilities sector		Wholesale retail trade, & hospitality	
VARIABLES	(1) Δ wage	(2) Δ wage	(1) Δ wage	(2) Δ wage
After * I2R	0.0379 (0.0518)		0.0908 (0.0661)	
After * I2R same		0.0770 (0.0496)		0.134** (0.0662)
After * I2R new		-0.0265 (0.0928)		-0.0612 (0.131)
Observations	4,666	4,666	2,893	2,893
R-squared	0.019	0.021	0.026	0.029
Number of individuals	1,416	1,416	1,084	1,084
Reference: I2I	Panel C		Panel D	
	Finance, business, education & health		Public administration & defence	
VARIABLES	(1) Δ wage	(2) Δ wage	(1) Δ wage	(2) Δ wage
After * I2R	-0.0777 (0.0874)		-0.316** (0.122)	
After * I2R same		-0.0428 (0.106)		-0.269* (0.143)
After * I2R new		-0.193 (0.174)		-0.435** (0.218)
Observations	3,000	3,000	352	352
R-squared	0.028	0.029	0.222	0.225
Number of individuals	1,127	1,127	148	148

Other control variables are age and its squared, monthly tenure, household head status, marital status, educational attainment, industry, and year dummies. Standard errors are clustered at individual level in parentheses.

***p<0.01, **p<0.05, *p<0.1.

Table 3. 20. Wage growth results for transitions from irregular to regular and new irregular employment, by sector

<55 years				
Reference: I2I same	Panel A		Panel B	
	Industrial & utilities sector		Wholesale retail trade, & hospitality	
VARIABLES	(1) Δ wage	(2) Δ wage	(1) Δ wage	(2) Δ wage
After * I2R	0.0209 (0.0550)		0.0793 (0.0630)	
After * I2R same		0.0770 (0.0500)		0.144** (0.0673)
After * I2R new		-0.0205 (0.0941)		-0.0478 (0.130)
After * I2I new		-0.0007 (0.0632)		0.0952 (0.0762)
Observations	4,369	4,666	2,638	2,893
R-squared	0.023	0.022	0.027	0.031
Number of individuals	1,369	1,416	1,027	1,084
	Panel C		Panel D	
	Finance, business, education & health		Public administration & defence	
VARIABLES	(1) Δ wage	(2) Δ wage	(1) Δ wage	(2) Δ wage
After * I2R	-0.0770 (0.0917)		-0.301** (0.129)	
After * I2R same		-0.0373 (0.107)		-0.255* (0.145)
After * I2R new		-0.183 (0.175)		-0.423** (0.196)
After * I2I new		0.194 (0.530)		0.117 (0.125)
Observations	2,851	3,000	302	352
R-squared	0.030	0.030	0.195	0.235
Number of individuals	1,105	1,127	121	148

Other control variables are age and its squared, monthly tenure, household head status, marital status, educational attainment, industry, and year dummies. Standard errors are clustered at individual level in parentheses.

***p<0.01, **p<0.05, *p<0.1.

3.6.6. General Equilibrium Effects

In this subsection, I discuss the potential general equilibrium effects of the reform, and how they may impact the estimated effects presented in Chapter 3 and at the worker level in Chapter 4. Since the reform affects both workers and firms, the point estimates in the results may be affected by changes to both the demand and supply of labour. I show in Chapter 4 Table 4.4 that firms reduced overall employment, although the overall effect is quite small at 1.7%, with an increase in regular employment of 14.3% and a larger decrease in irregular employment of 22.3%. This suggests there may not be a 1:1 conversion of irregular workers into regular workers. Rather, some irregular workers get laid off. While the definition of an irregular worker covered by the reform is broader in the WPS than the KLIPS (defined as fixed-term contract and dispatched workers in the WPS, but unlike the KLIPS there is no information on the age or tenure of these workers, which determines their eligibility for the policy), it still suggests that we should expect to see an increase in transitions from irregular to regular employment, and irregular employment to non-employment or self-employment. The results in Table 3.4 showed that while the transitions from irregular employment to non-employment or self-employment are insignificant, I am also only looking at a subset of the working population (aged 46 to 64). The KLIPS data allows me to conduct a difference-in-difference analysis for workers around the age 55 cut-off. However, from the WPS I cannot observe whether

it is the same workers that move from irregular to regular employment, or if it is the case that firms just hire more regular workers right away. Therefore, the results in Chapter 3 help me to analyse the results at the individual level in more detail.

Regarding the general equilibrium effects for the firm-side there are two effects on firm entry and exit that I do not observe. That is, potentially the reform may result in increased firm exits for firms that predominantly used irregular workers. However, I do not expect to see a large effect on firm exits for two reasons. Firstly, the overall effect on employment is quite small (1.7%), and secondly, firms can still use irregular workers but for a maximum of 2 years. So potentially if firms do not mind a high turnover (for instance, when employing low-skilled labour), they can still hire irregular labour.

The second general equilibrium effect stems from the labour supply. For instance, with increased protection, workers might be more likely than before the reform to take an irregular job since they anticipate that it will eventually be converted to a regular job. Conversely the opposite may occur since they are more likely to be fired after 2 years instead of remaining in this job for a longer period, whereas prior to the reform, these fixed-term contracts could be renewed indefinitely. Therefore, part of the decrease in irregular jobs at the firm level can be due to the supply effect (i.e., workers just simply do not want to work in irregular jobs). However, given that irregular jobs still pay much less, it can be argued that there is not a large effect on supply. Most likely, workers may not want irregular jobs to begin with and even with a stronger protection, they would still prefer a regular job.

3.7. Conclusion

This study exploits a recent reform on employment protection of irregular workers in Korea. I examine the impacts of the reform on transitioning from irregular wage to regular wage employment. Employing an annual panel labour force survey of Korea, I show that the 2007 reform increases the probability of transitioning from irregular to regular wage employment by 4.9%. The majority of this figure is driven by movements into regular employment in the same job with the same employer, at 3.4%. In addition, the probability of remaining in irregular employment falls by 5.7%, and this is driven mainly by the probability of moving to a new irregular position falling by 4.8%. Therefore, the results suggest the policy achieved its intended effect. In particular, low-skilled irregular workers benefit from the policy, as they experience an 8.2% increase in probability of transitioning to regular work, and 6.9% increase in probability of becoming regular in the same job. However, at the same time, low-skilled workers are also more at risk of becoming unemployed or inactive due to the policy, with the probability increasing between 8.6% to 11.2%. This may be because the reform makes irregular workers potentially more legally and financially burdensome upon conversion to regular employment status.

The findings of this article also add to the literature, showing that the effect of an increase in the protection level of irregular workers depends on the workplace. Irregular workers in private firms are 7.6% more likely to transition to regular work and 5.7% more likely to transition in the same job, however the effect on transitions is less clear for government sector workers. In addition to looking at transitions, I find that workers in private firms experience a wage increase upon conversion to regular employment in the same job, suggesting that as well as officially granting them regular status employment, private firms are in fact treating their newly converted regular workers “better” in terms of wages. On the other hand, government sector workers take a pay cut between the last year of irregular work and the first year of regular work. Given the data shows that regular government sector workers earn the most and experience the longest tenure among all workers, it may be the case that they accept a wage cut in the first year in return for the benefits of regular employment.

CHAPTER 4 Temporary Employment Protection Legislation. Firm-level Evidence from South Korea.

In Chapter 4, I examine the impact of the same Korean 2007 employment reform on employment and worker outcomes (wages and employment benefits), and financial performance indicators, using firm-level panel data. This study is not the first to look at the effect of the policy on establishments. I follow Baek & Park (2018) in this chapter, and extend their analysis to answer some additional questions on the impact of the policy, such as whether the response of firms to the reform differ by business division (i.e. private vs public), sector, and firm size. Lastly, I also extend on their paper by examining the effect of the policy on wages and social insurance coverage of irregular workers, and explore in more detail the impact on financial indicators of the firm. I replicate their findings in Tables 4.4, using a longer panel and show that the main results are robust to using a longer post-reform period. Section 4.1 motivates the research question with reference to the literature on the effect on firms of changing employment protection levels. Section 4.2 describes the data. Section 4.3 describes the empirical framework. Section 4.4 provides the employment outcome results. Section 4.5 provides the results for labour markets and financial outcomes. Section 4.6 concludes.

4.1. Introduction

During the past few decades, the incidence of temporary jobs has increased across the OECD. According to OECD data, the proportion of temporary employment among dependent employment increased from 10.3% in 1990 to 12.3% in 2018 across all OECD nations, on average. Proponents of stronger employment protection for irregular workers argue that it discourages the increase in use of irregular work contracts (OECD, 2014). On the other hand, strict EPL is frequently cited as a key factor of high unemployment rates, particularly in European countries. Despite widespread constraints on labour-shedding in Japan and Europe, they appear particularly stringent in Europe (Bertola, 1990). Cahuc & Postel-Vinay (2002) examine the simultaneous use of strong employment protection and irregular job creation, which theoretically have offsetting effects since the former aims to limit job destruction, whilst the latter intensifies it. They find that the majority of workers may be willing to support this combination of two instruments with opposite effects on job destruction and job creation which increase unemployment and reduce efficiency, especially when firm ownership is concentrated.

This chapter aims to better understand the impact of increasing employment protection and benefits for irregular workers, using a biennial panel of Korean firms to identify its effect on various types of employment. Previous literature on employment protection has focused primarily on its impact on employment. There have been a number of studies examining the effect at the firm level, but they do not all agree on the direction and extent to EPL affects unemployment rates.

Empirical Studies

For instance, Kugler & Pica (2008) studied the Italian reforms of 1990 which raised unjust dismissal costs for small firms that were previously exempt from regulations, but not for larger firms. Flows both into and out of employment decreased for smaller firms relative to larger firms, lending support to the findings that more stringent EPL reduces labour flow dynamics (Blanchard & Wolfers, 2000; Siebert, 1997). Siebert (1997) investigates institutional factors in European countries, arguing that reforming the key labour market institutions to have more flexible labour markets would solve

unemployment problems in Europe. Similarly, Blanchard & Wolfers (2000) suggest that more strict labour market institutions are a determinant for high unemployment rates in Europe.

Bauer et al., (2007) studied the effect of changes in the threshold scale exempting small German firms from dismissal protective provisions on worker flows, finding no statistically significant effect of dismissal protection on worker turnover. The findings of Kugler & Pica (2008), and Bauer et al., (2007), also challenge the argument that market flows are lower in contexts with stronger EPL. In other cases, reforms were enacted uniformly across the economy. For example, Blanchard and Landier (2002) study the effect of France's policy in the 1990s of lowering costs of firing workers from temporary jobs on transitions to permanent work; and Boeri & Garibaldi (2007) study the effects on employment and productivity of Italy's late 1990s reforms which made it easier for firms to create temporary jobs, finding that employment increased temporarily following the relaxation of regulation. Boeri & Garibaldi coined the term “honeymoon effect” of marginal reforms, referring to the temporary aggregate outcome of declining unemployment and an increasing employment rate. The reforms carried out in several European countries in the 1990s introduced two tier systems, as the increased labour market flexibility mainly took the form of a series of marginal reforms liberalising the use of fixed-term contracts while leaving the legislation applying to permanent workers largely unchanged. Bentolila & Bertola (1990), find that firing costs have larger impacts on the firm's decision to fire rather than hire, suggesting that a reduction in firing costs could raise a firm's willingness to hire new workers. Nickell (1997) analyses determinants of unemployment in the OECD, highlighting certain labour market features to explain high unemployment. Among them is a high level of unionization for collective bargaining, which could increase unemployment if there is no coordination among either employers or unions in wage bargaining.

Theoretical Models

Bertola et al (1999) develop a theoretical model which predicts that stricter legislation leads to more stable employment as it reduces both hiring and firing. Pissarides (2001) constructs a theoretical model analysing the role of EPL in job creation, showing that optimally chosen severance pay and advance notice of termination plays an insurance role and does not reduce job creation with an exogenous unemployment insurance system. Autor, Kerr, & Kugler (2007) use the adoption of protection against wrongful discharge in US states from 1970 to 1999 to evaluate the relationship between dismissal costs and productivity. Their findings suggest that wrongful discharge protection reduces employment flows and entry rates of new firms in adoptive states. Because the theory does not provide any clear-cut predictions, it is not surprising, perhaps, that the empirical results pertaining to the repercussions of employment protection on the employment level are mixed (Boeri and Garibaldi 2007; Kahn 2010).

Calmfors & Driffill (1988) proposed a hypothesis that the effects of employment protection depends on whether insider wages can be adjusted downwards to compensate for the increased costs due to the legislation. Under the assumption that wage demands from insiders have less impact where wages are negotiated at the firm level (collective bargaining is lower), if insiders have a weak bargaining position, this increases the possibility of firms being able to pass on the costs to insiders in the form of lower wages. In contrast, wage demands have more impact where wages are negotiated at the higher (industry) level. If insiders have a strong bargaining position, this reduces the chance of costs being passed on to insiders in the form of lower wages. As the degree of co-ordination increases again to the national level, unemployment falls as the unions exercise monopoly power, thus giving the relationship between unemployment and degree of co-ordination an inverted U-shape. Bassanini & Duval (2006) suggest a hump-shape, but find the relationship between aggregate unemployment rate and EPL is not robust. Institutional determinants of unemployment are unemployment generosity

measure, EPL, union membership rates, and the measure of centralization (coordination of wage bargaining). They find that while tax wedge and average replacement rate are positively associated with unemployment rates, EPL and union density are not significant determinants of the unemployment rate. Output gaps (proxy for business cycle fluctuations) and high corporatism are found to reduce the unemployment rate.

Intermediate bargaining power reduces unemployment at the 10% level, and high bargaining power also reduces unemployment but the effect is insignificant. On the other hand, the OECD (1999) show that with higher co-ordination levels, stronger employment protection reduces unemployment, i.e. the relationship is linear rather than hump-shaped. However, they do both find that flows into and out of unemployment decrease, while unemployment duration increases. Lazear (1990) produced a seminal study on the impact of employment protection on aggregate employment and unemployment. Using data on notice periods and severance pay for 22 countries over 1956-1984, countries with more stringent employment protection experience lower employment and higher unemployment.

In Korea, the negotiations are decentralized and predominantly happen at the firm level, rather than through collective bargaining. The trade union density is very low by OECD standards, at around only 10% among total employees during the 2000s and ranking second-lowest, only higher than France. Collective bargaining coverage is also the lowest among all OECD countries, with around 10%. Overall, the presence of unions is low in Korea, but they remain firmly entrenched in large firms and among regular workers. According to the firm-level Korean Workplace Panel Survey data, only 16% of smaller firms with less than 100 workers had labour unions, however, 65% of larger firms with more than 300 workers had labour unions. In addition, the individual-level KLIPS data shows a marked difference in terms of union membership between regular and irregular workers. The percentage of regular workers in a union is around 25%, compared to 6% for irregular workers. The results in Chapter 3 show that at the worker level, unions have a positive and significant effect on worker wages, and at the firm level, Baek & Park (2018) find that firms with unions (i.e. protection for their current regular workers) increased their usage of regular workers by less than firms without unions.

Contribution to literature

I exploit Korea's labour reforms, which came into effect in 2007 after being passed in late 2006, to identify the impact of employment protection at the firm level. The major component of these reforms is to increase the employment protection levels of specific types of irregular workers with tenure exceeding two years. The firm-level impact of the reforms depends on the pre-policy proportion of affected temporary workers at each firm, enabling me to apply a difference-in-differences framework to compare the various business-level outcomes across firms with varying degrees of treatment intensity, following the approach of Baek & Park (2018).

To the best of my knowledge, Baek & Park (2018) is the only other study that empirically quantifies the impact of the 2007 labour market reform in Korea at the firm-level, providing additional evidence on whether the businesses respond to the labour regulation by adjusting the size and composition of their workforce. They apply a differences-in-differences framework on a representative sample of firms, using biennial Korean firm-level panel data from the Workplace Panel Survey (WPS), for 2005, 2007, 2009, and 2011 to examine the impact of the employment protection law on firm-level outcomes such as employment and profitability. Taking into account that the impact of the reforms is greater for firms that intensively used irregular workers, they find that businesses responded to the reform by reducing the use of temporary contracts and partially substituting them with permanent contracts and irregular workers on unprotected contracts. As a result, the reform decreased overall employment level of establishments. They provide evidence that the employment

protection for irregular workers has a small but statistically significant negative impact on the total employment level. A 10% point increase in treatment intensity (the pre-policy proportion of workers on protected irregular contracts) is associated with a 3.2% decrease in total number of workers. Firms with a high proportion of affected irregular workers reduced total employment by a larger amount compared to those using these workers less intensively. Additionally, employment protection for specific types of irregular workers had unintended consequences. Firms responded to increased employment protection for irregular workers with protected contracts by increasing their use of other types of irregular workers who are not covered by the reforms. In this case, the use of atypical irregular workers by firms increased after the introduction of the protective measures for typical workers. This balloon effect – an increase in the incidence of unprotected irregular contracts, is more prominent among firms who protected their incumbent regular workers, i.e., firms with a labour union. Overall, businesses respond to the EPL by replacing workers who become legally burdensome by the reforms.

Furthermore, Baek & Park (2018) find that the newly introduced regulations had a limited negative impact on firms' profitability. Evidence suggests that establishments also improved their capital intensity and their labour productivity in response to the labour reform. Employing the standard difference-in-differences approach with control and treatment groups assumes that firms with differing proportions of irregular workers among all workers are affected to the same extent, which is unlikely. Therefore, they use the proportion of irregular workers among all workers in each firm in 2005, a pre-reform wave, as a continuous indicator of treatment intensity instead of using control and treatment groups. Their paper forms the basis for Chapter 4, and I aim to answer some additional questions on the impact of the policy, such as whether the response of firms to the reform differ by business division (i.e. private vs public), sector, and firm size. Lastly, I also extend on their paper by examining the effect on wages and social insurance coverage of irregular workers, and explore in more detail the impact on financial indicators of the firm.

Therefore, I contribute to the literature by building upon the study from Baek & Park (2018), extending on their analysis by examining the effect of the policy on wages and social insurance coverage of irregular workers, and explore the impact on financial and additional business-level outcomes such as labour productivity and profitability, by sector. These areas are relatively unexplored, with the few exceptions including the aforementioned Autor et al. (2007), and Bird & Knopf (2009). The latter estimate the effect of protection against wrongful discharge in adoptive US states from 1977 to 1999, using data on approximately 18,000 banks. They find adoption negatively impacts on profitability, corroborating Artur et al's findings that wrongful-discharge laws place increased costs on employers. This relative scarcity of evidence may be unexpected because EPL for workers acts as a restriction on labour use from the perspective of the firm. To the best of my knowledge, my study is among the first to examine the impact of regulations pertaining to irregular workers on profitability outside of the banking sector.

4.2. WPS Data

In order to study the impact of the 2007 reform, I use biennial data from the Workplace Panel Survey (WPS) from 2005 to 2013, with the dataset consisting of a panel of around 1,800 firms on average in each wave. The survey was first conducted in 2005 and are collected every two years by the Korea Labour Institute. The main specifications are estimated using five waves of data – 2005 (pre-policy wave), 2007, 2009, 2011, and 2013. The firms in the WPS are randomly chosen from a nationally representative sample in the 2005 Census on Establishments collected by Statistics Korea. The WPS covers establishments in all sectors apart from agriculture, forestry, fishing, and mining and quarrying. The dataset covers 65

industries classified by the 9th edition Korean Standard Industrial Classification (KSIC), at the 2-digit level. The summary statistics are shown in Table 4.1 and Table 4.2.

Table 4.1 Panel A contains information on the firm, such as the age of the establishment, the presence or existence of a labour union, regional location, and whether it is a single workplace or there are multiple workplaces, and type of business entity. In addition, Panel B displays a number of financial outcome indicators such as labour cost per worker, which comprises of the sum of wages and other labour-related expenses, such as fringe benefits and severance pay. The firms also provide information on the wages of irregular and regular workers. The size of firms in terms of production and expenditure, and profits are important factors in terms of competitiveness and ability for exploitation of economies of scale.

More importantly for this study, the WPS surveys firms on the total number of workers employed, including not only workers directly hired by the firm, such as regular (permanent) workers, but also on the various types of irregular (temporary) workers, such as dispatched workers (covered by the reform). Therefore, the employment data, summarized in Table 4.2, provides an opportunity to examine the effects of the 2007 EPL on overall employment levels of a firm and the composition of the workforce, i.e. the share of regular and irregular workers. In 2005, the pre-policy survey wave, the average number of total workers in a firm was around 473. This sum is the total of regular and irregular workers, with figures of 346 and 127 respectively. In turn, these irregular workers comprise of those employment contracts covered by the 2007 Act on the Protection of Temporary Workers, and those contracts that are unprotected. In the average firm in 2005, two thirds of the irregular workers were covered by the new legislation (these contracts were fixed-term and dispatched workers), and the remaining third were not covered. Overall, firms hired approximately 21% of their total workforce as irregular workers, where 14% (7%) of the workforce were protected (unprotected). The data collection started in 2005, two years before the policy was enforced, which allows me to identify firms expected to be affected by the reform to varying degrees by examining the share of protected irregular workers in 2005.

Table 4. 1. Summary Statistics of the Workplace Panel Survey

VARIABLES	(1) 2005	(2) 2007-2013
Panel A: Firm characteristics		
Labour union	0.40	0.38
Firm age	19.3 [14.9]	24.2 [16.7]
Located in city	0.54	0.55
Firm is a corporation	0.98	0.96
Single workplace firm	0.52	0.48
Performance pay for regular workers	0.57	0.49
Private or public sector firm	0.91 N=1,905	0.94 N=7,017
Panel B: Financial information		
Labour cost per worker (million KRW)	41.2 [18.1] N=1,389	47.7 [20.9] N=5,422
Operating profit to revenue	0.06 [0.16] N=1,414	0.04 [0.17] N=5,545
Revenue per worker (billion KRW)	2.5 [12.5] N=1,453	3.5 [20.2] N=5,631
Capital per worker (million KRW)	244.5 [3804.6] N=1,448	534.8 [4734.9] N=5,560
Wage of directly hired irregulars (% of regular workers)	82.8 [17.2] N=970	88.5 [18.1] N=2,186
Wage of indirectly hired irregulars (% of regular workers)	77.7 [15.3] N=466	87.2 [16.4] N=477
Wage of fixed-term workers (10,000 KRW)	2239.0 [917.9] N=538	2360.1 [994.6] N=2,995
Starting wage of regular university graduates (10,000 KRW)	2287.6 [579.6] N=1,835	2533.6 [653.9] N=6,393
Starting wage of regular high-school graduates (10,000 KRW)	1878.9 [457.2] N=1,521	22119.1 [517.1] N=5,800

Notes: Column (1) reports the statistics for 2005, the pre-policy survey wave. Column (2) reports the statistics for the post-policy period, from 2007 to 2013. Standard deviations in square brackets.

Table 4.1 and 4.2 summarize the data used in the empirical analysis. From Table 4.1 Panel B, it can be seen that labour cost per worker has increased by 6.5 million won (around £4,200), but revenue per worker has also increased by 1 billion won (around £640,000), and capital per worker by 290 million won (around £185,000). This suggests that firms were not necessarily financially impacted by the reform. They may have adjusted their capital and productivity to mitigate any potential negative effects of the reform. The wage of irregular workers as a percentage of regular workers who carry out similar work has increased for both directly hired and indirectly hired irregular workers. Indirect hires refer to workers who are employed through outsourcing firms, and thus do not have a direct employment relationship with the user firm. The wage differential between irregular and regular workers seems to have decreased over time, with wage as a percentage of regular wage increasing from 78% to 89%. The definition of different work arrangements can be found in Table 4.3.

Table 4. 2. Employment Summary Statistics of the Workplace Panel Survey

VARIABLES	(1) 2005	(2) 2007-2013
Employment		
Total workers	472.9 [1321.3]	393.9 [911.4]
Regular workers	346.1 [1059.2]	300.8 [729.8]
Irregular workers	126.8 [520.0]	93.1 [403.8]
Protected irregular workers	85.5 [388.5]	44.5 [227.4]
Unprotected irregular workers	41.3 [285.1]	48.6 [309.7]
Share of irregular workers	0.21 [0.28]	0.17 [0.26]
Share of protected irregular workers	0.14 [0.22]	0.09 [0.17]
Share of unprotected irregular workers	0.07 [0.18]	0.08 [0.21]
	N=1,905	N=7,017
Number of fixed-term workers converted to regular workers	14.1 [90.6]	7.0 [47.9]
Rate of conversion	0.21 [0.36]	0.15 [0.37]
	N=713	N=2,109
% of firms that primarily employ fixed-term (protected) workers when employing directly hired irregular workers	77.3 N=1,205	73.6 N=4,219
% of firms that primarily employ dispatched (protected) workers when employing indirectly hired irregular workers	79.3 N=783	31.2 N=2,255
% of firms that provide social insurance		
National pension provided to all directly(in) hired irregulars	80.1 (57.9)	84.2 (77.5)
Provided to 50% or more	2.0 (2.4)	1.9 (1.5)
Provided to 50% or less	1.9 (0.7)	1.5 (0.8)
Provided to none	16.0 (39.0)	12.4 (20.2)
National health insurance provided to all directly(in) hired irregulars	84.0 (58.7)	87.4 (78.5)
Provided to 50% or more	1.6 (1.9)	1.2 (1.5)
Provided to 50% or less	1.1 (0.9)	1.3 (0.3)
Provided to none	13.3 (38.5)	10.1 (19.7)
Employment insurance provided to all directly(in) hired irregulars	82.9 (58.9)	84.8 (78.2)
Provided to 50% or more	1.5 (1.5)	1.3 (1.7)
Provided to 50% or less	1.0 (1.5)	1.1 (0.7)
Provided to none	14.6 (38.1)	12.8 (19.4)
Injury compensation provided to all directly(in) hired irregulars	90.2 (60.4)	89.8 (78.8)
Provided to 50% or more	0.9 (1.1)	1.0 (1.3)
Provided to 50% or less	0.3 (1.3)	0.8 (0.6)
Provided to none	8.6 (37.2)	8.4 (19.3)
	N=970 (466)	N=4,188 (1,762)

Notes: Column (1) reports the statistics for 2005, the pre-policy survey wave. Column (2) reports the statistics for the post-policy period, from 2007-2013. Figures for indirectly employed irregular workers in parentheses.

Table 4.2 displays the summary statistics on employment. It can be seen that the average number of employed in a firm has fallen from 473 to 394, so the regulations appear to be accompanied with a downsizing of the workforce. In addition, all types of workers with the exception of unprotected irregular workers experienced a decrease in employment numbers. Irregular workers as a share of total workers also decreased over time, from 21% to 17%. However, unprotected irregular workers as a share of all irregular workers has significantly increased from 33% to 50%. This suggests that firms adjusted the composition of the workforce by substituting irregular workers protected by the reform with less financially

burdensome irregular contracts who are not covered by the reform. In terms of social insurance, indirectly hired irregular workers have also experienced an improvement in coverage, with the probability of four main insurances being provided to all indirectly hired irregulars increasing from round 60% to 80%.

Table 4. 3. Definitions of work arrangements in Korea

Directly hired irregular workers	
Fixed-term contract workers (covered by reform)	Workers with work contracts that have fixed time limits (including those that are limited according to verbal or tacit agreements and contracts) who may maintain employment relations by having such contracts repeatedly renewed, but who are not treated as regular employees.
Part-time workers	Workers who work considerably fewer hours per week (e.g. 30 hours per week) than regular working hours (generally about 40 hours per week) or those who work fewer days per week (e.g. 3, 4 days per week) compared to regular work weeks.
Indirectly hired irregular workers	
Dispatched workers (covered by the reform)	Workers employed by a dispatch company but work at your workplace. Wage and employment relationship follows rule and order of the users, but managed by dispatch agency.
Subcontracted workers	Workers employed by the in-house subcontracting company but work under a user company (in-house subcontracting, etc.), and under the leadership of the contractor in terms of wages and employment relationship.
Casual workers	Workers who work for short hours whenever there is a job available, without work continuity or regularity and regardless of the employment type, providing work non-continuously on an on-call basis by an acquaintance, company, association or job placement agency. For example, part-time workers at department stores, event assistants and daily construction workers.
Special / independent contractors	Workers who seek clients and provide products and/or services on their own and receive income (commission, fee, etc.) in proportion to their work, and determine the method of work delivery and working hours on their own. (Insurance planners, workbook teachers, "quick" delivery men, golf caddies, ready mixed concrete truck drivers and credit card salesmen, etc.)
Range of workers	
Regular workers	Workers who have a contractual relationship with a single employer with the expectation of continuous employment and working a full day. Fixed-term workers (contract/temporary) and part-time workers (workers with shorter working hours/days per week) are not included.
Disabled workers	Workers confirmed with a degree of disability under the Act on the Welfare for the Disabled.
Foreign workers	Foreign professional workers with an employment visa.

Source: Workplace Panel Survey

4.2. Empirical Framework

In order to identify how businesses respond to changes in the employment protection of irregular workers, I apply a difference-in-differences framework, in order to compare employment and financial outcomes for firms that were strongly affected by the reform with firms that were less heavily affected. I employ a difference-in-differences approach with intensity of treatment, assuming that firms with a higher share of protected irregular workers in 2005, a pre-policy wave, are affected by the policy to a larger degree. I use the proportion of protected irregular workers (fixed-term and dispatched contracts) among all workers in 2005 is used as a continuous indicator of treatment intensity. This would then capture the effect of the reform on employment and financial outcomes.

The effect of the reform is estimated with Equation (1):

$$Y_{ijrt} = \beta_0 + \beta_1 After_t + \beta_2 After_t * Treat_i + X_{ijrt} \phi + \delta_i + \rho_j + \gamma_r + \tau_t + \lambda_{st} + \mu_{jt} + \varepsilon_{ijrt}, \quad (1)$$

Y_{ijrt} is the outcome variable for firm i , in industry j , in region r , at year t , such as number of the workers, proportion of a given type of workers, and financial performance indicators, like total labour cost per worker, and profit to revenue ratio.

$After_i$ is a dummy variable that takes 0 for the first survey wave (2005), and 1 for the four succeeding waves, after the reform was implemented. $Treat_i$ is the continuous treatment intensity indicator, defined as the proportion of irregular workers covered by the reform among all workers in a firm in 2005. The coefficient of interest is the interaction term between $After_i$ and $Treat_i$. It captures the causal effect of the employment reform on outcome variable, Y_{ijrt} . δ_i and ρ_j are the firm and industry dummies, and γ_r and τ_t represent region and year fixed effects. X_{ijrt} is the vector of time-variant firm characteristics, such as firm age, use of performance-related pay for regular workers, type of business entity, and existence of a labour union.

The validity of a conventional difference-in-difference framework hinges on the assumption that trends in Y_{ijrt} across firms with differing degrees of treatment intensity would be similar in the absence of the policy. Unfortunately, the parallel trend assumption cannot be tested since the WPS contains only one wave of data prior to the reform. Therefore, following the approach of Baek & Park, to further account for the possible difference in trend of the outcome variable across firms with differing degrees of treatment intensity, firm size-by-year and industry-by-year effects are included in all specifications, represented by λ_{st} and μ_{jt} respectively. S indicates the categorized size of the establishment in terms of total workers in 2005, so they account for the possible difference in trends between firms with different employment levels. Finally, the error term, ε_{ijrt} , is clustered at the firm level.

4.3. Employment Outcomes

4.3.1 The Effect of Irregular Employment Protection on Employment

This section presents the estimates of the causal impact of the reform on employment numbers and composition of the workforce. Table 4.4 below replicates the first of three regression tables in Baek & Park (2018) for a longer sample, and summarizes the results from estimations with Equation (1), using the log of number of workers according to various types of employment contracts, and the proportion of various types of irregular workers among all workers as the dependent variable. Table 4.4 lends support to the evasion hypothesis (Yoo & Kang, 2012), where firms exploit a loophole in the law by substituting irregular workers who are protected by the reform with irregular workers who are not protected. Regular worker numbers also increase, but the increase in regular workers and unprotected irregular workers does not compensate for the decrease in number of protected irregular workers, resulting in an overall reduction in employment.

Table 4. 4. Effect of the reform on employment levels and shares

VARIABLES	In logs					Proportion of total workers		
	(1) Total workers	(2) Regular workers	(3) Irregular workers	(4) Protected irregulars	(5) Unprotected irregulars	(6) Irregular workers	(7) Protected irregulars	(8) Unprotected irregulars
After * Treatment	-0.166** (0.0744)	1.431*** (0.187)	-2.229*** (0.200)	-3.238*** (0.241)	1.327*** (0.443)	-0.535*** (0.0329)	-0.756*** (0.0245)	0.221*** (0.0293)
Observations	6,862	6,525	4,578	3,915	2,397	6,862	6,862	6,862
R-squared	0.043	0.073	0.105	0.214	0.150	0.099	0.338	0.042
Number of firms	1,905	1,878	1,606	1,457	1,107	1,905	1,905	1,905

Notes: After * Treatment is the interaction term between After and Treatment intensity, where After is a dummy indicating years after the legislation was enforced in 2007, Other control variables include firm age, type of business entity, existence of a labour union, and use of performance based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

In Table 4.4 and all following regression tables, the coefficient of interest is the interaction between the post dummy and treatment intensity. The coefficient on treatment intensity, namely, the proportion of protected irregular workers among all workers as of 2005, is used as a fixed effect and therefore is not estimated. The interpretation of the interaction coefficient differs to that of a standard DiD model, since the post-dummy is interacted with a continuous variable (treatment intensity ranging from 0 to 1 in 2005, a pre-policy year), rather than a treatment or control dummy. Therefore, the effect of the EPL on firms is assumedly dependent on the use of fixed-term and dispatched workers in 2005, a pre-reform year. Table 4.4 column (1) shows that a 10% point increase in treatment intensity is associated with a 1.7% decrease in the total number of workers. So, a firm with 10% of the workforce on fixed-term and dispatched contracts in the pre-reform period would experience a 1.7% decrease in total number of workers due to the reform, compared to a firm that didn't hire any of these types of irregular workers. In addition, the reform increased (decreased) regular (irregular) employment numbers for firms. Prior to the reform, firms could theoretically employ irregular workers on their contracts indefinitely, but now the reform states that protected irregular workers must be converted to regular contracts after the two-year period has passed, or the contract be terminated. Table 4.4 suggests that firms are reluctant to frequently hire and fire the now protected irregular workers, and instead substitute these workers with regular workers and unprotected irregular workers. However, the increase in these workers does not compensate for the fall in protected irregular workers, leading to an overall fall in total employment levels.

Columns (2) and (3) show that a firm with 10% point higher treatment intensity increased the number of regular workers by 14.3% more and decreased irregular employment by 22.3% more than firms with a lower pre-policy share of irregular workers covered by the reform.

Column (4) displays the effect of the reform on the incidence of fixed-term and dispatched contract workers, and column (5) displays the effect on the incidence of irregular workers on atypical contracts, such as subcontracted workers, casual workers, and independent contractors. These estimates show that firms reduced (increased) the number of protected irregular (unprotected irregular) workers by 32.3% (13.3%), compared to a firm that used no protected workers. Consistent with these results, the share of protected irregular workers decreased, but the share of unprotected workers increased in response to the reform, as seen in columns (7) and (8).

As a result of the increase (decrease) in regular (irregular) workers due to the reform, shown in columns (2) and (3), the share of irregular workers (including those not protected by the reform) fell within firms, as seen in column (6). Firms with a 10% point higher share of protected irregular workers prior to the reform experienced a decrease in the share of irregular workers by 5.3% more than firms with a lower treatment intensity level. This coefficient is the sum of the coefficients in columns (7) and (8). Columns (7) and (8) show that the decrease in share of irregular workers is mainly driven by a decrease in the share of protected irregular workers (-7.4%), which is partially offset by an increase in the share of irregular workers not covered by the reform (2.1%). Overall, these findings suggest that the 2007 reform had a net negative effect on the total employment level of firms, where the decrease in the number of protected irregular workers outweighs the increase in number of regular workers. They also suggest an unintended side effect of the reform. It seems firms responded to the new law by substituting irregular workers covered by the law with unprotected irregular workers who would have lower hiring and firing costs.

The main concern about the robustness of the results in Table 4.4 is regarding the 2008 financial crisis which occurred just one year after the reform. It is possible that the change in composition of the workforce is the result of the crisis, rather

than causally linked to the policy. Therefore, I allow the effect of business cycles on firms to differ according to their degree of usage of the protected irregular workers. The estimation in Equation (1) controls for year-fixed effects, which vary over time but are common between firms. However, it is plausible that a shock such as the crisis has heterogeneous effects on firms depending on their treatment intensity, and if this were the case, the results may have been driven by the crisis rather than the employment reform. I follow the approach of Baek & Park (2018) and Kugler & Pica (2008), to account for the macro-shock by including the interaction between the GDP growth rate and the treatment intensity into Equation (1), which captures the treatment intensity-specific cyclical effect. The results are quantitatively similar to those in Table 4.4, and are displayed in Table A.4.1 in the Chapter 4 appendix. Therefore, I can be more certain that the results are not in fact driven by heterogeneous effects of the business cycle between firms with differing treatment intensity. As an additional check, the sample is also limited to firms that appear in all five waves, resulting in a balanced panel. I use a balanced panel to see whether possible endogenous attrition biases the results. Unfortunately, the WPS does not have information regarding cause of attrition, so it is impossible to distinguish between firms not responding to the survey and firms shutting down. Again, the results are similar to those in Table 4.4.

4.3.2. Private vs Public Sector Workplaces

Table 4. 5. Effect of the reform on employment levels and shares by workplace

Panel A	Private sector workplace					Proportion of total workers		
	In logs							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Total workers	Regular workers	Irregular workers	Protected irregulars	Unprotected irregulars	Irregular workers	Protected irregulars	Unprotected irregulars
After * Treatment	-0.172** (0.0837)	1.552*** (0.213)	-2.145*** (0.214)	-3.402*** (0.266)	1.470*** (0.482)	-0.527*** (0.0366)	-0.782*** (0.0270)	0.256*** (0.0326)
Observations	6,097	5,787	3,893	3,254	2,085	6,097	6,097	6,097
R-squared	0.045	0.078	0.098	0.229	0.164	0.090	0.344	0.048
Number of firms	1,615	1,593	1,332	1,186	950	1,615	1,615	1,615
Panel B	Public sector workplace							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After * Treatment	-0.186 (0.145)	1.039*** (0.276)	-2.735*** (0.498)	-2.413*** (0.516)	-0.154 (2.252)	-0.698*** (0.0747)	-0.683*** (0.0629)	-0.0153 (0.0612)
Observations	765	738	685	661	312	765	765	765
R-squared	0.213	0.204	0.334	0.363	0.398	0.326	0.412	0.180

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include type of business entity, existence of a labour union, and use of performance-based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

The effect of the reform may also depend on if the firm is a private or public sector employer, namely, public enterprises, government invested enterprises, and the government, or government branches. For instance, public sector employers may be more financially sound on average than the private workplaces. The results are displayed in Table 4.5. Since the 1997 Asian financial crisis, hiring irregular workers in the public sector became common practice. The Kim Dae-Jung administration (1998-2003) at the time pushed heavily for public sector reforms and the privatization of public enterprise according to International Monetary Fund guidelines. Since the government passes the law, the regulation may be more strongly complied with in the public sector. On the other hand, whether a worker is given a regular contract may mostly depend on the cost of conversion to employers, which would entail a much higher degree of wage-related expenses at the very least. There is suggestive evidence of this as the WPS surveys firms on the annual starting wage of regular workers

who graduate university or high school. In 2005, the average starting wage of a regular public sector worker with university level educational attainment was 26mn won (£16,500), while a private sector worker who also graduated university experienced an average starting wage of 22mn won (£14,000). The latter starting wage is identical to that of public sector workers who graduated only from high school, and private sector workers who graduated high school earn a starting wage of 18mn won (£11,400). In addition, public sector firms also have a higher expense per worker at 57mn won (£37,000) compared to private sectors firms with 46mn won (£30,000). The substantial difference in expenses per worker between workplaces suggests that public sector employers may be more financially secure than private sector employers, which may explain why only the private sector firms respond to the reform by significantly increasing the number, and proportion of unprotected irregular workers among all workers.

Table 4.5 column (1) suggests that the policy had a negative effect on total employment in private firms, with a 10% point increase in treatment intensity reducing the total number of workers by 1.7%. For public sector firms however, the decrease in total employment numbers is not significant. As expected, both types of workplaces reduced their usage of irregular workers protected by the reform, shown in columns (4) and (7) in Panels A and B. However, only private sector firms experienced a significant change (in this case, an increase) in employment of unprotected irregular workers, displayed in columns (5) and (8). For a 10% increase in treatment intensity, private firms increased the number of unprotected irregular workers by 14.7%, and increased the proportion of unprotected irregular workers by 2.6%. Because public sector firms do not increase their level or proportion of unprotected irregular workers, this results in a larger magnitude of the fall in total number and proportion of all irregular workers in columns (3) and (6) in the public than private sector. The number of irregular workers in public (private) firms falls by 27% (21%), and, the proportion of irregular workers in public (private) firms falls by 7% (5%).

Therefore, Table 4.5 suggests overall that private sector workplaces reduced their total employment levels, and substituted the protected irregular contracts with unprotected irregular contracts and regular contracts by a larger percentage than government workplaces. The increase in number of regular workers in private sector firms is consistent with the finding in Chapter 3 Table 17, that private sector workers are more likely to transition from irregular contracts to regular contracts than public sector workers. However, what the WPS data shows that the KLIPS microdata data cannot show is that simultaneously private firms also appear to respond to the reform by replacing the workers legally covered by the reform with workers who are not required to be converted into regular workers.

Overall, regular public sector workers experience the highest wages and security, and therefore illustrates the desirability of regular employment in the public sector. Additional reasons for the desirability of regular public sector work from the worker perspective include the fierce competition for jobs at the large family-owned conglomerates and the income disparity between these large firms and medium to small sized firms, as well as the preference for the stability of a government job over the risk of working in the private sector in a slowing economy. The Seoul Youth Guarantee Centre reports that applications to civil service exams tripled from 1995 to 2015. As of 2015, family-owned conglomerates (Samsung, LG, Hyundai, etc) generated half of the revenue in Korea but only provided 20% of the jobs in the country. Moreover, starting salaries at these large corporations average around £30,000 and workers receive higher coverage of workplace benefits, compared to approximately £20,000 for smaller firms despite working similar hours, and with poorer benefits coverage. Regular public sector workers are usually guaranteed high wages until retirement because of the seniority-based pay system, so the cost of conversion may be the highest for public sector employers out of all the workplaces. Despite the cost, if the public sector employers are compliant with the new employment law then the

difference-in-difference coefficient on regular employment in column (2) should be positive. Column (2) indeed suggests that public sector workplaces increased their number of regular workers, but by a smaller amount than private workplaces, at 10% compared to 15.6%. This is consistent with what I find in Chapter 3 using individual worker data, where the probability of transitioning from irregular to regular employment is higher from private than public sector workers.

4.3.3. The Effect of Economic Sectors on Employment

Table 4. 6. Effect of the reform on employment levels and shares by sector

Panel A		Industrial & utilities sector						
	In logs					Proportion of total workers		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Total workers	Regular workers	Irregular workers	Protected irregulars	Unprotected irregulars	Irregular workers	Protected irregulars	Unprotected irregulars
After * Treatment	-0.0416 (0.0990)	1.387*** (0.237)	-2.651*** (0.336)	-4.310*** (0.439)	0.743 (0.985)	-0.592*** (0.0461)	-0.814*** (0.0319)	0.222*** (0.0461)
Observations	4,093	3,933	2,411	1,955	1,239	4,093	4,093	4,093
R-squared	0.036	0.063	0.085	0.233	0.087	0.084	0.378	0.020
Number of firms	1,133	1,117	905	797	608	1,133	1,133	1,133
Panel B		Wholesale & retail trade, & hospitality						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After * Treatment	-0.498** (0.201)	1.232*** (0.440)	-1.991*** (0.457)	-3.059*** (0.487)	2.445*** (0.720)	-0.469*** (0.0762)	-0.820*** (0.0509)	0.351*** (0.0730)
Observations	801	694	593	508	368	801	801	801
R-squared	0.107	0.119	0.182	0.347	0.265	0.144	0.530	0.130
Number of firms	223	216	198	180	151	223	223	223
Panel C		Finance & business, education & health, & public services						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After * Treatment	-0.0114 (0.114)	1.607*** (0.359)	-2.095*** (0.327)	-2.361*** (0.306)	0.498 (0.724)	-0.549*** (0.0608)	-0.635*** (0.0495)	0.086** (0.0396)
Observations	1,968	1,898	1,574	1,452	790	1,968	1,968	1,968
R-squared	0.059	0.091	0.130	0.152	0.202	0.121	0.202	0.056

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include type of business entity, existence of a labour union, and use of performance-based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 4.6 displays the effect of the reform by economic sector. Examining the effects by economic sector is important because some industries differ in their usage of irregular work contracts prior to the reform. For instance, firms in the industrial sector in 2005 employed 16% of their workforce on irregular contracts (including both protected and unprotected contracts), while retail and hospitality firms employed 37%, and financial, education, and public services employed 23%. Firms in the industrial sector, like in manufacturing and construction, decreased usage in both the number and proportion of irregular workers by 26.5% and 5.9% respectively, as shown in Panel A columns (3) and (6). Column (4) shows industrial firms also reduced the number of protected irregular workers by 43%, the largest amount. This is despite firms in this sector also having considerably the lowest share of total (protected and unprotected) and protected irregular workers among all workers. This suggests that firms in the industrial sector may be easier for the relevant authorities to monitor, or they are more compliant of the reform.

Panel B column (1) shows that only firms in the wholesale and retail, and hospitality services experience a fall in total employment. This suggests that the main result in Table 3 column (1) is driven by this sector. Firms in these industries that employed 10% of its workers on contracts that would end up being protected by the reform prior to the reform, experienced

a fall in total employment of almost 5%. Column (5) shows that only this industry experienced an increase in the number of irregular workers not protected by the reform, with a 10% increase in treatment intensity associated with a 24.5% increase in usage of unprotected irregular contracts. Irregular workers comprised of 37% of total workers in retail and hospitality firms in 2005, the highest of the three aggregated sectors. In addition, firms in this sector employed the highest share of protected irregular workers among all workers in 2005 with 26%, compared to 9% for the industrial sector and 19% for the finance, business, education, public services sector. This suggests that the fall in total employment seen in Panel B column (1) is driven by costs of potentially converting a large proportion of their irregular workforce into regular work contracts. In addition, the smaller firms may be most affected by the reform in terms of the need to downsize the workforce. The average size of the total workforce in firms in this sector in 2005 was 332 workers compared to the overall average of 472. On the other hand, the number is 438 (600) for the industrial (finance, business, education, public services) sector. Perhaps surprisingly, the WPS data shows that the share of unskilled workers among all workers (8.9%) is not much different than in the industrial (9.3%) and finance, business, education, public services sector (10%). This suggests that the overall fall in total employment level is the result of the small workforce and large proportion of potentially costly protected contracts among all workers. Column (7) shows that this sector also reduced the proportion of protected irregular workers by 8.2%, only slightly more than firms in the industrial sector, who decreased the proportion of protected irregular workers by 8.1%. However, column (8) shows retail and hospitality firms increased the proportion of unprotected irregular workers by 3.51%, compared to 2.2% (0.7%) in the industrial (finance, business, education, public services) sector. Columns (4) and (5) also show that there is more substitution of protected irregular workers with unprotected regular workers in retail.

Panel C shows the employment effect on firms in the finance, business, education, public services sector. Again, the coefficients are all of the same sign as the other two sectors, but firms in this sector increased the number of regular workers by 16% as seen in column (2), the largest increase of all sectors. Furthermore, firms in this sector are also significantly the largest in terms of total workforce, employing 600 workers on average in 2005. Industrial sector and retail trade and hospitality sector firms employ 438 and 332 workers respectively on average. In addition, firms in this sector employed the largest proportion of professional tier workers, with professionals comprising 45% of the workforce. The shares in industrial sector; and retail trade and hospitality firms are 18% and 12% respectively. Given the large size of the workforce and the high proportion of professional tier workers, firms in this sector may be more financially able to employ regular workers. Overall, the key takeaway from the results by sector is as follows. The retail trade and hospitality sector is the only sector to experience a fall in total employment level, and it appears to be driven by the comparatively high proportion of protected contract workers among all workers in the pre-policy period.

4.3.5. The Effect of Firm Size on Employment

Table 4. 7. Effect of the reform on employment levels and shares by firm size

Panel A								
Small firm (<100)						Proportion of total workers		
In logs								
VARIABLES	(1) Total workers	(2) Regular workers	(3) Irregular workers	(4) Protected irregulars	(5) Unprotected irregulars	(6) Irregular workers	(7) Protected irregulars	(8) Unprotected irregulars
After * Treatment	0.0769 (0.0983)	1.837*** (0.308)	-1.667*** (0.301)	-2.288*** (0.445)	1.212 (1.080)	-0.623*** (0.0571)	-0.704*** (0.0407)	0.0809 (0.0531)
Observations	2,474	2,406	1,255	988	580	2,474	2,474	2,474
R-squared	0.062	0.122	0.155	0.205	0.295	0.143	0.272	0.066
Number of firms	694	690	501	423	313	694	694	694
Panel B								
Medium firm (100-300)								
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After * Treatment	-0.114 (0.145)	0.932*** (0.287)	-2.171*** (0.385)	-3.049*** (0.411)	0.503 (0.934)	-0.404*** (0.0652)	-0.697*** (0.0549)	0.294*** (0.0612)
Observations	1,900	1,784	1,284	1,099	645	1,900	1,900	1,900
R-squared	0.101	0.108	0.146	0.233	0.214	0.116	0.338	0.100
Number of firms	527	518	456	417	313	527	527	527
Panel C								
Large firm (>300)								
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After * Treatment	-0.332** (0.131)	1.376*** (0.342)	-2.722*** (0.353)	-4.148*** (0.356)	1.680** (0.673)	-0.617*** (0.0565)	-0.832*** (0.0365)	0.215*** (0.0442)
Observations	2,488	2,335	2,039	1,828	1,172	2,488	2,488	2,488
R-squared	0.079	0.092	0.134	0.284	0.216	0.155	0.441	0.098

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include type of business entity, existence of a labour union, and use of performance-based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 4. 8. Distribution of irregular workers by firm size in 2005

		Total	Irregular (%)	Protected (%)	Unprotected (%)
Firm size	Small	56.1	13.6	9.5	4.1
	Medium	180.1	22.6	15.2	7.4
	Large	1121.5	26.4	17.8	8.6
	Total	472.9	20.7	14.0	6.7

Source: WPS data 2005.

Firm size may also have an influence on composition of employment. Table 4.8 displays the average number of workers and share of irregular workers by firm size in 2005. Perhaps surprisingly, the share of irregular workers is larger in larger firms, even though the incidence of irregular work might be expected to be higher in the smaller firms. Table 4.7 column (1) shows that large firms experience a fall in total employment numbers. Column (2) shows that all size firms experienced an increase in the number of regular workers but Panel A shows small firms experienced the largest increase in regular workers, with a 10% increase in treatment intensity increasing the number of regular workers by 18%. Column (6) also shows that whilst all size firms experience a fall in the proportion of irregular workers among all workers, small firms reduced the proportion of irregular workers among all workers the most, at 6.23%, slightly more than the 6.17% fall experienced by large firms. Large firms usually hire far more irregular workers, including outsourced workers, so these firms may be more affected by the reform (Kim, 2014). Panel C column (1) shows that large firms experienced the largest percent reduction in total number of workers, with a 10% increase in treatment intensity reducing total employment by 3.3%. They experienced the largest fall in total number of irregular and protected workers in columns (3) and (4), with

figures of 27% and 41% respectively. Large firms increased their number of unprotected irregular workers, at 16.8%, as seen in column (5), highlighting their extensive use of irregular contracts. As discussed previously, larger firms often prefer subcontracting the work to smaller and medium sized firms, as opposed to hiring irregular workers directly, allowing them to cut costs and maintain business flexibility. Column (7) also shows that large firms reduced their proportion of protected irregular contracts among all workers by the largest amount.

The results of the firm size on employment outcomes are consistent with the effect of economic sector on employment. In Table 4.6, the retail trade and hospitality sector is the only sector to experience a statistically significant fall in total employment levels. Like firms in this sector, larger firms also had a high initial proportion of all irregular workers and protected irregular workers among all workers. Larger firms appear to use more irregular contracts, often outsourcing workers to reduce costs and maintain business flexibility.

Overall, the findings of the reform for employment are as follows. In response to the policy, firms reduced their total employment levels. The number and proportion of all irregular workers (sum of both protected and unprotected), and protected workers decreased, whereas the number and proportion of unprotected irregular workers who are less financially burdensome to firms, increased. The number of regular workers also increased, but not enough to compensate for the fall in employment of protected irregular workers, resulting in lower total employment.

Firms that protected their regular workers in 2005 (unionized firms) experience a larger fall in total employment, and a smaller increase in regular employment. Unionized firms also experienced a larger decrease in number and proportion of all irregular and protected irregular workers, and a larger increase in number and proportion of unprotected irregular workers.

There are also differences in impact of the reform by the type of workplace, i.e. private or public sector employer. Private firms experience a statistically significant fall in total employment levels and a larger decrease (increase) in protected irregular (in regular) workers, than do public sector firms. However, only private firms increased their usage of unprotected irregular workers, substituting them for the protected irregular workers.

The sectoral results show that the general result of total employment levels falling in may be driven by the retail sector, which is also the sector with the highest initial share of irregular (unprotected irregular) workers among all workers at 37% (26%). Only the retail sector substitutes protected irregular contracts with unprotected contracts.

Larger firms reduced their total employment levels and the number of all irregular and protected irregular workers by more than smaller firms. Only larger firms significantly increase their numbers of unprotected irregular contracts, and thus are the only firms to substitute unprotected regular workers in place of protected regular workers.

4.3.6. Conversion of Irregular Workers to Regular Workers

Table 4. 9. Effect of the reform on conversion of fixed-term workers

VARIABLES	In logs			Proportion of fixed-term workers converted		
	(1) Fixed-term to regular Full sample	(2) Fixed-term to regular Union	(3) Fixed-term to regular No union	(4) Fixed-term to regular Full sample	(5) Fixed-term to regular Union	(6) Fixed-term to regular No union
After * Treatment	-1.904*** (0.713)	-2.075* (1.129)	-1.827** (0.853)	-0.0324 (0.0788)	-0.211* (0.126)	0.0794 (0.105)
Observations	769	399	370	2,426	1,277	1,149
R-squared	0.231	0.415	0.414	0.072	0.083	0.164
Number of firms	563	286	277	998	489	509

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include type of business entity, existence of a labour union, and use of performance-based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Finally, regarding employment outcomes, I look at the policy's effect on the conversion of fixed-term workers (one of the protected contracts) to regular workers. There is no data on the conversion of dispatched workers (other protected contract). Fixed-term workers are generally the most common type of irregular employment contracts. In 2005, of the 1,905 firms surveyed, 987 (52%) of the firms employed at least one fixed-term worker. The second most common type of irregular workers are contract workers who are not affected by the reform (eg, cleaners, security), where 718 (38%) of the firms employed at least one of these workers in 2005. Of the 2,830 responses to firms being asked how many irregular workers they had converted at the end of the last survey year in the entire dataset, 1,940 (68%) answered that zero were converted. Table 4.9 column (1) shows that overall, the number of fixed-term workers that were converted to regular workers fell by 19% following the reform. Columns (2) and (3) show that fixed-term workers are less likely to be converted in firms that protect their regular workers. In firms with a union in 2005, the pre-policy wave, the number of fixed-term workers converted to regular workers fell by almost 21% following a 10% increase in treatment intensity, even if at the 10% level. On the other hand, in non-unionized firms, the coefficient is slightly lower at 18%. This is consistent with Baek & Park (2018), who showed that increase in number of regular workers following the reform, is lower for firms where there was a labour union. Columns (4) to (6) run the same regression but using the proportion of fixed-term workers who are converted to regular workers as the dependent variable. Column (4) shows that the policy reduced the share of fixed-term workers in firms, although the coefficient is not significant. Columns (5) and (6) show that firms with unions experienced a larger fall in the proportion of fixed term workers who are converted to regular contracts. A 10% increase in treatment intensity in unionized firms is associated with a 2.1% fall in the proportion of fixed-term contracts that were converted to regular contracts. Column (6) shows that the policy has a positive effect for non-unionized firms, however it is insignificant. The reform has a negative and significant effect on converting fixed-term workers to regular workers for firms that protect their current regular workers, even if at the 10% level, and the impact is larger than in non-unionized firms. Table 4.9 provides suggestive evidence that the policy negatively impacts on the conversion of fixed-term contracts to regular contracts in firms with higher initial shares of protected irregular workers.

This contrasts with the findings in chapter 3, where the difference-in-difference estimates suggest the policy was effective in transitioning irregular workers to regular workers. However, the opposite sign of the interaction coefficient in Table 4.9 column (1) does not mean the individual-level and firm-level results are contradictory. This is because the interpretation of the interaction coefficients in Chapter 4 are different to the conventional interpretation in Chapter 3. As mentioned in

section 4.2, the post-dummy is interacted with a continuous variable (treatment intensity ranging from 0 to 1 in 2005, a pre-policy year), rather than a treatment dummy. Firms with higher initial shares of protected irregular contracts among all workers face higher legal and financial costs with conversion of these contracts to regular workers, hence the number of converted workers is a decreasing function of the proportion of protected irregular workers, as would be expected.

4.4. Labour Market & Financial Outcomes

4.4.1. Wage Effects on Regular Workers

The Korean labour market displays some very clear dualities in terms of wage employment. The clearest manifestation of labour market duality in Korea is the high prevalence of irregular workers who accounted for more than a third of salaried workers in 2015. From the firm perspective, i.e. demand side of labour, the effect of the prevalence of irregular workers on regular workers is ambiguous, depending on whether the bargaining power of regular workers changes or not. Assuming the rise in irregular employment does not affect the protection level of regular workers, given that regular workers are more costly to dismiss, then in turn their bargaining power should also remain unchanged. On the other hand, the bargaining position of regular workers could fall due to the following reason. If the share of irregular wage employment increases, the probability of finding a similar permanent job could fall, and the probability of job loss may also increase. I use the firm-level panel data from the WPS to identify if there is an association between the share of irregular workers and bargaining power of regular workers, proxied by the wage of regular workers.

This section explores if the prevalence of irregular workers in Korea affects the wages of regular workers, and the policy implications on the usage of irregular employment contracts. For instance, according to 2002 data from the Korean Workplace Panel Survey, which collects data on changes in human resource management practices, Korean firms increasingly hire under irregular contracts. The main reasons cited were “more employment flexibility” and “lower labour costs”. So, employers state that high wages of regular workers and a need for increased labour market flexibility, especially since the 1997/98 Asian financial crisis, causes the use of irregular contracts. In addition, regular workers may be viewed as using the increasing share of irregular workers and their lower wages as a buffer in wage bargaining.

Irregular employment can affect wages of regular workers through several channels, as evidenced by the literature. Bentolila & Dolado (1994) find regular workers can bargain for wage increases without putting their job at risk, because these workers who are subject to higher firing costs, can use irregular workers as a buffer against the employment destruction that would otherwise be caused by wage increases. Therefore, because regular workers see their jobs as more secure and less substitutable, their wages will be higher when the share of irregular workers, who have low firing costs, increases. On the other hand, regular workers' wages could fall. The prevalence of irregular employment may reduce their bargaining strength, since irregular workers are less likely to take part in strikes. Jimeno & Toharia (1996) found that incentives to exert effort and avoid absenteeism were relatively higher for irregular workers who, given their low firing costs, feel the threat of dismissal much more than regular workers. Kuroki (2012) finds that the growth in irregular employment contributed to a fall in perceived job security among regular workers in Japan. As a result, firms may realize their regular workers feel a higher threat of job loss and a lower probability of obtaining a similar permanent job, and pay lower wage levels. Hubler & Hubler (2006) also report a significantly negative association between the share of irregular work and job security. Therefore, job insecurity for regular workers may be proxied by the share of irregular workers, which could have the same effect on wages as unemployment rates and lead to a reduction in wages. In sum, as irregular

employment grows, regular workers may feel the possibility of unemployment or losing this permanent job is higher; and this fall in perceived job security results in reduced bargaining power and wages for regular workers. Therefore, the share of irregular employment may be a negative determinant of regular wages.

Table 4. 10. Effect of the reform on regular worker wages by educational attainment and unionization

	Union		No union	
	(1)	(2)	(3)	(4)
VARIABLES	Log wage of regular university graduates	Log wage of regular high-school graduates	Log wage of regular university graduates	Log wage of regular high-school graduates
After * Treatment	0.0147 (0.0314)	0.0314 (0.0436)	-0.0436** (0.0198)	-0.0483** (0.0230)
Observations	2,647	2,294	3,660	3,276
R-squared	0.244	0.208	0.366	0.347
Number of firms	779	701	1,108	1,036

Notes: Refer to Table 3.3 for the definition of After * Treatment. Other control variables include type of business entity, existence of a labour union, and use of performance-based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

The estimation on regular wages is done using Equation (1) again, and the results are shown in Table 4.10. The dependent variable is the log of hourly wage for regular workers who are university graduates, or high-school graduates. Table 4.1 shows that the starting wage of a regular high-school graduate is around 80% of university graduates' starting wages. Again, the coefficient of interest is the interaction term between *After_{it}* and *Treat_{it}*. It captures the causal effect of the employment reform on regular worker wages, i.e. how does an increase in protected irregular contracts with the potential to turn regular, affect the starting regular wage. For the analysis, the wage regressions are weighted by the firm size.

Table 4.10 columns (1) and (2) show that the effect of an increase in the proportion of irregular workers among total workers on the wages of regular workers in unionized firms is positive but not statistically significant. Columns (3) and (4) display the results on wages of regular workers in firms with less protection for regular workers. A 10% increase in treatment intensity decreases the wage of regular university graduates by 0.43%, and the wage of regular high-school graduates by 0.48%. While the effects may be small, they are still significant. The higher probability of experiencing job loss for regular workers in non-unionized firms relative to their counterparts in unionized firms, or lower probability of finding a similar permanent job, may play a role in bargaining between firms and workers. So, this may explain the larger negative effect on wages among regular workers in non-unionized firms. Regular workers who are protected by labour unions are not adversely affected by an increase in prevalence of protected irregular workers.

4.4.2. Wage and Social Insurance Effects on Irregular Workers

The anti-discrimination law has the goal of reducing the labour condition differentials between irregular and regular workers. This section explores the effect of the law on the wage ratio of irregular workers to regular workers and social insurance coverage of irregular workers. The WPS does not survey firms explicitly on the average wage of its irregular workers, but it does provide their wage as a percentage of regular workers in similar work. Table 4.1 shows that in 2005, directly (indirectly) hired irregular earned 82.8% (77.7%) of the wages of regular workers. Indirect hiring is less costly compared to direct hiring and is usually done through subcontracting out work to smaller firms. It enhances business flexibility and hence reduces labour costs, thus resulting in lower wages for indirect irregular hires. Unlike regular workers, irregular workers do not receive the fullest benefits afforded by Korea's labour laws, among them the four major insurances.

These are the national pension, accident compensation insurance, employment insurance, and national health insurance. In 2005, between 83.4% to 89.9% of firms provided at least one of the four insurances to all their directly employed irregular workers, and between 57.9% to 60.4% of firms provided at least one type of insurance to all their indirectly employed irregular workers.

Table 4.11 columns (1) and (3) shows the results of the effect of the reform on the ratio of wages of directly and indirectly employed irregular workers to regular workers who perform similar work. The WPS also surveys firms on their primary type of direct and indirect employment contracts. Columns (2) and (4) run the same regression but conditional on the primary type of irregular employment in 2005 being the protected direct (fixed-term) and protected indirect (dispatched worker) irregular contracts. Columns (1) and (2) shows that the wages of directly hired irregular workers also (includes part-time workers not protected by the reform) are not affected by an increase in treatment intensity. The coefficient of 0.029 in column (2) is larger than 0.021 in column (1), when the primary employment type of directly hired irregular workers are the contracts that are protected, and therefore potentially more legally and financially burdensome for the firm, but it is still insignificant.

Column (3) however shows that a 10% increase in share of protected workers among all workers is associated with a 2.3% fall in wages of indirectly hired irregular workers. Column (4) shows that if the firm primarily utilises dispatched workers as their indirectly employed irregular workers, the wage ratio of indirectly hired irregulars to regular workers decreases further to 2.7%. These type of indirectly hired workers may be the most vulnerable in a firm, as the worker-firm relationship still holds between the firm (not the subcontractor) and a worker in the subcontractor, therefore these contracts are often used to cut firms' costs. Table 1 shows that in 2005, the pre-reform year, wages of indirectly hired irregular workers were 77.7% of regular workers who did similar work, whereas wages of directly hired regular workers was 82.8% of regular workers.

Table 4. 11. Effect of the reform on wages of irregular workers

Panel A	Wages of directly hired irregular workers (%) of regular wage		Wages of indirectly hired irregular workers (%) of regular wage	
	(1) All directly hired irregular workers	(2) Fixed-term workers (covered by reform)	(3) All indirectly hired irregular workers	(4) Dispatched workers (covered by reform)
VARIABLES				
After * Treatment	-0.0209 (0.0435)	-0.0295 (0.0428)	-0.234** (0.0970)	-0.270** (0.111)
Observations	2,568	1,634	813	545
R-squared	0.114	0.147	0.354	0.414
Number of firms	1,321	810	628	426
Panel B	Private sector workplace			
	(1)	(2)	(3)	(4)
After * Treatment	-0.0384 (0.0532)	-0.0143 (0.0545)	-0.165* (0.0931)	-0.190* (0.103)
Observations	2,186	1,315	710	460
R-squared	0.149	0.175	0.400	0.532
Number of firms	1,099	620	541	353
Panel C	Public sector workplace			
	(1)	(2)	(3)	(4)
After * Treatment	0.229* (0.137)	0.220** (0.111)	-	-
Observations	382	319	103	85
R-squared	0.318	0.506	1.000	1.000
Number of firms	222	190	87	73

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include type of business entity, existence of a labour union, and use of performance-based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Estimation cannot be obtained in Panel C columns (3) and (4) due to sample size. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

So, it seems at least for indirectly employed irregular workers, the reform increases the wage differential with regular workers, whereas the wage differential between directly hired irregular workers and equivalent regular workers is unchanged. Column (3) suggests that firms with higher initial shares of protected irregular contracts are either treating indirectly hired irregular workers worse after the reform, despite carrying out similar tasks according to the firm, or hiring unprotected indirect irregular workers cheaper. It is not possible to state which effect dominates, since column (3) includes both unprotected and dispatched contracts, of which we know employment in the former increased, and employment in the latter decreased. Column (4) is concerned with dispatched workers, one of the protected contracts, being the primary type of indirect employment. Since the employment results showed that the employment level and share of protected irregular workers decreased, the negative interaction coefficients suggest that decrease in employment of dispatched workers is also accompanied by a decrease in their wages. In particular, dispatched workers that are commonly in outsourced jobs may experience a larger fall in wage because they may have lower bargaining power and are not directly employed by the firm. Even though the policy is supposed to improve the labour conditions of workers on protected irregular contracts, there are possible explanations why the results suggest that this has not happened for indirect irregular hires. It may depend on the will of the government to enforce and monitor the policy, or irregular workers may be less willing to take legal action against their employer. If an irregular worker claims to receive discriminatory treatment without reasonable grounds, i.e. pay differentials due to reasons other than productivity, type of work, etc, they can appeal to the Korean Labour Relations Commission. If the Commission finds the employer to have displayed discriminatory treatment, and they still do not eliminate this, they are liable to a maximum penalty of 100 million won (£70,000).

Table 4.11 Panels B and C show how the wage results differ between private workplace and state-owned workplace. Panel B columns (1) and (2) show that the wage ratio of directly hired irregular workers in private sector workplaces falls, but the effect is insignificant. However, column (3) suggests that indirectly hired irregular workers in private firms experience a 1.65% fall in the wage ratio to regular workers. Column (4) shows that when the primary employment type of indirectly hired irregulars are dispatched workers, the wage ratio falls slightly more to 1.9%. Panel C columns (1) and (2) shows that the reform in fact improves the wages of direct irregular hires in state-owned workplaces, increasing the wage ratio by between 2.2% to 2.3%. Table 4.11 suggests that the effect of the reform on wages, one of the main labour market outcomes, depends on the type of workplace. Since the government passes the reform, then the treatment of irregular workers in state-owned firms may be more easily trackable by the government. As a result, at least the directly hired irregular workers in these workplaces experience an improvement in wages, whereas the wages of directly hired irregular workers in private workplaces are unaffected. Indirectly hired irregular workers, particularly dispatched workers, can be more vulnerable than directly hired irregular workers because they are employed by the dispatch agency rather than the companies they work for.

Table 4. 12. Effect of the reform on social insurance coverage of irregular workers

	National Pension provided		All 4 insurances provided	
Panel A: All workplaces	(1)	(2)	(3)	(4)
VARIABLES	All directly hired irregular workers	Fixed-term workers (covered by reform)	All directly hired irregular workers	Fixed-term workers (covered by reform)
After * Treatment	-0.206** (0.0806)	-0.0522 (0.0729)	-0.147* (0.0815)	-0.0182 (0.0777)
Observations	4,101	2,570	4,101	2,570
R-squared	0.038	0.042	0.028	0.029
Number of firms	1,514	872	1,514	872
Panel B: All workplaces	All indirectly hired irregular workers	Dispatched workers	All indirectly hired irregular workers	Dispatched workers
VARIABLES				
After * Treatment	-0.280* (0.163)	-0.413** (0.161)	-0.264* (0.164)	-0.392** (0.160)
Observations	1,845	1,121	1,841	1,120
R-squared	0.118	0.145	0.117	0.147
Number of firms	912	520	911	520
Panel C: Private sector	All directly hired irregular workers	Fixed-term workers	All directly hired irregular workers	Fixed-term workers
VARIABLES				
After * Treatment	-0.232*** (0.0892)	-0.103 (0.0771)	-0.175* (0.0907)	-0.0545 (0.0867)
Observations	3,515	2,086	3,515	2,086
R-squared	0.041	0.053	0.031	0.037
Number of firms	1,281	676	1,281	676
Panel D: Private sector	All indirectly hired irregular workers	Dispatched workers	All indirectly hired irregular workers	Dispatched workers
VARIABLES				
After * Treatment	-0.217 (0.188)	-0.358* (0.182)	-0.231 (0.179)	-0.397** (0.169)
Observations	1,582	950	1,578	949
R-squared	0.148	0.178	0.126	0.160
Number of firms	771	427	770	427
Panel E: Public sector	All directly hired irregular workers	Fixed-term workers	All directly hired irregular workers	Fixed-term workers
VARIABLES				
After * Treatment	-0.214 (0.205)	0.179 (0.153)	-0.0663 (0.204)	0.203 (0.179)
Observations	586	484	586	484
R-squared	0.217	0.246	0.111	0.117
Number of firms	233	196	233	196
Panel F: Public sector	All indirectly hired irregular workers	Dispatched workers	All indirectly hired irregular workers	Dispatched workers
VARIABLES				
After * Treatment	-0.892*** (0.340)	-0.815** (0.362)	-0.501 (0.351)	-0.591 (0.393)
Observations	263	171	263	171
R-squared	0.434	0.513	0.355	0.437
Number of firms	141	93	141	93

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include type of business entity, existence of a labour union, and use of performance-based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Another goal of the reform is to prohibit the discrimination of irregular employees, not only in terms of wages, but other labour conditions such as the provision of social insurances. In Table 4.12, the estimation on social insurance coverage is again done using Equation (1). The dependent variables are the provision of national pension contribution, or the four main social insurances, to 100% of direct and indirectly hired irregular workers. Since the dependent variables are binary, the linear probability model is used. Including national pension, the other three social insurances are health insurance, employment insurance, and injury compensation. Columns (1) and (2) look at national pension coverage in particular, since national pension coverage is often used by the OECD and ILO to proxy formal wage employment. Columns (3) and (4) are the results for all four social insurances. Again columns (2) and (4) run the same regression as (1) and (3) but conditional on the primary type of irregular employment in 2005 being the protected direct (fixed-term) and protected indirect (dispatched worker) irregular contracts. Panel A and B are the results for directly and indirectly hired irregular workers respectively.

Panel A column (1) suggests that a 10% increase in treatment intensity is associated with a 2.1% decrease in the probability of national pension coverage being provided to 100% of directly hired irregular workers. Panel A column (2) runs the same regression as column (1) conditional on fixed-term workers being the primary type of directly hired irregular workers. Now, the coefficient becomes insignificant. This means that 100% of directly hired irregular workers in firms where fixed term (protected) workers are the primary type of directly employed irregulars, will still contribute to the national pension. Panel A column (3) suggests the probability that all four social insurances are provided to all irregular workers falls by 1.5% following a 10% increase in treatment intensity. The smaller coefficient can be explained by the fact the data shows firms who provide national pension coverage to all of their directly hired irregulars are also likely to provide the other three social insurances to all of their directly hired irregulars. Column (4) again runs the same regression as column (3) conditional on fixed-term workers as the primary type of directly hired irregular workers. Again, the coefficient is insignificant, suggesting that 100% of directly hired irregulars are still covered by all four social insurances. Therefore, if protected direct irregular hires are the primary employment type of direct irregular hires, then an increase in treatment intensity has no negative effect on the provision of the four main insurances for directly hired irregular workers.

Panel B displays the results for indirect irregular hires. The magnitudes of the coefficients for indirectly hired irregular workers are larger than the corresponding coefficients for directly hired irregular workers in Panel A. This means the probability that 100% of indirectly hired irregular workers receive social insurance coverage is lower than for directly hired irregular workers.

Panels C and D show the social insurance coverage results for direct and indirect hires respectively, in private sector workplaces. Panel C columns (1) and (3) show that as treatment intensity increases, the probability that all direct hires receive social insurance coverage decreases. However, if the estimation is conditioned on fixed-term contracts as the primary type of direct irregular employment, the effect becomes insignificant, suggesting that direct hires are not negatively affected by an increase in protected irregular workers. Panel D columns (1) and (3) show that the probability of all indirect hires receiving social insurance coverage is unaffected by the reform. However, if the primary type of indirect employment is dispatched work, then the reform has a negative effect on all indirect hires receiving social insurance coverage, suggesting that dispatched workers receive lower coverage, even though these indirect contracts are protected by the reform.

Panels E and F show the social insurance coverage results for direct and indirect hires respectively, in state-owned workplaces. Panel E shows the reform has no effect on coverage for direct hires. Panel F columns (1) and (2) show the reform has a negative effect on national pension coverage for indirect hires. A 10% increase in treatment intensity is associated with a fall of 8.2% to 8.9% probability of all indirect hires receiving national pension coverage.

In sum, direct and indirect hires experience different outcomes in both wages and social insurance coverage. This may be because direct hires have a significant labour relationship with the firm, whereas this does not apply for indirect hires, leaving them more exposed to differential treatment.

4.4.3. The Effect of Irregular Employment Protection on Financial Indicators

In this section, I examine whether the EPL affects the financial performance of firms, namely, labour costs and profitability. Given that the reform causes changes in the composition of the labour force, it may also have an impact on firm's profitability if the reform causes large adjustment costs or savings for firms. For instance, if firms substitute protected irregular workers with unprotected irregular workers, then this may serve to save costs as unprotected contracts are not required to be converted to regular contracts. However, results suggest that firms also increased their use of regular workers, which would in turn increase labour costs given their higher wages and fringe benefit coverage.

Table 4. 13. Effect of the reform on labour cost and profitability by sector

Panel A					
Industrial & utilities sector					
VARIABLES	(1) Labour cost per worker (log)	(2) Operating profit to revenue ratio	(3) Capital per worker (log)	(4) Regular workers on performance- based pay	(5) Revenue per worker (log)
After * Treatment	-0.125* (0.0662)	0.105*** (0.0386)	0.247 (0.176)	-0.0360 (0.106)	0.328* (0.169)
Observations	3,420	3,144	3,357	3,574	3,574
R-squared	0.173	0.012	0.216	0.053	0.115
Number of firms	1,018	992	1,028	1,055	1,055
Panel B					
Wholesale & retail trade, & hospitality					
VARIABLES	(1)	(2)	(3)	(4)	(5)
After * Treatment	0.305** (0.130)	0.0312 (0.465)	0.0894 (0.217)	0.0193 (0.121)	0.308 (0.325)
Observations	669	559	621	680	680
R-squared	0.335	0.105	0.157	0.085	0.195
Number of firms	188	177	180	191	191
Panel C					
Finance & business, education & health, & public services					
VARIABLES	(1)	(2)	(3)	(4)	(5)
After * Treatment	0.140 (0.119)	0.238 (0.158)	0.164 (0.228)	0.234 (0.154)	0.239 (0.235)
Observations	1,034	704	1,008	1,111	1,111
R-squared	0.315	0.153	0.161	0.093	0.133
Number of firms	363	283	352	381	381

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include time-variant characteristics such as type of business entity, existence of a labour union, and, use of performance-based pay for regular workers, except where the dependent variable is proportion of regular workers on performance pay. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 4.13 shows the impact of the reform on financial indicators by economic activity. Panel A displays the result for firms in the industrial sector. First, I look at whether the reform affected the labour cost per worker. The labour cost is the

sum of wages and the labour-related expenses: severance pay, welfare, and benefits expenses. Column (1) suggests that labour cost per worker falls by 1.25% following a 10% increase in treatment intensity. Column (2) displays the changes in profitability due to the reform, and suggests profitability increased by 1.05%. Overall, it seems the financial performance of industrial sector firms improves following the reform, as shown in column (5), which shows increased prices of goods and services. This increase may be a result of the changing composition of the workforce, and increased capital intensity.

Panel B shows the effect of the reform on firms in retail trade and hospitality. As the proportion of protected irregular workers who have the potential to become regular increases, average labour cost per worker increases by 3.05%. The potential increase in labour costs per worker for the firm caused by the reform may have been mitigated by simply downsizing the total labour force, as happened in Table 4.4 column (1). Column (2) suggests that the regulation had no significant effect on profits. There may be several reasons why profitability is unaffected. Firms may have responded to the increased cost of business by increasing their usage of irregular employment contracts that are not covered by the reform, which is observed in the main employment outcome results in Table 4.4. These irregular workers would be cheaper to employ since they are not legally required to be converted to regular contracts, and the increase in number and proportion of these atypical contracts may have alleviated any negative impact on profitability. Column (3) shows that the regulation has no effect on capital per worker. Column (4) shows the use of a performance-based pay among regular workers increased more for firms with higher treatment intensity, although the increase is not statistically significant. The salary scheme for regular workers may have increased productivity and compensated for the increased costs of the reform. Column (5) examines the impact on productivity measured by revenue per worker, and suggests no effect on revenue per worker.

In sum, the regulations had heterogenous effects by industry, with a positive impact only on industrial firms' profitability, and an increase in the labour cost per worker only for retail sector firms. A 10% increase in the proportion of protected contracts is associated with a 3.05% increase in labour cost per worker. The retail trade sector is also the only sector to experience a significant fall in total employment levels, as shown in Table 4.6 Panel B column (1). Therefore, the fall in total employment is possibly the result of this increase in labour costs. Firms in the industrial sector appear to make labour cost savings and increase profit and productivity, while firms in retail and trade experience an increase in labour cost.

Table 4. 14. Effect of the reform on labour cost and profitability by workplace

Panel A					
Private sector workplace					
VARIABLES	(1) Labour cost per worker (log)	(2) Operating profit to revenue ratio	(3) Capital per worker (log)	(4) Regular workers on performance- based pay	(5) Revenue per worker (log)
After * Treatment	0.0481 (0.0571)	0.0497 (0.0937)	0.230* (0.125)	0.0759 (0.0737)	0.262* (0.149)
Observations	4,671	4,057	4,531	4,858	4,858
R-squared	0.210	0.064	0.197	0.055	0.136
Number of firms	1,413	1,298	1,394	1,454	1,454
Panel B					
Public sector workplace					
VARIABLES	(1)	(2)	(3)	(4)	(5)
After * Treatment	0.246* (0.137)	0.074 (0.0529)	0.269 (0.416)	0.142 (0.202)	0.389 (0.268)
Observations	452	350	455	507	507
R-squared	0.400	0.270	0.364	0.185	0.361

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include time-variant characteristics such as type of business entity, existence of a labour union, and, use of performance-based pay for regular workers, except where the dependent variable is proportion of regular workers on performance pay. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table 4.14 shows the effect of the policy on financial indicators by workplace. These results suggest that not only do private sector firms adjust the composition of their workers, but other determinants of productivity, such as levels of capital and the management of regular workers Panel A column (3) suggests for private workplaces. at the 10% level, a 10% increase in treatment intensity increases capital per worker by 2.3%, which in turn may have increased labour productivity and offset the negative impact of the reform. Column (5) shows that revenue per worker also increased, by 2.6%. Panel A suggests that in response to the reform, private firms increased their capital per worker, which may increase productivity, measured by revenue per worker. Panel B shows the corresponding results for state-owned workplaces. A 10% increase in treatment intensity is associated with a 2.5% in labour cost per worker. This may be explained by the fact that on average, labour costs for public sector workers are higher than private sector workers. Therefore, the cost of changing the composition of the workforce due to the reform would be higher in state-owned firms. In sum, private sector firms mitigate the impact of the reform by adjusting their capital levels, and only public sector firms experience an increase in labour cost per worker. Given the prestige of public sector jobs in Korea, state-owned firms may be more able to financially cope with the reform.

4.5. Conclusion

This paper examines the response of firms to the irregular employment protection reform in Korea, which aims to reduce the labour market outcome differentials between regular and regular workers, and restrict the maximum duration of specific types of irregular contracts. The estimation exploits variation in the pre-reform usage of fixed-term and dispatched contracts, allowing for a quasi-natural experiment. The results are obtained using a difference-in-difference framework on firm-level panel data, and compared the change in outcome variables of firms with varying degrees of treatment intensity before and after the reform.

The analysis shows that the increased employment protection for irregular workers led to a fall in total employment at the firm level, and the relative proportion of irregular workers among all workers compared to regular workers. Additionally,

firms responded to the reform by reducing (increasing) the use of irregular contracts covered (not covered) by the reform. This pattern was more prevalent in unionized firms. This is possibly the result of the evasion hypothesis (Yoo & Kang, 2012). Korean firms may have learnt how to evade the regulation by using subcontracting. Since these contracts were not protected by the policy, employers would recognize these work arrangements as legal loopholes in the law. Rather than directly hiring irregular workers, employers may be induced to instead transfer part of the internal jobs to subcontractors outside the firm. I add to Baek & Park (2018), by looking at how the effect of the reform on employment outcomes differs by type of workplace, economic sector, and firm size. We also evaluate whether the reform affects the conversion of fixed-term contracts into regular contracts, and find that there is a decrease in conversion in firms that protected their regular workers (firms with labour unions). This is consistent with the finding that unionized firms increased their number of regular workers by a smaller amount than non-unionized firms.

We further extend on their work by looking at additional outcomes, namely labour market outcomes, and examining whether the reform had an impact on wages of regular workers. There is suggestive evidence that the effect of the regulation on the wages of regular worker differs between union membership and education level. Regular worker wages in unionized firms are unaffected by the reform, regardless of their educational attainment. However, regular workers' wages in non-unionized firms fall, more so for high-school graduates than university graduates. We also evaluate the impact of the reform on the wages and social insurance coverage of irregular workers. The wages of directly hired irregular workers are not affected by an increase in treatment intensity, however indirectly hired irregular workers, who do not have a direct relationship with the firm, experience a decrease in wages. In addition, indirectly hired irregulars also experience a larger decrease in the probability of being provided social insurance coverage by the firm.

Finally, we look at the effect of the reform on the financial performance of firms. Since the policy makes hiring irregular workers potentially more expensive (contracts becoming potentially permanent), it is logical to also examine the effect on financial indicators. The findings suggest that overall, the regulations had no effect on firms' profitability, although the results by industry suggested the profitability of industrial firms increased. Also, there is suggestive evidence that firms increased their capital per worker and labour productivity in response to the new restriction on labour use and possible negative impact on business costs.

Appendix for Chapter 3

The following tables serve as robustness checks for the main employment transition results in Chapter 3. In every table, column (1) shows the results for the baseline older control and younger treatment age groups. The baseline control group are workers aged 56-64. Workers aged 56 and over are unaffected by the reform that intends to convert irregular workers into regular workers after two consecutive years of irregular employment. The baseline treated group are workers aged 46-55. Anyone who is 55 or younger in an irregular job is covered by the reform.

As a robustness check, I reduce the age windows of the control and treated groups for three more years. Therefore, this makes the treatment and control groups more similar to each other in terms of age, but at the same time the sample size is reduced.

Table A.3. 1. Table 3.5. with most restrictive age window

	(1)	(2)
Panel A: I2R		
VARIABLES	46-55 56-64	49-55 56-61
After * Treated	0.0488** (0.0194)	0.0463** (0.0230)
R-squared	0.051	0.048
Panel B: I2R same job	(1)	(2)
After * Treated	0.0339** (0.0164)	0.0360* (0.0191)
R-squared	0.057	0.057
Panel C: I2R new job	(1)	(2)
After * Treated	0.0149 (0.0120)	0.0102 (0.0148)
R-squared	0.016	0.015
Panel D: I2I	(1)	(2)
After * Treated	-0.0565* (0.0334)	-0.110*** (0.0393)
Observations	9,461	6,559
R-squared	0.035	0.048
Number of individuals	2,520	1,889

Other explanatory variables are the post and treatment dummies, monthly tenure, household head status, educational attainment status, marital status, job industry, occupation, and year fixed effects. Standard errors are clustered at individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3. 2. Table 3.7 sectors with most restrictive age window

	Industrial & utilities sector		Wholesale retail trade, & hospitality services	
Panel A: I2R	(1)	(2)	(3)	(4)
VARIABLES	46-55 56-64	49-55 56-61	46-55 56-64	49-55 56-61
After * Treated	0.0824*** (0.0243)	0.0684** (0.0275)	0.0276 (0.0822)	0.0005 (0.0983)
R-squared	0.048	0.049	0.047	0.067
Panel B: I2R same job	(1)	(2)	(3)	(4)
After * Treated	0.0576*** (0.0217)	0.0614** (0.0242)	-0.0194 (0.0592)	-0.0230 (0.0723)
R-squared	0.041	0.041	0.082	0.092
Panel C: I2R new job	(1)	(2)	(3)	(4)
After * Treated	0.0248** (0.0123)	0.00701 (0.0157)	0.0470 (0.0564)	0.0235 (0.0654)
R-squared	0.019	0.025	0.028	0.028
Panel D: I2I	(1)	(2)	(3)	(4)
After * Treated	-0.0811* (0.0441)	-0.102** (0.0515)	-0.245** (0.116)	-0.230* (0.119)
Observations	4,020	2,842	1,957	1,365
R-squared	0.037	0.048	0.074	0.091
Number of individuals	1,068	799	681	501
	Finance, business, education & health		Public administration & defence	
Panel A: I2R	(1)	(2)	(3)	(4)
VARIABLES	46-55 56-64	49-55 56-61	46-55 56-64	49-55 56-61
After * Treated	0.0367 (0.0545)	0.0341 (0.0632)	0.0139 (0.0525)	-0.0671 (0.0866)
R-squared	0.123	0.164	0.099	0.095
Panel B: I2R same job	(1)	(2)	(3)	(4)
After * Treated	0.0373 (0.0473)	0.0200 (0.0590)	0.0240 (0.0203)	0.0061 (0.0106)
R-squared	0.130	0.152	0.129	0.098
Panel C: I2R new job	(1)	(2)	(3)	(4)
After * Treated	-0.0005 (0.0313)	0.0141 (0.0282)	-0.0101 (0.0503)	-0.0732 (0.0876)
R-squared	0.050	0.081	0.082	0.129
Panel D: I2I	(1)	(2)	(3)	(4)
After * Treated	-0.0829 (0.0772)	-0.147 (0.0932)	-0.0559 (0.196)	-0.130 (0.238)
Observations	1,876	1,207	396	289
R-squared	0.095	0.103	0.162	0.188
Number of individuals	662	449	185	141

Other explanatory variables are the post and treatment dummies, monthly tenure, household head status, educational attainment status, marital status, job industry, occupation, and year fixed effects. Standard errors are clustered at individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3. 3. Table 3.8 workplaces with most restrictive age window

	Private firm		Government firm, government, or government branch	
Panel A: I2R	(1)	(2)	(3)	(4)
VARIABLES	46-55 56-64	49-55 56-61	46-55 56-64	49-55 56-61
After * Treated	0.0763*** (0.0292)	0.0543* (0.0328)	0.0233 (0.0577)	-0.0053 (0.0648)
R-squared	0.063	0.063	0.206	0.345
Panel B: I2R same job	(1)	(2)	(3)	(4)
After * Treated	0.0571** (0.0260)	0.0544* (0.0299)	-0.0074 (0.0543)	-0.0335 (0.0634)
R-squared	0.074	0.071	0.145	0.314
Panel C: I2R new job	(1)	(2)	(3)	(4)
After * Treated	0.0192 (0.0171)	-3.66e-05 (0.0188)	0.0307 (0.0187)	0.0281** (0.0138)
R-squared	0.014	0.019	0.257	0.376
Panel D: I2I	(1)	(2)	(3)	(4)
After * Treated	-0.135*** (0.0435)	-0.188*** (0.0511)	-0.0121 (0.0576)	0.0126 (0.0655)
Observations	6,421	4,459	738	503
R-squared	0.042	0.054	0.204	0.311
Number of individuals	1,966	1,445	238	193

Other explanatory variables are the post and treatment dummies, monthly tenure, household head status, educational attainment status, marital status, job industry, occupation, and year fixed effects. Standard errors are clustered at individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table A.3. 4. LPM transition results by skill level, all workplaces and private firms, with most restrictive age window

	Low-Skilled all workplaces		High-Skilled all workplaces	
Panel A: I2R	(1)	(2)	(3)	(4)
VARIABLES	46-55 56-64	49-55 56-61	46-55 56-64	49-55 56-61
After * Treated	0.0820*** (0.0302)	0.0658** (0.0310)	0.0391 (0.0294)	0.0413 (0.0362)
R-squared	0.076	0.088	0.055	0.049
Panel B: I2R same job	(1)	(2)	(3)	(4)
After * Treated	0.0693*** (0.0264)	0.0490* (0.0264)	0.0216 (0.0252)	0.0309 (0.0326)
R-squared	0.066	0.075	0.061	0.058
Panel C: I2R new job	(1)	(2)	(3)	(4)
After * Treated	0.0128 (0.0178)	0.0168 (0.0214)	0.0175 (0.0137)	0.0104 (0.0152)
R-squared	0.036	0.045	0.021	0.020
Panel D: I2I	(1)	(2)	(3)	(4)
After * Treated	-0.167*** (0.0571)	-0.192*** (0.0667)	-0.0390 (0.0459)	-0.0905 (0.0565)
Observations	2,924	2,017	5,325	3,686
R-squared	0.058	0.077	0.053	0.053
Number of individuals	946	684	1,566	1,150
	Low-skilled in private firm		High-skilled in private firm	
Panel A: I2R	(1)	(2)	(3)	(4)
VARIABLES	46-55 56-64	49-55 56-61	46-55 56-64	49-55 56-61
After * Treated	0.0963** (0.0377)	0.0865* (0.0359)	0.0646 (0.0393)	0.0724 (0.0484)
R-squared	0.104	0.107	0.065	0.071
Panel B: I2R same job	(1)	(2)	(3)	(4)
After * Treated	0.0859** (0.0356)	0.0703** (0.0357)	0.0331 (0.0357)	0.0558 (0.0436)
R-squared	0.100	0.106	0.077	0.083
Panel C: I2R new job	(1)	(2)	(3)	(4)
After * Treated	0.0105 (0.0205)	0.0163 (0.0207)	0.0315** (0.0147)	0.0166 (0.0204)
R-squared	0.038	0.042	0.018	0.031
Panel D: I2I	(1)	(2)	(3)	(4)
After * Treated	-0.212*** (0.0644)	-0.254*** (0.0743)	-0.110** (0.0560)	-0.145** (0.0708)
Observations	2,151	1,480	4,270	2,979
R-squared	0.082	0.106	0.040	0.038
Number of individuals	768	544	1,38	1,021

Other explanatory variables are the post and treatment dummies, monthly tenure, household head status, educational attainment status, marital status, job industry, occupation, and year fixed effects. Standard errors are clustered at individual level in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Appendix for Chapter 4

The following tables serve as robustness checks for the main firm-level results in Chapter 4. In every table, Panel A shows the results when the sample of firms is limited to those that appear in all five waves, resulting in a balanced panel. The purpose of the balanced panel is to see whether possible endogenous attrition biases the results. Unfortunately, the WPS does not have information regarding cause of attrition, so it is impossible to distinguish between firms not responding to the survey and firms shutting down.

Panel B shows the results when I allow for a year specific macro-shock by including the interaction between the GDP growth rate and the treatment intensity into Equation (1), which captures the treatment intensity-specific cyclical effect. It is entirely plausible that a shock such as the 2007-2008 financial crisis has heterogeneous effects on firms depending on their treatment intensity, and if this were the case, the results may have been driven by the crisis rather than the employment reform. The purpose of accounting for the macro-shock is to ensure that the results are not in fact driven by heterogeneous effects of the business cycle between firms with differing treatment intensity.

Table A.4. 1. Table 4.4 with various specifications

	In logs					Proportion of total workers		
Panel A: Balanced panel	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
VARIABLES	Total workers	Regular workers	Irregular workers	Protected irregulars	Unprotected irregulars	Irregular workers	Protected irregulars	Unprotected irregulars
After * Treatment	-0.206** (0.0867)	1.335*** (0.218)	-2.190*** (0.228)	-3.242*** (0.287)	1.710*** (0.506)	-0.543*** (0.0383)	-0.773*** (0.0286)	0.230*** (0.0359)
Observations	4,800	4,552	3,216	2,727	1,762	4,800	4,800	4,800
R-squared	0.048	0.074	0.115	0.226	0.165	0.104	0.323	0.043
Number of firms	960	954	867	796	680	960	960	960
Panel B: Year-specific macro shock	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
After * Treatment	-0.153** (0.0719)	1.415*** (0.190)	-2.182*** (0.198)	-3.244*** (0.240)	1.356*** (0.448)	-0.520*** (0.0330)	-0.748*** (0.0250)	0.228*** (0.0297)
Observations	6,862	6,525	4,578	3,915	2,397	6,862	6,862	6,862
R-squared	0.044	0.073	0.106	0.214	0.150	0.101	0.339	0.043
Number of firms	1,905	1,878	1,606	1,457	1,107	1,905	1,905	1,905

Notes: After * Treatment is the interaction term between After and Treatment intensity, where After is a dummy indicating years after the legislation was enforced in 2007, Other control variables include firm age, type of business entity, existence of a labour union, and use of performance based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses.

***p<0.01, **p<0.05, *p<0.1.

Table A.4. 2. Table 4.11 with various specifications

	Wage of directly hired irregular workers (%) of regular wage		Wage of indirectly hired irregular workers (%) of regular wage	
Panel A: Balanced panel	(1)	(2)	(3)	(4)
VARIABLES	All directly hired irregular workers	Fixed-term workers (covered by reform)	All indirectly hired irregular workers	Dispatched workers (covered by reform)
After * Treatment	-0.0104 (0.0526)	-0.0090 (0.0471)	-0.326*** (0.105)	-0.346*** (0.126)
Observations	1,731	1,056	500	316
R-squared	0.115	0.150	0.480	0.590
Number of firms	747	417	350	225
Panel B: Year-specific macro shock	(1)	(2)	(3)	(4)
After * Treatment	-0.0119 (0.0433)	-0.0211 (0.0434)	-0.235** (0.0991)	-0.271** (0.111)
Observations	2,568	1,634	813	545
R-squared	0.115	0.149	0.354	0.414
Number of firms	1,321	810	628	426

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include type of business entity, existence of a labour union, and use of performance-based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

Table A.4. 3. Table 4.12 with various specifications

All workplaces	National Pension		All 4 insurances	
Panel A: Balanced panel	(1)	(2)	(3)	(4)
VARIABLES	All direct irregular workers	Primary direct: Fixed-term	All direct irregular workers	Primary direct: Fixed-term
After * Treatment	-0.217** (0.0944)	-0.0329 (0.0895)	-0.186* (0.0984)	-0.0233 (0.0943)
Observations	2,928	1,772	2,928	1,772
R-squared	0.041	0.056	0.032	0.034
Number of firms	868	450	868	450
Panel B: Balanced panel	All indirect irregular workers	Primary indirect: Dispatched	All indirect irregular workers	Primary indirect: Dispatched
After * Treatment	-0.317* (0.190)	-0.466** (0.184)	-0.281 (0.190)	-0.438** (0.184)
Observations	1,290	744	1,286	743
R-squared	0.148	0.183	0.146	0.186
Number of firms	551	284	550	284
Panel C: Year-specific macro shock	All direct irregular workers	Primary direct: Fixed-term	All direct irregular workers	Primary direct: Fixed-term
After * Treatment	-0.202** (0.0810)	-0.0493 (0.0736)	-0.145* (0.0817)	-0.0175 (0.0780)
Observations	4,101	2,570	4,101	2,570
R-squared	0.038	0.042	0.028	0.029
Number of firms	1,514	872	1,514	872
Panel D: Year-specific macro shock	All indirect irregular workers	Primary indirect: Dispatched	All indirect irregular workers	Primary indirect: Dispatched
After * Treatment	-0.267* (0.161)	-0.391** (0.156)	-0.240 (0.162)	-0.371** (0.156)
Observations	1,845	1,121	1,841	1,120
R-squared	0.121	0.150	0.119	0.151
Number of firms	912	520	911	520

Notes: Refer to Table 4.4 for the definition of After * Treatment. Other control variables include type of business entity, existence of a labour union, and use of performance-based pay for regular workers. All regressions include firm size, industry, region, and year-fixed effects, and size-by-year and industry-by-year effects. Standard errors are clustered at firm level in parentheses. ***p<0.01, **p<0.05, *p<0.1.

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