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TEMPORARY EMPLOYMENT AND EARNINGS INEQUALITY IN SOUTH KOREA

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TEMPORARY EMPLOYMENT AND EARNINGS INEQUALITY IN SOUTH KOREA

A Dissertation Presented

by

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DEDICATION

To my parents

and

To my teacher,

Peter Skott

Thank you for all of your love, support, help, encouragement, and dedication.

ABSTRACT

TEMPORARY EMPLOYMENT AND EARNINGS INEQUALITY

IN SOUTH KOREA

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My dissertation explores the effect of growth of temporary employment on earnings inequality. Temporary workers make up a sizeable part of the labor force in many countries. European debates have focused mainly on the employment effects of temporary contracts. In Korea, by contrast, worsening wage distribution has been the main issue: the composition of the labor force has seen significant change and inequality has increased dramatically, but official unemployment rates have remained consistently low.

In the first essay, I find that during a time when there was a nearly 10 percentage points increase in the share of temporary workers in the Korean labor market (but prior to the global recession), the rise in temporary employment can account for a substantial part (20-30 percent) of the growth in overall wage inequality. These

results appear to be robust to alternative ways of performing the decomposition, including using the recently developed recentered influence function approach of Firpo, Fortin and Lemieux. In addition, the rise of temporary employment mainly affects the lower-tail of the distribution and fattens the very bottom; female temporary workers in sales and service or doing elementary occupations are the people who suffered from the change the most.

In the second essay, joint with Peter Skott, we use an extension of a standard efficiency wage model to explain the wage gap between temporary and permanent workers. Temporary workers have a chance to become permanent; this possibility – combined with the existence of an employment rent for permanent workers – gives short-term workers an incentive to work hard. Thus, a high wage to permanent workers serves a dual purpose: it affects the effort of both permanent and temporary workers. Applying the model to the Korean experience, we discuss how institutional changes have contributed to increasing earnings inequality.

My third essay explores wage effects of the use of temporary employment upon permanent workers' wage. I propose an idea; as temporary employment grows, the fear of job loss is getting higher and the probability of getting a similar job is getting lower for permanent workers. This lower job insecurity tends to lower their bargaining power, and thus their pay level. Using a firm-level panel, I find that wages for permanent workers decrease as the share of temporary workers increases. The analysis also shows that wages for permanent workers in non-union and small/medium-sized firms have greater negative impacts; this helps explain the evolution of inequality in Korea.

Key words: temporary workers, inequality, decomposition, Korea, deregulation, efficiency wages, job insecurity

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CHAPTER 1

THE EFFECT OF TEMPORARY EMPLOYMENT TO INEQUALITY

1.1 Introduction

This essay investigates the proximate causes of increasing Korean wage inequality during the 2000s but prior to the global recession. More specifically, I focus on the rise in temporary employment as a source of increasing inequality. As temporary employment became prevalent after a sharp rise by a nearly 10 percentage points from 2001 to 2004, temporary employment has become an important research topic in Korea. The definition and size of temporary employment, the existence and the amount of the wage differential between permanent and temporary workers, and the causes of the signicant rise in temporary work arrangements have been discussed. However, wage effects of the use of temporary workers have not received much attention.

The trends in wage inequality are depicted in Figure 1. Figure 1 describes the trends of Gini coefficients, variance in log wages and log wage differentials between 90th and 10th percentile using the Wage Structure Survey (WSS) during 1985-2012. Earnings inequality increased dramatically from the mid-1990s up to the late 2000s, followed by a slightly falling trend.

A number of studies suggest that the changes in returns to educational attainment are the main cause of the evolution of earnings inequality in Korea. Fields and Yoo (2000) and Yoo (1998) find that the decrease in the returns to schooling can explain the decrease in wage inequality until the mid-1990s using Fields's decomposition approach. Kang and Yun (2008) also employed a decomposition method to study the question of what factors contributed to the changes in wage inequality in Korea during the equalizing period, 1980-1994, and the disequalizing period, 1994-2005 using the WSS. They find that changes in the wage structure significantly contribute to the changes in wage inequality, and that the wage structure effect of human capital factors has played a major role for both periods. After the mid-1990s, the skill-biased technical change (SBTC) hypothesis as a factor of rising inequality was also studied in Korea (Jeong et al., 2004; Hur et al., 2005).

Here, I observe that in addition to the sharp increase in overall inequality, Figure 1 shows an increase in lower-tail (50-10) inequality that is only slightly smaller than that in upper-tail (90-50). This is different from the trends in inequality in the United States during the 1990s that upper-tail inequality kept rising, but lower-tail inequality plateaued or decreased. Autor et al. (2008) explained the divergence in inequalities using a version of the SBTC hypothesis that still emphasizes the role of information technology that replaces routine tasks. However, the hypothesis is hard to explain the sharp increase in lower-tail inequality. The changes in returns to observed skills (Fields and Yoo, 2000; Yoo, 1998; Kang and Yun, 2008) and the SBTC hypothesis (Hur, 2005; Jeong et al., 2004) may be appropriate in explaining the movements of upper-tail in Korea, too. However, the rise in inequality in lower-tail in Korea may need another explanation, as a reduction in minimum wage (Lee, 1999; Slonimczyk and Skott, 2012) or the power-biased technical change (Skott and Guy, 2007) explain the evoluation of inequality in lower-tail in the United States.

In this paper, I focus on a Korean type institutional change: the liberalization of temporary contracts during the second half of 1990s in Korea. In 1998 two key elements of deregulation were implemented – relaxion of employment protection on permanent contracts and of the use of temporary contracts (KLI, 2008; Cho and Lee, 2007). The institutional changes ended up with a sharp increase in temporary workers. According to Figure 1, after the institutional changes and the economic crisis in the late 1990s, the composition of the labor force has seen significant change. The share of temporary workers among wage and salaried workers rose by 10.2 percentage points from 2001 to 2004; subsequently the share has fluctuated around 34% with a slight decline after 2007. The trends in inequality and in the share of temporary employment in this figure gives us the idea that the sharp increase in temporary employment could affect wage inequality.

A recent Spanish study also provides a hint on this topic. As a result the reform in 1984, Spain has one of the highest temporary employment rates in Europe: 23.7% in 2012 as compared to 13.9% EU-wide (Ferreiro and Serrano, 2013)[1]. Cervini-Pla, and Ramos (2012) examine the effect of the decline in temporary employment during 1993-2000 on earnings variance and find that fixed-term workers face more instability than permanent workers. This evidence implies the decrease in temporary contracts is responsible for the decreasing earnings inequality. Therefore, the growth of temporary employment is worth considering to analyze the evolution of earnings inequality in Korea.

In this chapter, the proximate sources of rising inequality are analyzed using alternative ways of doing decomposition. First, the recently developed recentered influence function (RIF) approach of Firpo, Fortin and Lemieux will be combined

[1]The temporary employment rates in Spain only include the fixed-term contracts, temporary agency work and on-call work. Using the same definition, one of highest rates for each country are 33.3% in Spain and 27.4% in Korea both in 2005.

with the traditional Oaxaca-Blinder (OB) decomposition. Second, a reweighting method introduced by DiNardo, Fortin, and Lemieux (1996) (DFL) will be implemented. A regression-based approach (RIF-regression) provides a starting point and the DFL method complements the RIF-regressions: it overcomes the assumption of the invariance of the conditional distribution of temporary status (Fortin, Lemieux, and Firpo, 2011) and probes the robustness of the RIF-regression results.

The decompositions show large effects of changes in temporary employment: these changes account for about 20-30% of the raw change in the Gini and variance prior to the global recession. In addition to the numerical contribution, I also provide movements of wage densities for all employees and by gender so that we can understand how the changes in the composition of employment, especially employment status, are associated with the evolution of inequality.

Section 2 describes the main changes in the Korean labor market with respect to the composition of employment, wage distribution and the share of temporary employment. The decomposition methods are explained in Section 3. Section 4 estimates the contribution of the growth of temporary employment to the increase in wage inequality and discusses the importance of the developments in the composition of employment for understanding increasing inequality. Section 5 concludes.

1.2 Data and descriptive statistics

1.2.1 Data

The analysis draws on the supplement to the Economically Active Population Survey (EAPS supplement). The survey has been conducted every March and August since 2000 (only August until 2006) by the Korean National Statistical

Office. The EAPS is a Korean labor force survey and Korean government calculates the share of temporary workers using its supplements in March and August. Since the data is the source of calculating official number of temporary employment, a number of studies used this dataset to measure the wage differentials between temporary and permanent workers.

In addition to the information of employment status, the EAPS contains most of the information used in the wage equation for individuals. Real hourly earnings are calculated as average monthly wages for three months divided by individual usual work hours. The data also includes human characteristics (gender, age, educational attainment, total labor market experience, and tenure) and job characteristics (industry and occupation). A shortcoming is that union membership and firm size, which are both likely to affect pay level, have been surveyed only since 2004 and 2005 respectively, so I do not include them as covariates in the wage equations.

I choose the two periods, 2001-02, and 2004-05, because during 2002-04 the share of temporary workers had a sharp rise and both periods are free from any economic turbulence. One drawback of the EAPS supplement is that it covers neither the mid-1990s when the trends of wage inequality reversed nor the late 1990s when the relevant institutions changed. Nevertheless, since the early 2000s also exhibits obvious increases in wage inequality and in the ratio of temporary employees, the research question can be answered with those periods.

The shortcomings of the dataset lead to some limitations. Because the EAPS presents survey data for individuals, the answers for their wages and contract type may have measurement errors. However, I found that the EAPS supplement are quite reliable in terms of wage distributions by comparing inequality trends to the WSS that were answered by employers. In addition, the interpretation of the significant rise in temporary employment in the early 2000s needs caution, because

the very early 2000s was the time before the definition of temporary work was settled down and actively applied in the survey. However, it is widely accepted that the late 1990s and the early 2000s are the periods that temporary contracts became prevalent.

The samples with independent cross-sections for the pre and post period only contain data on workers who were on the payroll of a firm in August for each period. The sample only includes non-agricultural workers who are 25-65 years old. Therefore, the final samples involve 84,835 observations – 39,924 for 2001-02 and 44,911 for 2004-05.

1.2.2 Changes in the composition of employment and wage inequality

Table 1 shows the main changes in the composition of employment between the two periods in terms of contractual type, gender, age, educational attainment, experience, and seniority. Above all, a sharp increase in the share of temporary employment is observed. The ratio of temporary employees out of wage and salaried workers increased by 9.2 percentage points. This was pictured in Figure 1. Despite of the prevalence of temporary work, it is surprising that workers tended to stay longer within a firm, hence years of seniority increased. The financial crisis in the late 1990s can solve this puzzle; during the crisis, the unemployment rates increased from below 3% to about 7% and the unemployed found their job in the early 2000s, so workers' tenure, on average, are lower in 2001-02. The proportion of female workers increased by 1.8 percentage points. In addition, workers tend to be older and more educated.

The second set of columns with the "Average hourly wage" display each group's average hourly wage in each period and growth rates in percentage. The hourly wages were weighted by hours of work. Given the wage gap between permanent

Table 1: Summary statistics

	Share (%)		Average hourly wage (KRW)		
	Pre	Post	Pre	Post	Δ(%)
Employment status					
Permanent	74.2	65.0	7,649	9,101	19.0
Temporary	25.8	35.0	5,676	6,418	13.1
Gender					
Male	63.2	61.4	8,268	9,559	15.6
Female	36.8	38.6	5,248	6,037	15.0
Age (years)					
25-35	39.6	36.4	6,755	7,655	13.3
35-45	33.0	32.9	7,939	9,143	15.2
45-55	18.5	21.5	7,685	8,827	14.9
55-65	8.8	9.2	5,630	6,323	12.3
Education					
Middle	22.8	18.3	4,575	4,906	7.2
High	40.9	39.7	6,513	7,101	9.0
2 years college	12.4	13.4	7,451	8,184	9.8
>4 years college	23.8	28.5	11,135	12,437	11.7
Experience (years)					
<10	26.7	25.2	6,847	7,690	12.3
10-20	33.5	32.6	7,894	9,138	15.8
20-30	24.4	25.9	7,529	8,766	16.4
>30	15.5	16.3	5,913	6,667	12.7
Seniority (years)					
<1	29.2	28.2	5,002	5,461	9.2
1-3	22.6	22.5	6,113	6,738	10.2
3-7	23.5	22.9	7,012	7,926	13.0
>7	24.7	26.4	11,135	13,060	17.3
Industry					
Manufacturing	26.7	25.4	7,064	8,311	17.7
Construction	10.2	9.8	6,690	7,212	7.8
Retail Trade and Accommodations	26.0	24.3	5,950	6,390	7.4
FIRE and Business Services	14.4	16.0	8,046	9,205	14.4
Social and Personal Services	22.0	23.8	8,659	10,055	16.1
Occupation					
Managers and Professionals	23.0	24.2	10,905	12,290	12.7
Clerks	17.0	19.8	8,624	10,081	16.9
Sales and Service Workers	17.4	16.2	5,022	5,554	10.6
Craft, Operators and Assemblers	28.3	25.4	6,384	7,200	12.8
Elementary Occupations	13.6	14.0	4,240	4,521	6.6
Observations	39,924	44,911	7,215	8,265	14.6

and temporary workers, the lower growth of the average hourly wage of temporary workers than that of permanent workers make the wage distribution worse in 2004-05.

Other compositions and wage growth show a similar trend: wages for high-wage earners grow fast, while ones for low-wage earners grow slowly. In detail, growth rates of wages for female, young, low-educated, less experienced, less tenured workers, workers in construction or wholesale and retail trade, restaurants and hotels, and workers with elementary occupations were lower than those for male, aged, high-educated, experienced, tenured workers, workers in manufacturing or FIRE, and professionals or clerks. This trend simply indicates that low wage earners tend to be suppressed to the very bottom of the wage distribution and the overall wage distribution becomes more dispersed. Furthermore, the changes in the composition illustrate that the proportion of the highly paid groups went up in the post period in general. Using the brief summary statistics, we can expect that the changes in wage structure contributed to the increasing inequality and the changes in the composition – top or bottom earnings groups tended to grow – also did.

Focusing on the dramatic increase in temporary work arrangements, Table 2 illustrates a more detailed picture of the changes in the labor force composition in terms of contractual type and the changes in wage differentials.

The first set of columns with "Share of temps" display the fraction of temporary workers in each group. For example, 34.4% of female workers had a temporary contract in the pre period and the share increased to 43.3% in the post period. Like Table 1, the second set of columns show the average hourly wages and growth rates by employment type. The increase in temporary contracts across subgroups is not surprising, given the significant overall rise in temporary workers.

From the age groups, we can see that elder workers older than 55 are the most

Table 2: Share of temps and hourly wage by employment status

	Share of temps (%)		Average hourly wage (KRW)					
			Permanent			Temporary		
	Pre	Post	Pre	Post	Δ(%)	Pre	Post	Δ(%)
Gender								
Male	20.8	29.8	8,735	10,452	19.7	6,441	7,441	15.5
Female	34.4	43.3	5,424	6,526	20.3	4,832	5,279	9.3
Age (years)								
25-35	20.3	30.0	6,849	7,868	14.9	6,336	7,108	12.2
35-45	25.1	33.5	8,463	10,038	18.6	6,142	7,178	16.9
45-55	29.5	37.6	8,515	10,386	22.0	5,470	6,055	10.7
55-65	45.7	54.4	6,732	8,271	22.9	4,183	4,559	9.0
Education								
Middle	40.4	53.3	4,771	5,352	12.2	4,234	4,460	5.3
High	25.6	36.0	6,816	7,703	13.0	5,519	5,917	7.2
2 years college	18.0	28.8	7,690	8,621	12.1	6,251	7,026	12.4
>4 years college	16.3	24.8	11,328	13,005	14.8	9,993	10,566	5.7
Experience (years)								
<10	18.6	29.0	6,857	7,834	14.3	6,797	7,307	7.5
10-20	22.8	31.2	8,304	9,781	17.8	6,292	7,554	20.1
20-30	28.4	36.6	8,182	10,081	23.2	5,663	6,301	11.3
>30	40.9	49.4	6,852	8,353	21.9	4,408	4,803	9.0
Seniority (years)								
<1	46.6	58.8	5,192	5,749	10.7	4,745	5,224	10.1
1-3	24.9	36.0	6,134	6,901	12.5	6,038	6,415	6.2
3-7	18.9	29.8	7,122	8,158	14.5	6,486	7,346	13.3
>7	8.7	13.2	11,288	13,381	18.5	9,456	10,932	15.6
Industry								
Manufacturing	12.6	21.2	7,285	8,641	18.6	5,258	6,990	33.0
Construction	51.0	63.5	7,762	9,097	17.2	5,586	6,079	8.8
Retail & Acco.	25.7	34.1	6,137	6,775	10.4	5,305	5,526	4.2
FIRE & B Ser.	38.1	48.8	9,187	11,254	22.5	6,169	7,096	15.0
Social & P Ser.	22.7	30.2	9,239	11,160	20.8	6,180	6,988	13.1
Occupation								
Managers & Pro.	16.6	25.7	11,078	12,787	15.4	9,894	10,690	8.0
Clerks	12.1	21.1	8,791	10,545	19.9	7,239	8,217	13.5
Sales & Service	36.3	44.8	5,015	5,673	13.1	5,038	5,375	6.7
Craft & Ope.	23.2	32.5	6,598	7,626	15.6	5,638	6,281	11.4
Elementary	50.6	63.7	4,573	5,116	11.9	3,853	4,133	7.3

precarious group in terms of type of contract. The fact that growth rates of pay level for temporary workers in this group are very low, 9.0%, indicates their temporary status is likely to affect wage determination and push them into the bottom of the distribution. This is true that these elder workers are the people who are in poverty and tend to participate more in the labor market not with a decent job, but with a temporary and least paid job.

Also, note that aged workers with permanent contracts have, on average, a similar pay level with the group of 25-35 years old, but elders with temporary contracts obtain the lowest level. The polarization of wage growth rates between them (22.9% vs. 9.0%) made it worse. This tells us that the employment status does not make wage gaps only at a time, but affects wage profiles for longer time. This is associated with different seniority wages for different contract types. In the categories of "Seniority", even though the groups with shorter than 3 years of tenure do not show large wage differentials, the gaps get large, as tenure increases. The more serious problem is that temporary workers are likely to lose the even lower seniority wages. Based on the samples, 53% of temporary workers can work within a firm for less than 1 year and only 8% of them can obtain the seniority wages by staying more than 7 years in a firm. Therefore, temporary workers tend to and have to frequently move in-and-out of firms and even the pool of labor force, hence they are likely to lose their potential seniority wages and face much flatter wage profiles than permanent workers.

The notable increase in temporary employment had no exception for high-educated workers and professionals. We can expect that low-educated people and workers with elementary occupations are highly likely to be a temporary worker; the statistics confirm this. But between the two periods the proportions of temporary contracts for high-educated and professionals grew by almost 10 percentage

points. The fact that these highly-educated employees or professionals but with a temporary contract had very low wage growth rates (5.7% and 8.0%, respectively) indicates that within-group inequality among temporary workers would have declined.

The cagories of "Occupation" add another picture. Occupations tend to make a very clear earnings class which is least affected by employment status. Table 2 shows that regardless of their type of contract, sales and service workers and workers with elementary occupations are likely to belong to the lowest earnings classes. These groups that account for more than 30% of employees had only 6.7-13.1% of wage growth. This tells a story on the very bottom of the distribution for both permanent and temporary workers: their relative wages declined and the bottoms were fattened by them in the post period.

Table 3: Mean and distribution of log hourly wage by employment status

	(1) All			(2) Perm			(3) Temp		
	Pre	Post	Δ	Pre	Post	Δ	Pre	Post	Δ
p90	9.497	9.671	0.175	9.563	9.767	0.204	9.177	9.361	0.184
p75	9.090	9.266	0.175	9.167	9.361	0.194	8.822	8.978	0.156
p50	8.675	8.801	0.126	8.765	8.924	0.160	8.446	8.559	0.113
p25	8.290	8.363	0.073	8.359	8.472	0.113	8.084	8.196	0.113
p10	7.982	8.067	0.085	8.071	8.151	0.079	7.746	7.897	0.151
mean	8.701	8.823	0.122	8.778	8.936	0.158	8.453	8.595	0.143
s.d.	0.599	0.625	0.026	0.571	0.608	0.037	0.618	0.596	-0.022
90-10	1.515	1.605	0.090	1.492	1.616	0.124	1.431	1.464	0.033
90-50	0.822	0.871	0.049	0.799	0.842	0.044	0.731	0.802	0.071
50-10	0.693	0.734	0.041	0.693	0.774	0.081	0.700	0.662	-0.038
Varinace	0.359	0.391	0.032	0.326	0.369	0.043	0.382	0.356	-0.027
Gini	0.039	0.040	0.002	0.037	0.039	0.002	0.040	0.039	-0.001

Table 3 and Figure 2 confirm above stories. Table 3 summarizes hourly wage at percentiles and the average wage at each period in the first panel, and five inequality measures for all and within-group inequalities by employment status in the second

panel. Figure 2 illustrates wage densities.

In the first panel of the table, the increase in wage at 90th percentile is much greater that those at 50th and 10th (0.175 v. 0.126, 0.085 respectively); this indicates earnings inequality increased. The flattened distribution in 2004-05 (solid lines in the figure) supports the increase in overall wage inequality. We can also confirm that the changes in inequality in upper-tail and lower-tail are quite similar.

In addition, we alse see that wage inequality within permanent workers increased in 2004-05. The flattening wage density and the fattening upper-tail for permanent workers in Figure 2(c) show the change.

The changes in earnings distribution among temporary workers are interesting; the fact that the increase in wage at 10th percentile is greater than that at median among temporary workers and the reduction in standard deviation and distributional statistics in the second panel indicates that their within-group inequality declined. Differently from the expectation of that the wages at high percentiles grew slowly, the wage growth at 90th was high. Among temporary workers, only a small fraction of workers with more than 7 years of tenure seemed to have the benefit of high wage growth according to Table 2. For other high-wage earners, as long as they have a temporary status, the wage differentials seem greater in 2004-05. Therefore, temporary workers' overall wage did not grow as much as permanent workers. The more left centered and more densed wage distribution for temporary workers in 2004-05 (in Figure 2(b) and 2(d)) show the change.

In sum, in terms of temporary status the inequality within temporary workers declined, however the rise in within-group wage inequality among permanent workers who are still the majority of the labor force outweigh the reduction. The seemingly greater average wage differentials implies greater between-group inequality by the type of contract.

1.3 Methodology

Each method has two stages. In the first stage, changes in earnings distribution are divided into a composition effect reflecting how changes in the share of temporary employment, human characteristics and job characteristics affect the distribution) and a wage structure effect (reflecting how changes in returns to temporary status, additional years of schooling and labor market experience affect the distribution). In the second stage, composition effects are further divided into the separate contribution of each covariate – temporary status, educational attainment, experience, tenure, industry, occupation, and gender.

RIF-regressions recently proposed by Firpo et al. (2007) will be combined with the traditional Oaxaca-Blinder (OB) decomposition. No reweighting and a reweighting method as DFL will be performed. RIF-regression with OB decomposition will give us a full picture of detailed decomposition; contributions of each covariate.

The DFL method is hard to implement for detailed decomposition. However, when the covariate is a dummy variable, it is possible to isolate the contribution of the covariate. When the dummy covariate is not independent of the other covariates, DFL method is more appropriate to decompose the effect of the dummy variable. Therefore, the DFL method complements to RIF-regressions.

Here, I focus on the composition effect of temporary status, since this chapter aims to measure the contribution of the rise in temporary employment to the increase in earnings inequality.

1.3.1 Total composition effect

A RIF-regression is similar to a standard regression, except that the dependent variable, Y, is replaced by the recentered influence function (RIF) of a distributional statistic of interest. In other words, an estimate of the influence function corresponding to an observed wage y for a distributional statistic of interest, ν_τ in τ-quantile, is found and then recentered. This RIF then becomes the dependent variable in a regression of RIF on the covariates.

Central to this method, rather than estimating the effect of each covariate on hourly earnings directly in wage equations, I estimate the effect of each covariate on the distributional statistic of hourly earnings. Denote the resulting regression coefficient estimates as $\widehat{\gamma}_0^\nu$ and $\widehat{\gamma}_1^\nu$ for the period 0 and 1 respectively.

Then using the estimated coefficients, we can write and perform the equivalent of the OB decomposition for any unconditional quantile as

$$\widehat{\Delta}_O^\nu = \overline{X}_1 \left(\widehat{\gamma}_1^\nu - \widehat{\gamma}_0^\nu\right) + \left(\overline{X}_1 - \overline{X}_0\right) \widehat{\gamma}_0^\nu = \widehat{\Delta}_S^\nu + \widehat{\Delta}_X^\nu. \tag{1.1}$$

where X denote covariates in wage equations. The first term in eq. (1.1) represents wage structure effects ($\widehat{\Delta}_S^\nu$) and the second term in eq. (1.1) represents composition effects ($\widehat{\Delta}_X^\nu$).

To the no reweighting method, the composition effect can be written using the sample weights provided in the survey data, w_t for period t,

$$\widehat{\Delta}_X^\nu = \left(\sum_{i=1}^{N} w_{1i} X_{1i} - \sum_{i=1}^{N} w_{0i} X_{0i}\right) \widehat{\gamma}_0^\nu. \tag{1.2}$$

For a reweighting RIF-regression method, the total composition effect can be computed by considering a counterfactual state of the base period 0, where the

distribution of all the covariates (X) remained in period 1. The subscript C denotes counterfactual.

Creation of the counterfactual state requires appropriate weights be placed on observations in the period 0. The counterfactual weights can be found by multiplying a reweighting function (Ψ) by the sample weights (w_t). The reweighting factor $\widehat{\Psi}(X)$ for observations in period 0 is following:

$$\widehat{\Psi}(X) = \frac{\widehat{P}(D_1 = 1|X)/\widehat{P}(D_1 = 1)}{\widehat{P}(D_1 = 0|X)/\widehat{P}(D_1 = 0)} \tag{1.3}$$

where $\widehat{P}(D_1 = 1|X)$ is the predicted probability of belonging to period 1 and $\widehat{P}(D_1 = 0|X)$ is the predicted probability of belonging to period 0, and $\widehat{P}(D_1 = 0)$ and $\widehat{P}(D_1 = 1)$ are the sample proportions in period 0 and 1 respectively. For the conditional probability $\widehat{P}(D_1 = 1|X)$, a logit model is used.

Then the composition effect of the reweighting method can be written[2]

$$\widehat{\Delta}_X^{\nu} = \left(\sum_{i=1}^{N} w_{Ci} X_{0i} - \sum_{i=1}^{N} w_{0i} X_{0i} \right) \widehat{\gamma}_0^{\nu}. \tag{1.4}$$

That is, the weights $w_C = w_0 \widehat{\Psi}$, instead of the sample weights w_0, yield the counterfactual distributional statistic that would have prevailed if the distribution of X had remained as it was in period 1.

In the first stage, the way of measuring the total composition effect by DFL is

[2]The wage structure effects of the reweighting method can be written

$$\widehat{\Delta}_S^{\nu} = (\widehat{\gamma}_1^{\nu} - \widehat{\gamma}_C^{\nu}) \sum_{i=1}^{N} w_{1i} X_{1i}$$

The difference between the sum of composition and wage structure effects and $\left[\left(\sum_{i=1}^{N} w_{1i} X_{1i} \right) \widehat{\gamma}_1^{\nu} - \left(\sum_{i=1}^{N} w_{0i} X_{0i} \right) \widehat{\gamma}_0^{\nu} \right]$ is the specification error. The reweighting error is used for checking whether the linear model is well specified. I chose 2001-02 as base period, because this error is much lower than the case when 2004-05 is base period.

same in the RIF-regressions.

1.3.2 The contribution of changes in temporary employment

The second stage of the decomposition further divides the composition effects into the contributions of each factor. Just as a OB decomposition provides a procedure to decompose changes in the mean into the contributions of each factor to composition and wage structure effects, the innovations in Firpo et al. (2007) allow us to do the same for any distributional statistic.

The composition effect in eq. (1.1) can be rewritten in terms of the sum of the contribution of each covariate (X_k) as

$$\widehat{\Delta}_X^{\nu} = \sum_{k=1}^{K} \left(\overline{X}_{1k} - \overline{X}_{0k}\right) \widehat{\gamma}_{0k}^{\nu}. \tag{1.5}$$

This is an unconditional reweighting procedure based on the change in the marginal, as opposed to the conditional distribution of covariates. Unless the covariates are independent, however, this will yield biased estimates (Fortin, Lemieux, and Firpo, 2011). This problem can be solved using the conditional reweighting procedure as DFL.

In the second stage, DiNardo, Fortin, and Lemieux (1996) show how to compute the composition effect corresponding to a binary covariate like union status. Using the same method to the binary of temporary status, I can compute the contribution of the increase in temporary employment to the composition effect by estimating what would happened to the wage distribution in period 0 if the distribution of employment status (T), but none of the other covariates (X_{-T}), looked like it did in the period 1. In other words, consider the counterfactual distribution that would prevail if the conditional distribution of employment status was what it was

in period 1.

Note that we consider the distribution of temporary status conditional on the other attributes, $F_X(T|X_{-T})$. Unless employment status is independent of other covariates($T \perp X_{-T}$), the marginal distribution of temporary status, $F_X(T)$, will depend on the distribution of X_{-T} , $F_X(X_{-T})$. An advantage of the DFL is that the method can rule out the confounded effects induced by changes in the other attributes (Fortin, Lemieux, and Firpo, 2011).

The counterfactual can be estimated using an appropriate reweighting function.

$$\widehat{\Psi}_T(T, X_{-T}) = T \cdot \frac{\widehat{P}_1(T=1|X_{-T})}{\widehat{P}_0(T=1|X_{-T})} + (1-T) \cdot \frac{\widehat{P}_1(T=0|X_{-T})}{\widehat{P}_0(T=0|X_{-T})}. \tag{1.6}$$

where $\widehat{P}_1(T=1|X_{-T})$ the predicted probability of being a temporary employee in period 1.

Again, the counterfactual distributional statistic and the counterfactual density using kernel density methods can be estimated placing new weights $w_{C,T} = w_0 \widehat{\Psi}_T(T, X_{-T})$ on the observations of the base period 0. The most important strength of this semiparametric approach is that it helps us to get the base and counterfactual densities. Comparing two density functions, we can obtain more detailed information on what parts of the earnings distribution have been influenced most.

Note that, however, one limitation of the DFL detailed decomposition is that the results depend on the order in which the covariates are sequestially introduced (DiNardo, Fortin, and Lemieux, 1996). For instance, estimates of the effect of unions may be overstated if union workers tend to be concentrated in industries that would pay high wages even in the absence of unions. To overcome the limitation, Fortin, Lemieux, and Firpo (2011) suggests a way around the problem of path

dependence.

The basic idea is that the coefficient on the last covariate (T) to be introduced in the regression is not biased since the other covariates (X_{-T}) are controlled for. So after considering the changes in all the other covariates, then we add the factor of our interest. The unbiased estimator can be obtained by computing a reweighting factor $\Psi_{X_{-T}}(X_{-T})$ based on all the covariates except the one considered for the detailed decomposition (T). The reweighting factor is

$$\widehat{\Psi}_{X_{-T}}(X_{-T})) = \frac{\widehat{\Psi}(X)}{\widehat{\Psi}_{T|X_{-T}}(X_{-T})} \tag{1.7}$$

where

$$\widehat{\Psi}_{T|X_{-T}}(X_{-T}) = \frac{\widehat{P}(D_1 = 1|X_{-T})/\widehat{P}(D_1 = 1)}{\widehat{P}(D_1 = 0|X_{-T})/\widehat{P}(D_1 = 0)}. \tag{1.8}$$

And then the difference in distributional statistics between the counterfactual using the reweighting factor using all covariates ($\Psi(X)$ in eq. (1.3)) and the counterfactual using the ratio of reweighting factors $\Psi(X)\Psi_{X_{-T}}(X_{-T})$ is the estimated contribution of covariate of our interest, here the temporary status (T), to the composition effect.

In sum, after taking advantages and disadvantages of each method into account, Fortin, Lemieux, and Firpo (2011) suggest to first use a regression-based approach like the RIF-regressions and the DFL reweighting procedure can then be used to probe the RIF-regression results, and make sure they are robust to the functional-form assumptions implicit in the RIF-regressions. By comparing the results from RIF-regression and DFL, I confirm the effect of the change in employment status to the total composition and check the robustness of the estimates.

1.4 Decomposition results

1.4.1 Total composition effect

Table 4 shows how much of the raw difference in distributional statistics between the two periods is explained by the changes in the composition of employment. Both decomposition methods estimate the contributions for all employees and by gender. The reasons why I add the decomposition results for male and female workers are that many studies provide evidence that the wage determination process differs according to gender. Also, in this study how the prevalence of temporary work affect wage distribution is likely to differ by gender.

Table 4 shows that the majority of, and sometimes even more than 100% of the raw difference in inequality are due to the movements of the composition. These results are contrary to Kang and Yun (2008) that find changes in the wage structure significantly contribute to the changes in wage inequality. The main difference with respect to the relative contribution of composition effects and wage structure effects may come from different data sources or different sample periods – the early 2000s is the period that the Korean economy adjusts to the high unemployment during the financial crisis and to the institutional changes in the late 1990s.

Also, I can find the reason in that the contributions of composition effects are quite different in upper and lower-tail of the distribution, whereas Kang and Yun (2008) did not examine wage distribution. The decomposition results in Table 4 exhibit greater contribution of composition effects in lower-tail (101% from RIF-regression and 94.5% from the DFL method) than in upper-tail (about 60%). This can give a hint that wage structure effects corresponding to skill components such as schooling and labor market experience are more associated with upper-tail, whereas composition effects may be more relevant to lower-tail.

Table 4: Total composition effect (2004-05)

Dstat.	90-10	90-50	50-10	Variance	Gini
RIF-regression					
		All			
2001-02	1.5116	0.8166	0.6951	0.3586	0.0385
2004-05	1.6102	0.8749	0.7354	0.3906	0.0401
Difference	0.0986	0.0583	0.0403	0.0320	0.0016
Composition	0.0761	0.0354	0.0407	0.0334	0.0017
(% of Diff.)	(77.1)	(60.7)	(100.9)	(104.4)	(107.8)
		Male			
2001-02	1.3940	0.7522	0.6418	0.3058	0.0348
2004-05	1.5288	0.8156	0.7132	0.3519	0.0372
Difference	0.1348	0.0635	0.0713	0.0461	0.0024
Composition	0.0692	0.0272	0.0420	0.0261	0.0015
(% of Diff.)	(51.3)	(42.9)	(58.9)	(56.6)	(61.5)
		Female			
2001-02	1.3216	0.8363	0.4852	0.3131	0.0362
2004-05	1.4356	0.9045	0.5311	0.3235	0.0368
Difference	0.1140	0.0681	0.0459	0.0103	0.0006
Composition	0.0883	0.0489	0.0394	0.0440	0.0026
(% of Diff.)	(77.4)	(71.8)	(85.9)	(425.8)	(413.5)
DFL					
		All			
2001-02	1.5149	0.8220	0.6929	0.3586	0.0385
2004-05	1.6045	0.8706	0.7340	0.3906	0.0401
Difference	0.0897	0.0486	0.0411	0.0320	0.0016
Composition	0.0666	0.0278	0.0388	0.0331	0.0016
(% of Diff.)	(74.3)	(57.3)	(94.5)	(103.4)	(104.7)
		Male			
2001-02	1.3943	0.7544	0.6399	0.3058	0.0348
2004-05	1.5041	0.7836	0.7205	0.3519	0.0372
Difference	0.1098	0.0292	0.0806	0.0461	0.0024
Composition	0.0835	0.0287	0.0548	0.0271	0.0015
(% of Diff.)	(76.0)	(98.1)	(68.0)	(58.8)	(62.0)
		Female			
2001-02	1.3189	0.8334	0.4855	0.3132	0.0362
2004-05	1.4351	0.9163	0.5188	0.3235	0.0368
Difference	0.1162	0.0829	0.0333	0.0103	0.0006
Composition	0.0674	0.0395	0.0279	0.0390	0.0023
(% of Diff.)	(58.0)	(47.6)	(83.9)	(377.3)	(360.7)

Table 15 report the decomposition results of the RIF-regressions. The wage structure effects of "Education" and "Experience" show the contribution of the wage structure effect of human capital factors. Both categories increased the inequality only in the upper-tail (90-50). These results are comparable to Kang and Yun (2008) and the SBTC hypothesis.

The significant composition effect in the lower-tail suggests the importance institutional factors. The decline in real value of minimum wages may have been important in the United States. In Korea, however, minimum wages are far below the basic needs and many employers avoid their legal responsibility. Other institutional factors can be considered. The Korean economy had a wave of globalization in the second half of 1990s and partly as a response to new development labor market flexibility increased a lot. The Korean labor market now uses temporary contracts the second most frequently to Spain. Thus, the increased prevalence of temporary contracts is worth considering as a factor of rising inequality.

The decomposition results for male workers show that the composition effect accounts for 50-60% of the raw difference in wage inequality. When we recognize that the wage structure for males more faithfully reflect the market situation, these results are more reliable and comparable to Kang and Yun (2008). The results also confirm that the composition effect is greater in the lower-tail.

In addition, Figure 3 shows the wage densities for both periods, a counterfactual density (defined as unchanged composition of 2004-05), and the difference between the counterfactual and the 2001-02 density. The difference states that a group of people below and around the median wage would have moved away in the counterfactual, whereas there would have been a dense group of workers in the top of the distribution whose compensation is much farther from the median wage. That is, if the distribution of covariates remained in 2004-05, the upper tail would be fat-

tening, so the distribution would be worse than the actual distribution in 2001-02. For male workers, the trend is more obvious. The second graph of male workers (b) shows a very typical difference in wage density when inequality grows. The median workers tend to spread to each poles of the distribution.

In addition, the graphs in the third row show the real wage growth rates and counterfactual wage growth by the composition effect. The counterfactual wage growth (the dashed line) is flatter than the real wage growth (the solid line), which means the composition effects cannot fully explain the increasing inequality. However, the slope in lower-tail is very close to the real growth, which means the rise in inequality in lower-tail can be explained the composition effects. This is more obvious for males. For females, the steepness of the two lines of wage growth is pretty similar, which means the composition effects are influential on overall inequality for female workers (except the very top).

1.4.2 The contribution of changes in temporary employment

The composition effect corresponding to the employment status is shown with "Temp" in Table 5 and counterfactual distributions are depicted in Figure 4.

The RIF-regression results in (1) of Table 5 with a reweighting approach show that the effects account for 29.1% of changes in log variance and 26.7% of changes in Gini coefficients; about a quarter of the change in wage inequality can be attributed to the rise in temporary workers. This is a significant impact. When it comes to the log wage differential between the 90th and 10th percentile, however, it decreased to 8.2%. However, in lower-tail the contribution is much greater than in upper-tail (23.7% vs -2.5%). This is quite consistent to my hypothesis that the changes in distribution in lower-tail are more affected by the growth of temporary contracts than in upper-tail. It is intuitive that the effects of the growth of temporary

employment hit the low wage earners more than the high wage earners.

Since the detailed decomposition of RIF-regressions assume each factor is independent of the other covariates, the estimators might be biased if they are correlated. For example, the growth of the business service sector whose share of temporary workers is already 40% in 2001-02 might result in the rise in temporary work. Although this change is induced by changes in industrial sectors, RIF-regression estimates would include this to the effects of temporary status. The DFL decomposition method can rule out the confounded effects (Fortin, Lemieux, and Firpo, 2011) and provide unbiased estimators.

The effects from DFL decomposition results in (2) are a bit lower than those of RIF-regressions. In Table 5, the effects are only 2.3% of the changes in log wage differential between 10th and 90th percentile. However, for variance and Gini that contain all the information on pay levels (not only at a few quantiles), the effects are large. The effects account for 27.5% of the change in log variance and 24.4% of changes in Gini coefficients.

In the perspective of the correlation between the covariate of our interest (T) and the other covariates (X_{-T}), the DFL results in (2) might be more reliable and unbiased than the RIF-regression results. However, as described in the section 1.3, the DFL approach suffers from path dependence. The estimators that are free from path dependenece are shown in (3) under the DFL panel.

The results of (3) also show that the effects account for 28.1% of changes in log variance and 25.8% of changes in Gini coefficients. The estimators show that the effects are in between the RIF-regression and the DFL results in (2). Contrary to our worry of overestimation of the DFL method in (2), they seemed to have been underestimated. The confounded factor might have run the reverse; for instance, the labor force tends to more educated in 2004-05, thus the overall likelihood of

Table 5: The composition effect of employment status (2004-05)

Dstat.	90-10	90-50	50-10	Variance	Gini
RIF-regression					
		All			
2001-02	1.5116	0.8166	0.6951	0.3586	0.0385
2004-05	1.6102	0.8749	0.7354	0.3906	0.0401
Difference	0.0986	0.0583	0.0403	0.0320	0.0016
Temp (1)	0.0081	-0.0014	0.0095	0.0093	0.0004
(% of Diff.)	(8.2)	(-2.5)	(23.7)	(29.1)	(26.7)
		Male			
2001-02	1.3940	0.7522	0.6418	0.3058	0.0348
2004-05	1.5288	0.8156	0.7132	0.3519	0.0372
Difference	0.1348	0.0635	0.0713	0.0461	0.0024
Temp	0.0106	0.0023	0.0083	0.0060	0.0003
(% of Diff.)	(7.9)	(3.6)	(11.7)	(13.0)	(13.8)
		Female			
2001-02	1.3216	0.8363	0.4852	0.3131	0.0362
2004-05	1.4356	0.9045	0.5311	0.3235	0.0368
Difference	0.1140	0.0681	0.0459	0.0103	0.0006
Temp	0.0127	-0.0035	0.0162	0.0138	0.0008
(% of Diff.)	(11.1)	(-5.1)	(35.2)	(133.3)	(126.0)
DFL					
		All			
2001-02	1.5149	0.8220	0.6929	0.3586	0.0385
2004-05	1.6045	0.8706	0.7340	0.3906	0.0401
Difference	0.0897	0.0486	0.0411	0.0320	0.0016
Temp (2)	0.0021	0.0016	0.0005	0.0088	0.0004
(% of Diff.)	(2.3)	(3.3)	(1.2)	(27.5)	(24.4)
Temp (3)	0.0101	0.0083	0.0018	0.0090	0.0004
(% of Diff.)	(11.2)	(17.1)	(4.3)	(28.1)	(25.8)
		Male			
2001-02	1.3943	0.7544	0.6399	0.3058	0.0348
2004-05	1.5041	0.7836	0.7205	0.3519	0.0372
Difference	0.1098	0.0292	0.0806	0.0461	0.0024
Temp	0.0164	0.0064	0.0101	0.0051	0.0003
(% of Diff.)	(15.0)	(21.9)	(12.5)	(11.1)	(11.2)
		Female			
2001-02	1.3189	0.8334	0.4855	0.3132	0.0362
2004-05	1.4351	0.9163	0.5188	0.3235	0.0368
Difference	0.1162	0.0829	0.0333	0.0103	0.0006
Temp	0.0366	-0.0047	0.0413	0.0166	0.0009
(% of Diff.)	(31.5)	(-5.7)	(124.1)	(160.6)	(147.0)

being a temporary employee must have decreased. Nevertheless, the share of temporary workers has increased in the post period. This indicates the effects might be even larger after excluding the effects of the other factors' changes in composition.

Therefore, the unbiased estimates in DFL (3) confirm that the effects of temporary employment are influential in the increase in earning inequality in the early 2000s.

Figure 4 illustrates what would be the counterfactual distributions if the composition of employment status looked like in 2004-05. In the second figure in Figure 4(a), many low wage earners tend to spread to the very bottom and to the middle and top, hence the fattening two tails would increased the overall wage inequality.

The results that the composition effect of the employment status explains more about the distribution below median is more obvious for female workers. Based on the RIF-regression results, 35.2% of the changes in inequality below median are due to the growth of temporary work. Figure 4(c) show that the left bottom was fattened a lot and the last figure of (c) shows that the real and the counterfactual wage growth have very similar trends below the 40th. Female workers' within-group inequality rose in upper-tail which is depicted by the upward sloping wage growth line, but the very flat and non-monotonic wage growth above the 40th indicates that the rise in temporary work did not seem to give any wage growth for female-temporary-middle and high wage earners. It is well-known that service workers in hotels and restaurants and workers with elementary occupations obtain very low wages. The sample also shows that female employees account for about 70% of the sales and service and about half of elementary occupations, and Table 2 shows those occupations are the top two categories that use temporary work arrangements. These facts tell us female workers doing sales, service and elementary work suffer from the prevalence of temporary employment because they are easily exposed to

poor working condition and low earnings due to their temporary status.

The very flat upward sloping (dashed) line in the last figure of Figure 4(b) and low contributions for male in Table 5 show that the effects of the composition declined to about 10% for male workers, while they increased a lot for female workers. This is consistent to the fact that the likelihood of being a temporary employee is higher for female when they enter the market or re-enter it after the maternity leave. Like Kang and Yun (2008), the wage structure effect seems greater for male.

Figure 5 displays the RIF-regression coefficients of the temporary status in the pre and the post period, and the counterfactual of the pre period. Because these are coefficients of unconditional quantile regressions, they can be used to estimate the impact of X on the corresponding unconditional quantile, while quantile regression estimates cannot be used to assess the more general economic or policy impact of a change of X on the corresponding quantile of the unconditional distribution of Y (Firpo et al., 2007).

In 2001-02, temprary work tended to reduce the hourly wage below the 40th quantile, but much smaller impact above the point, which is likely to match to general thinking of that low paid or low skilled jobs tend to have high association with temporary status. In 2004-05, after a significant increase in temporary workers, the situation seems to have changed. The line is pretty flat, and even downward as the quantile goes up. Ironically, this resulted in the effect of temporary employment is estimated to attenuate earnings inequality because of the reduction in the conditional dispersion of wages (the "within" effect). This impact is shown with the large negative wage structure effect of the rise in temporary employment in Table 15.

The movements of wage structure remain unexplained. If the movements have

any causal relation between the growth of temporary employment, the total effect of the prevalence of temporary employment could have improved the inequality. However, with the increase in the wage differentials between temporary and permanent employees, I find the changes in the composition significantly worsened inequality (the "between" effect).

1.4.3 Robustness

We can check the robustness of the decomposition results employing a different post period, 2006-07. The decomposition results using the same methods are displayed in Table 6 and Table 16.

The distributional statistics show that earnings inequality worsended from 2004-05 to 2006-07, although the speed is lower. The sharp increase in the early 2000s and the slow growth of wage inequality afterwards in the decompostion tables match to the trends estimated using the WSS.

The composition effects corresponding to the employment status are quite similar through (1)-(3) in terms of variance and Gini. They account for 15.7-19.9% of the change in variance and 16.1-21.1% of the change in Gini; the effects are still significant, even though the effects are smaller than Table 5 by 7-9 percentage points.

1.5 Conclusion

Wage inequality and the proportion of temporary workers in total employment have increased dramatically in Korea after the mid-1990s. This chapter estimates the contribution of the temporary employment to rising earnings inequality. The wage penalties associated with temporary work are substantial and can account for

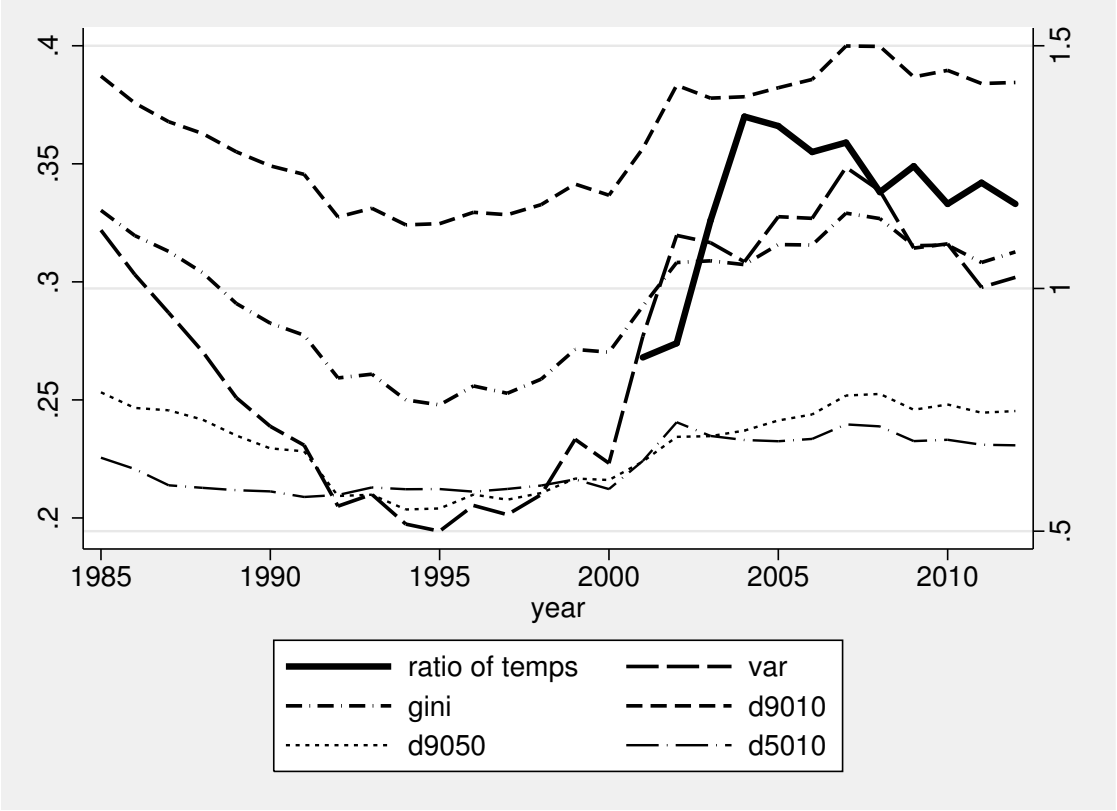
Table 6: The composition effect of employment status (2006-07)

Dstat.	90-10	90-50	50-10	Variance	Gini
			RIF-regression		
2001-02	1.5116	0.8166	0.6951	0.3586	0.0385
2006-07	1.6517	0.9111	0.7407	0.3982	0.0402
Difference	0.1401	0.0945	0.0456	0.0396	0.0017
			Reweighting		
Total composition	0.1015	0.0536	0.0479	0.0414	0.0021
(% of Diff.)	(72.4)	(56.7)	(105.0)	(104.6)	(127.2)
Temp (1)	0.0068	-0.0012	0.0081	0.0079	0.0004
(% of Diff.)	(4.9)	(-1.3)	(17.6)	(19.9)	(21.1)
			DFL		
2001-02	1.5149	0.8220	0.6929	0.3586	0.0385
2006-07	1.6219	0.8799	0.7419	0.3982	0.0402
Difference	0.1070	0.0579	0.0490	0.0396	0.0017
Total composition	0.0891	0.0416	0.0476	0.0418	0.0021
(% of Diff.)	(83.3)	(71.2)	(97.0)	(105.5)	(125.7)
Temp (2)	0.0021	0.0016	0.0005	0.0070	0.0003
(% of Diff.)	(0.5)	(0.4)	(0.5)	(15.7)	(16.1)
Temp (3)	0.0101	0.0070	0.0031	0.0076	0.0003
(% of Diff.)	(9.4)	(12.0)	(6.3)	(19.3)	(20.5)

a substantial part (20-30%) of the growth in overall wage inequality like the Gini and variance in log wages. And these results appear to be robust to alternative ways of doing the decomposition, including using the recently developed recentered influence function approach of Firpo, Fortin and Lemieux.

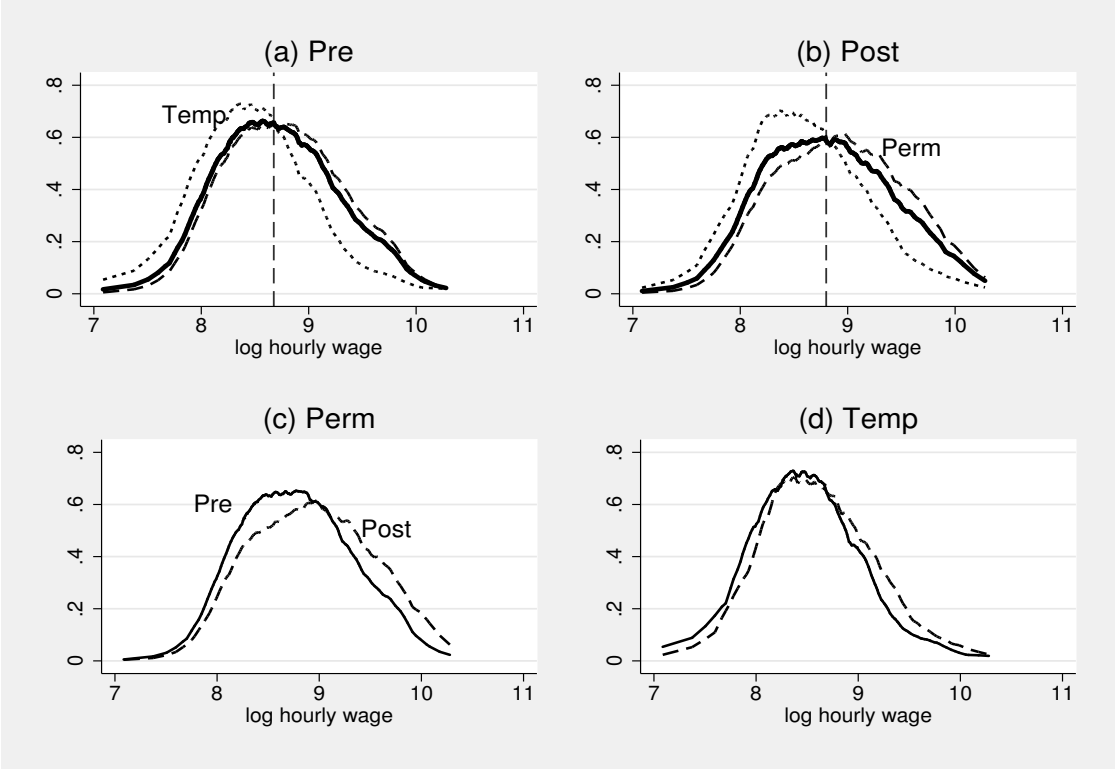
The analysis also shows that the changes in the composition of employment status primarily affect the lower-tail of the distribution. Second, female temporary workers below the median are the people who are affected the most by the prevalence of temporary work and its negative influence on wages; these workers are hired mainly in sales and services and elementary occupations.

Figure 1: Trends in wage inequality and share of temps in South Korea



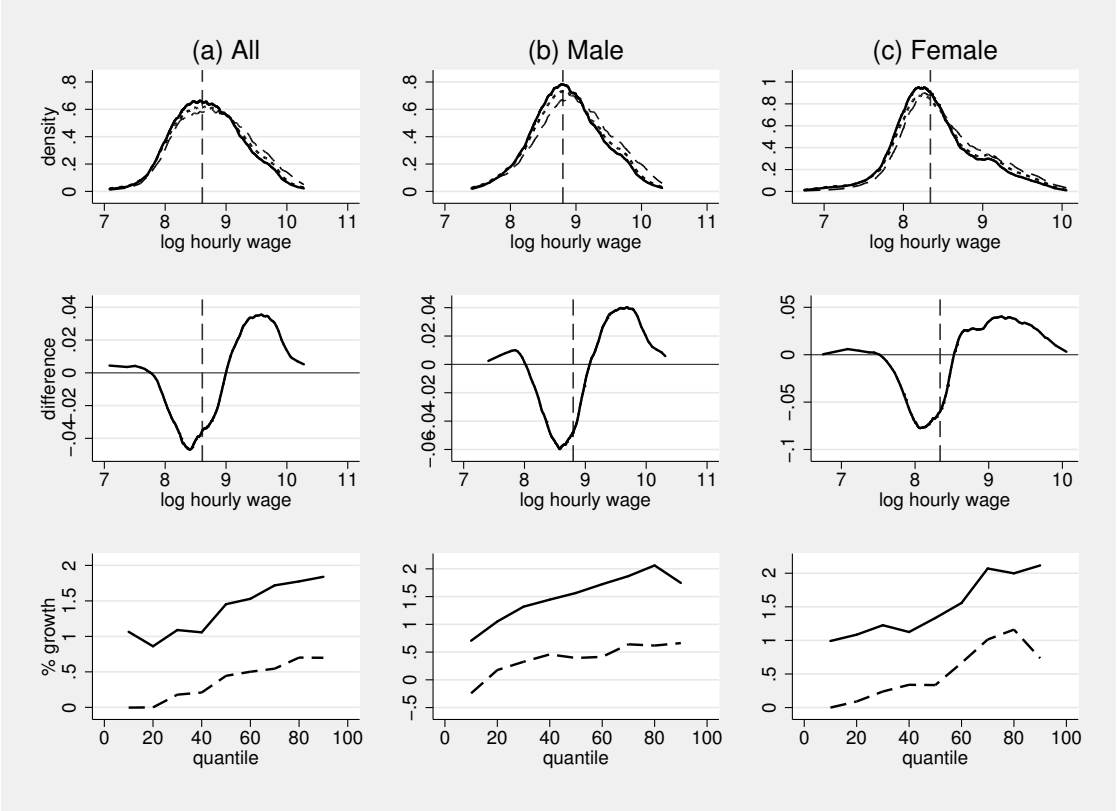
Note: The five distributional measures are Gini coefficients and variance in log hourly wages, and log wage differentials between 90th and 10th (d9010), between 90th and 50th (d9050), and between 50th and 10th (d5010) percentile. The right axis shows the values of the Gini and variance. The distributional statistics are computed using the WSS during 1985-2012. For calculating the share of temporary workers, the EAPS supplement 2001-12 are used.

Figure 2: Changes in wage distribution by employment type



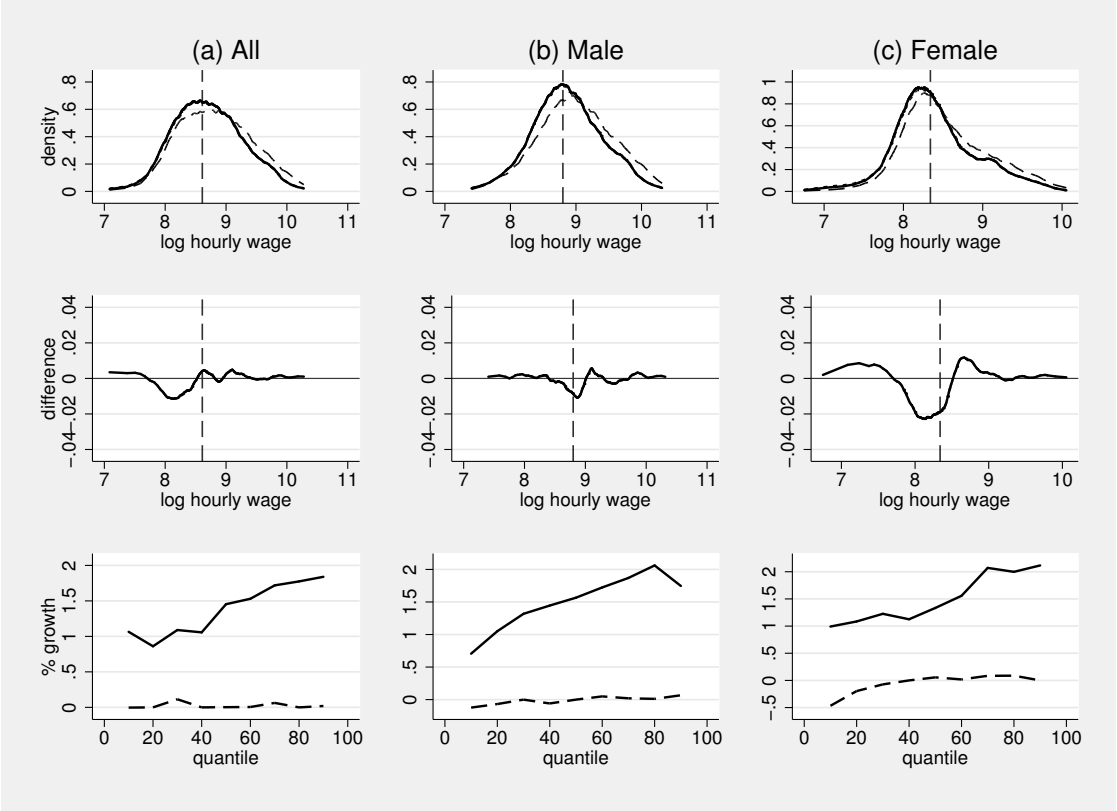
Note: (a) and (b) show wage densities for all employees (the solid line) and for permanent (the dashed line) and temporary workers (the dotted line) in 2001-02 and 2004-05, respectively. The vertical reference lines are the median hourly wages in each period (8.675 in 2001-02 and 8.8 in 2004-05). (c) and (d) compares wage densities of permanent and temporary workers between 2001-02 (solid) and 2004-05 (dashed).

Figure 3: Counterfactual: total composition effects



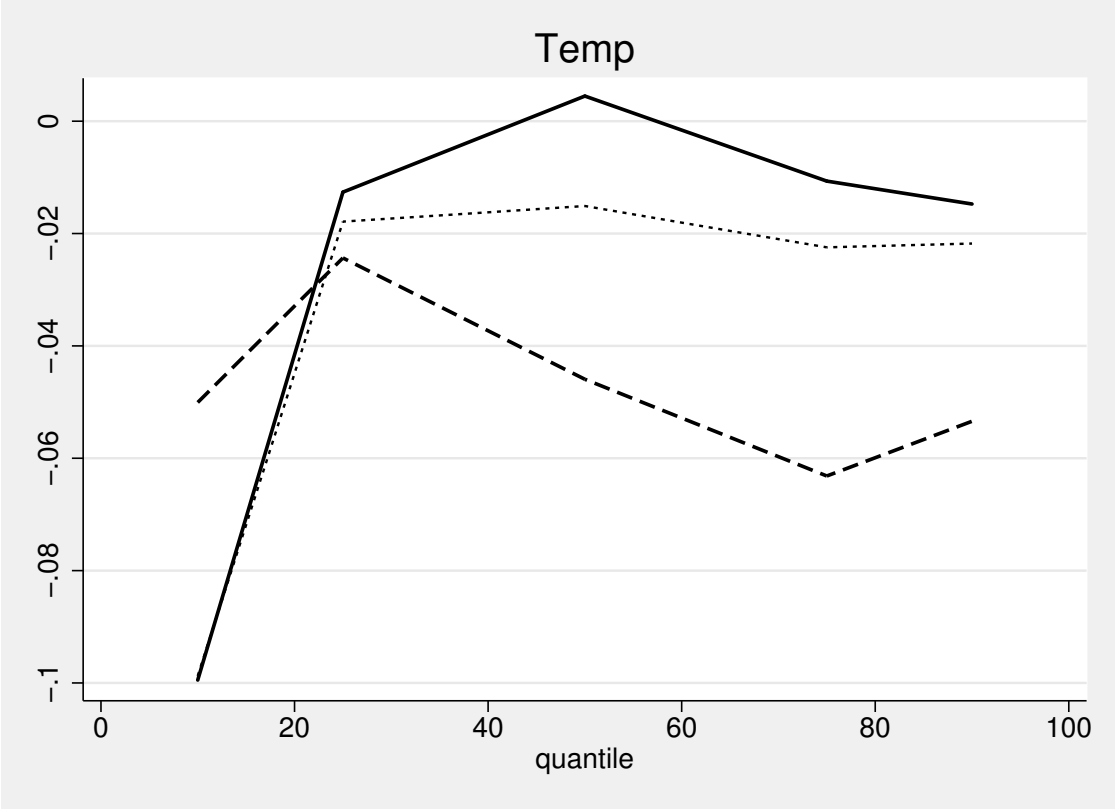
Note: The upper figures show the densities in 2001-02 (the solid line) and in 2004-05 (the dashed line) and the counterfactual density (the dotted line). The figures in the second row show the difference between the counterfactual and the 2001-02 density. The graphs in the third row show the real wage growth rates (the solid line) and counterfactual wage growth (the dashed line) by the total composition effect.

Figure 4: Counterfactual: composition effects of employment status



Note: The upper figures show the densities in 2001-02 (the solid line) and in 2004-05 (the dashed line) and the counterfactual density (the dotted line). The lower figures show the difference between the counterfactual and the 2001-02 density. The last row shows the real wage growth rates (the solid line) and counterfactual wage growth (the dashed line) by the composition effect corresponding to the increase in temporary status.

Figure 5: Coefficients of "Temp" of unconditional quantile regressions



Note: The solid line show the coefficient of unconditional quantile regression in 2001-02 and the dashed line if for 2004-05. The dotted line shows the counterfactual wage structure when the composition of the pre period looked like in the post period.

CHAPTER 2

LABOR MARKET REFORM AND WAGE INEQUALITY

2.1 Introduction

A large and growing literature discusses the causes of increasing Korean inequality. Off-shoring, greater exposure to the global market, and skill-biased technological change have figured prominently in this discussion.[1] These factors may have contributed to increasing inequality, but legal and institutional changes can also influence both relative wages and relative employment. In this paper we focus on two changes: labor market reforms have reduced the employment protection for permanent workers and relaxed the constraints on the use of non-regular employment contracts. These reforms, we argue, may help account for the observed patterns of employment and wages.

Non-regular contracts take different forms, including fixed-term contracts (the employment relationship is terminated automatically after the fixed-term), part-time work (defined as less than 36 hours of weekly work), indirect employment (dispatched work and temporary agency work), as well as independent contract work, on-call work/daily work, and tele-work/home-based work. The different forms of

[1] Ahn et al. (2007) point to off-shoring to lower-income East Asian countries as a source of downward pressure on the demand for low-skill workers; Hur et al. (2005) and Jeong et al. (2004) suggest that skill-biased technical change increased the wage for high-skill workers.

non-reglar employment share a common feature: all non-regular workers typically hope to gain 'permanent' employment, that is, to get a standard, open-ended employment contract. Temporary workers make up the majority of the non-regular workers, and we shall use the term 'temporary' as a short-hand for the different non-regular contracts.

Temporary workers make up a sizeable part of the labor force in many countries and a substantial literature addresses different aspects of this phenomenon. European debates have focused mainly on the employment effects of temporary contracts (Cahuc and Postel-Vinay 2002, and so on.). The employment effets have been less of a concern in Korea; official unemployment rates have been consistently low, averaging 3.4% over the period from 1990 to 2012 with peaks of 7% during the East Asian crisis in 1998 and 3.7% in the recent recession. In contrast to these modest fluctuations in unemployment, wage inequality shows a dramatic increase from the mid-1990s (see Figure 1). The increase in inequality coincided with pronounced movements in the share of temporary workers; the share rose by more than 10 percentage points from 2001 to 2004 followed by a decline of about 3.5 precentage points between 2004 and 2010 (Table 7). The wage premium for permanent workers was substantial throughout the period and increased slightly after 2007.

Table 7: The share of temporary workers and the relative wages

	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
L_T/L (%)	26.8	27.4	32.6	37.0	36.6	35.5	35.9	33.8	34.9	33.3
w_T/w_P (%)	73.9	76.3	70.2	73.4	70.9	71.1	72.1	68.9	63.2	64.7

Source: the EAPS supplement.
Note: $L = L_T + L_P$

While clearly not conclusive, these simple patterns suggest that changes in the prevalence of temporary contracts could help explain the rise in equality; this hy-

pothesis gains support from the results in chapter 1. Controlling for worker characteristics as well as changes in sectoral composition, the decomposition shows that, depending on the precise method of decomposition, the rising share of temporary workers can account for 20-30 percent of the growth in inequality between 2001 and 2007.

Even if the rise in temporary employment can be explained as the result of labor market reforms, the employment and wage patterns present several puzzles. A 50 percent rise in the employment ratio L_T/L_P was accompanied by a relative wage w_T/w_P that was virtually the same in 2001 and 2004. This pattern could be explained by assuming that temporary and permanent workers are close substitutes but differ in terms of productivity, with permanent workers being more productive. Anecdotal evidence, however, suggests that temporary workers do not have a lower productivity (see below). More importantly, the explanation is at odds with the findings that temporary workers tend to receive a lower pay after controlling for worker and job characteristics (Ahn 2004, and so on.) Thus, the question arises, why do permanent workers receive a large wage premium if the two groups are close substitutes and equally productive? Korean firms may face constraints that prevent them from using temporary contracts, but no legal or institutional constraints compel firms to offer their permanent workers a large wage premium. In a system with powerful labor unions, the employment constraints could give permanent workers a strong bargaining position. Korean unions are not powerful, however; they have at times been militant, but the union density in Korea is very low.

In this paper we show how a wage gap between temporary and permanent workers can be explained using an efficiency wage model. Temporary workers have a chance to become permanent, and this possibility – combined with the existence of an employment rent for permanent workers – gives temporary workers an incentive

to work hard. Thus, a high wage to permanent workers serves a dual purpose: it affects the effort of both permanent and temporary workers. Taking into account legal and institutional constraints on the use of temporary workers and on firms' the ability to dismiss permanent workers, an efficiency model along these lines can be used to shed light on some of the effects of the Korean reforms.

Institutional constraints can take a variety of forms. In Korea some job categories cannot be filled with temporary agency workers. Other constraints come in the form of limits on the possibility to roll over temporary contracts. The ability of firms to dismiss permanent workers is curtailed by restrictions, too; some of these restrictions affect the average termination rate (but not the determination of who gets dismissed); others restrict the ability of the firm to single out low performance workers.[2] The specific Korean reforms and their implications for the parameters of the model will be discussed in section 3. The key element in our argument is both simple and intuitive, however: temporary workers may be motvated by the prospect of promotion to permanent status. This argument is supported by a variety of studies.

Lautsch (2002) presents evidence for two Boston-based companies, Polaroid and Sarco, for the period 1996-97. The study describes four management systems for contingent work. Each of the four systems has distinct labor practices, including wage rules and career ladders. The use of temporary workers in Polaroid Digital Products exemplifies our argument. At Polaroid, temporary and permanent workers worked side-by-side in the same occupations. Despite their temporary status, and equal or lower pay, the temporary workers performed at least as well as per-

[2]Restrictions of this kind are analogous to the restrictions that follow from an inability to monitor and determine the performance of individual workers. Thus, the effects of a relaxation of firing constraints can be similar to those of 'power-biased technical change' (Skott and Guy 2007, 2013); the Korean reforms involve 'power-biased institutional change'.

manent workers in the same jobs. The prospect of a permanent position motivated them to work hard: a survey showed that 75% of the temporary workers accepted a temporary position hoping to gain promotion to permanent status if they performed well. This hope was justified: the best-performing temporary workers (roughly the top 20%) were in fact rewarded by getting permanent employment.

Engellandt and Riphahn (2005) show that Swiss employees with a fixed-term contract do significantly more overtime work and are less absent than those with an open-ended contract. Engellandt and Riphahn interpret this finding as signaling behavior from temporary workers who want to get a permanent position. Booth et al. (2002) reach similar conclusions using U.K. data. Booth et al. conclude that high effort among temporary workers is positively correlated with the probability of career advancement.

At a more anecdotal level, there is significant evidence that workers see low paid pemporary positions as a possible route to a permanent job. An interview with a Korean temporary worker – Miss Kim, 27 – in E-daily News, August 2, 2011, provides an example. Miss Kim started to work in a public business as an intern in 2009. According to the interview, she expected to transition to a permanent position if she worked harder than existing permanent workers; because of this expectation, she accepted a very low wage. The willingness of both students non-students in many countries to accept unpaid internships can be explained along similar lines, although in principle internships should include a strong educational component for the benefit of the intern.

The model in section 2 presents a simple formalization of wage setting in a labor market with temporary and permanent workers. Section 3 discusses the application of the model to the Korean labor market reforms after the 1997 crisis. To be clear, the model – like any stylized model – leaves out many features that may have

influenced inequality. Thus, there is no claim that the model fully explans the rise in Korean wage inequality. The aim is more modest: to highlight a particular mechanism that may have played a part. Section 4 concludes.

2.2 The model

Temporary and permanent workers are not always identical in terms of qualifications, and they sometimes perform different tasks. Any such differences may clearly help account for differences in pay. In many cases, however, permanent and temporary workers receive different wages even though they seem to perform the same tasks and have equivalent skills. The model focuses on these cases: we assume that all workers are identical with respect to qualifications and that they are perfect substitutes in production. Disregarding non-labor inputs, the output of the representative firm is given by

$$Y = F(e_P L_P + e_T L_T) \tag{2.1}$$

where L_i denotes the number of workers with i-type contract and e_i is the workers' effort. The model is set in discrete time. Workers are hired at the beginning of a period and cannot be fired until the end. We assume that workers cannot move directly from unemployment to a permanent job; all permanent workers acheived their status by being promoted from a temporary position.

Temporary workers Temporary workers work for one period; at the end of this period they are either dismissed or promoted to the status of permanent worker. They choose the level of effort to maximize the expected value of the stream of

future utility:[3]

$$\max_{e_T} \; V_T = w_T - v(e_T) + \beta[p(e_T)V_p + (1 - p(e_T))\overline{u}] \tag{2.2}$$

where w_T is the wage rate for temporary workers, $v(e_T)$ the disutility associated with the effort e_T, and β the discount factor; $\bar{u}, V_T$ and V_p denote the expected present value of future utility streams for an unemployed worker, a temporary worker and a permanent worker, respectively; $p(e_T)$ is the probability that a temporary worker gains permanent status at the end of the contact period. The solution to the maximization problem (2.2) satisfies the first order condition

$$v' = \beta p'[V_p - \overline{u}] \tag{2.3}$$

Consider the two functions $p(e_T)$ and $v(e_T)$. Given the permanent-worker wage premium, the incentives for temporary workers are stronger, the higher is the sensitivity of promotion to effort. The ability of firms to link promotion to effort is constrained, however, by the monitoring technology which determines the sensitivity of observed performance to variations in actual performance (effort). It seems reasonable to suppose that a firm's ability to distinguish between the effort of two workers will depend on the ratio of their effort.[4] Using a simple specification with this property, we assume a log linear relation (with a ceiling at 1 and a floor at zero):

[3]Dismissed workers either become unemployed or get a temporary contract at another firm. In equilibrium the value of these two states will be equal (see below). Thus, the expression in (2.2) covers the possibility that dismissed temporary workers move to another temporary position.

[4]'Effort' may have no natural cardinal scale. Implicitly, however, the specification of the production function (2.1) pins down a particular cardinal representation: effort is measured in terms of its productivity.

$$p(e_T) = \min\{\max\{0, \bar{p} + \lambda \log \frac{e_T}{\bar{e}_T} + a\}, 1\} \tag{2.4}$$

where $\bar{e}_T$ the average effort of the firm's temporary workers. The value of λ is taken to be determined by the available monitoring technology; the value of $\bar{p}$, determines the average rate of promotion. Turning to $v(e_T)$, we assume that the disutility of effort takes the following form

$$v(e_T) = e_T^{\gamma}, \qquad \gamma > 1 \tag{2.5}$$

Given the functional forms in (2.4) and (2.5), the first order condition (2.3) implies that

$$e_T = [\frac{\beta\lambda}{\gamma}(V_P - \overline{u})]^{\frac{1}{\gamma}} \tag{2.6}$$

As indicated by equation (2.6), temporary workers' optimal effort is independent of the temporary wage but increasing as a function of V_P, the value function for permanent workers. These properties of equation (2.6) are quite intuitive (and do not depend on the specific functional forms in (2.3)-(2.4)). Temporary workers cannot be fired during the period and are either dismissed at the end of the period or promoted to permanent status. Their wage rate in the temporary job therefore has no incentive effects; it is the prospect of promotion to a permanent position that provides the incentives for temporary workers to put in effort. Because the temporary wage plays no role in the effort decision, employers will want to set it as low as possible; that is, the participation constraint must be binding:

$$V_T = \overline{u} \tag{2.7}$$

The participation constraint determines the wage w_T. By assumption unemployed workers never move directly to a permanent job; the only way to get a permanent job is through promotion from a temporary position.[5] Using (2.2) and (2.5)-(2.7), we get an expression for w_T :

$$w_T = \beta(\frac{\lambda}{\gamma} - p)[V_p - \overline{u}] + (1-\beta)\bar{u} \tag{2.8}$$

$$= \beta(\frac{\lambda}{\gamma} - p)V_p + [1 - \beta(1 - p + \frac{\lambda}{\gamma})]\bar{u} \tag{2.9}$$

w_T is increasing in λ but decreasing in p and β. An increase in λ (in firms' monitoring ability) generates a rise in effort; with a given promotion rate a compensating increase in w_T is needed to satisfy the participation constraint. Higher promotion rates or an increase in the discount factor, conversely, raise the present value of expected future utility flows, allowing a reduction in the current wage without violation of the participation constraint. Changes in V_P and $\bar{u}$, finally, have ambiguous effects. An increase in V_P reduces the required value of w_T for any given effort. But effort is not given: the increase in V_P provides an incentive for temporary workers to raise effort, with negative effects on the utility flow $w_T - v(e_T)$; if this incentive is strong enough (the value of λ is sufficiently high), a rise in w_T

[5]This assumption implies that

$$\begin{aligned} \bar{u} &= w_U + \beta(\delta\bar{u} + (1-\delta)V_T) \\ &= w_U + \beta\bar{u} \end{aligned}$$

where w_U is the flow utility from being unemployed and where the second equality follows from the determination of w_T by the participation constraint, $V_T = \bar{u}$. Thus,

$$\bar{u} = \frac{w_U}{1-\beta}$$

The value of w_U is taken as exogenous; it may reflect a range of factors, including income opportunities in informal subsistence sectors and the level of unemployment benefits.

may be needed to satisfy the participation constraint. Analogously, an increase in $\bar{u}$ tightens the participation constraint, given V_P, and therefore raises w_T for any given effort; the induced reduction in effort may offset this effect if λ is high.

Permanent workers Turning to the determination of V_p, the expected present value of future utility streams for a worker in a permanent job is given by

$$V_P = w_P - v(e_P) + \beta(\alpha(e_P)V_P + (1 - \alpha(e_P))\bar{u}) \tag{2.10}$$

where w_P, $v(e_P)$ and $\alpha(e_P)$ denote the wage, the worker's disutility of effort, and the probability that the worker continues in the job in the following period. The sensitivity of a permanent worker's continuation probability to variations in her effort will reflect a combination of institutional constraints on the dismissal of low-performing workers and technical constraints on the ability of firms to monitor the performance of individual workers. These constraints reduce – but do not eliminate, we assume – the effect of effort on the individual worker's risk of dismissal, that is, $\alpha'(e_P) > 0$.

Permanent workers choose the level of effort to maximize the value function (2.10). In a steady state (with constant values of w_p and $\bar{u}$) the first order condition implies that

$$v's = [w_P - v(e_P) - (1 - \beta)\overline{u}]s', \tag{2.11}$$

where

$$s = 1/(1 - \beta\alpha) \tag{2.12}$$

s can be interpreted as the discounted expected duration of the permanent job.[6] By assumption the continuation probability α is increasing in e_P and it follows that so is s. Analogously to the specification of temporary workers' probability of promotion, we assume that s depends on the ratio of the worker's own effort to the average effort $\bar{e}_P$. Using a log-linear formulation,

$$\log s = \bar{s} + \mu \log \frac{e_P}{\bar{e}_P} \tag{2.13}$$

where $\bar{e}_P$ is the average effort of permanent workers.[7] Equation (2.13) implies that

$$\frac{s'}{s} = \mu \frac{1}{e_P} \tag{2.14}$$

The specification of $v(e_P)$, finally, follows from the assumption that all workers are identical; the disutility of effort in permanent jobs takes the same form as (2.4):

$$v(e_p) = e_P^\gamma, \qquad \gamma > 1 \tag{2.15}$$

Using (2.14) and (2.15), the first order condition (2.11) can be written

$$\gamma e_P^\gamma = [w_P - e_P^\gamma - (1-\beta)\overline{u})]\mu \tag{2.16}$$

Hence,

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[6]The value function can be written, alternatively, as

$$\begin{aligned} V_P =& E[\sum_0^{T-1}(w_P - v(e_P))\beta^t + \beta^T \overline{u}] \\ =& \overline{u} + [w - v - (1-\beta)\overline{u}]s \end{aligned}$$

where T is the time of job loss and $s = \frac{1}{1-\beta\alpha}$.

[7]The specification can be seen as a log-linear approximation to a more general functional form.

$$e_P = [\frac{\mu}{\gamma + \mu}(w_P - (1-\beta)\overline{u})]^{\frac{1}{\gamma}} \tag{2.17}$$

As one would expect, a permanent worker's effort is increasing in permanent workers' wages (w_P) but decreasing in the value of unemployment ($\overline{u}$).

Equations (2.10) and (2.17) can be used to derive the cost of job loss ($V_P - \bar{u}$):

$$V_P - \bar{u} = \frac{\gamma s}{\gamma + \mu}(w_P - (1-\beta)\overline{u}) \tag{2.18}$$

Firms Firms minimize unit labor cost subject to workers' choice of effort and the participation constraints. Using (2.6), (2.8), (2.17) and (2.18) the minimization problem can be written

$$\min_{w_P, w_T, L_P, L_T, p} \; w_P L_P + w_T L_T \tag{2.19}$$

$$\begin{aligned} s.t. \quad & e_P L_P + e_T L_T = 1 \\ & e_P = [\frac{\mu}{\gamma + \mu}(w_P - (1-\beta)\overline{u})]^{\frac{1}{\gamma}} \\ & e_T = [\frac{\beta\lambda s}{\gamma + \mu}(w_P - (1-\beta)\overline{u})]^{\frac{1}{\gamma}} \\ & w_T = \beta s \frac{\lambda - p\gamma}{\gamma + \mu}[w_P - (1-\beta)\overline{u}] + (1-\beta)\bar{u} \\ & pL_T = (1-\alpha)L_P \qquad (2.20) \\ & w_P \geq (1-\beta)\bar{u} \qquad (2.21) \end{aligned}$$

Equation (2.20) is a steady-state condition: the number of permanent workers can only be constant if the flow into permanent status (pL_T) equals the flow out of permanent employment ($(1-\alpha)L_P$). The inequality (2.21) is the participation constraint for permanent workers: workers will only accept a permanent job if

$V_P - \bar{u} \geq 0$; using (2.18) this condition can be written as in (2.21).

Equilibrium Consider an institutionally constrained equilibrium in which (i) the ratio of temporary to permanent employees has an exogenous, binding upper limit ($L_T/L_P = M$), (ii) the average separation rate for permanent employees (and therefore the average value of $\bar{s}$) is exogenous, and (iii) the sensitivity of the firing rate for an individual permanent worker to changes in the worker's effort is exogenous. In addition to these institutional constraints, we assume that the sensitivity of the promotion rate for temporary workers to variations in effort (λ) is fully determined by the given monitoring technology.

As shown in Appendix B, these assumptions yield the following equilibrium solution:

$$w_P = [\frac{\gamma + \mu}{\gamma - 1} \frac{1 - \bar{\alpha} + \bar{p}}{\bar{p}(\gamma + \mu) + (1 - \bar{\alpha})\beta\bar{s}(\lambda - \bar{p}\gamma)} + 1](1 - \beta)\bar{u} \tag{2.22}$$

$$w_T = [\beta\bar{s}\frac{\lambda - \bar{p}\gamma}{\gamma - 1} \frac{1 - \bar{\alpha} + \bar{p}}{\bar{p}(\gamma + \mu) + (1 - \bar{\alpha})\beta\bar{s}(\lambda - \bar{p}\gamma)} + 1](1 - \beta)\bar{u} \tag{2.23}$$

where $(1 - \bar{\alpha})$ is the institutionally determined separation rate for permanent workers and $\bar{p} = (1 - \bar{\alpha})/M, \bar{s} = 1/(1 - \bar{\alpha}\beta)$. Equations (2.22)-(2.23) can be used to analyze the effects of labor market reforms that alter the constraints on the use of temporary workers (the ratio M) and/or the constraints on the dismissal of permanent workers (the elasticity μ or the average dismissal rate $\bar{\alpha}$).

2.3 Korean labor market reforms

In the mid-1990s Korean policy makers became increasingly influenced by the 'Washington Consensus'. The dominant view suggested that in an era of increasing

globalization Korea's competitiveness suffered from problems of high costs and low efficiency; these problems, it was argued, could be addressed by a deregulation of the Korean labor market which would reduce labor costs and allow a quick adjustment to economic conditions.

In 1998 two key elements of deregulation were implemented (KLI, 2008; Cho and Lee, 2007). The deregulation of dismissal law had been discussed at the Reform Committee of Korean Industrial Relations in 1996 and spurred by IMF demands, the Tripartite Commission reached agreement on 26 February 1998. This legislation introduced the concept of dismissal of workers for "urgent managerial needs" (ILO, 2011) and relaxed the strict employment protection on regular contracts (Yoo and Kang, 2012).

Employment flexibility was further enhanced in July 1998 by the decision to allow temporary work agencies under the Dispatched Workers Act. Under the new law, dispatching agencies are allowed to hire out workers to firms for up to two years in 26 occupations that require special expertise and experience (OECD, 2000). The new law retained flexibility in the use of fixed-term contracts: no maximum duration of fixed-term contracts was specified and there were no restrictions on contract renewal (Yoo and Kang, 2012).

These labor market reforms are reflected in OECD indicators of employment protection. The indicator for strictness of regulation on temporary contracts - calculated as a weighted sum of items relating to fixed-term contracts and temporary work agency contracts - falls from 3.125 to 2.125; the indicator for dismissal of employees on regular contracts falls from 3.036 to 2.369.

Wage and employment effects of the 1998 reforms The reforms, first, reduced employment protection for permanent workers. This increased the sensitivity of a worker's risk of dismissal to changes in her effort (i.e. μ shifted up) and raised the

average dismissal rate ($\bar{\alpha}$ and hence $\bar{s} = 1/(1-\beta\bar{\alpha})$ shifted down). The relaxation of restrictions on the use of temporary agency workers, second, raised the upper limit of the ratio of temporary to permanent employees (M increased). The changes in M and $\bar{\alpha}$ have opposite effects on the average promotion rate $\bar{p}$; we assume – in line with the evidence – that $\bar{p}$ was left unchanged by the reform.[8] Table 8 presents comparative statics for changes in $\bar{s}$ and μ.

Table 8: Comparative statics

	e_P	e_T	w_T	w_P
$\bar{s}\downarrow$	$+$	$-$	$\pm$ if $\lambda - \gamma\bar{p} \lesseqgtr 0$	$+$
$\mu\uparrow$	$+$	$-$	$\pm$ if $\lambda - \gamma\bar{p} \lesseqgtr 0$	$\pm$ if $\lambda - \gamma\bar{p} \gtreqless 0$

The reforms increase e_P and reduce e_T; the share of temporary employment also increases. The effects on the two wage rates and the relative wage cannot be signed in general. The ambiguity is resolved if $\lambda = \gamma\bar{p}$; in this special case w_T is unchanged while w_P increases. A positive value of $\lambda - \gamma\bar{p}$ reinforces the tendency for wage inequality to increase; a negative value may offset the rise in inequality.

Numerical simulation can be used to evaluate the likely outcomes. Using plausible parameters, we find that the 1998 reforms raise inequality and the employment ratio $L_T/(L_T + L_P)$ significantly; the relative wage w_T/w_P is reduced slightly. The details are in Appendix C. The simulations are in line with the data in Figure 1 as well as with the results in chapter 1.

[8]It is convenient to use $\bar{s}$ and $\bar{p}$ as shift parameters instead of the two institutionally determined values, the permissible termination rate $(1-\bar{\alpha})$ and the maximum ratio of temporary to permanent employment M. The values of $\bar{s}$ and $\bar{p}$ are determined directly by $(1-\bar{\alpha})$ and M : $\bar{s} = 1/(1-\bar{\alpha}\beta)$ and $\bar{p} = (1-\bar{\alpha})/M$.

2.4 Conclusion

This paper is motivated by two observations. Temporary workers in Korea, first, earn significantly less than comparable permanent workers. Labor market reforms, second, have been associated with a substantial rise in the proportion of temporary workers and a very modest increase in the wage gap. The theoretical model in this paper can account for these observations and help explain the rise in inequality.

The model is highly stylized and has obvious limitations. From an applied perspective, perhaps the most obvious problem is the focus on a particular mechanism; the model shows why identical workers can get very different wages in equilibrium. Not all workers are identical, however, and the assumption of identical workers excludes some of the mechanisms that may have contributed to the rise in Korean earnings inequality (skill biased technical change, for instance). The formal analysis, furthermore, introduces several restrictive assumptions, including an exogenously given value of the value of unemployment ($\bar{u}$) and a steady-state assumption. An exogenous value of $\bar{u}$ would be plausible in a dual economy with a large subsistence sector and a perfectly elastic supply of labor to the modern sector. This description, however, no longer fits the Korean economy. Alternatively, the fixed $\bar{u}$ could be justified as being part of the steady-state assumption: the wage ratio is independent of $\bar{u}$, and the analysis concerns the properties of steady states with a given $\bar{u}$. This immediately brings up another weakness; the Korean economy has experienced considerable turbulence in the last 20 years and a convincing analysis of this period requires a relaxation of the steady-state assumption. This and other extensions of the analysis are left for future research.

CHAPTER 3

TEMPORARY EMPLOYMENT, JOB INSECURITY, AND WAGES

3.1 Introduction

This chapter explores effect of the use of temporary employment on permanent workers' wages and suggests a theoretical explanation. This topic is important for several reasons. We need to understand how wages are determined in a two-tier labor market in a certain set of institutions such as low union density and decentralized collective bargaining like in Korea. A volume of literature provide several theories of how the use of temporary employment affects wage determination (Bentolila and Dolado, 1994; Blanchflower et al., 1990; Gűell, 2000). The analysis of Korean data can narrow down which explanation matches the real world in a set of institutions similar with those of Korea. The analysis can give policy implications. Employers shift the blame for the use of temporary workers to permanent workers' high wages. In addition, permanent workers are blamed for taking advantage of temporary workers' low wages by using them as a buffer. The results of this chapter test if these arguments are true and give policy suggestions on the overuse of temporary work arrangements.

This chapter, first, proposes a theoretical explanation of the wage effects of the use of temporary employment. As a factor of workers' bargaining power in the standard bargaining theory, I focus on the perceived job insecurity. As workers have the perception of higher probability of job loss and of lower possibility of getting a similar job, their wage growth is likely to be lower (Campbell et al., 2007). A number of studies also show that pay level (not only wage growth rate) has negative relations with local unemployment rates that reflect the likelihood of losing jobs (Blanchflower and Oswald, 2005). The share of temporary workers will be introduced as a measurement of the fear of job loss or perceived job insecurity.

Second, I provide empirical evidence using the biannual Workplace Panel Survey (WPS) 2005-2011; the findings are that wage levels have negative associations with the share of temporary workers in a firm. The empirical analysis for subgroups by unionism and firm size supports the idea of the negative relation between the fraction of temporary employees and pay level. Furthermore, the analysis for subgroups explains the evolution of wage inequality during the 2000s in Korea.

The outline of the rest of the chapter is as follows. Section 2 reviews existing literature and section 3 introduces my hypothesis. Section 4 describes data, and the empirical models and the estimation results are provided in section 5. This section also discusses the wage inequality in Korea using the estimation results. Section 6 concludes.

3.2 Literature review

The literature provides several channels through that the use of temporary employment affects permanent workers' wages.

Permanent workers' wages can rise, first, based on the insider-outsider distinc-

tion. Insiders under permanent contracts subject to high firing costs see their jobs are more secure, as outsiders under temporary contracts with no firing costs grow. Thus, insofar as the existence of temporary jobs provides a buffer against the negative effect of wage increases on their employment probability, the wages of permanent workers will be higher when the share of temporary jobs is higher (Bentolila and Dolado, 1994). Second, the proportion of temporary workers may affect workers' bargaining power. Permanent workers can warn about being uncooperative with temporary workers; the "harassment" effect improves the bargaining position (Bentolila and Dolado, 1994). In addition, higher profits from taking advantage of temporary workers can be shared with permanent workers, then permanent workers' wages will increase (Blanchflower et al., 1990).

On the other hand, permanent workers' wage could decline. First, the prevalence of temporary employment may reduce workers bargaining position, since temporary workers are unlikely to participate in strikes. This is the "discipline" effect (Bentolila and Dolado, 1994). Second, the increase in job security for permanent workers boosts their job satisfaction. Therefore, the incentive compatible wage can be reduced (Gűell, 2000).

The efficiency wage model in chapter 2 also predicts wage effects of the use of temporary employment. Because a number of parameters (promotion rates, the sensitivity of a worker's risk of dismissal to changes in his effort and the dismissal rate, and separation rate) influence wages, not just the share of temporary workers, the results for wages are ambiguous. However, the theory can accommodate any institutional changes and predict the movements of permanent and temporary workers' wages. For example, simulating the 1998 reforms in Korea and assuming a simplicity ($\lambda = \gamma\bar{p}$), we could expect the wage increases for permanent workers[1].

[1]The reduced employment protection raises the sensitivity of a worker's risk of dismissal to

A number of empirical studies from the Spanish experience support the idea that permanent workers' wage tend to increase as the share of temporary workers increases. Jimeno and Toharia (1993) analyzed the Spanish industry panel for 1987-91 and 44 sectors and found that there is a positive correlation between the share of temporary workers and the bargained wage. Bentolila and Dolado (1994) analyzed a large sample of private Spanish manufacturing firms over 1985-1988 and found that each percentage point increase in temporary employment could raise permanent employees' wage up to one-third of one percentage.

A Korean empirical study provides the opposite result. The study of Hwang and Jang (2012) is the seminal paper examining the wage effect of the increase in temporary employment from the Korean experience. They analyzed the effect of the share of temporary workers in each firm on permanent workers' wages measured by 5 scales using the WPS 2005-09. Their finding is that the share of temporary employment negatively impacts permanent workers' wages. Therefore, they reject the argument that permanent workers enjoy high salary at the cost of temporary workers.

The different results between from the Spanish experience and from the Korean experience could be rooted in different methods or samples for the analysis, different institutional background such as employment protection legislations and the coverage of collective bargaining. Using the empirical evidence, we can narrow down a possible theory among a number of stories in existing literature and my explanation.

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changes in his effort and the average dismissal rate. These changes produce a rise in permanent workers' wage and their effort; the rise in the sensitivity make permanent workers' effort more sensitive to changes in the wage, thus giving firms an incentive to raise permanent workers' wage

3.3 A hypothesis

Contrary to the buffer effect of the use of temporary contracts on permanent workers' job security, the growth of temporary employment can threaten permanent workers' job security. The reason why permanent workers' job security is expected to increase by the use of temporary contracts is when employers want to reduce their number of employees, they will terminate temporary contracts with no cost, instead of firing permanent workers with firing costs. Different stories are also possible: temporary employees earn much less wages, but do the same or similar tasks as permanent workers. Employers have incentives to replace permanent workers with temporary workers; if the wage gap between temporary and permanent workers outweighs the firing costs, then firms may have incentives to hire temporary employees in the place of permanent workers and if institutional constraints on the use of temporary employment are easied, employers also would replace permanent with temporary workers. For other purposes of labor practice – to weaken the union or increase labor market flexibility, temporary contracts can be preferred to permanent contracts. By these scenarios, permanent workers can feel higher threat of job loss from the use of temporary contracts. Kuroki (2012) finds that the expansion of temporary employment contributes significantly tos a rise in perceived job insecurity among permanent workers in Japan.

The fall in perceived job security can slow down wage growth. Campbell et al. (2007) finds that high fears of unemployment have significant negative impacts on wage growth for male workers. This is the hypothesis of "traumatized workers". In 1995 the former Federal Reserve Chairman Alan Greenspan stated, "that fear has doubtless played a significant role in the slowdown in growth of labor compensation as workers have in effect sought to preserve their jobs by accepting lesser increases

in wages."

Subjective job insecurity also can affect pay level (not only wage growth along the Phillips curve). Along the line of the "Wage Curve", the negative relation between local or industry unemployment rates and pay level in Blanchflower and Oswald (1994) and Blanchflower and Oswald (2005) is suggestive. Local unemployment rates reflect joblessness, and affect job insecurity. Thus, as unemployment rises, firms realize that their employees feel a higher threat of losing jobs, and pay lower levels of wage (Blanchflower and Oswald, 2005).

A similar reasoning may work under the anticipated effects of the use of temporary contracts; as the labor market use more temporary workers, permanent workers will realize they can be replaced by temporary workers and it is more difficult to find a similar job. This reasoning can also work for lower wages for temporary workers. However, here I focus on permanent workers. According to Munoz de Bustillo and De Pedraza (2010), subjective job insecurity depends on the subjective probability of exogenous job destruction and also the prospects for new employment. That is, the higher proportion of temporary jobs, the lower probability of getting a decent permanent job. Thus, the use of temporary workers harms permanent worker's job insecurity more and hence their wages.

In the two-tier labor market with permanent and temporary contracts, Pearce (1998) suggests the share of temporary contracts as a better measure of job insecurity since temporary employment inevitably means uncertainty about future employment. Hűbler and Hűbler (2006) also report that correlation between the share of temporary workers and job security is significantly negative. Therefore, as a measure of job insecurity, the share of temporary workers could play the same role in determining wage levels with unemployment rates and result in lowering wages. In sum, as temporary employment grows, permanent workers feel a higher

threat of job loss; this decline in subjective job security reduces workers' bargaining position and thus their wages. Therefore, it can be argued that pay level can have a negative relation with the share of temporary employees.

This relation can vary across subgroups. First, the presence or absence of unions may affect this relation. The decline in bargaining position can affect union's and also individual's bargaining. This paper focuses on the subjective job insecurity that is somewhat different from objective values like unemployment rates. The fear of job loss may work more implicitly in bargaining between an employer and an individual worker, while the unemployment rates more explicitly play an role in bargaining between a union and a firm. Therefore, I expect larger negative effects among workers in non-union firms. Second, firm size also can have an influence; in that the cost of job loss is great for permanent workers in large firms due to their high wages, the decline in job security could be greater for them. However, in reality, large firms tend to have strong unions, thus permanent workers in large firms are unlikely to be fired. Instead, large firms tend to employ more temporary workers, especially outsourced workers. In this case, temporary workers become rather a buffer and the use of temporary contracts is unlikely to harm permanent workers' employment. Thus, the workers in small and medium-sized firms are the people who are expected to suffer from the higher fear of job loss.

3.4 Data and descriptive statistics

The estimation begins with wage eqautions. The equations estimate the wage effects of changes in the ratio of temporary to permanent workers. They are estimated using the biannual WPS 2005-2011. Therefore, the WPS include 4 waves and 7,147 observations during 2005-2011 – 1,905 in 2005, 1,735 in 2007, 1,737 in

2009 and 1,770 in 2011.

The basic estimation is performed by following wage equation:

$$logw_{ijt} = \gamma\phi_{ijt} + \beta X_{ijt} + \alpha_{ij} + \mu_{jt} + \epsilon_{ijt}. \tag{3.1}$$

The dependent variable is the log of hourly earnings of permanent workers. For the earnings of permanent workers, the survey asks the annual pre-tax starting wages of male permanent workers who graduate college or high school. Hourly earnings are calculated as weekly real wages divided by usual work hours which are the sum of statutory and extra work hours[2]. I use permanent workers' starting wages as proxies of permanent workers' wages.

The independent variable of interest is the share of temporary workers[3] of the firm i in sector j in year t (ϕ_{ijt}).

A question can be posed: why the share of temporary workers in a worker's own firm affect the worker's job insecurity in terms of the probability of losing a worker's job and of getting a good, new job in case of job termination. It may be acceptable that unemployment expectations for permanent workers are influenced by own firms' labor practice, thus the share of temporary workers in a worker's own firm is likely to catch the fear of job loss. However, the worker's chances of getting a good, new job in case of job termination are hard to rely on the ratio in the worker's own firm. The shares of temporary workers in industry sectors or occupational categories are more appropriate, because a worker will gauge the likelihood of getting a permanent job within similar sectors or with a similar occupation using

[2]Since work hours were not surveyed in 2005, the hours in 2007 were imputed

[3]The share was computed by the sum of fixed-term contracts, part-time, and indirect contracts divided by the total number of employees which is also the sum of the number of total employees in the survey and the number of indirect contracts.

the same skills. Technically, the share of temporary workers in each occupational category is difficult to compute using the WPS. The economic conditions than the labor practice seem more deterministic in the probability of getting a job in a sector. Therefore, the share of temporary workers in a firm seems the best one in that the variable catches the fear of job loss.

Table 9: Descriptive statistics and variables

Variables	Mean (Standard Deviation)				
	2005	2007	2009	2011	Total
Hourly wage (college)	8.474	8.258	8.496	8.380	8.409
(thousands KRW)	(2.313)	(2.340)	(2.087)	(2.051)	(2.176)
Hourly wage (high school)	7.217	7.220	7.101	7.086	7.147
(thousands KRW)	(1.851)	(1.997)	(1.667)	(1.604)	(1.768)
Share of temps (1)	0.125	0.113	0.102	0.118	0.115
	(0.209)	(0.203)	(0.198)	(0.202)	(0.203)
Share of temps (2)	0.240	0.226	0.203	0.214	0.222
	(0.238)	(0.244)	(0.225)	(0.252)	(0.240)
Number of total employees	134	135	135	136	135
	(462)	(429)	(423)	(390)	(425)
Sales per employee	2,943	2,557	3,563	3,349	3,124
(millions KRW)	(14,744)	(15,095)	(19,755)	(21,039)	(18,157)
Productivity	3.208	3.160	3.128	3.110	3.150
	(0.676)	(0.628)	(0.530)	(0.608)	(0.613)
Union	0.197	0.205	0.204	0.194	0.200
	(0.398)	(0.404)	(0.403)	(0.395)	(0.400)

The other covariates (X) include firm's characteristics such as firm size, sector, financial situation and workers' bargaining power. I use the log of sales per employee and productivity as default controls for financial situation. Productivity is a 5-point scaled item that ranges from 1 very "unproductive" to 5 "very productive". I can use profit per employee, operating profit, and debt as alternatives: I found that operating profit and debt do not have relevance to wages, while net profit per employee does. Therefore, I use net profit per employee as an alternative of the

sales per employee. Another important control is permanent workers' bargaining power as insiders; the existence of union and the coverage of the union are used to capture this. The existence of union is the default variable.

According to studies on inter-industry wage differentials, institutional factors such as unions, rent sharing, monitoring difficulty, and recruitment difficulty (Fairris and Erik, 2008) explain a part of the wage variations. Therefore, sector dummies are expected to control for the differences in starting wages from variation in human capital-required skill to occupations and also institutional differences like sectoral bargaining and features of efficiency wages like mornitoring difficulty.

Descriptive statistics of these variables are summarized in Table 9. The summary statistics were weighted by the cross-sectional sample weight. Not surprisingly, college graduates earn more than high school graduates. The table says that high school graduates at the beginning obtain 80% of college graduates' starting wages. I provide two shares of temporary workers weighted by the cross-sectional sample weight (1) and by the number of total employees (2). The first value means a firm hire temporary employees about 10%, on average. However, when the share is weighted by the number of employees, the fraction increases to 22.2%. It says that large firms tend to use more temporary contracts. This is much closer to the official share of temporary workers (about 33%) from the Korean labor force survey. Both values show the same trend; the fraction tends to be lower during 2005-2009. For the analysis, the sample weights (1) (the cross-sectional sample weights for the pooling regressions and the panel weights for the panel analysis) are employed for the question of how a permanent worker's wage is affected by the share of temporary employees.

3.5 Empirical formulation and estimation results

3.5.1 Wage effects

Table 10 displays the main results. All the specifications include a set of controls – number of employees, sales per employee, productivity, the existence of union. The first 3 specifications are repeated cross-sectional regressions that do not control for firms' unobserved heterogeneity. Model 1 is the baseline; in addition to the set of controls, this specification allows year effects and 2-digits industry (76 sectors) fixed effects. Year effects reflect economic conditions which are influential on wage determination. Furthermore, inter-industry wage differentials are widely accepted; profitability, levels of required skills (related to individual educational attainment) and monitoring difficulty vary across industries and they affect pay level through various theoretical paths such as the bargaining theory, human captial theory, and efficiency wage model. Thus, these controls are included in the baseline. Industries, however, can face different economic situation, hence sectors may have different time effect. This is considered in model 3.

Model 2 includes a lagged dependent variable considering possibly autoregressive wages. It is known that current pay level largely depend on their pay level in the past; the coefficients of the lagged dependent variable are often greater than 0.5, which tells significant influence of the variable. In Table 18 and 19, the coefficients are 0.4 and 0.35 that are a bit lower. However, the sectoral fixed effects are likely to be correlated to the lagged value. Thus, this specification is still meaningful in that it provides consistent estimates after considering the feature of autoregressive wages.

In addition to sectoral heterogeneity, firms also have their own labor practice in terms of wage determination. The unobserved characteristics are controlled

Table 10: Effects of the share of temporary workers on wages

	Cross-sectional			Panel		
	(1) Base	(2) Lagged	(3) Time	(4) Fixed	(5) Trends	(6) Time
	dep: log(hourly wage of college graduates)					
Share of temps	-0.108***	-0.090**	-0.108***	-0.076**	-0.089***	-0.091**
(p-value)	(0.000)	(0.005)	(0.000)	(0.003)	(0.001)	(0.001)
Observations	2,598	1,738	2,598	2,598	2,598	2,598
R^2	0.405	0.544	0.465	0.755	0.784	0.809
	dep: log(hourly wage of high school graduates)					
Share of temps	-0.067*	-0.063	-0.072*	-0.029	-0.062*	-0.072*
(p-value)	(0.020)	(0.052)	(0.019)	(0.310)	(0.035)	(0.019)
Observations	2,389	1,588	2,389	2,389	2,389	2,389
R^2	0.312	0.445	0.393	0.682	0.716	0.748
Year effects	Yes	Yes	Yes	Yes	No	No
Sector fixed effects	Yes	Yes	No	Yes	No	No
Sector time trends	No	No	No	No	Yes	No
Sector year effects	No	No	Yes	No	No	Yes
Unit fixed effects	No	No	No	Yes	Yes	Yes

in model 4-6. Model 5 and 6 include sector time trends and sector specific year effects, respectively. Referring to Table 18 and 19, the effects of firm size, sales per employee, and the existence of union seem to be contained in the unit fixed effects. The effects of productivity and share of temporary workers are still statistically significant after controlling for firms' fixed effects.

The most preferred model is the one with sector specific time effects and unit fixed effects – model 6. According to the hausman test, fixed effects model is preferred. Furthermore, before and after the economic crisis in 2008, economic shocks may have different effects to each sector, hence sector specific time effects are appropriate.

The preferred model says college graduates' (with permanent contracts) starting wages decrease by 0.09% when the share of temporary workers rise by 1 percentage point. The effects are very small, but still statistically significant. For high school graduates, the effects are even smaller and they are statistically significant only at the 5% significance level. Thus, we can conclude that pay level decrease as the share of temporary workers in a firm increases, or at least, the possibility of a positive relation is denied.

In this case, it is possible for the relation to run the other way; high labor costs for permanent workers may induce higher share of temporary workers. However, their association by the reverse causality is positive. Therefore, although the estimates of Table 10 might be inaccurate, the direction is correct, and the negative impacts could be even greater.

3.5.2 Explanation on wage inequality

Hourly wage of college graduates, hourly wage of high school graduates, on average, and share of temporary employees are summarized in Table 11. During

Table 11: Wages for permanent workers and share of temporary workers

	Hourly wage(col)					Hourly wage(high)					Share of temps				
	<100	<300	>300	N	Y	<100	<300	>300	N	Y	<100	<300	>300	N	Y
2005	8.14	8.32	10.41	8.23	9.41	7.07	7.13	8.52	7.03	7.95	0.10	0.11	0.29	0.12	0.14
	(2.1)	(2.2)	(2.6)	(2.1)	(2.8)	(1.7)	(1.8)	(2.1)	(1.7)	(2.3)	(0.2)	(0.2)	(0.3)	(0.2)	(0.2)
2007	7.94	8.12	10.04	8.06	9.10	7.00	7.13	8.51	7.05	7.89	0.08	0.10	0.26	0.11	0.14
	(2.1)	(2.3)	(2.6)	(2.0)	(3.3)	(1.8)	(1.9)	(2.3)	(1.6)	(2.9)	(0.2)	(0.2)	(0.3)	(0.2)	(0.2)
2009	8.27	8.40	9.75	8.48	8.56	6.97	7.05	7.83	7.09	7.15	0.07	0.09	0.26	0.09	0.14
	(1.9)	(2.0)	(2.3)	(2.0)	(2.5)	(1.6)	(1.7)	(1.7)	(1.5)	(2.1)	(0.2)	(0.2)	(0.3)	(0.2)	(0.2)
2011	8.07	8.24	10.22	8.22	9.04	6.87	7.00	8.25	6.96	7.63	0.08	0.11	0.29	0.11	0.16
	(1.8)	(1.9)	(2.6)	(1.8)	(2.7)	(1.5)	(1.5)	(2.0)	(1.4)	(2.1)	(0.2)	(0.2)	(0.3)	(0.2)	(0.2)

Note: N and Y are the non-union and union workplace, respectively. Wages and ratios of temporary workers are reported by firm size and union. Standard deviation in parentheses.

Table 12: Regression table: union

	Baseline		Time trend		Fixed effect	
	(1) No	(2) Union	(3) No	(4) Union	(5) No	(6) Union
	dep: log(hourly wage of college graduates)					
Share of temps	-0.092**	-0.052	-0.105**	-0.086	-0.109**	-0.137*
(p-value)	(0.004)	(0.371)	(0.002)	(0.183)	(0.002)	(0.013)
Observations	1,682	1,261	1,682	1,261	1,682	1,261
R^2	0.356	0.386	0.442	0.454	0.765	0.801
	dep: log(hourly wage of high school graduates)					
Share of temps	-0.044	-0.082	-0.063	-0.106	-0.091*	-0.123
(p-value)	(0.159)	(0.198)	(0.069)	(0.122)	(0.019)	(0.052)
Observations	1,575	1,162	1,575	1,162	1,575	1,162
R^2	0.271	0.266	0.375	0.349	0.703	0.744

p-values in parentheses

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

the 4 waves, the wage differentials show a similar situation; workers in non-union firms tend to earn lower pay than workers in union firms. However, the wage gaps between small and medium-sized firms, and large firms are much greater. Firm size is a very important wage determinant in Korea. Small and medium-sized firms are pretty vulnerable to economic conditions, hence their profitability or even survival are very uncertain. More importantly, large firms are likely to take advantage of small and medium-sized firms using their economic power. Thus, the pies of small and medium-sized firms are small. In addition, workers in large firms tend to have strong unions, hence high wages.

Table 12 displays the estimation results of three sets of model. The first model controls for sector heterogeneity and year effects (like the baseline in Table 10) and shows that the negative effects for non-union firms are larger than for union firms (-0.09 vs. -0.05) and statistically significant at 1% significance level. The third model with fixed effects shows somewhat inconsistent results with the first model;

the effect is larger in union firms. Note that, however, once sector time trends are controlled in model 2, the results are similar with the first model; the effect is smaller and statistically insignificant in union firms, but significant negative effects for non-union firms (-0.105). The model 2 is preferred, since there is a statistically significant negative linear trend in permanent workers' starting wages only for union firms. This trend is explained by the general trend of weaker unions from globalization. This is consistent to Hwang and Jang (2012); they found that the coefficient of the interaction of the union dummy and the share of temporary workers is close to zero or positive but statistically insignificant.

Table 13: Regression table: firm size

	Baseline			Fixed effect		
	(1) <100	(2) <300	(3) >300	(4) <100	(5) <300	(6) >300
	dep: log(hourly wage of college graduates)					
Share of temps	-0.131**	-0.105**	-0.084	-0.230**	-0.127**	-0.010
(p-value)	(0.006)	(0.002)	(0.052)	(0.002)	(0.003)	(0.824)
Observations	902	1,720	1,223	902	1,720	1,223
R^2	0.316	0.331	0.389	0.816	0.800	0.862
	dep: log(hourly wage of high school graduates)					
Share of temps	-0.082	-0.056	-0.082	-0.145*	-0.093*	-0.001
(p-value)	(0.059)	(0.090)	(0.084)	(0.043)	(0.039)	(0.990)
Observations	867	1,640	1,097	867	1,640	1,097
R^2	0.284	0.251	0.322	0.787	0.751	0.827

p-values in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Another disaggregate estimation was performed by firm size. The baseline and the fixed effects model with sector specific time effects show the similar results. Small or medium-sized firms with less than 100 or 300 employees have much larger negative impacts in both specifications. The results in Table 13 support my hypothesis that higher job insecurity measured by the share of temporary workers

tends to lower workers' wage, especially that in small and medium-sized firms. The movements of bargaining position by the use of temporary employment differ by institutional settings; where unions are powerful or bargaining is centralized, the more temporary employees, the more secure for the insiders with a permanent contract; where bargaining happens between an individual worker and a firm, the perceived job insecurity plays an important role. Thus, Table 12 and 13 support my argument; the negative impacts are greater for permanent workers who have a weak union like in small and medium-sized firms and who are in the decentralized bargaining in non-union firms.

In addition, we can get an important clue to increasing wage inequality from Table 12 and 13. Given the wage gaps between small and large firms, and between union and non-union firms, the tables show that the growth of temporary workers have much more severe negative impacts to workers' wages in small and medium-sized firms, and non-union firms. These results help explain how the wage effects of the use temporary workers have worsen the distribution during the first half of 2000s in Korea.

The effects on the wage distribution have controversy, because Table 10 states that the use of temporary workers have negative effects for both high school and college graduates. However, note that firm size plays an important role in wage determination; Table 11 shows that high school graduates in large firms earn more than college graduates in small and medium-sized firms (except 2009) at the beginning. In addition, by the Statistics Korea, a worker's relative wage in small and medium-sized firms to that of large firms declined from 77% in 1994 to 65% in 2007. These values tell us that the wage gaps between large and small/medium-sized firms increase with tenure because workers in large firms have seniority wages in the internal labor markets, but workers in small/medium-sized firms tend to

have high separation rates and firms' profitability is also very uncertain (and their wages too). Furthermore, the inequality rose during the second half of 1990s and the 2000s.

Furthermore, the tendency of increasing wage differentials is related to the prevalence of non-regular contracts. Large firms tend to make subcontracts and the small and medium-sized subcontractors pay less. Because the actual employer-employee relationship holds between the large firm (not the subcontractor) and a worker in the subcontractor, this type of contract and work arrangements are often used to reduce large firms' costs. The large firms' management decision results in increases in temporary employment and worsening inequality.

Table 14: Regression table: manufacturing

	Manu.	Union		Firm size		
	(1)	(2)	(3)	(4)	(5)	(6)
	All	N	Y	<100	<300	>300
	dep: log(hourly wage of college graduates)					
Share of temps	-0.186***	-0.250***	-0.156*	-0.371***	-0.196**	-0.147*
(p-value)	(0.000)	(0.000)	(0.048)	(0.000)	(0.002)	(0.037)
Observations	1,496	867	629	500	908	588
R^2	0.768	0.762	0.849	0.789	0.762	0.860
	dep: log(hourly wage of high school graduates)					
Share of temps	-0.181***	-0.237***	-0.125	-0.298**	-0.163**	-0.220*
(p-value)	(0.000)	(0.000)	(0.175)	(0.001)	(0.010)	(0.013)
Observations	1,468	859	609	507	910	558
R^2	0.709	0.708	0.781	0.747	0.702	0.813

p-values in parentheses

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

To compare the results with Spanish empirical work for manufacturing firms, I estimated a unit fixed effect model with sector specific year effects for different subgroups. The results in Table 14 are the same as the results from the total sample even for subgroups. Therefore I confirm that the different results are likely from

different institutional settings like the coverage of collective bargaining.

According to ECB (2008), Spain has a high level of collective agreement coverage. Therefore, although a rise in temporary employment could raise Spanish workers' fear of unemployment, it can be attenuated by the collective bargaining; the buffer effect is more plausible in Spain. In Korea, however, the opposite story seems more plausible; the union density is very low (about 10% among total employees during the 2000s) and employment protection was weakened in 1998. Only a part of core workers in large firms have strong unions and the coverage of collective bargaining is pretty low (Although industry unions are well organized in Korea, negociation or bargaining basically happens with the firm level.). And the sharp rise in temporary contracts in the early 2000s ended up with replacement of permanent work with temporary contracts. Therefore, from the Korean experience and in those institutional setting, it is more probable that the prevalence of temporary workers reduce permanent workers' perceived job security and wages.

A study also connects Spain's prevailing wage bargaining to movements of wages. In Spain, wage inequality has not increased since the 1980s when the temporary employment significantly rose. According to Ferreiro and Serrano (2013), one of elements that helped avoid a high wage inequality is the prevailing wage bargaining model and unions' stable bargaining power since the 1980s.

In sum, the growth in temporary work can have wage effects. In Spain, the strong unions and the bargaining system could help avoid a high wage inequality. In Korea, however, wage bargaining is rather decentralized and happens between an individual worker and an employer, then a worker's fear of job loss can result in negative effects on their level of wage.

3.6 Conclusions

This chapter empirically finds different results from the Spanish experience; the negative association between permanent worker's pay level and the share of temporary workers. Using the estimation results, I conclude that: (i) higher job insecurity for permanent workers by the growth of temporary workers is consistent with the wage effects of the use of temporary workers on permanent worker's wage.; (ii) different results can be due to different labor market institutions. This remains a possibility of comparative study with Spain and many countries that use temporary contracts.

The results are also meaningful in explaining the increasing wage inequality in Korea and in linking to findings in chapter 1. The estimation results for subgroups show that workers in small and medium-sized firms or non-union firms suffer from the prevalence of temporary workers the most. This is consistent to the findings in chapter 1 – within-group inequality among permanent workers increased and the very bottom of the distribution hurt by the rise in temporary employment the most.

APPENDICES

Appendix A: RIF-regression decomposition results

Table 15: RIF-regressions decomposition results (2004-05)

	90-10	90-50	50-10	Variance	Gini
2001-02	1.5116	0.8166	0.6951	0.3586	0.0385
2004-05	1.6102	0.8749	0.7354	0.3906	0.0401
Difference	0.0986	0.0583	0.0403	0.0320	0.0016
Total composition	0.0761	0.0354	0.0407	0.0334	0.0017
Temp	0.0081	-0.0014	0.0095	0.0093	0.0004
Female	0.0007	0.0029	-0.0022	0.0007	0.0001
Education	0.0304	0.0168	0.0136	0.0107	0.0005
Experience	0.0158	0.0115	0.0043	0.0057	0.0003
Tenure	0.0101	0.0051	0.0050	0.0031	0.0002
Industry	0.0043	-0.0001	0.0044	0.0009	0.0001
Occupation	0.0067	0.0006	0.0061	0.0030	0.0001
Wage structure	0.0342	0.0192	0.0150	-0.0003	0.0000
Temp	-0.0372	-0.0108	-0.0264	-0.0260	-0.0012
Female	-0.0174	-0.0138	-0.0036	-0.0136	-0.0007
Education	-0.0009	0.0074	-0.0082	0.0034	0.0002
Experience	-0.0070	0.0233	-0.0303	-0.0006	-0.0003
Tenure	0.0163	-0.0247	0.0410	0.0194	0.0009
Industry	-0.0181	0.0350	-0.0531	-0.0138	-0.0009
Occupation	-0.0300	-0.0122	0.0422	0.0039	0.0003
Constant	0.0686	0.0151	0.0535	0.0270	0.0016
Error	-0.0052	-0.0021	-0.0031	-0.0010	0.0000

Table 16: RIF-regressions decomposition results (2006-07)

	90-10	90-50	50-10	Variance	Gini
2001-02	1.5116	0.8166	0.6951	0.3586	0.0385
2006-07	1.6517	0.9111	0.7407	0.3982	0.0402
Difference	0.1401	0.0945	0.0456	0.0396	0.0017
Total composition	0.1015	0.0536	0.0479	0.0414	0.0021
Temp	0.0068	-0.0012	0.0081	0.0079	0.0004
Female	0.0009	0.0039	-0.0030	0.0010	0.0001
Education	0.0392	0.0217	0.0175	0.0137	0.0007
Experience	0.0265	0.0188	0.0076	0.0096	0.0005
Tenure	0.0076	0.0042	0.0033	0.0024	0.0001
Industry	0.0058	0.0002	0.0055	0.0008	0.0001
Occupation	0.0147	0.0059	0.0087	0.0060	0.0003
Wage structure	0.0444	0.0384	0.0060	-0.0032	-0.0005
Temp	-0.0252	0.0005	-0.0256	-0.0206	-0.0009
Female	-0.0472	-0.0461	-0.0011	-0.0248	-0.0013
Education	-0.0516	0.0193	-0.0708	-0.0013	-0.0002
Experience	-0.0463	0.0010	-0.0473	0.0036	-0.0002
Tenure	0.0178	0.0062	0.0116	0.0254	0.0013
Industry	-0.0513	0.0080	-0.0594	-0.0202	-0.0012
Occupation	0.0505	0.0020	0.0485	0.0173	0.0012
Constant	0.1977	0.0475	0.1502	0.0175	0.0008
Error	-0.0008	0.0017	-0.0025	0.0008	0.0001

Appendix B: Cost minimization

The representative firm's minimization problem can be written

$$\min_{w_P, w_T, L_P, L_T, p} \quad w_P L_P + w_T L_T \tag{B1}$$

$$s.t. \quad e_P L_P + e_T L_T = 1 \tag{B2}$$

$$e_P = [\frac{\mu}{\gamma + \mu}(w_P - (1-\beta)\overline{u})]^{\frac{1}{\gamma}} \tag{B3}$$

$$e_T = [\frac{\beta\lambda s}{\gamma + \mu}(w_P - (1-\beta)\overline{u})]^{\frac{1}{\gamma}} \tag{B4}$$

$$w_T = \beta s \frac{\lambda - p\gamma}{\gamma + \mu}[w_P - (1-\beta)\overline{u}] + (1-\beta)\bar{u} \tag{B5}$$

$$pL_T = (1-\alpha)L_P \tag{B6}$$

$$w_P \geq (1-\beta)\bar{u} \tag{B7}$$

Substituting (B2)-(B6) in (B1), the problem can be re-written

$$\min_{w_P} \quad \frac{\bar{p}w_P + (1-\bar{\alpha})\{\beta s \frac{\lambda - p\gamma}{\gamma+\mu}[w_P - (1-\beta)\overline{u}] + (1-\beta)\bar{u}\}}{\bar{p}[\frac{\mu}{\gamma+\mu}(w_P - (1-\beta)\overline{u})]^{\frac{1}{\gamma}} + (1-\bar{\alpha})[\frac{\beta\lambda s}{\gamma+\mu}(w_P - (1-\beta)\overline{u})]^{\frac{1}{\gamma}}} \tag{B8}$$

$$s.t. \quad w_P \geq (1-\beta)\bar{u} \tag{B9}$$

This problem can be expressed more simply as

$$\min_{x} \quad C[Ax^{1-\frac{1}{\gamma}} + Bx^{-\frac{1}{\gamma}}] \tag{B10}$$

$$s.t. \quad x \geq 0 \tag{B11}$$

where

$$A = \bar{p} + (1-\alpha)\beta s \frac{\lambda - p\gamma}{\gamma + \mu} \tag{B12}$$

$$B = (1 - \bar{\alpha} + \bar{p})(1-\beta)\bar{u} \tag{B13}$$

$$C = [\bar{p}(\frac{\mu}{\gamma+\mu})^{1/\gamma} + (1-\bar{\alpha})(\frac{\beta\lambda s}{\gamma+\mu})^{1/\gamma}]^{-1} \tag{B14}$$

$$x = w_P - (1-\beta)\bar{u} \tag{B15}$$

Assuming the inequality condition (B11) is met, the first-order condition becomes

$$\frac{\gamma - 1}{\gamma} A x^{-\frac{1}{\gamma}} - \frac{1}{\gamma} B x^{-\frac{1}{\gamma}-1} = 0 \tag{B16}$$

Hence,

$$w_P - (1-\beta)\bar{u} = x = \frac{1}{\gamma - 1}\frac{B}{A} \tag{B17}$$

$$= \frac{\gamma + \mu}{\gamma - 1} \frac{1 - \bar{\alpha} + \bar{p}}{\bar{p}(\gamma+\mu) + (1-\alpha)\beta s(\lambda - \bar{p}\gamma)}(1-\beta)\bar{u} \tag{B18}$$

and, using (B5),

$$w_P = [\frac{\gamma+\mu}{\gamma-1}\frac{1-\bar{\alpha}+\bar{p}}{\bar{p}(\gamma+\mu)+(1-\alpha)\beta s(\lambda-\bar{p}\gamma)}+1](1-\beta)\bar{u} \tag{B19}$$

$$w_T = [\beta s\frac{\lambda-p\gamma}{\gamma-1}\frac{1-\bar{\alpha}+\bar{p}}{\bar{p}(\gamma+\mu)+(1-\alpha)\beta s(\lambda-\bar{p}\gamma)}+1](1-\beta)\bar{u} \tag{B20}$$

The model loses its efficiency-wage character if the participation constraint (B11) is binding; in this (uninteresting) case, the solutions simplify to

$$w_P = w_T = (1-\beta)\bar{u} \tag{B21}$$

Appendix C: Wage effects of Korean reforms

The calendar length of the unit period is taken to be 2 years in the baseline simulation; this unit period fits evidence for the average duration of temporary workers' attachment to the same firm. With this unit period, a standard value for the discount factor is $\beta = 0.9$. Our choices of $\bar{\alpha} = 0.774$ and $\bar{p} = 0.4$ are based on evidence from the panel data in the EAPS supplement for 2003-07; the data show an annual continuation rate for permanent workers of about 0.88 and an annual promotion rate for temporary workers of about 0.226. The values of $\bar{\alpha}$ and β can be used to calculate both the expected duration and the discounted expected duration of a permanent job: the expected duration is given by $1/(1-\bar{\alpha}) = 4.43$ periods or 8.86 years; the discounted expected duration is $\bar{s} = 3.321$. The implied steady-state value of the share of temporary workers in total employment is 0.36.

The remaining parameters in Table 17 $(\gamma, \mu, \lambda, \bar{u})$ are hard to pin down empirically. The chosen value of λ ($\lambda = 1.2$) implies that an individual temporary worker who raises effort (=productivity) by 10% increases her chances of promotion from 0.226 to 0.34; an individual permanent worker who raises effort (=productivity) by 10% reduces her per-period risk of separation from 0.226 to 0.1. These sensitivities seem plausible but we have no real evidence and have not yet carried out a more detailed sensitivity analysis to check the robustness of our results to variations in these assumptions. The values of γ and $\bar{u}$ were chosen to get a positive relation between w_T and $\bar{u}$ (which requires $1-\beta(1-\bar{p}+\frac{\lambda}{\gamma}) > 0$) and to achieve an empirically

plausible value of the relative wage.

In the baseline scenario the optimal effort levels for each type of contracts are $e_P = 1.450$ for permanent workers and $e_T = 1.764$ for temporary workers. The precise values of the effort levels have no significance, but the result fits qualitative evidence which suggests that e_T tends to be greater than e_P. Another way to look at the differences in effort comes from noting that for a temporary worker who provides the optimal effort level for permanent employees (1.450), the probability of promotion would be 19%, rather than 22%. The wage rates are calculated using (2.22) and (2.23). The results – $w_T = 9.748$ and $w_P = 17.375$ – imply that temporary workers obtain 56.1% of permanent workers' wages.

Table 17: Numerical exercises

	base	1998 reforms
β	0.903	0.903
$\bar{\alpha}$	0.774	**0.672**
γ	3.000	3.000
μ	2.000	**2.500**
λ	1.200	1.200
$\overline{u}$	100.0	100.0
$\bar{p}$	0.400	0.400
$\bar{s}$	3.321	**2.544**
e_P	1.450	**1.591**
e_T	1.764	**1.644**
w_T	9.748	**9.748**
w_P	17.375	**18.618**
w_T/w_P	0.561	**0.524**
$L_T/(L_T + L_P)$	0.361	**0.450**
Variance of log wage	0.077	**0.104**

The baseline simulation is in the first column of Table 17; the results of the 1998

reforms are displayed in the second column. The 1998 scenario assumes a decrease in annual continuation rate of permanent workers by 0.06 and an increase in μ by 0.5.[4] These changes produce a rise in w_P and e_P; the rise in μ makes permanent workers' effort more sensitive to changes in the wage, thus giving firms an incentive to raise w_P. Temporary workers' effort goes down (because V_P and the value of promotion drop) but their wage is unchanged (because the two effects of V_P on w_T offset each other in the baseline case with $\lambda - \gamma\bar{p} = 0$). As a result, the distribution of income worsens – temporary workers now earn 52.4% of the permanent wage (down from 56.1%) – and the ratio of temporary employment increases to 45% (up from 36.1%).

[4]The new continuation rate gives an expected average job duration of 5.1; the observed average duration of permanent jobs in Korea was about 6.2 years in the very early 2000s.

Appendix D: WPS estimation results

Table 18: Regression table (college graduates)

	(1) Base	(2) Lagged	(3) Time	(4) Fixed	(5) Trends	(6) Time
Share of temps	-0.108***	-0.090**	-0.108***	-0.076**	-0.089***	-0.091**
	(0.000)	(0.005)	(0.000)	(0.003)	(0.001)	(0.001)
Log(employee)	0.063***	0.034***	0.062***	0.008	0.002	0.013
	(0.000)	(0.000)	(0.000)	(0.520)	(0.850)	(0.307)
Log(sales)	0.036***	0.020***	0.037***	0.003	0.004	0.008
	(0.000)	(0.000)	(0.000)	(0.627)	(0.563)	(0.251)
Productivity	0.029**	0.028**	0.031**	0.018**	0.019**	0.018*
	(0.001)	(0.004)	(0.001)	(0.009)	(0.006)	(0.011)
Union	0.079***	0.059***	0.080***	-0.003	0.003	0.011
	(0.000)	(0.000)	(0.000)	(0.897)	(0.922)	(0.689)
Lagged wages		0.411***				
		(0.000)				
Observations	2598	1738	2598	2598	2598	2598
R^2	0.405	0.544	0.465	0.755	0.784	0.809

p-values in parentheses

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

Table 19: Regression table (high school graduates)

	(1) Base	(2) Lagged	(3) Interaction	(4) Fixed	(5) Trends	(6) Time
Share of temps	-0.067*	-0.063	-0.072*	-0.029	-0.062*	-0.072*
	(0.020)	(0.052)	(0.019)	(0.310)	(0.035)	(0.019)
Log(employee)	0.042***	0.024***	0.042***	0.005	0.007	0.018
	(0.000)	(0.000)	(0.000)	(0.739)	(0.621)	(0.211)
Log(sales)	0.030***	0.021***	0.031***	0.011	0.008	0.014
	(0.000)	(0.000)	(0.000)	(0.151)	(0.287)	(0.091)
Productivity	0.026**	0.028**	0.030***	0.018*	0.015*	0.020*
	(0.003)	(0.006)	(0.001)	(0.018)	(0.046)	(0.014)
Union	0.082***	0.056***	0.081***	-0.001	0.010	0.008
	(0.000)	(0.000)	(0.000)	(0.971)	(0.750)	(0.815)
Lagged wages		0.357***				
		(0.000)				
Observations	2389	1588	2389	2389	2389	2389
R^2	0.312	0.445	0.393	0.682	0.716	0.748

p-values in parentheses

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

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