

Does the Minimum Wage Affect Non-wage Workers?*

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Non-wage workers, although not directly subject to the minimum wage laws, can be affected by a minimum wage increase, because labor markets are not segmented between wage and non-wage workers. Using 10-year longitudinal data on the universe of establishments in South Korea, we find that an increase in the minimum wage negatively affects the job growth of non-wage workers and that the largest channel for the effect is job destruction through business closing. The effect is larger in sectors that mainly consist of small businesses and low-skilled workers.

JEL Classification: J23, J38, L23

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I. Introduction

While a vast body of literature has examined the effects of the minimum wage on employment, almost all studies focus on its impact on wage workers, thus ignoring

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the other part of the labor force—*non-wage workers*. This is not surprising because they are not subject to the minimum wage law. However, non-wage workers can be affected by the wage floor policy. First, the labor markets for wage and non-wage workers are not completely segmented. Job choice theory shows that the minimum wage is a key determinant for the opportunity cost of being a non-wage worker relative to being a wage worker, especially if one is a low-skilled worker in a financially marginal firm. Second, the self-employed, who account for the majority of non-wage workers, hire wage workers and run their businesses. An increase in the minimum wage increases the wage bill and decreases profits.¹ However, higher minimum wages may decrease the labor demand for wage workers and push some of them to be non-wage workers such as the self-employed or unpaid family workers.² Therefore, the impact of the minimum wage on non-wage workers is theoretically ambiguous. Given that it has not been well investigated empirically, we want to fill this gap in the literature.

Ignoring the impact on non-wage workers can severely bias the estimate of the labor-market effect of the minimum wage. Non-wage workers consist of a substantial part of the labor force in many countries. In South Korea (Korea, hereafter), the share of non-wage workers is high. According to data from the Korean Current Population Survey (K-CPS), about 25% of the whole labor force comprised non-wage workers in 2017. Among them, 84% are business owners (self-employed) either with or without paid employees. They make up 21% of the labor force. According to the OECD statistics on the self-employment rate, Korea is ranked as the second highest country next to Greece (Boeri, Giupponi, Krueger and Machin, 2020). Unlike the United States, many European and Asian countries have high self-employment rates. In Korea, these workers are not only substantial in their relative size in the labor force but also play a crucial role in employment dynamics in the labor market, accounting for 30% of job reallocation—the sum of job creation and destruction. Furthermore, a number of wage workers choose to become self-employed after retirement (Giandrea et al., 2008; Wang et al., 2008). In 2017, about 13% of workers aged 30-39 are self-employed and the proportion increases to 28% for those aged 50-59 and 38% for those aged 60 or older.

Another important feature of non-wage workers is that they tend to work in small

¹ Even the self-employed without employees might as well be affected by the minimum wage indirectly because an increase in the minimum wage could increase the costs of materials that they use. Moreover, many solo self-employed workers would plan to grow their business and hire workers in the future. Increases in the minimum wage might discourage them from keeping their business.

² Blau (1987) used the minimum wage as a proxy for wage rigidity and expected that a higher minimum wage would increase the number of self-employed individuals. But his time series analysis finds the opposite result. Caliendo et al. (2018) discuss the possibility that firms could prefer to employ *Scheinselbständigkeit* (those officially registered as self-employed) rather than hiring wage workers. Using the synthetic control method, Ganserer et al. (2022) find that the share of solo self-employment increased after the introduction of the minimum wage in Germany.

establishments like family-owned local stores. In 2017, 73% of non-wage workers worked in micro establishments employing less than five workers. A high share of non-wage workers corresponds to a high share of small establishments in the firm size distribution. The share of establishments with less than 10 workers is 92%. This is much higher than the 60% in the United States (Statistics of U.S. Businesses, 2017) or the 78% in Japan (the Economic Census for Business Frame, 2014). The employment share of micro-enterprises with less than 10 workers amounts to about 44% for Korea, similar to Greece and Italy, but much higher than the 10.4% in the United States. This fact is important for a study examining the employment effect of the minimum wage because small firms tend to be financially vulnerable to a labor cost shock. Given that small firms are limited in adopting new technologies and substituting labor with capital, the employment effect of the minimum wage can be more severe than larger firms.

The majority of non-wage workers are self-employed who work in small firms. Hence, we need to look at firm dynamics to see more clearly the effect of the minimum wage on non-wage workers. Thus, we not only estimate the effect of the minimum wage on the net job growth rate but also decompose it into its effects on job flows at the intensive and extensive margins along firm dynamics. We expect that employment changes among non-wage workers after a minimum wage hike appear more distinctly at the extensive margin because of the high entry and exit rates of small firms that employ the majority of non-wage workers.

To this end, we take advantage of data from the *Census on Establishments* (Census, hereafter), which covers the *universe* of registered non-agricultural private establishments.³ The data are advantageous for our study. First, the data are longitudinal at the individual-establishment level. Therefore, we can construct the variables of job flows from job creation and destruction within establishments as well as those from entries and exits of establishments. Second, another advantage of the data is that they span a long period of time, 10 years, in which the minimum wage increased substantially. The nominal minimum wage growth rate is, on average, 6.2% per year nominally during the sample period of 2008–2017, but varying year by year from 2.75% to 8.1%. There is no cross-sectional variation in the minimum wage, as it is a single rate nationwide applying to all wage workers with virtually no exception. Thus, we utilize the fraction of bound workers—those between the current and new minimum wage—as a measure of the national

³ According to a report by Statistics Korea in 2015, the employment share of unregistered establishments is about 1.9%. Minimum wage increases may push workers from registered to unregistered establishments. Some studies have examined whether jobs and workers move between formal and informal sectors after minimum wage hikes in developing countries such as Brazil, Costa Rica and Indonesia (Gindling and Terrell, 2005; Lemos, 2009; Comola and Mello, 2011; Carpio and Pabon, 2017). The transition between formal and informal sectors is not likely to be an economically significant transition path for workers in Korea.

minimum wage's bite in each county's wage distribution (Card, 1992; Machin et al., 2003; Draca et al., 2011; Harasztosi and Lindner, 2019). That is, we leverage year-to-year variations in the national minimum wage and subsequent within-county variations in the fraction of bound workers.

To preview our main findings, we find that the minimum wage has a significant impact on job growth of non-wage workers. The effect is sizable; ignoring the effect on non-wage workers, we underestimate the negative effect on employment by about 28%. This estimate is similar to the share of non-wage workers in the labor force. Furthermore, decomposing the effect on the net job growth into the effects at different margins of job flows, we find that the most important channel is job destruction at the extensive margin, i.e., business closing. This is in contrast with the finding that the major channel for wage workers is adjustment at the intensive margin (hiring/layoffs and hours worked). Last, we find that the effects on non-wage workers are larger in the sectors where establishments are smaller and where workers are low-skilled.

Our study contributes to the literature on the minimum wage by exploring the effect of the minimum wage on non-wage workers. Most non-wage workers are business owners. Hence, their jobs are created or destructed via firm entries or exits. In this regard, our study is related to the literature on firm dynamics. Few studies have examined the effect of the minimum wage on firm dynamics. Portugal and Cardoso (2006), using employer-employee matched panel data from Portugal, examine the effects of the minimum wage on worker flows at the intensive and extensive margins. They exploit a natural experiment in 1987-1988 where the minimum wage for young workers under the age of 20 was raised and find two countervailing effects: a positive effect on job attachment among teenagers and a negative effect on new hiring. However, their study focuses only on wage workers. Draca et al. (2011) examine the effect of the introduction of the national minimum wage in the United Kingdom on firms. They find that profits significantly dropped, while there is no significant short-run effect on firm dynamics.

Some studies have found that firm entries and exits are significantly affected by the minimum wage. Using the Longitudinal Business Database in the United States, Chen (2019) finds that an rise in the minimum wage increases the probability of firm exit (plant closing) in manufacturing. Aaronson et al. (2018) find that an increase of the minimum wage increases the exit rate of limited-service restaurants and especially chain ones. However, they also find that the entry rate increases after the minimum wage increase. Focusing on restaurants and using the Yelp data, Luca and Luca (2019) find that in response to a minimum wage increase, restaurants with lower ratings increased their delivery price but were also more likely to go out of business because of it. Given that marginal restaurants are likely to be non-franchise and independently owned by the self-employed, their findings are suggestive of the employment effect of the minimum wage on self-employed

workers through its impacts on firm dynamics.

Several studies have examined the effect of the minimum wage in Korea especially after the minimum wage hike during 2018-2019. For example, using data from the Korean Current Population Survey, Kim and Lee (2019) estimate the employment impact of the minimum wage hike and find that about 25% of the reduction in employment from 2017 to 2018 can be attributed to the minimum wage increase. Doh et al. (2022) construct the variable of firm-level minimum wage exposure and find that firms reduce employment through layoffs and closing plants. Adopting a search and matching model, Seok and You (2022) show that an increase in the minimum wage may decrease the employment of low-productivity workers in the long run.⁴

While all the above studies examine the impact of the minimum wage on wage workers, Bai and Kim (2021) focus on non-wage workers. Using individual-level panel data, they show that, after a minimum wage increase, business owners switch themselves to wage workers because the opportunity cost of running businesses increases as the minimum wage rises. Our study is closely related to Bai and Kim (2021) given our focus on non-wage workers. While they look at individuals' occupational changes, we examine county-level job flows and firm dynamics.

II. Institutional Background

2.1. Minimum Wage

The minimum wage in Korea is set nationally and applied to all workers as a single hourly rate regardless of region, industry, age, or nationality. A unique feature of the Korean minimum wage system is that it is revised every year. The Minimum Wage Council (MWC) makes the final decision before August 5. The new minimum wage starts to take effect on January 1 in the following year.

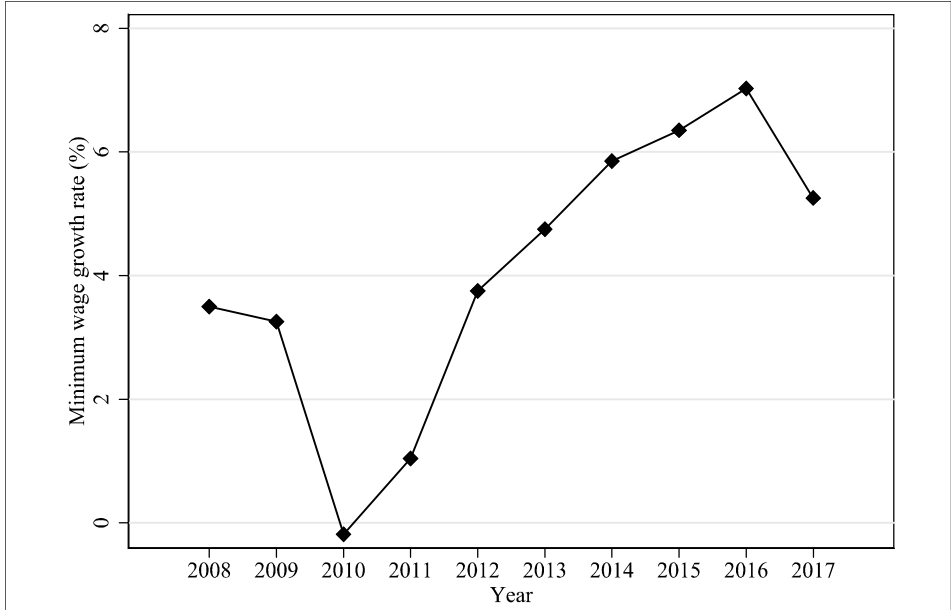
Figure 1 shows the trends of the minimum wage growth rate in real terms during the sample period of 2008-2017. Notably, the minimum wage growth rate varies over years. For example, the minimum wage decreased in 2010, while it increased by more than 6% in 2016.

Given the temporal variation in the minimum wage growth rate at the national level, the variation in the minimum wage's bindingness at the county level, associated with the idiosyncratic evolution of each county's hourly wage distribution, allows us to identify the causal effect of the minimum wage. Figure 2 shows the

⁴ Baek and Park (2016) and Baek et al. (2022) leverage the introduction of the minimum wage in 1988 and estimate the effects of the minimum wage on employment and the characteristics of new establishments in manufacturing.

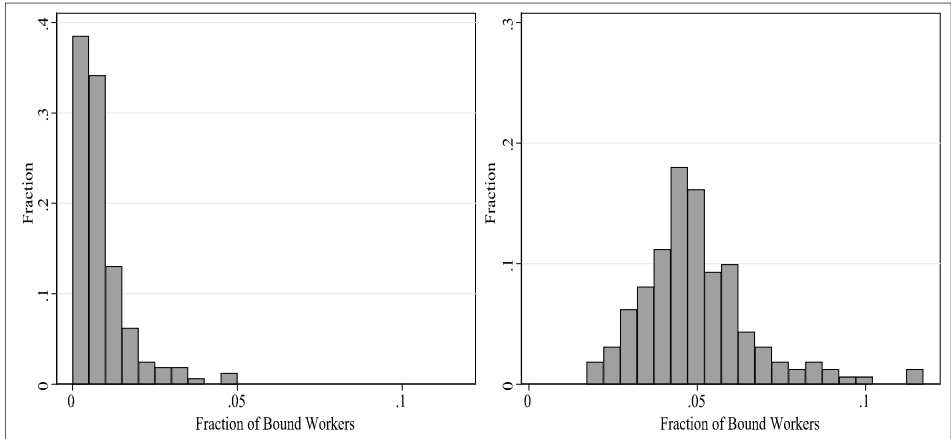
geographic dispersion of the fraction of bound workers. We compare two periods, 2010-2011 and 2015-2016, when the minimum wage growth rate was low and high. The graphs clearly show that the minimum wage’s bindingness varies not only over time at the national level but also differs across regions.

[Figure 1] Minimum Wage Growth Rates, 2008-2017



Note: The real minimum wage growth rates in 2008-2017.

[Figure 2] Distribution of the Fraction of Bound Workers



Note: Graph A is the distribution of the fraction of bound workers in 2010-2011 when the minimum wage growth rate was low. Graph B is the distribution of the fraction of bound workers in 2015-2016 when the minimum wage growth rate was high.

2.2. Non-wage Workers and Small Businesses

A key structural feature of the Korean labor market is a large share of non-wage workers. Table 1 presents the descriptive statistics of the variables showing labor force composition from the Census of 2008 and 2017. In 2008, there are about 15.5 million workers, and about 27.4% of them are non-wage workers. Given that non-wage workers work longer hours, their share in terms of full-time equivalent (FTE) jobs becomes slightly larger (29.7%). In 2017, the share of non-wage workers is lower (23.6%), thus reflecting the decline of the self-employment rate at the national level.

Non-wage workers have three different groups: business owners, unpaid family workers, and independent contractors. Business owners are those who run their own businesses and most of them themselves work in their stores. Independent contractors also operate their own businesses and work independently. For example, truck drivers and freelancers belong to this group. Nearly all unpaid family workers work with business owners in family businesses. For this reason, the OECD defines the self-employment rate as the share of business owners plus unpaid family workers in the labor force. According to that definition, in 2008, the self-employment rate of Korea was 22.5%, much higher than those of the United States (6.1%) and Japan (10%) while comparable with those of Italy (22.7%) and Chile (27.2%). Among the OECD countries, Mexico, Greece, and Turkey have self-employment rates higher than 30%. However, even the OECD definition of the self-employment rate underestimates the economic importance of the self-employed in the Korean labor market. Note that the self-employed hire wage workers and other types of non-wage workers (e.g., family workers) as well. If we count all of them, workers working in the establishments owned by the self-employed account for about 40% of the entire labor force of Korea.

Table 1 shows that non-wage workers are different from wage workers in observable characteristics.⁵ We find that non-wage workers are older than wage workers, which reflects the fact that retired wage workers tend to start their own businesses.⁶ The self-employed are more likely to be female and less educated. They are also more likely to be unskilled than wage workers.

A large share of non-wage workers coincides with a large share of small establishments. Looking at the distribution of workers over establishment sizes, non-wage workers are highly concentrated in small establishments. About 83% of non-wage workers work in establishments with fewer than 10 workers.⁷

⁵ Given that the Census does not provide information on age and education, we obtained the statistics from the K-CPS data of 2010 and 2017.

⁶ In Korea, although the mandatory retirement age is 60, people retire as wage workers much earlier. According to data from the Korean Labor and Income Panel Study (KLIPS), in 2009-2017, the average age of the first transition from full-time to self-employment was 39.

⁷ Small establishments are generally defined as those with fewer than 50 employees, while

[Table 1] Descriptive Statistics of Labor Force Composition

	2008		2017	
	Non-wage	Wage	Non-wage	Wage
Number of workers	4,290,645 (27.4)	11,351,981 (72.6)	4,897,695 (23.6)	15,899,224 (76.4)
Business owners	2,769,389 (17.7)		3,200,786 (15.4)	
Unpaid family	743,179 (4.8)		734,250 (3.5)	
Independent contractors	778,077 (5.0)		962,659 (4.6)	
Number of FTE jobs	5,186,691 (29.7)	12,301,035 (70.3)	5,428,950 (25.6)	15,771,751 (74.4)
Age	51.0	41.0	52.7	43.5
Male	51.3	61.4	51.7	58.1
High school	41.1	41.3	43.2	37.7
College or higher	24.1	41.5	32.6	49.9
Metropolitan areas	48.3	50.5	45.6	48.5
By establishment size				
1-4	75.3	14.2	73.0	14.1
5-9	7.2	14.5	8.3	16.0
10-19	3.9	13.3	3.9	13.2
20-49	7.0	15.8	7.0	15.3
50-99	3.4	12.6	3.5	11.4
100-299	2.2	13.3	2.8	12.9
300+	1.0	16.3	1.5	17.1
By industry				
C (manufacturing)	8.0	26.5	8.7	23.5
G and I	50.1	18.6	46.4	19.5
Others	41.9	54.9	45.0	57.0

Note: Except for the variables related to the number of workers, jobs, and age, all numbers show the share of the labor force in terms of percentages. Statistics about age and education were obtained from the K-CPS of 2010 and 2017. An FTE job employs 44 hours per week. The industry code G is Wholesale and Retail Trade, and I is Accommodation and Food Service Activities.

microenterprises have at most 10, or in some cases 5, workers (OECD, 2015). The legal definition of a small business varies by country and by industry. For example, the legal definition of a small business in Korea is firms with fewer than 50 employees for manufacturing while those with fewer than 10 employees for services.

Furthermore, 75% work in businesses with fewer than 5 workers. This is in sharp contrast with wage workers who are almost evenly distributed over establishment sizes. The distributions have changed little between 2008 and 2017.

Most small establishments face intensive market competition. This is an important point for our study because the effect of the minimum wage depends on the ability of firms to pass the burden of the minimum wage onto consumers and the ability is constrained by the extent of market competition. Small establishments in Korea, mostly owned by the self-employed, mainly consist of small mom-and-pop stores and restaurants. This is in contrast with the United States, where large chains and franchised stores and restaurants are prevalent.

In Korea, the majority of restaurants are non-franchise and of a small scale, owned by the self-employed. Only 14% of restaurants are franchise businesses, which are much lower than the 47% in the United States. The average number of workers per restaurant in Korea is three, which is only one-sixth of that of the United States. The restaurant industry is highly competitive. Even if the population of Korea is only 13% of that of the United States, the number of establishments in the restaurant industry is surprisingly about the same, around 650,000 (*US Economic Census*, 2017; *KOREA Economic Census*, 2015). The retail sector is also similar. The majority of establishments in the retail sector in Korea are independent non-chains and owned by the self-employed, whereas multi-unit stores accounted for 60% of the employment in the retail trade in the United States in 2007 (Foster et al., 2016).

Table 2 shows that the compositions of workers and establishments are different across industries. The statistics are obtained from the K-CPS of 2017, except for the share of small establishments, which is obtained from the Census. First, we find that the share of non-wage workers varies widely by industry. In the industry of Accommodation and Food Service Activities (I), including restaurants, more than a half of workers are non-wage workers. The share of non-wage workers is also high in such industries as S, R, G, and H, all higher than 40%. On the other hand, the share is low in such industries as D, E, J, N, M, and F, lower than 10%. The share of non-wage workers is positively correlated with the share of small establishments. The correlation coefficient is 0.7 and statistically significant.

Table 2 also shows that non-wage workers are on average lower-skilled than wage workers. We find that in those industries with a higher share of non-wage workers, workers tend to be less educated and their occupation status is lower (defined as elementary, service, or sales workers). For example, industry I, where the employment share of small establishments is high (85%), there are more low-educated workers (78%), and more low-occupation workers (94%) than other industries. Given that these workers are more likely to be bound by a minimum wage increase and their establishments operate in a competitive market, we expect that the effect of the minimum wage is larger for them. We will explore this heterogeneity later.

[Table 2] Establishment and Worker Characteristics by Industry

	(1)	(2)	(3)	(4)	(5)
	Non	Small	Low skilled		
	wage	estab.	Both	Edu.	Occ.
B. Mining and quarrying	14.9	16.2	2.8	62.7	3.7
C. Manufacturing	10.3	27.9	12.6	62.5	14.9
D. Electricity, gas, steam and air conditioning	0.5	6.3	4.6	27.6	7.0
E. Water supply	3.6	29.9	19.8	58.8	21.9
F. Construction	8.8	62.4	15.7	68.6	18.0
G. Wholesale and retail trade	44.8	75.8	52.3	62.7	72.9
H. Transportation and storage	43.3	54.5	12.1	74.3	16.4
I. Accommodation and food service activities	55.3	84.5	76.0	78.1	94.2
J. Information and communication	4.3	22.5	5.1	20.8	8.4
K. Financial and insurance activities	37.5	13.3	20.1	33.8	32.8
L. Real estate activities	29.2	72.8	20.8	57.1	25.2
M. Professional, scientific and technical activities	7.7	37.7	2.1	15.9	3.7
N. Business facilities mgmt. and support services	7.0	40.4	51.3	71.1	60.1
P. Education	17.5	35.4	7.0	19.9	8.1
Q. Human health and social work activities	10.4	38.3	23.9	40.0	27.8
R. Arts, sports and recreation-related services	47.2	62.8	39.0	53.8	53.6
S. Membership org., repair and personal services	47.3	79.0	36.9	66.5	45.8

Note: The employment share of small establishments with fewer than 10 workers was calculated from the Census. Individual characteristics were obtained from the K-CPS. Low skilled workers in terms of education level were defined as those with high school graduates or less. Low skilled workers in terms of occupation were defined as those with elementary, service, or sales occupations. In column (3), we show the share of low skilled workers in terms of education and occupation.

III. Data

3.1. Sample Construction

We construct county-level panel data of employment dynamics and wage distribution from two micro data sources: the Census and the Local Area Labor Force Survey (hereafter, LALFS). The Census provides data on establishments, while the LALFS provides information on individual workers.⁸ We combine two datasets at the county level from 2009 to 2017. Korea has 161 counties (*Si* and *Goon*).

The Census is annually conducted by Statistics Korea. The prime advantage of the Census is that it covers *all* private establishments except for family-owned farms;

⁸ To construct our main explanatory variable, the fraction of bound workers, using another establishment-level data like the Survey of Labor Conditions by Employment Type (SLCET) instead of the LALFS would be more appropriate but unfortunately the SLCET does not have information on region. In Appendix C.2, we compare the measure of hourly wage between the LALFS and SLCET.

about 4 million establishments per year.⁹ We use the data on all non-agricultural private establishments in 17 one-digit industries. Furthermore, the Census is longitudinal at the establishment level, thus allowing us to track individual establishments over the years until they go out of business and their expansion and contraction during their lifespan. The data provide basic information about establishments, such as location, industry, business start year, and the number of workers, disaggregated by sex and “worker type.” There are five worker types: regular, temporary/daily, business owners, unpaid family workers, and independent contractors. The first two types are wage workers, while the latter three are non-wage workers. All workers are counted as of the last day of each year (December 31).¹⁰

Using the Census, we construct data on the within-establishment flows of job creation and destruction. Following Davis et al. (1998), we classify establishments into three groups—*continuers*, *new entrants*, and *exitors*. Continuers are those establishments that existed in year $(t-1)$ and continue to run in year t . New entrants are startups—those which did not exist in year $(t-1)$ but appear in year t . Exitors existed in $(t-1)$ but go out of business (shut down) in t . Employment changes by continuers are the changes on the intensive margin; new hires or layoffs. Since we measure employment by FTE jobs (a FTE job = 44 hours per week), employment changes by continuers also reflect their adjustment of work hours.¹¹ New entrants create jobs, while exitors destroy them. For example, in 2015-2016 the number of establishments increased from 3.8 million to 3.9 million.¹² Among them, 3.3 million were continuers while 0.6 million establishments entered the market in 2016 and 0.5 million exited. We explain our measures of job flows in more detail in Section 4.

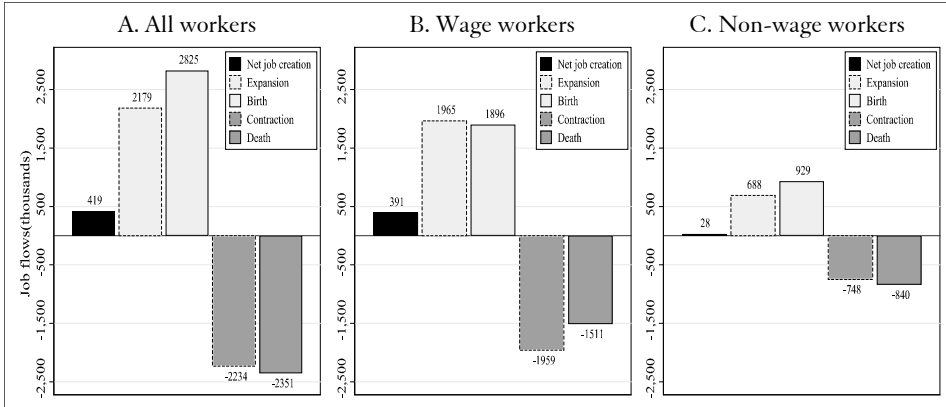
A limitation of the Census is its lack of information on work hours. It only provides information on the number of workers by gender and worker type. For each year, we calculate group-level average hours by sex, worker type, county, and industry. Then, we impute the total work hours for each individual establishment in the Census depending on the establishment’s composition of workers by sex, worker

⁹ In Appendix A, we introduce the Census in detail.

¹⁰ Given that the minimum wage is revised every year around July and the revised one comes into effect on January 1 of each calendar year, the level of employment on December 31 of the previous year may be the outcome after adjusting to the new minimum wage. We checked this possibility but found that firms did not adjust labor in advance. We did not find any effect on wages either.

¹¹ Estimating the employment effect of the minimum wage, it is misleading to measure employment just by the headcount of workers, because the share of part-time workers is increasing during the sample period.

¹² To the best of our knowledge, we are the second to use 100% census data for estimating the effect of the minimum wage, next to Harasztosi and Lindner (2019). They used the Hungarian Corporate Income Tax Data. Our data also do not have information on individual worker-level wages but only total labor costs and the number of workers by employment type.

[Figure 3] Job Flows by Worker Type and Decomposition into Adjustment Margins

Note: The graphs show the average values of job flows of all workers, wage, and non-wage workers in 2009-2017; net job creation, expansion, entry, contraction, and exit. The unit is 1,000.

type, county, and industry.¹³ For example, suppose that a retail store in Seoul in 2015 had one male self-employed owner, two male regular wage workers, and three female temporary workers. Then, the total work hours of that establishment are about 259 ($= 1 \times 50.6 + 2 \times 46.7 + 3 \times 38.4$) or 5.9 FTE jobs.

Figure 3 shows the net job flows, job creation, and destruction for all workers and then for wage and non-wage workers, separately. We find that about 0.42 million jobs are net-created: 5.0 million jobs are created, while 4.58 million jobs are destroyed. For job creation, about 56% are created by entries of new establishments. For job destruction, about 51% are destroyed by exits of establishments. In Figure 3, we find that the extensive margin is relatively more important for non-wage workers. For wage workers, the contribution of the extensive margin is 49% for job creation and 44% for job destruction. For non-wage workers, establishment entries account for 57% of job creation and establishment exits account for 53% of job destruction.

3.2. Fraction of Bound Workers

Our identification strategy is to exploit within-county variation in the fraction of bound workers. The fraction of bound workers represents the extent to which the minimum wage is binding. To construct this variable, we use the LALFS data and calculate the hourly wage for each individual worker by using the information on earnings and working hours. Then, for each county and each year, we calculate the fraction of bound workers who are paid the current minimum wage or higher but

¹³ Some groups have only a few observations. Hence, a small-sample bias may occur. We check the robustness of our results later by dropping those small cells or using coarser cells.

lower than the next year's minimum wage.¹⁴ This variable represents the expected impact of the next year's minimum wage given the current hourly wage distribution.¹⁵

Two things should be noted. First, hourly wage is calculated by dividing monthly earnings by weekly work hours. The LALFS asks three-month average earnings and weekly working hours if the respondent worked in the previous week.¹⁶ Note that there is inconsistency between the time intervals for earnings and working hours, which might lead to a bias in hourly wages. Especially, for part-time workers who work irregularly, hourly wages are underestimated because three-month average earnings include those weeks when they did not work, while reported work hours are the hours in the last week they worked. Thus, monthly work hours, converted from weekly hours, are overestimated and hourly wages are underestimated. Given that part-time workers are likely paid around the minimum wage, the fraction of bound workers can be overestimated.¹⁷

Second, we find that a significant number of workers are paid below the minimum wage. We interpret them in two different ways. First, they are non-compliance workers. They are out of the formal labor markets and are not covered by the minimum wage law. In this case, we can ignore them when we construct the variable of the minimum wage bite.¹⁸ Alternatively, "non-compliance" is actually either the result of measurement error or retrospective reporting error. This assumption is reasonable because, as we explained above, the hourly wage is likely underestimated especially for low-wage workers who work part-time or irregularly. Under this assumption, they are actually not non-compliance workers but paid more than the minimum wage but presumably slightly above it. Even if they are currently non-compliance workers, they might be also affected by the minimum wage. This is true if a higher minimum wage increase pressures their employers or

¹⁴ The definition of a county in the LALFS is close to that of a commuting zone. There are 161 counties and 125 commuting zones. They include 17 metropolitan cities, which consist of several administrative subdistricts. However, we treat them as a single county. We checked the robustness of our results by using a commuting zone as a geographic unit. Nonetheless, results are qualitatively the same.

¹⁵ Our definition of bound workers is different from that used by the MWC. First, the MWC uses the Economically Active Population Survey (EAPS), while we use the LALFS because there is no information on workplace location in the EAPS. Second, the MWC's definition includes all of those below the next year's minimum wage, while our measure does not include those who are paid below the current year's minimum wage. Please see Appendix C.3 for more information.

¹⁶ If one worked in the past three months but did not in the last week, his/her wage is not included.

¹⁷ Our results are robust to widening the range of bound workers below the current minimum wage and above the next year's minimum wage by up to about 2%, while the estimates become less precise.

¹⁸ The non-compliance rate is defined as the proportion of workers below the current year minimum wage. The punishment for non-compliance with the minimum wage law is strict in Korea. Employers that failed to pay in compliance with the minimum-wage level face maximum jail time of three years or a maximum fine of 20 million Korean won (about 18,000 USD).

[Table 3] Summary Statistics of County-Level Variables

	(1) All	(2) High impact	(3) Low impact	(4) Diff. [p-value]
A. Minimum wage				
Fraction of bound workers	0.019 (0.015)	0.032 (0.001)	0.008 (0.000)	0.023 [0.000]
Below MW	0.094 (0.031)	0.100 (0.006)	0.089 (0.005)	0.011 [0.000]
B. Wage and employment change				
Hourly wage growth	0.019 (0.041)	0.024 (0.002)	0.015 (0.001)	0.009 [0.008]
Employment growth: all workers	0.021 (0.039)	0.014 (0.003)	0.028 (0.001)	-0.014 [0.000]
Employment growth: wage workers	0.020 (0.029)	0.017 (0.002)	0.023 (0.001)	-0.006 [0.002]
Employment growth: non-wage workers	0.001 (0.017)	-0.003 (0.002)	0.005 (0.001)	-0.008 [0.000]
C. Predetermined county characteristics				
High school or below	0.507 (0.085)	0.508 (0.018)	0.506 (0.029)	0.001 [0.921]
Per capita GRDP (log)	-2.216 (1.573)	-2.272 (0.307)	-2.165 (0.371)	-0.107 [0.590]
Population (log)	13.869 (1.593)	13.780 (0.368)	13.950 (0.556)	-0.170 [0.485]
Female population	0.500 (0.008)	0.501 (0.001)	0.499 (0.002)	0.001 [0.237]
Age group 40-59	0.319 (0.020)	0.323 (0.002)	0.315 (0.002)	0.007 [0.001]
Age group 60+	0.163 (0.057)	0.171 (0.005)	0.156 (0.004)	0.016 [0.000]
Share of workers in manufacturing	0.101 (0.052)	0.101 (0.006)	0.101 (0.008)	0.000 [0.998]
Average hourly wage (log)	9.378 (0.129)	9.365 (0.026)	9.389 (0.040)	-0.024 [0.139]
N =	1,449	724	725	

Note: Standard deviations are presented in parentheses. The average population size during the sample period is used as weight. The p-values for the equality test are presented in brackets in column (4).

gives more bargaining power to workers. Our results are robust to alternative ways of handling non-compliance workers.

Table 3 shows the summary statistics of county-level aggregate variables that we used in our empirical analysis. During the sample period, the minimum wage in the real value of 2010 increased on average 4.2% per year. As a result, the fraction of bound workers is on average 1.9% with the standard deviation of 1.5. The minimum

is 0%, and the maximum is 11%. The fraction of bound workers is 0% in 2009 because the minimum wage growth rate was lower than the inflation rate. In columns (2) and (3), we divide the sample by the median value of the fraction of bound workers into high-and low-impact samples. The average fraction of bound workers is 3.2% in the high-impact sample and 0.8% in the low-impact sample.

The average employment growth rate during the sample period is 2.1%. When we divide the sample by the fraction of bound workers, we find that the employment growth rate is lower in the high-impact sample (1.4%) compared with 2.8% in the low-impact sample. If the fraction of bound workers is random, then we can use the statistics here and obtain an Wald-type estimate of the effect on the employment growth rate, which is $(2.8-1.4)/(0.8-3.2) = -0.54$. Given that a 1% increase of the minimum wage increases the fraction of bound workers by 0.42 percentage point (Appendix B), the implied elasticity of employment with respect to the minimum wage is -0.2.

Table 3 also reports means and standard deviations of control variables; the share of workers with high school graduation or lower, per capita GRDP (in log), population (in log), the share of female population, the shares of the population by age groups and the share of workers in manufacturing sectors. We construct these control variables using the Census data except the population for which we use the administrative resident registration data. In the last column (4), we compute the difference between high-and low-impact samples for each variable and test its mean equality. The p -values are presented in brackets. We find that counties in the high-impact sample have lower average wages than those in the low-impact sample. This is not surprising because the fraction of bound workers tends to be negatively correlated with the average wage. We also find that high-impact counties have more older workers. On the other hand, the high-and low-impact samples are not different in terms of the other characteristics, such as education, GRDP, population, female share, and industrial composition.

IV. Effects on Job Growth and Flows

4.1. Estimation Model

Using the county-level panel data that we have constructed in the previous section, we estimate the average effect of the minimum wage on job growth. Our baseline regression model is as follows:

$$\Delta L_{ct} = \beta_1 \text{Bound}_{c,t-1} + \beta_2 (\text{Bound}_{c,t-1})^2 + X_{c,t-1} \gamma + \alpha_c + \tau_t + \varepsilon_{ct} \quad (1)$$

where ΔL_{ct} is the FTE job growth rate of county c from year $(t-1)$ to t . The exact definition of the dependent variable is as follows:

$$\Delta L_{ct} = \frac{L_{ct} - L_{c,t-1}}{(L_{ct} + L_{c,t-1}) / 2} \quad (2)$$

where L_{ct} is the number of FTE jobs in county c in year t . The numerator is the difference in the number of jobs between two years and the denominator is the average number of jobs (Davis et al., 1998; Asquith et al., 2019).

The key explanatory variable, $Bound_{c,t-1}$ (the fraction of bound workers), is included in the quadratic form. While the functional form is determined empirically, two theoretical reasons can rationalize the quadratic specification.¹⁹ First, as Lee (1999) and Autor et al. (2016) pointed out, the quadratic form is “to capture the idea that a change in the minimum wage is likely to have more impact on the wage distribution where it is more binding” (Autor et al., 2016). Further, Harasztosi and Lindner (2019) argue that a linear relationship between the minimum wage and employment is not consistent with imperfect competition or monopsony where a small increase of the minimum wage would have a small negative or even positive effect on employment but a larger increase beyond a certain point should start decreasing employment. We believe that this argument is applicable to the job growth rate.

Second, contrary to the first reason, one may think that a minimum wage increase beyond a certain threshold may have little extra effect on employment. This might be because there might be a certain limit to employment adjustment, especially within a local labor market where a minimum level of labor demand exists at least in the short run. This is probably because there are essential goods and services (necessities) whose demand is inelastic. Alternatively, it makes sense that the labor adjustment costs could be convex, so non-compliance could be a rational choice after a certain threshold (Basu et al., 2010; Soundararajan, 2019).²⁰

Whether the employment effect is convex or concave or whether any non-linear effect exists remains an empirical question. The answer to this question depends upon various factors such as labor market structure and institutions. For robustness, in addition to the quadratic form, we try a more parsimonious specification by using an indicator for whether the fraction of bound workers is higher than the sample median ($Impact_{c,t-1}$), which we use to divide the sample in Table 3, and check our

¹⁹ We also tried the cubic and quartic specifications but found that the cubic and quartic terms have negligible effects on the results.

²⁰ Given that we can define the non-compliance rate as the share of workers below the minimum wage, we can test whether the non-compliance rate increases after a certain level of the minimum wage growth. Please see Appendix D.

results.²¹

Vector $X_{c,t-1}$ includes a set of control variables: log population, lower-education (high school or below) population share, female share, population shares by age groups (younger than 40, 40-59, and 60+), the share of manufacturing plants, and log GRDP (province level). We lag all the variables by one year, predetermined at year $(t-1)$, which is the same year we define the fraction of bound workers. Given that counties are different in population size, observations are weighted by population in the previous year.²² And robust standard errors are obtained by clustering at the county level. Last, α_c and τ_t are county-and year-specific fixed effects, respectively. We check the robustness of our results by allowing county-specific linear trends, which is a common practice in the difference-in-differences literature.²³

After we estimate the effect of the minimum wage on the net job growth rate for all workers, we estimate the effect on wage workers (W) and that on non-wage workers (S), separately.

$$\Delta L_{ct} = \frac{W_{ct} + S_{ct} - W_{c,t-1} - S_{ct}}{(L_{ct} + L_{c,t-1}) / 2} = \frac{W_{ct} - W_{c,t-1}}{(L_{ct} + L_{c,t-1}) / 2} + \frac{S_{ct} - S_{c,t-1}}{(L_{ct} + L_{c,t-1}) / 2} \quad (3)$$

Given that $L = W + S$, the sum of the effects on wage and non-wage workers should be the same as the total effect on all workers. Therefore, we can calculate the contribution of non-wage (or wage) workers on the total effect.

4.2. Results on Job Growth

Table 4 summarizes regression results. Column (1) shows the results using a linear specification. Next, we present the results from the main model in columns (2)-(4). Columns (1) and (2) present the results after controlling for only county and year fixed effects. We add more control variables in columns (3) and (4). Column (3) controls for county-level predetermined characteristics. Column (4)

²¹ One limitation of our main specification is that it estimates only the contemporaneous effect of the minimum wage. However, the effect may take time to appear. In particular, the impact on business closing would not be immediate. However, the dynamic effect of the minimum wage for Korea is difficult to estimate because the minimum wage is revised every year.

²² Using different weights such as the average population during the sample period or the number of workers does not change our main results. Also as Solon et al. (2015) suggested, we compare the results with those with no weight and find that the results have minimal change.

²³ Given that the dependent variable is the net job growth rate, controlling for county fixed effects is equivalent to controlling for county-specific linear trends in the equation where the dependent variable is the level of employment. Meer and West (2016) point out that when the effect of the minimum wage is occurring dynamically over several periods, controlling for jurisdiction linear trends may attenuate the treatment effect.

additionally controls for county-specific linear trends.²⁴

For the sake of space-saving, in columns (2) to (4), we present only the estimates for the effect evaluated at the sample mean fraction of bound workers. We take the case of no minimum wage increase as the benchmark, $Bound = 0$. In other words, we compare the net job growth rate at the mean fraction of bound workers with that when there is no minimum wage increase, $\hat{\beta}_1 \overline{Bound} + \hat{\beta}_2 \overline{Bound}^2$ where \overline{Bound} is the sample mean of the fraction of bound workers.²⁵ We also present the results using the alternative measure of the minimum wage's impact ($Impact_{c,t-1}$) as defined in the previous subsection. Panel A presents the results for all workers. Panel B and C present the results for wage and non-wage workers, respectively.

We find that the estimates from the linear model are small and statistically insignificant. However, the results from our main model for all workers in Panel A show that there is a negative effect on the net job growth. The magnitude of the effect is not small. According to our estimates in Panel A, the average fraction of bound workers leads to a decrease of the net job growth rate by about 1.6-1.9%p.

The results change little from column (2) to (3) after including county-level characteristics such as age and education composition of the population and local macroeconomic condition. This suggests that the fraction of bound workers is not correlated with those county variables. It turns out that the estimates do not change much even without year and county fixed effects. This means that our key explanatory (treatment) variable is “random on the observable” and further, considering that our set of control variables is rich, it is less likely that there is selection on the unobservable. Furthermore, column (4) shows that the results are robust to controlling for county-specific linear trends.

We restrict the sample period to 2010-2011 and run the same regression for all workers. Remember in Figure 2, in the two years, the real minimum wage did not increase or increased little. As seen in Figure 3, there are still some variations in the fraction of bound workers across counties and over time within counties. However, if any, the effects of the minimum wage are expected to be small. In this sense, this analysis using the restricted sample can work as a placebo test. In fact, we find no significant effect. Evaluated at the average fraction of bound workers, the effect is estimated to be -0.5%p and statistically not different from zero. If we evaluate the effect at a higher fraction of bound workers, the estimate becomes even positive although not significant.

²⁴ As explained before, the use of county fixed effects (in columns (1) to (3)) and county-specific linear trends (in column (4)) are equivalent to controlling for the county-specific first-and second-order polynomial time trends of the number of FTE jobs, respectively. These time controls would at least partially control for some confounding effects of local business cycles.

²⁵ We find that the effect is concave, i.e., a minimum wage increase beyond a certain threshold may have little extra effect on employment. One possible explanation is that non-compliance is higher when the minimum wage growth is too fast. See Appendix D for more details.

[Table 4] Effects of the Minimum Wage on Job Growth of Wage and Non-wage Workers

	(1)	(2)	(3)	(4)
	Linear	Specification		Quadratic
		Quadratic	Quadratic	Quadratic
A. All workers				
Fraction of bound workers	-0.0870 (0.2148)	-0.0163 (0.0053)	-0.0163 (0.0055)	-0.0185 (0.0065)
<i>MW elasticity</i>	-0.3654	-0.3881	-0.3881	-0.4405
High impact		-0.0115 (0.0047)	-0.0120 (0.0052)	-0.0169 (0.0074)
B. Wage workers				
Fraction of bound workers	-0.0692 (0.176)	-0.0114 (0.0041)	-0.0118 (0.0042)	-0.0136 (0.0049)
<i>Relative to own group</i>	-0.0959	-0.0158	-0.0163	-0.0188
High impact		-0.0079 (0.0031)	-0.0085 (0.0035)	-0.0122 (0.0052)
<i>Relative to own group</i>		-0.0109	-0.0118	-0.0169
C. Non-wage workers				
Fraction of bound workers	-0.0178 (0.0874)	-0.0048 (0.0025)	-0.0045 (0.0026)	-0.0049 (0.0030)
<i>Relative to own group</i>	-0.0641	-0.0173	-0.0162	-0.0177
High impact		-0.0036 (0.0021)	-0.0035 (0.0022)	-0.0046 (0.0029)
<i>Relative to own group</i>		-0.0130	-0.0126	-0.0166

Note: Column (1) and (2) presents the results after controlling for county and year fixed effects only. Column (3) additionally controls for county-level predetermined characteristics. Column (4) controls for county-specific linear trends. In all regressions from column (1) to (4), we weighted each observation by county-level population in the previous year. The estimates for ‘Fraction of bound workers’ in the first row of each panel show the effects evaluated at the sample average fraction of bound workers from the quadratic specification in equation (1). The estimates of β_1 and β_2 are presented in Appendix H. The estimates for ‘High impact’ represent the results using the dummy variable that indicates whether the fraction of bound workers is higher than the sample median. We show the within-group effect in the row labeled as “Relative to own group” by dividing the point estimate by the average employment share during our sample period. Robust standard errors, clustered at county level, are presented in parentheses.

In Panels B and C, we distinguish wage and non-wage workers. Since the relationship in equation (3) is an identity, in each column, the sum of the estimates in Panels B and C should be equal to that in Panel A. We find that the average minimum wage increase reduces the net job growth rate for wage workers by 1.1-1.4%p and that for non-wage workers by 0.5%p.²⁶ Therefore, the relative contribution of the effect on non-wage workers to the total effect is 26-29%, slightly

²⁶ In Appendix E, we present the results for the effect of the minimum wage on the average hourly wage.

larger than the share of non-wage workers in the labor force. The results are qualitatively the same when we use the alternative variable of the minimum wage's impact. We find that when the fraction of bound workers is higher than the median, the job growth rate drops by 1.1-1.7%p for all workers and by 0.8-1.2%p for wage workers. The remaining 0.3-0.5%p drop comes from non-wage workers. The relative contribution of the effect on non-wage workers is 27-31%.

Note that the estimates for non-wage workers are smaller than those for wage workers. This is mainly because there are more wage workers among all workers. To exclude the effect of the group size, we calculate the effect relative to the own group. Specifically, we assume that the share of wage workers is constant, i.e., not affected by the minimum wage, and divide the estimate for wage workers by the share. Similarly, we also calculated the effect relative to the own group for non-wage workers. The results are presented in Panels B and C. It turns out that the size-adjusted effects are not different between wage and non-wage workers. For wage workers, the effect is -0.016 to -0.019 while it is -0.016 to -0.018 for non-wage workers.

In Table 3, we also calculate the elasticity of employment with respect to the minimum wage. Given that the fraction of bound workers is almost linearly related to the minimum wage growth rate, the average fraction of bound workers is associated with the average real minimum wage increase, 4.2%.²⁷ Therefore, we can assume that the decreases in the job growth rate presented in Table 3 are driven by the average minimum wage increase. Then, by the back of envelope calculation, the implied elasticity of employment with respect to the minimum wage is about -0.4 for all workers. This is larger than those found in the previous studies such as Neumark and Wascher (2008), Meer and West (2016), Cengiz et al. (2019), and Harasztsi and Lindner (2019). We want to point out that the estimated effect of the minimum wage is non-linear and so the implied elasticity also depends on where it is evaluated.

Note that our estimates might be biased because of some limitations of our data. For example, the Census does not cover some types of workers (e.g., truck drivers and door-to-door salespersons) or sectors. How this omission would bias our estimates is ambiguous. If the omitted workers are more vulnerable to a minimum wage increase, our estimates would be upwardly biased. However, if those workers who have lost their jobs after the minimum wage increase move to those establishments not covered by the Census, then our estimates should be downwardly biased.

The LALFS is a household survey covering workers in the informal sector who are not subject to the minimum wage laws. If the presence of informal workers

²⁷ In Appendix B, we show that the fraction of bound workers is linearly correlated with the minimum wage growth rate.

causes a classical measurement error in the variable of the fraction of bound workers, our estimates should be attenuated. Meanwhile, if there exists a non-classical measurement error, for example, if there are more informal workers in high-impact counties, then our estimates should be upwardly biased.

4.3. Decomposition into Job Flows

We decompose the effect on the net job growth into the effects on the extensive and intensive margins (Davis et al., 1998; Haltiwanger et al., 2013). As mentioned in the introduction, we conjecture that the employment effect of the minimum wage on non-wage workers appears more distinctly on the extensive margin in the form of firm entry-and-exit dynamics. The reason is that non-wage workers are mostly business owners and unpaid family workers who work in small businesses. Hence, a substantial part of employment dynamics should be driven by the corresponding firm dynamics. By decomposing the total effect into the effects on the intensive and extensive margins, we expect to find the effect on non-wage workers more clearly and also find that it is different from the adjustment margin of labor for wage workers.

The net job growth rate, ΔL_{ct} in equation (1), can be decomposed into the four channels of labor adjustment; job creation by continuers (*expansion*, E_{ct}), job destruction by continuers (*contraction*, C_{ct}), job creation by new entrants (*entry*, B_{ct}), and job destruction by exiters (*exit*, D_{ct}):

$$\Delta L_{ct} = \frac{(E_{ct} - C_{ct}) + (B_{ct} - D_{ct})}{(L_{ct} + L_{c,t-1})/2} = (e_{ct} - c_{ct}) + (b_{ct} - d_{ct}) \quad (4)$$

where e_{ct} is the job creation rate by continuers, c_{ct} the job destruction rate by continuers, b_{ct} is the job creation rate by entrants, and d_{ct} the job destruction rate by exiters. Then the job change rate on the intensive margin is the gap between e_{ct} and c_{ct} , and the job change rate on the extensive margin is the gap between b_{ct} and d_{ct} .²⁸

To implement the decomposition of the total effect, we estimate equation (1) again using as the dependent variable each job flow variable of e_{ct} , c_{ct} , b_{ct} , and d_{ct} , one by one. Then, as we did before, we evaluate the effect on each job flow at the sample mean of the fraction of bound workers and denote it as β_e , β_c , β_b , and β_d , respectively. We have the following relationship: $\beta = (\beta_e - \beta_c) + (\beta_b - \beta_d)$.

²⁸ There are three subchannels in which continuers change their employment, by changing hiring, firing, or work hours of continuing workers. Given that we are not able to track individual workers in our data, we cannot distinguish these subchannels.

[Table 5] Decomposition Results

	(1) Total ($= \beta$)	(2) Intensive ($= \beta_e - \beta_c$)	(3) Extensive ($= \beta_b - \beta_d$)
A. All workers	-0.0163 (0.0055)	-0.0086 (0.0040)	-0.0077 (0.0042)
Contribution of each margin		52.8%	47.2%
Job creation		-0.0032	-0.0005
Job destruction		0.0054	0.0071
Share of job destruction		62.8%	93.4%
B. Wage workers	-0.0118 (0.0042)	-0.0070 (0.0033)	-0.0048 (0.0033)
Relative to own group	-0.0163	-0.0097	-0.0066
Contribution of each margin		59.3%	40.7%
Job creation		-0.0039	-0.0004
Job destruction		0.0031	0.0043
Share of job destruction		44.3%	91.5%
C. Non-wage workers	-0.0045 (0.0026)	-0.0016 (0.0020)	-0.0029 (0.0012)
Relative to own group	-0.0162	-0.0058	-0.0105
Contribution of each margin		35.6%	64.4%
Job creation		-0.0004	-0.0001
Job destruction		0.0012	0.0027
Share of job destruction		75.0%	96.4%

Note: All estimates in Table 5 are from separate regressions. In column (1), we present the total net employment effect by worker types; all, wage, and non-wage workers. Through column (2) and (3), we show the decomposition results at the intensive and extensive margins. The intensive-margin effect can be decomposed into expansion (job creation) and destruction (job destruction). The extensive-margin effect can be decomposed into entry (job creation) and exit (job destruction). We show the within-group effect in the row labeled as “Relative to own group” by dividing the point estimate by the average employment share during our sample period. In all regressions, we use county-specific fixed effects, year fixed effects, and a set of county-level control variables. The population size in the previous year was used as weights. Robust standard errors, clustered at counties, are in parentheses.

The decomposition results are presented in Table 5. Similar to Table 4, we present the results for all workers (Panel A) and for wage and non-wage workers, respectively (Panels B and C). Column (1) shows the total effects, which are our baseline-model results in column (2) in Table 4. The total effect is decomposed into the effects on the intensive and extensive margins in columns (2) and (3), respectively. Then, for each margin, we present the results after we further decompose the effect into job creation (expansion and entry) and destruction

(contraction and exit). Using our notations in the previous section, the estimate for job creation is $\beta_c + \beta_b$ and that for job destruction is $\beta_c + \beta_d$. The intensive-margin effect is $\beta_c - \beta_e$, while the extensive-margin effect is $\beta_b - \beta_d$.

In Table 5, for all workers, we find that the intensive and extensive margins are almost equally important. The contribution of the intensive margin is 52.8% of the total effect. Of the intensive margin adjustment, 62.8% comes from job destruction and the remaining 37.2% from a decrease of job creation. Meanwhile, the extensive-margin change is nearly all (93%) explained by job destruction via the exits of establishments.²⁹

The most important finding in Table 5 for the purpose of our paper is that the relative importance of the intensive and extensive margins is different for wage and non-wage workers. In Panel B, we find that 59% of the total effect on wage workers occurs on the intensive margin. This is in contrast with the result for non-wage workers that the extensive margin effect accounts for 64% of the total effect. That is, the extensive margin is relatively more important for non-wage workers. Last, for both intensive and extensive margins, the channels of job destruction are predominantly important.³⁰

The large contribution of extensive-margin adjustment by the exits of establishments for non-wage workers is not surprising given the fact that self-employed workers typically work in financially marginal establishments whose turnover rates are high. Most of non-wage workers are business owners, so their disemployment means their businesses close too.

V. Heterogeneity by Industry

So far, we have established the empirical evidence that a minimum wage increase negatively affects the job growth of non-wage workers. Then, why are non-wage workers affected by the minimum wage? In fact, this question is odd because it is theoretically hard to believe that non-wage workers are not affected, given that they are not separate from wage workers in the labor market.³¹ Non-wage workers are

²⁹ Note that the employment effect can be driven by a change in working hours of existing workers or by a change in the number of jobs. Appendix F presents the results when we use the latter as the outcome variable.

³⁰ Another intriguing difference between wage and non-wage workers is that the effect on job creation in the intensive margin is quite important for wage workers. That is, minimum wage increases depress continuers' expansion for wage workers. The same channel is not so important for non-wage workers.

³¹ The labor markets for wage and non-wage workers are not separable. The data from the Korean Longitudinal Income Panel Study (KLIPS) show that in job-to-job transitions between two consecutive years, about 7% of the self-employed become wage workers while 3% of wage workers become non-wage workers.

affected by a minimum wage increase even if they are exempted from the minimum wage law, because their firms are affected by the cost increase due to the minimum wage increase in both labor (directly hired or outsourced) and materials. Moreover, as shown by Bai and Kim (2021), the minimum wage increase may induce non-wage workers to switch themselves to wage workers.³² This theoretical prediction implies that the employment effect on non-wage workers should be heterogeneous; the effect is likely to be larger for marginal workers in marginal firms. That is, the effect is likely to be larger for those in financially weak firms because those firms are more vulnerable to the cost shock from the minimum wage increase. Moreover, the effect should be larger for those non-wage workers whose income is as low as what they could earn from working as wage workers at the minimum wage.

In this paper, we chose to investigate heterogeneity by industry. The reason we chose industry as a major source of heterogeneity is that, as already seen in Table 2, firms and workers are qualitatively different across industries.³³ Specifically, we focus on two industries, G (Wholesale and Retail Trade) and I (Accommodation and Food Service Activities), since in the two industries not only the share of small establishments but also the share of low-skilled workers are high. Therefore, we expect that the effect on non-wage workers should be larger for these two industries.³⁴

We also separately examine manufacturing (C) because manufacturing is a representative tradable sector where the output demand is more elastic and so it is difficult for firms to pass a cost increase to consumers (Cengiz et al., 2019; Harasztosi and Lindner, 2019; Gopalan et al., 2021). This is especially true for manufacturing in Korea; the share of manufacturing trade in GDP is 70% in 2015, by far greater than 18% in the United States and 25.2% in Japan. But in manufacturing, establishments are on average large and workers are more skilled relative to those in the service sector. Therefore, we expect that the effect of the minimum wage on non-wage workers should be relatively small while that on wage workers can be large.

³² Bai and Kim (2021) find that a minimum wage increase can cause owners to become wage workers (especially, non-regular and temporary workers). This supports our hypothesis that an increase in minimum wage can affect non-wage workers.

³³ Many recent studies have found that the effect of the minimum wage is heterogeneous not only cross-sectionally across local labor markets, different firms, and demographic groups of workers but also over time depending on business cycle (Sabia, 2014). Also see Okudaria, Takizawa, and Yamanouchi (2019), Wang, Phillips, and Su (2019), and Oka and Yamada (2019).

³⁴ The results are quite robust to alternative classifications such as including N (Business Facilities Management and Business Support Services; Rental and Leasing Activities), R (Arts, Sports and Recreation Related Services), or S (Membership Organizations, Repair, and Other Personal Services). For N, the share of small establishments is not high but that of low-skilled workers is high. On the other hand, for R and S, the share of small establishments is pretty high but workers are not as low skilled as those in G and I. The share of small establishments is high in L (Real Estate Activities) but workers in the industry are licensed.

[Table 6] Heterogeneous Effects by Industry

	(1)	(2)	(3)
	G and I	Besides G and I	
		All	Manufacturing
A. Wage workers	-0.0039 (0.0020)	-0.0079 (0.0034)	-0.0053 (0.0022)
Share of workers	19.3%	80.7%	26.0%
Share of the effect	33.1%	66.9%	44.9%
B. Non-wage workers	-0.0031 (0.0015)	-0.0013 (0.0019)	-0.0007 (0.0006)
Share of workers	51.5%	48.5%	7.8%
Share of the effect	70.5%	29.5%	15.9%

Note: All regressions include county fixed effects, year fixed effects, and a set of county-level control variables. The population size in the previous year is used as weight. Robust standard errors, clustered at counties, are in parentheses. G and I refer to “Wholesale and retail trade” and “Accommodation and food service activities,” respectively.

We present the results on heterogeneity by industry in Table 6. Overall, we find that the results are consistent with the prediction that the minimum wage affects non-wage workers through the channel of its impact on the opportunity cost of working as non-wage workers. Panel B of Table 6 shows the results for non-wage workers. We find that the effect on non-wage workers is concentrated in industries G and I, which we expect are vulnerable to a minimum wage increase. Non-wage workers in the two industries contribute to 71% of the total effect on all non-wage workers, while they account for about 51% of all non-wage workers.

On the other hand, we find that the effects in the industries except for G and I are statistically insignificant and smaller in size than the effect in G and I. Even when we separately look at non-wage workers in the manufacturing sector, it turns out that the effect is statistically insignificant and small although they seem to be more sensitive to a minimum wage increase than others except for G and I.

Panel A presents the results for wage workers. We find that the results are quite different from those for non-wage workers. It turns out that the effect of the minimum wage is large and significant on wage workers in manufacturing. On the other hand, the effect on wage workers in G and I is not small but not statistically significant. Wage workers in manufacturing contribute to 45% of the effect on all wage workers, while they are only 26% of all wage workers.³⁵

³⁵ We present the results on heterogeneity by establishment size in Appendix G.

VI. Conclusions

In this study, we provide empirical evidence that non-wage workers are affected by the minimum wage, although they are not subject to the wage floor policy. We find that ignoring non-wage workers may lead to significantly underestimating the effect of the minimum wage on employment. We find that non-wage workers account for 27.6% of the effect for all workers, which is close to the average share of non-wage workers, 27.4%. We also find that the effect on non-wage workers occurs mainly via business closing, and the effect is larger in those industries where establishments are smaller and workers are unskilled.

Our findings have a few implications for the literature on the minimum wage. First, given that non-wage workers are affected by the minimum wage, estimating the effect of the minimum wage only for wage workers could underestimate the employment effect on the whole labor force. Such a bias should be more severe for countries where the self-employment rate is high.

Second, our findings imply that the labor markets for wage and non-wage workers are closely associated. Since an increase in the minimum wage affects the labor costs of firms owned by the self-employed, the exits of those firms should destroy not only the jobs of non-wage workers but also those wage workers who are hired by non-wage workers. Moreover, the minimum wage influences the outside option for non-wage workers in the labor market. An increase of the minimum wage could push non-wage workers, especially those at the margin, to wage workers.

Third, in line with the growing literature on the heterogeneous effects of the minimum wage, our findings highlight the importance of gathering more evidence from different countries and labor markets with various institutional backgrounds. The effect of the minimum wage and its mechanisms should differ not only quantitatively but also qualitatively, depending on various factors such as labor market institutions, industrial structure, and firm size distribution. More research using international data is warranted.

A Data: Census on Establishments

The Census on Establishments is annually conducted by Statistics Korea. It covers all establishments except family-owned farms, as long as they have physical business locations. The data contain information on about 4 million establishments per year. Given that unique establishment identifier is provided, we can track individual establishments and distinguish continuers, new entrants, and exiters. Table A1 presents the number of establishments in the three categories in each year and the corresponding number of workers.

[Table A1] Number of Establishments and Workers in the Census Data

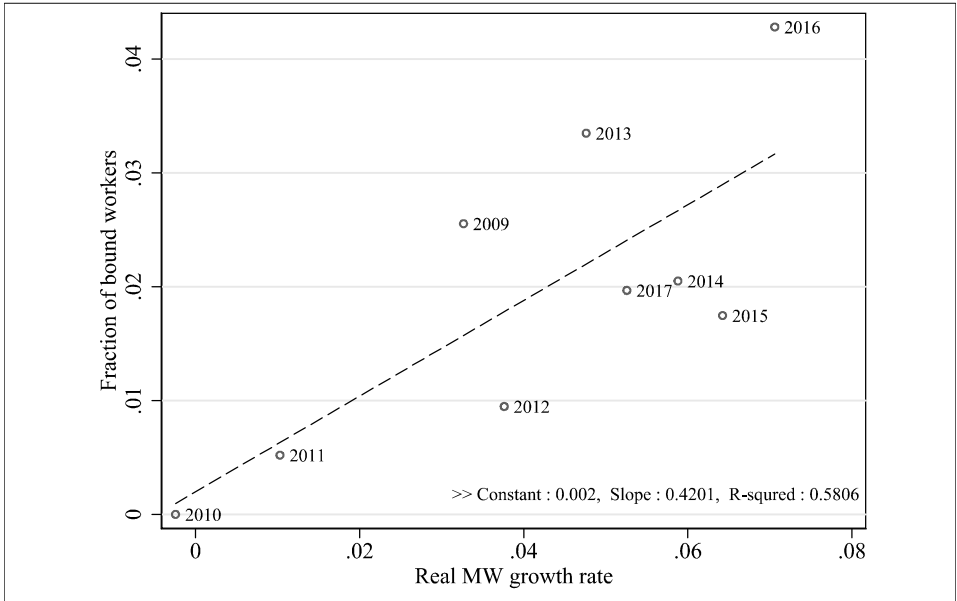
	Continuers		New Entrants		Exiters	
	Establishments	Workers	Establishments	Workers	Establishments	Workers
2008	2,646	13,029	594	2,609	523	2,134
2009	2,626	13,576	486	3,322	614	2,183
2010	2,626	13,966	709	2,957	486	2,045
2011	2,904	14,990	545	2,401	431	1,784
2012	2,853	15,237	727	2,617	596	2,208
2013	2,986	15,620	668	2,825	594	2,185
2014	2,963	16,081	824	3,074	691	2,328
2015	3,076	17,133	771	2,895	712	2,496
2016	3,317	18,120	605	2,330	530	2,077
2017	3,346	18,240	643	2,552	575	2,196

Note: The number of establishments and workers. The unit is 1,000 for both establishments and workers.

B Minimum Wage Growth and the Fraction of Bound Workers

The effect of a minimum wage increase on the fraction of bound workers is almost linear. Figure B1 is the scatter diagram of the minimum wage growth rate and the fraction of bound workers in 2009-2018. The horizontal axis represents the minimum wage growth rate each year and the vertical axis the average fraction of bound workers in the corresponding year. Not surprisingly, the more the minimum wage increases, the more workers are bound by the increase. In this graph, the slope is 0.42, meaning that a one-percentage point increase in the minimum wage growth rate increases the fraction of bound workers by 0.42 percentage points.

[Figure B1] Minimum Wage Growth and the Fraction of Bound Workers



Note: The dotted line is the linear regression line. The point estimates and R-squared are presented at the bottom of the graph.

C Measurement Issues

C.1 Reference Week of the LALFS

One of the concerns regarding the use of LALFS data is that the reference week of the survey frequently changed during the sample period (Table C1). To minimize any that may arise due to the changes in the timing of survey, such as seasonality in employment, we have selected surveys which were conducted at a similar period within a year. In 2008 and 2009, the LALFS was annual survey and conducted in October. For the rest of the years, we have selected the reference week that is closest to October. One exception is 2011, when the LALFS was conducted quarterly, we have selected the fourth quarter (12/12-12/19) because Chuseok (a major holidays in Korea, similar to Thanksgiving) was included in the reference week of the third quarter survey (9/12-9/19).

[Table C1] Reference Weeks of Selected Data

Year	Period	Reference week	Holidays (Chuseok)
2008	Year	10/12-10/19	
2009	Year	10/11-10/18	
2010	Quarter	9/12-9/19	
2011	Quarter	12/12-12/19	9/11-9/13
2012	Quarter	9/12-9/19	
2013	Half-year	10/15-10/21	
2014	Half-year	10/12-10/18	
2015	Half-year	10/11-10/17	
2016	Half-year	10/09-10/15	
2017	Half-year	10/15-10/21	

C.2 Accuracy of Hourly Wage Measure

We compare the quality of hourly wage information from the LALFS with that from the Survey of Labor Conditions by Employment Type (SLCET). The SLCET is the survey of establishments conducted by the MOEL and collects payroll records. The data provide monthly earnings and monthly hours. Given that they are taken directly from payroll records, measurement errors should be minimal among available datasets (See Lee and Lee (2016) for more detail about the SLCET).

As explained in the paper, the LALFS data provide only average earnings in the last three months and weekly work hours in the previous week. Therefore, we have to calculate the hourly wage by dividing monthly earnings by weekly work hours $\times 4.3$. However, non-regular and temporary workers tend to have irregular earnings and working hours. Hence, our measure of the hourly wage is likely to have measurement errors. For the SLCET, we calculate hourly wages by dividing monthly earnings (regular pay) by monthly work hours (non-overtime regular hours).

Table C2 presents the fraction of bound workers and the share of workers below the minimum wage computed from the LALFS and SLCET. While we obtain very different results for the fraction of below-MW workers between the two datasets (correlation coefficient is 0.117), it turns out that they are highly consistent for the fraction of bound workers, which is our main variable. The correlation coefficient is 0.9. Given the high quality of the SLCET, this relieves our concern about measurement errors with our hourly wage measure from the LALFS.

[Table C2] Comparison between LALFS and SLCET

Years	Bound Workers		Below MW	
	LALFS	SLCET	LALFS	SLCET
2008	0.026	0.009	0.085	0.059
2009	0.000	0.000	0.101	0.070
2010	0.005	0.003	0.094	0.065
2011	0.009	0.011	0.082	0.049
2012	0.033	0.013	0.076	0.028
2013	0.021	0.025	0.095	0.026
2014	0.017	0.022	0.100	0.032
2015	0.043	0.034	0.102	0.040
2016	0.020	0.023	0.113	0.051
2017	0.068	0.072	0.109	0.040
Correlation	0.900		0.117	

Note: We compare LALFS and SLCET data in terms of the fraction of bound workers and the share of workers below the minimum wage during our sample period, 2008-2017. SLCET contains wage information from payroll records.

C.3 Comparison with the MWC’s Measure

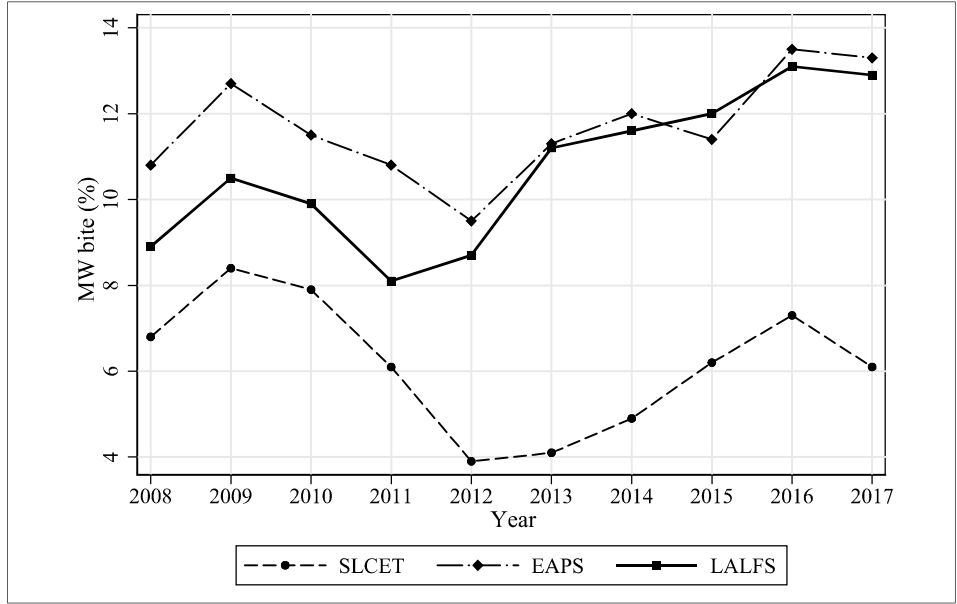
Every year the Minimum Wage Council (MWC) calculates and publishes the official statistics on the fraction of bound workers. We find that there are substantial discrepancies between the official statistics and our statistics. However, this is not surprising. First, the MWC’s definition of bound workers is different from ours: the official statistics include all of those workers below the next year’s minimum wage, while we exclude those who are paid below the current year’s minimum wage. Given the fraction of workers paid less than the prevailing minimum wage is estimated to be pretty high in the EAPS data, which the MWC uses, it is not surprising to find big discrepancies between the official statistics and those computed in our data.

Second, the exact calculation for the official statistics is complicated because of the limited availability of data at the time that the committee is held. To predict the fraction of bound workers for year $(t+1)$, they use the EAPS data from $(t-1)$, which is the latest available at year t when they decide the minimum wage for year $(t+1)$. Hence, using the data at $(t-1)$, they predict the distribution of hourly wages at year t according to their prediction about the average wage growth rate. Meanwhile, we use the realized distribution of hourly wage at year t to calculate the fraction of workers bound by the minimum wage at $(t+1)$.

The following graph (Figure C1) compares three datasets, the LALFS, EAPS, and SLCET, using the same definition of the fraction of bound workers and the same formula. It is notable that the trends in three datasets are quite consistent in terms of changes but different in terms of levels. The trends in the LALFS and

EAPS look quite similar. This suggests that the discrepancies between the official statistics and the statistics we presented in the paper are mainly due to differences in the timing of the data and the formula. By contrast, the fraction of bound workers obtained from the SLCET is lower.

[Figure C1] Fraction of Bound Workers in LALFS, EAPS, and SLCET

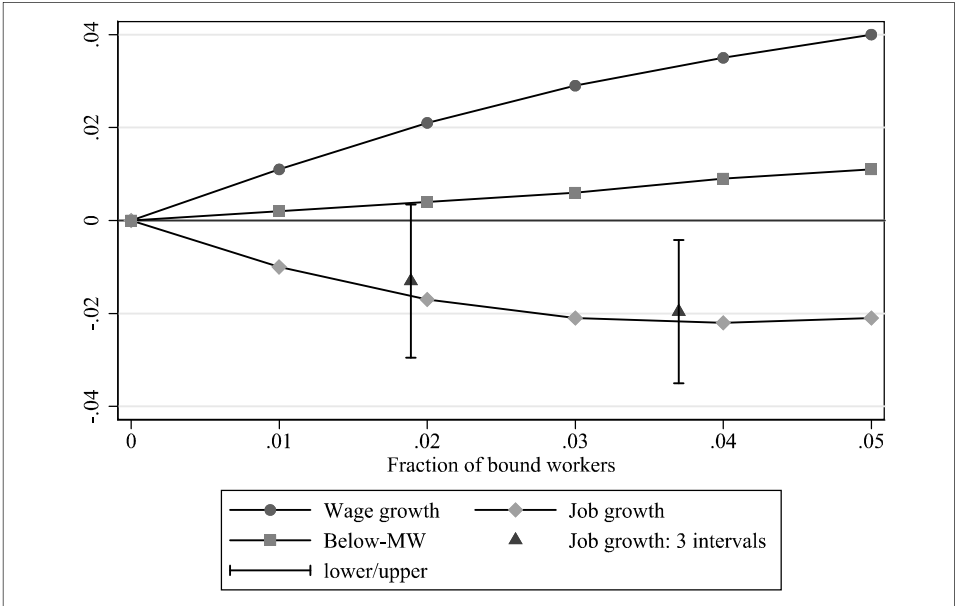


Note: The figure presents the trends of the fraction of bound workers computed from different datasets: SLCET, EAPS and LALFS. Bound workers are defined as those who are paid more than or equal to the current minimum wage but less than the next year's. The statistics presented here are different from the official statistics. The official statistics released by the MWC include those workers who are paid less than the current minimum wage.

D Quadratic Specification

We use the quadratic specification for the fraction of bound workers as our main specification. The quadratic specification is motivated empirically. Figure D1 shows the results from estimating the same equation as (1) non-parametrically, by using tertile dummies instead of the quadratic specification. The results show that the quadratic specification would fit our data well.

[Figure D1] Effects on Job and Wage Growth and the Share of Workers below MW



Note: The figure shows how the estimates for the effect of the fraction of bound workers (y-axis) vary over the distribution of the fraction of bound workers (x-axis). The estimates for wage growth are presented by circles. The estimates for the job growth rate are presented by diamonds. The estimates from a non-parametric specification using tertile dummies are presented by triangles with confidence intervals. The estimates for the effect on the share of below-MW workers, a proxy for the non-compliance rate, are presented by squares.

The results show that the minimum wage’s impact is not increasing after a certain threshold and even slightly decreasing in our data. As mentioned in the paper, there might be two reasons. First, this might be because the minimum wage is already high in Korea and there might be a certain limit to employment adjustment within a local labor market in the short run. Note that we can estimate only the one-year effect of a minimum wage increase because the minimum wage changes every year. Another possibility is endogenous non-compliance. If the minimum wage is increased too much or too fast, it may be optimal not to comply with it and, instead, take a risk of getting caught and paying the penalty. This is the main prediction of the standard economics of crime theory (Becker, 1968; Basu et al., 2010; Soundararajan, 2019). The explanation seems plausible in the Korean labor market where the share of below-MW workers is pretty high. As we discussed before, some part of below-MW workers are just misclassified due to measurement errors in earnings and work hours. But it is reasonable to assume that a significant part of them are actually paid below the minimum wage and their employers do not comply with the minimum wage law, given that many firms that employ low-wage workers are financially vulnerable and almost at the borderline between the formal

and informal sectors. To check if our finding of the diminishing impact of the minimum wage is driven by non-compliance, we run the same regression as equation (1) after replacing the dependent variable with the share of below-MW workers.

[Table D1] Regression Results on Job and Wage Growth by Percentile of Fraction of Bound Workers

	(1) 25%	(2) 50%	(3) 75%	(4) 95%
A. Net job growth	-0.0075*** (0.0026)	-0.0151*** (0.0051)	-0.0203*** (0.0067)	-0.0211*** (0.0082)
R-squared	0.4026	0.4026	0.4026	0.4026
B. Below-MW workers	0.0015 (0.0010)	0.0037* (0.0022)	0.0060** (0.0031)	0.0105*** (0.0041)
R-squared	0.7958	0.7958	0.7958	0.7958

Note: We present the estimates for the minimum wage’s impact evaluated at the selected percentiles (25%, 50%, 75%, 95% percentiles in columns (1) to (4)) from the distribution of the fraction of bound workers. In Panel A, the dependent variable is the net job growth as in Table 4. In Panel B, the share of workers under the minimum wage (below-MW workers) is the dependent variable. Through column (1) to (4), the effect is increasing at a diminishing rate in Panel A, while it is increasing at an increasing rate in Panel B. Robust standard errors, clustered at counties, are in parentheses. *** represents significance at the 1% level; ** at 5% level, and * at the 10% level.

The results are presented in Table D1. As before, after we estimate β_1 and β_2 in our main specification (the coefficients for linear and quadratic terms), we evaluate the estimated effect at a certain fraction of bound workers. Specifically, to check the shape of the quadratic function, in Table D1, we evaluate the effect at 25%, 50%, 75%, and 95% over the distribution of the fraction of bound workers (the 5 percentile is zero). The first row presents the effects on the employment growth rate and the second row the effects on the non-compliance rate. We find that the negative effect on employment is increasing in the absolute term but at a diminishing rate, as the fraction of bound workers increases. On the other hand, the positive effect on non-compliance is increasing. Endogenous non-compliance might be a reason why the employment effect in the absolute value is increasing at a decreasing rate.

E Effects on Hourly Wages

The effect of a minimum wage increase on hourly wage is estimated by using the same equation as (1) after replacing the dependent variable with the hourly wage

growth. The results are presented in Table E1.

[Table E1] Effect on Wage Growth

	(1)	(2)	(3)
Fraction of bound workers	1.3459** (0.5441)	1.1946** (0.5470)	1.1386* (0.6612)
Fraction of bound workers squared	-8.1183 (6.3436)	-7.7456 (6.5066)	-6.6232 (7.8926)
Effect evaluated at			
25%	0.0095** (0.0037)	0.0084** (0.0037)	0.0081* (0.0045)
50%	0.0208*** (0.0076)	0.0183** (0.0076)	0.0176* (0.0092)
75%	0.0314*** (0.0107)	0.0275*** (0.0106)	0.0268** (0.0128)
95%	0.0459*** (0.0132)	0.0395*** (0.0128)	0.0394** (0.0156)

Note: Column (1) presents the results after controlling for county and year fixed effects only. Column (2) controls for county-level predetermined characteristics. Column (3) additionally controls for county-specific linear trends. In each column, in the bottom panel, we show how the estimates change in accordance with the fraction of bound workers. Refer to Figure C1 for a graphical description. In all regressions from column (1) to (3), we weight each observation by county-level population in the previous year. Robust standard errors, clustered at counties, are in parentheses. *** represents significance at the 1% level; ** at 5% level, and * at the 10% level.

The results show that a higher fraction of bound workers increases the wage growth rate. Interestingly, we find a non-linear relationship with the wage growth, which seems to correspond to the non-linear relationship with the job growth in Figure C1. We also plot the results in Figure C1, together with those for job growth and non-compliance. The results are consistent with the explanation that minimum wage increases beyond a threshold induce non-compliance, so slowing down the wage growth and alleviating the negative effect on the job growth.

F Effects on the Number of Jobs

In the paper, we use FTE jobs as our main dependent variable. The employment growth can be driven by a change in working hours or a change in the number jobs. We re-estimated our main model with the growth of jobs as the dependent variable. Table F1 presents the results.

[Table F1] Decomposition Results: Effects on the Number of Jobs

	(1) Total	(2) Intensive	(3) Extensive
A. All workers			
Net job growth	-0.0074* (0.0043)	-0.0009 (0.0032)	-0.0065 (0.0042)
Job creation		-0.0005 (0.0025)	-0.0001 (0.0029)
Job destruction		0.0004 (0.0018)	0.0064** (0.003)
B. Wage workers			
Net job growth	-0.0060 (0.0037)	-0.0021 (0.0029)	-0.0038 (0.0033)
Job creation		-0.0019 (0.0022)	0.0002 (0.0025)
Job destruction		0.0002 (0.0015)	0.0040 (0.0027)
C. Non-wage workers			
Net job growth	-0.0014 (0.0016)	0.0012 (0.0012)	-0.0027** (0.0011)
Job creation		0.0004 (0.0008)	-0.0003 (0.001)
Job destruction		0.0008 (0.0008)	0.0023*** (0.0007)

Note: All estimates are from separate regressions. In column (1), we present the total net employment effect by worker type: all, wage, and non-wage workers. In column (2) and (3), we show the decomposition results at the intensive and extensive margins. The intensive-margin effect can be decomposed into expansion (job creation) and destruction (job destruction). The extensive-margin effect can be decomposed into entry (job creation) and exit (job destruction). In all regressions, we use county-specific fixed effects, year fixed effects, and a set of county-level control variables. The population size in the previous year was used as weights. Robust standard errors, clustered at counties, are in parentheses. *** represents significance at the 1% level; ** at 5% level, and * at the 10% level.

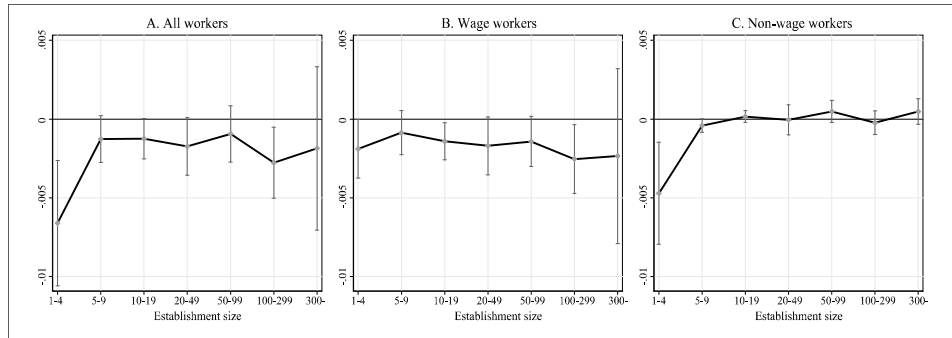
We find that the total effect is negative but only marginally significant. For all workers, the intensive-margin effect is small and not significant. This is perhaps because surviving firms replace full-time workers with part-timers. Then, we do not observe a decrease in employment at the intensive margin. The extensive-margin effect accounts for most of the total effect, and it is driven by job destruction. Dividing wage and non-wage workers, the effect on wage workers is large and accounts for most of the total effect. As we found in the paper, the extensive-margin effect on non-wage workers, especially job destruction, is statistically significant.

G Heterogeneity by Establishment Size

In the paper, we focused on industry as the main source of heterogeneity in the effect of the minimum wage. In this appendix, we examine heterogeneity by establishment size. It is well known that employment dynamics of job creation and destruction are fundamentally different by establishment size (Neumark et al., 2011; Moscarini and Postel-Vinay, 2012). For small establishments, job changes in the extensive margin through entry and exit of establishments are the major contributors for job creation and destruction, while changes in the intensive margin by new hires and layoffs are those for large establishments. Along with heterogeneity in employment dynamics between small and large establishments, small establishments are more vulnerable to economic shocks because small establishments are less productive and face financial constraints (Haltiwanger et al., 2013). Therefore, we expect that a labor cost shock due to a minimum wage increase should affect small establishments more severely. Furthermore, the effect may be more observable in the job flow along the extensive margin.

To allow the effect of the minimum wage to vary by establishment size, we distinguish establishments by their size based on the headcount of workers into seven groups as follows; 1-4, 5-9, 10-19, 20-49, 50-99, 100-299, and 300 or more. Note that this size classification is much finer than the convention in the industrial organization literature. This detailed distinction is feasible because our data are large enough to cover the universe of establishments.

[Figure G1] Heterogeneity by Size



Note: The figure shows the effect of minimum wage increase on net job creation by establishment size for each type of workers. Vertical lines indicate the 90% confidence intervals. The sum of all point estimates over sizes in each graph should be equal to the total effect for each type of workers.

We summarize the estimates for the effect on the job growth for each size in Figure G1. Three graphs are used for all workers, wage workers, and self-employed workers, respectively. For all workers, we find that the effect of the minimum wage

on the job growth is negative for all sizes, while some are statistically significant, whereas others are not. By construction, the sum of the estimates over sizes should be the same as the estimate for the total effect (-0.0163 in Column (2) in Table 4 in the main text). Therefore, the graph shows that the relative contribution is the largest for small establishments with fewer than five workers. The second largest contribution comes from establishments with 100-299 workers.

When we distinguish wage and self-employed workers, we find that the effect on wage workers is negative for all sizes. The effect is actually slightly larger for large establishments with 100 or more workers. Meanwhile, the effect on self-employed workers is exclusively concentrated in small establishments with fewer than five workers. This is consistent with the fact that we pointed out in Section 2; small establishments by the self-employed are vulnerable to a cost shock. They may respond to the shock by reducing workers and their work hours (unpaid family workers or the self-employed themselves). However, given their financial marginality and limitation to substituting capital for labor, some of them should choose to shut down.

The significance of the extensive margin adjustment is due to a disproportionate share of small establishments in self-employed businesses. In Korea, entry and exit account for more than 70% of job creation and destruction of small firms (Cho et al., 2017), while both expansion (hires) and contraction (layoffs) account for more than 70% for large firms (with 300 workers or more). Hurst and Pugsley (2011) show that most small businesses (defined as fewer than 20 workers) are substantially different from entrepreneurs in employment dynamics. Roughly about 80% of small (surviving) businesses in the United States neither increase nor decrease their employment even over three-year periods. In a similar vein, Haltiwanger et al. (2013) also shows that entering new businesses are a major source of job growth in the United States. Consistently, almost 60% of economy-wide job reallocation in Korea is also accounted for by the extensive margin mainly because of more than 40% of workers in Korea being employed at small self-employed businesses.

Large establishments may absorb a cost shock by postponing new hiring, replacing labor with capital, or substituting between skilled and unskilled labor. However, small firms might be limited in rearranging their production or adopting new technologies. This is perhaps because technologies that small firms use are already mature with little room for innovation or because they face a liquidity constraint, which limits their investment in new technologies (Chava et al., 2019). Also, they might have a difficulty in cutting working hours because of the relatively large fixed cost of labor. Therefore, a more realistic option for them would be to shut down and exit the market. Theoretically, a putty-clay approach initially studied by Johansen (1959) models the inflexibility of small firms' input adjustment. Based on the approach, Sorkin (2015) shows that the adverse effect of the minimum wage may increase the exits of small firms.

H Full Results

[Table H1] Full Results of Column (2) to (4) in Table 4

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	All workers			Wage workers			Non-wage workers		
Fraction of bound workers	-1.1175*** (0.3826)	-1.1182*** (0.3944)	-1.2389*** (0.4672)	-0.7814*** (0.2794)	-0.8029*** (0.2888)	-0.8955*** (0.3366)	-0.3362* (0.1845)	-0.3153* (0.1860)	-0.3434 (0.2164)
Fraction of bound workers ²	14.3153*** (6.5337)	14.1012*** (6.7434)	14.5524* (7.9578)	9.8928*** (4.1790)	9.8813*** (4.3491)	9.9616* (5.1293)	4.4226 (3.0664)	4.2199 (3.1207)	4.5908 (3.6248)
log(population)		0.0207 (0.0430)	0.1720 (0.1801)		0.0355 (0.0363)	0.1242 (0.1569)		-0.0147 (0.0145)	0.0477 (0.0709)
% of the low educated		-0.0527 (0.0522)	-0.0484 (0.0671)		-0.0304 (0.0393)	-0.0197 (0.0519)		-0.0223 (0.0219)	-0.0286 (0.0289)
% of female workers		0.5262 (0.9744)	4.1356* (2.4418)		0.4292 (0.9181)	4.0060* (2.1455)		0.0970 (0.2255)	0.1296 (0.9515)
% of the 40-50 aged		0.0530 (0.2204)	0.6848 (1.2216)		0.2045 (0.1882)	1.0613 (1.0957)		-0.1515** (0.0757)	-0.3764 (0.3904)
% of the aged more than 60		0.4524 (0.3614)	1.9579* (1.0706)		0.4793 (0.3033)	1.8320** (0.8790)		-0.0269 (0.1120)	0.1259 (0.4470)
GRDP per capita		0.0278 (0.0293)	-0.0366 (0.0520)		0.0298 (0.0280)	-0.0226 (0.0565)		-0.0020 (0.0111)	-0.0140 (0.0285)
% of manufacturing plants		-0.1871 (0.1825)	-0.3434 (0.5338)		-0.3247** (0.1522)	-0.7744 (0.5074)		0.1375** (0.0639)	0.4310** (0.1675)

Constant	0.0136** (0.0057)	-0.5008 (0.7555)	4.9709 (8.6095)	0.0239*** (0.0048)	-0.6876 (0.6702)	4.9415 (7.8216)	-0.0104*** (0.0025)	0.1868 (0.2392)	0.0293 (3.0955)
Linear combination									
coef	-0.0163*** (0.0053)	-0.0163*** (0.0055)	-0.0185*** (0.0065)	-0.0114*** (0.0041)	-0.0118*** (0.0042)	-0.0136*** (0.0049)	-0.0048* (0.0025)	-0.0045* (0.0026)	-0.0049 (0.0030)
(se)									
County FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional controls		Yes	Yes		Yes	Yes	Yes	Yes	Yes
County-specific trend			Yes			Yes			Yes
Adj. R-squared	0.4010	0.4026	0.3736	0.2726	0.2758	0.2457	0.3492	0.3497	0.2981
Obs.	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449	1,449

Note: The full results of Table 4 are presented. Columns (1), (4), and (7) present the results using county and year fixed effects for each type of workers (all, wage, and self-employed workers). Columns (2), (5), and (8) control for county-level predetermined characteristics. Columns (3), (6), and (9) additionally control for county-specific linear trends. In all regressions, we weight each observation by county-level population in the previous year. The estimate for 'Fraction of bound workers' in the first row of each panel in Table 4 corresponds to the coefficient in the bottom panel labeled as 'Linear combination.' Robust standard errors, clustered at counties, are in parentheses. *** represents significance at the 1% level, ** at 5% level, and * at the 10% level.

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최저임금이 비임금 근로자에 미치는 영향*

전 현 배** · 이 정 민*** · 신 동 한****

초 록 비임금 근로자들은 비록 직접적으로는 최저임금법의 적용대상이 아니지만 임금 근로자와 비임금 근로자의 노동시장이 서로 분리되어 있지 않기 때문에 최저임금 인상에 영향을 받을 수 있다. 본 논문은 우리나라의 사업체 전수의 10년 패널데이터를 구축하고 이를 이용하여 최저임금이 비임금 근로자의 고용에 미치는 영향을 살펴보았다. 분석 결과, 최저임금이 오르면 비임금 근로자의 고용증가에 부정적인 영향을 미치며, 부정적 영향의 가장 중요한 경로는 사업체 폐쇄를 통한 일자리 파괴라는 사실을 발견했다. 특히 부정적 영향은 소상공인과 저숙련 근로자가 집중되어 있는 업종에서 크게 나타났다.

핵심 주제어: 최저임금, 비임금 근로자, 자영업자, 고용동학, 소상공인

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