

The Effect of the Minimum Wage on Working Hours and Wages by Industry¹

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1. Introduction

Nowadays, the need to alleviate inequality and polarization is increasing. The current administration has promulgated income-led growth as its main economic policy paradigm. It is designed to stimulate aggregate demand by promoting income growth for household and the self-employed. It is based on wage-led growth.

The minimum wage is a very important policy tool for the incumbent government's economic policy. The minimum wage has sharply risen since the current government came to power; the minimum wage grew by 16.4 percent in 2018 and 10.9 percent in 2019. After the global financial crisis, the growth rate of the minimum wage in 2018 was the largest yet recorded, and the first instance of consecutive years of double-digit growth. In addition, the issue of the minimum wage level and its growth rate has typically attracted much public attention owing

to the fact that it has direct implications for worker's wages.

In Korea, the minimum wage was historically decided by the Minimum Wage Commission (MWC) annually on August 5, after reviewing workers' living costs, comparable workers' wages, labor productivity, the income distribution ratio and other variables. The MWC comprises three representative groups: Worker Councilors, Employer Commissioners and Public Interest Commissioners, and each group consists of nine persons.

Nowadays, most of the minimum wage is decided by a vote on the minimum wage level proposed by the Public Interest Commissioner. It is difficult to reach agreement with the Workers' and Employers' councils on the minimum wage level because they have diametrically opposed views of the minimum wage's effects on the economy and labor markets. It is worth noting that extensive studies of the minimum

¹ The article draws on Korea Institute for Industrial Economics and Trade Research Report 2019-911, *An Analysis of the Spillover Effects of Labor Market Institutions in Industry* (in Korean), by Youngmin and Sungwook Lee.

wage's effects on the economy and labor markets do not show the same results. Some papers show the minimum wage has positive effects on reducing wage inequality and employment, while the other papers find that the minimum wage has a negative effect on employment and non-significant effect on alleviating wage inequality.

After a review of previous studies, we began to wonder whether the minimum wage has different effects in different industries given that wage levels, employment structure, productivity and labor and capital intensity differs by industry. It is a very important issue because the Employer Council insists that the minimum wage be classified by industry or firm size, based on Article 4 of the Minimum Wage Act.

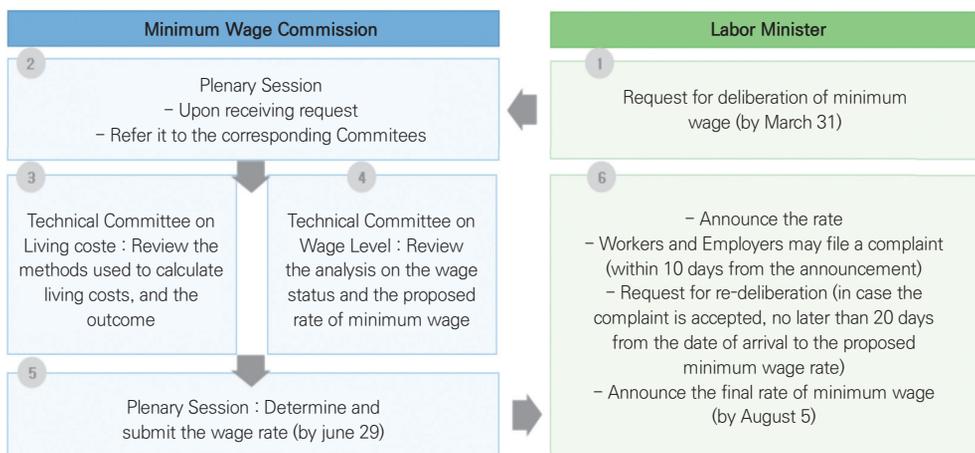
With these considerations in mind, in this paper I estimate the effects of the minimum wage on wages and working hours by industry and suggest some policy implications.

2. Minimum Wage System in Korea

The purpose of the Minimum Wage Act is to stabilize employees' lives and to improve the quality of the labor force by guaranteeing a certain minimum level of wages to employees, thereby contributing to the sound development of the national economy (Minimum Wage Act Article 1). The Minimum Wage Act was enacted in 1986 and covered manufacturing firms with 10 employees or more. Coverage eventually expanded to what it is today, and the Minimum Wage Deliberation Council has renamed the Minimum Wage Council in 2000.

The coverage of the minimum wage influences all business or workplaces with one employee or more save for those whose ability to work lags due to physical or mental disabilities, so long as their exclusion from the coverage is permitted by the Minister of Employment and Labor. An employer that fails to comply with

Figure 1. Process of Minimum Wage Deliberation and Determination



Source: Minimum Wage Council (<http://www.minimumwage.go.kr>).

the obligation to pay at the least minimum wage shall be punished by imprisonment of up to three years and/or a fine not exceeding 20 million KRW. Failing to comply with the obligation to inform employees of the minimum wage shall be punished by a fine not exceeding one million KRW.

The system of the minimum wage is illustrated in Figure 1.

The process of minimum wage deliberation and determination begins with a request from the Minister of Employment and Labor to the MWC for deliberation of the minimum wage by March 31. The MWC then considers some of the indicators mentioned previously for 90 days. After deliberation, the MWC determines and submits wage rates by June 29. When the Minister of Employment and Labor announces the minimum wage rate, the Workers and Employers Councils file any complaints within 10 days from the announcement. If the complaint is accepted, the MWC should re-determine the minimum wage rate within 20 days. When the Workers and Employers Councils exhaust their petitions, the Labor Minister announces the minimum wage rate by August 5, which applies for the following year.

The wage, for the purpose of calculating minimum wage rates, is defined in Figure 2.

In 2019 government suggested improvements to the minimum wage system to expedite the Worker and Employer Councils' efforts to reach agreement. These suggestions are as follows. First, the MWC is divided into a Range-Setting Committee and a Determination Committee. Second, minimum wage-fixing criteria are to be added and refined in order to ensure a more balanced consideration of workers' livelihoods, the labor market and economic conditions.

Reviewing the current minimum wage, the rate was 8,590 KRW per hour in 2020, reflecting 2.9 percent increase over the previous year. The rate of annual increase of the minimum wage had remained stable at six to eight percent in the years after 2008, though it grew by just 2.8 percent in 2010 owing to the fallout from the global financial crisis. The minimum wage jumped by 16.4 percent in 2018 and 10.9 percent in 2019. The rate of increase 2018 is the largest on record and the consecutive years of double-digit growth were also a first in the time since the global financial crisis. The number of minimum-wage workers steadily increased in 2019 and decreased in 2020. After peaking at 25

Figure 2. Calculating Minimum Wage Rates

Wage for the purpose of Calculating minimum wage rate	=	Wage as define in the Labor Standards Act	-	Wage elements not counted for calculating minimum wage rates (①+②+③)
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Source: Minimum Wage Council (<http://www.minimumwage.go.kr/eng/sub04.html>).

Note: ① Payments other than regular disbursements made at least once every month ② Payments other than those made for the given number of working hours or working days ③ Other payments for which inclusion in wage elements is not appropriate.

Table 1. Minimum Wage Rates by Year

Unit: Korean won, %, thousand persons

	hourly minimum wage rate (₩)	Increase (%)	no. of workers covered	no. of beneficiary workers	Influence rate (%)
2008	3,770	8.3	13,351	2,214	13.8
2009	4,000	6.1	15,882	2,085	13.1
2010	4,110	2.8	16,103	2,566	15.9
2011	4,320	5.1	16,479	2,336	14.2
2012	4,580	6.0	17,048	2,343	13.7
2013	4,860	6.1	17,510	2,582	14.7
2014	5,210	7.2	17,734	2,565	14.5
2015	5,580	7.1	18,240	2,668	14.6
2016	6,030	8.1	18,776	3,420	18.2
2017	6,470	7.3	19,312	3,366	17.4
2018	7,530	16.4	19,627	4,625	23.6
2019	8,350	10.9	20,006	5,005	25.0
2020	8,590	2.9	20,045	4,153	20.7

Source: Minimum Wage Council (<http://www.minimumwage.go.kr>).

Note: The influence rate is measured by the beneficiary workers divided by the covered wage workers.

percent of all workers in 2019, the proportion of workers receiving less than the minimum wage decreased to 20.7 percent of workers in 2020.

3. The Hourly Wage and Working Hours by Industry

The average hourly wage across all industries grew 17.5 percent, from 12,449 KRW in 2013 to 14,633 KRW in 2018. The average hourly wage in the manufacturing sector increased 20.3 percent, from 12,937 to 15,567 KRW from 2013 to 2018. The hourly wages of workers in electricity, gas, steam and air conditioning supply sector was highest, followed by workers in the financial and insurance activities sector and workers for extraterritorial organizations and

bodies. On the other hand, workers in the domestic services, accommodations and lodging and food service sectors recorded the lowest wages in 2018. The gap in average hourly wages between the highest and lowest-paid workers was 15,195 KRW.

The proportion of workers who earned below the minimum wage increased 1.1 percentage point, from 9.1 percent in 2013 and 10.2 percent in 2018 across all industries, but in the manufacturing sector the percentage of workers who earned below minimum wage declined from 5.4 percent to 5.2 percent in the same period. This means that the rate of increase in the minimum wage is faster than the rate of increase of hourly wages across all industries. The proportion of workers who received below the minimum wage the domestic services, accom-

Table 2. Basic Statistics by Industry

Industry	Hourly wage			Workers receiving below the minimum wage		
	2013	2018	Increase (%)	2013	2018	Increase (%)
Manufacturing	12,937	15,567	20.3	5.4	5.2	-0.2
Electricity, gas, steam and air conditioning supply	21,361	22,370	4.7	0.3	0.7	0.4
Water supply: sewage, waste management, materials recovery	12,325	14,262	15.7	2.2	4.1	1.9
Construction	12,163	14,687	20.8	4.3	5.3	0.9
Wholesale and retail trade	10,450	12,654	21.1	13.2	15.0	1.8
Transportation and storage	12,369	14,517	17.4	7.5	11.4	3.9
Accommodation and food service	6,957	8,769	26.1	29.1	35.1	6.0
Information and communication	16,526	18,492	11.9	2.0	3.3	1.3
Financial and insurance activities	17,948	20,109	12.0	1.6	3.2	1.6
Real estate activities	10,518	13,174	25.2	15.1	14.4	-0.7
Professional, scientific and technical activities	17,988	19,523	8.5	1.1	2.3	1.1
Business facilities management and business support; rental and leasing activities	9,011	11,581	28.5	15.8	12.4	-3.4
Public administration and defense; compulsory social security	15,764	17,350	10.1	5.8	5.3	-0.4
Education	15,013	17,211	14.6	4.6	6.3	1.7
Human health and social work activities	10,957	12,499	14.1	8.0	10.2	2.2
Arts, sports and recreation related services	10,000	11,916	19.2	15.4	18.6	3.2
Membership organizations, repair and other personal services	9,272	11,322	22.1	17.6	20.7	3.1
Domestic services	6,304	7,175	13.8	37.2	52.9	15.7
Activities of extraterritorial organizations and bodies	19,476	20,247	4.0	0.0	1.4	1.4
All industries	12,449	14,633	17.5	9.1	10.2	1.1

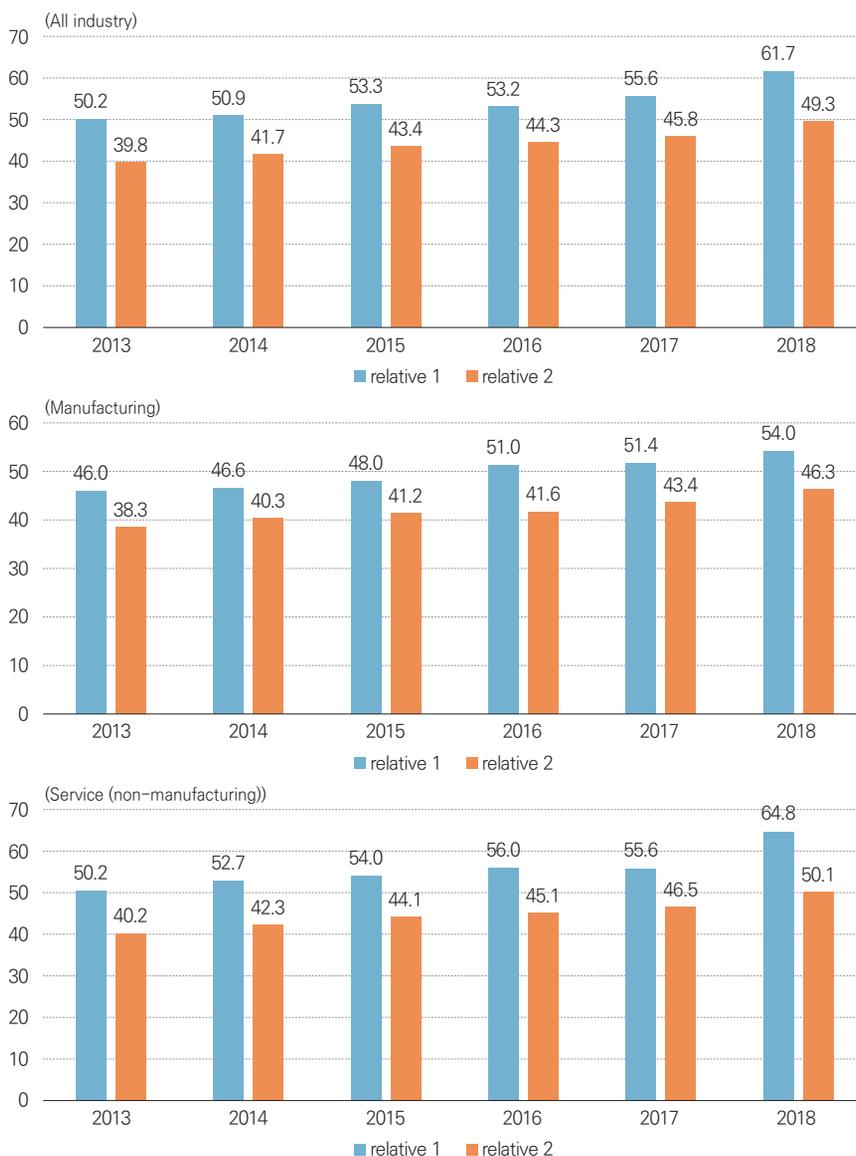
Source: Local Area Labor Force Survey (B-type).

modations and lodging and food service sectors is higher and grew faster than other industries in 2018. This means that the rate of wage increases in these industries is lower than in other industries.

The relative wages are shown in Figure 3. The relative wage is measured as the minimum wage divided by the median wage (relative 1) and the minimum wage divided by the average

wage (relative 2). The trend is of relative wages steadily increasing from 2013 to 2018. In particular, the relative wage increased in 2018 across all industries. Relative wages in the manufacturing sector are less volatile and lower than in the service sector. This suggests that wage distribution in the manufacturing sector is a concentrated mean, with average wages greater than in the service sector.

Figure 3. Relative Wages by Industry



Source: Local Area Labor Force Survey (B-type).

Note: Relative 1 is the minimum wage/median wage; relative 2 is the minimum wage/average wage.

4. The Minimum Wage's Effects on Wages and Working Hours by Industry

Extensive studies of the minimum wage's effects on the labor market and economy have pro-

duced contrasting results. Some papers show the minimum wage has positive effects on reducing wage inequality and employment, while other papers find that the minimum wage has a negative effect on employment and a non-sig-

nificant effect on alleviating wage inequality. A reviewing previous studies revealed the need for research on the varying effects of the minimum wage on sectoral wage levels, employment structure, productivity and labor/capital intensity. This is a critical issue important issue because the Employer Council insists that minimum wage be classified by industry or firm size based on Article 4 of the Minimum Wage Act.

This chapter describes the effects of the minimum wage on hourly wages and working hours by industry. As mentioned above, the extant literature exhibits contains contradictory results regarding the effects of a minimum wage on labor markets. The reasons for this vary; results depend on the estimation method employed, how minimum wages are measured and how the data is used. In particular, the measurement of minimum wages is an important issue because variation in minimum wage is only measured by year. If we use the just one, original value for a minimum wage, its variable would be replaced with year dummy. However in this case, with greater variations in the minimum wage, the minimum wage variable is defined as wage workers who earn below the minimum wage ($D=1 | wage_{it} < MW_t$).

To estimate the minimum wage effects on hourly wages and working hours by industry, we use the Local Area Labor Force Survey (B-type). To do this, we use the wage equation as follows:

$$Y_{it} = \alpha + \beta X_{it} + \theta MWD_{it} + \gamma year_t + \delta(MWD_{it} * year_t) + \varepsilon_{it}$$

The dependent variable Y_{it} is the natural logarithm of the real hourly wage and working hours. In the equation, control vectors (X_{it}) include age and its square, education level (less than high school, high school graduates, college graduates and university level or higher), job status (regular, temporary and daily workers), and household indicators and marital status. Three-digit codes for industry and occupation are included as dummies. In addition, to control for time, we include a year dummy. The independent variable MWD_{it} is a dummy defined as wage workers who earn below the minimum wage. So the minimum wage effects on wages and working hour by industry will show the coefficient of MWD_{it} . In addition, we include the interaction term (minimum wage multiplied by year) to estimate the effects of the minimum wage on workers who earn below the minimum wage by year. So if the coefficient (θ) is positive (negative), the minimum wage should exert positive (negative) effects on them.

Table 3 shows the results of the estimation by industry. The coefficient of MWD is positive and statistically significant in all columns regardless of industry, however, the magnitude of MWD is different by industry. The coefficient of MWD is -0.595 in all industries. It means that the rate of increase for the wages of workers who earn below the minimum wage is lower than that for workers who earn over the minimum wage. It was 59.5 percent in Column 1. In addition, the sign of the interaction term (MWD*2018) is positive and statistically signif-

Table 3. Results of Minimum Wage Effects on Industry

		All industries		Manufacturing		Service	
		(1)	(2)	(1)	(2)	(1)	(2)
Hourly wages	MWD	-0.595*** (0.001)	-0.646*** (0.003)	-0.556*** (0.004)	-0.597*** (0.009)	-0.599*** (0.002)	-0.653*** (0.004)
	MWD*2018		0.137*** (0.005)		0.114*** (0.013)		0.141*** (0.005)
work hour	MWD	0.126*** (0.001)	0.155*** (0.003)	0.114*** (0.002)	0.123*** (0.005)	0.130*** (0.001)	0.161*** (0.003)
	MWD*2018		-0.081*** (0.004)		-0.053*** (0.007)		-0.083*** (0.004)

Source: Local Area Labour Force Survey (B-type).

Note: 1) standard errors in parentheses.

2) *** is statistically significant at the 1% level.

3) For full analysis results, refer to Kim and Lee (2019).

icant in Column 2. This implies that the wage gap between sub-minimum wage workers and those that earn over the minimum wage narrows when the minimum wage is increased. Following this model, the gap was 64.6 percent in 2013 but just 50.9 percent (-0.646+0.137) across all industries. In addition, the coefficient of MWD and MWD*2018 is higher in the service sector than in manufacturing. In following our model, the gap was 59.7 percent in manufacturing and 65.3 percent in service, however the gap is decreased by 11.4 percentage points in manufacturing and 14.1 percentage points in service. We understand the results to mean that while the wage gap between sub-minimum wage workers and workers that earn over the minimum wage is greater in the service sector than in manufacturing, it decreases faster in the service sector than it does manufacturing. This may owe to the fact that the wages of workers earning below the minimum wage are more

distributed in the service sector than they are in the manufacturing sector, so the service industry is more sensitive to the effects of a minimum wage policy than the manufacturing industry.

The minimum wage effects on working hours are shown in the coefficient of MWD and the interaction term having the same sign and being statistically significant regardless of industry. The sign of MWD is positive and the sign of the interaction term (MWD*2018) is negative. This implies that the working hour of workers who earn below the minimum wage are longer than workers who earn over the minimum wage; however, the difference in working hours of sub-minimum wage workers and over-minimum wage workers narrows when the minimum wage increases. Following our model, the working hours of workers who earn below the minimum wage are longer by 12.6 percent across all industries, and longer by 11.4 percent in manufacturing and 13 percent in the service

sector. However, the gap decreased in 2018 by 0.81 percentage points across all industries, 0.053 percentage points in manufacturing and 0.083 percentage points in the service sector. It means that the working hour of workers earning below the minimum wage decrease relatively more than other workers when the minimum wage increases.

To summarize these estimations, the workers who earn below the minimum wage work for lower hourly wages and longer work hours than others, but increasing the minimum wage raised their hourly wages and reduced working hours. The minimum wage effects are more influenced in service than in manufacturing, because sub-minimum wage workers are more distributed in the service sector.

The minimum wage has different effects on wages and working hours both within and across industries, however it is difficult for these results to explain the broader effects the minimum wage has on industry. Given this, we need to find a method for explaining the general effects of the minimum wage on industry. To solve this problem, we could simulate monthly income by industry using the coefficient of

MWD and the interaction term in Table 3. The process of the simulation is as follows. First, it is assumed that wages and working hours for all workers than earn over the minimum wage are constant. Second, we suppose that the hourly wage is 1,000 KRW, a 40-hour workweek and 25 working days per month, as in 2013. In this case, monthly income would come to 1,000,000 KRW (1,000 KRW per hour times 40 hours per week times 25 workdays). With these assumptions, applying the minimum wage effect by industry in 2018, we can calculate monthly income using the coefficient of the interaction term in Table 3.

The results of the simulation are as follows.

Increasing the minimum wage led to higher monthly income regardless of industry, however the magnitude of the growth differs by industry. The simulation shows that the effects of an increase in the minimum are greater in manufacturing than in services. This carries crucial implications since the workers who earn below the minimum wage are more distributed in the service sector than in manufacturing, but the general effect of the minimum wage is greater in manufacturing than in services. The reasons

Table 4. Monthly Income Simulation Results

		Hourly wages (KRW)	Weekly working hours	No. of workdays	Monthly income (thousands)
2013	Base	1,000	40	25	1,000
2018	All industries	1,137	36.8	25	1,045
	Manufacturing	1,114	37.9	25	1,056
	Services	1,141	36.7	25	1,046

Note: The number of working days remains constant.

for this are more complicated, but I think that differences might owe to the fact that labor in manufacturing may possess greater bargaining power than labor in services due to the existence and strength of labor unions. Unions do not want to reduce working hours to protect income. It is also possible that it is more difficult to hire the workers in manufacturing than in services, so employers can not reduce working hours and sustain output even though wage costs increase due to increases in the minimum wage.

5. Conclusion and Implications

The minimum wage is a critical policy tool for the incumbent government's economic policy, because it has promulgated income-led growth as the main economic policy paradigm. It is designed to stimulate aggregate demand by promoting income growth for households and the self-employed. The minimum wage has sharply risen since the current government came to power. The minimum wage grew by 16.4 percent in 2018 and 10.9 percent in 2019. The issue of the minimum wage level and its growth has typically attracted much public attention owing to the fact that it has direct implications for workers' wages.

Although it is a very important issue, it is difficult for the Employers' and Workers' Councils to reach agreement owing to their diametrically-opposed views of the minimum wage's effects on the labor market and the economy as a whole, but also because the Employer Commis-

sioners want to classify the minimum wage by industry, firm size, and region based on Article 4 of the Minimum Wage Act.

Given these circumstances, we investigate the minimum wage's effects on wages and working hour by industry using data from the Local Area Labor Survey (B-type).

To summarize the results, workers who earned below the minimum wage have lower hourly wages and longer working hour than other workers, but increasing the minimum wage increased their hourly wages and reduced their working hours to a greater degree than it did for other groups. This was more clearly evident in the sector. In addition, we more generally that minimum wage to stimulates monthly income using the coefficient of the interaction term. Increasing the minimum wage led to higher monthly income regardless of industry, however the magnitude of that growth was greater in manufacturing than in services.

I would suggest the results of the analysis carrying the following policy implications. First, one of the stated goals of the minimum wage system is to protect low-wage workers and increase their incomes. However, a minimum wage has side effects due to industrial characteristics. As the results of the simulation of the general effects of a minimum wage illustrate, it has different effects by industry. Its effects are most clearly observable in the manufacturing sector, even though workers are more distributed across minimum wage levels in the service sector. It is therefore necessary to de-

vise measures to mitigate the side effects of a minimum wage. Second, in order to reduce social costs and foster an agreement on minimum wage levels between the Employers and Workers Councils, the optimal minimum wage system and how to create a formula for an optimal minimum wage level in Korea should be studied. Third, it is necessary to streamline the process of determining the minimum wage by simplifying the range of wages to be included. While Article 6 of the Minimum Wage Act does provide for a range of wages to be included in calculating the actual minimum wage, the current range of wages that could be legally defined as minimum wage is so vast that it is difficult to

determine in some cases if wages paid to employees are indeed in violation of the Minimum Wage Act or not. It is common for individuals to inquire on domestic portal sites as to whether or not their wages are in agreement with the law. For example, there was a debate over whether to national holiday allowances within the range of the minimum wage. Finally, it is necessary to revisit the kinds of criteria Public Interest Members review when deliberating. These include field/industry, firm and competitiveness. As our results make clear, the minimum wage has sectorally heterogeneous effects and thus it is important to understand how the firms react to increases in the minimum wage.

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