

The hike in minimum wage increased informal economy for men working in low wage sectors

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Executive Summary

The possible effects of minimum wage increase on informality are examined in this third and last research brief with econometric analysis. It is known that an increase in minimum wage will elevate especially low wages (minimum wage and below). Thus, a hike in minimum wage is expected to raise informality in low wage segments. Taking this expectation into account, we analyzed the changes in informality in sectors differentiated by the share of low wage workers, comparing pre- and post-minimum wage increase periods. Utilizing both descriptive graphics comparing how change in informality correlated with the share of low wage workers in a sector, and evidence based on econometric analysis, we concluded that the hike in minimum wage increased informality for men employed in low wage sectors. However, the increase in informality had occurred clearly during the first two quarters of 2016, then this effect attenuated.

Introduction

In the previous two research briefs, we examined the effects of high minimum wage increase in 2016 (from 1000 TL to 1300 TL) on informal employment (see Betam Research Brief 18/220 “Minimum wage affects formal employment negatively” and Betam Research Brief 18/222 “The effect of minimum wage hike on informality is concentrated on low-wage sectors”). The initial findings revealed positive effects.

In the research brief titled “Minimum wage affects formal employment negatively” we analyzed how the effects of minimum wage shock progressed within the framework of employment status (wage earners, employers, own account workers and unpaid family workers) over time. According to the findings, the increase in informal rate was more pronounced for the non-salaried workers (employers and own account workers). Moreover,

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we found that among non-salaried workers, the rate of informality which had decreased before the period of 2016, diverged from the general trend by increasing during the period of 2015-2016.

In the research brief titled “The effect of minimum wage hike on informal economy is concentrated on low-wage sectors” we analyzed the effects of minimum wage shock at sectoral level in order to further analyze the findings above. The wage distribution in each sector was used to evaluate the effect of minimum wage increase on informal employment. For this purpose, we calculated the ratio of low-paid employees (workers who earn around the minimum wage and below) at sectoral level. Our assumption was that the minimum wage increase would be more potent in the low wage sectors; moreover, informal employment would increase in comparison to other sectors. The initial findings demonstrated that the impact of increase in the minimum wage boosted the proportion of informal employment more, especially in sectors with low wage earners in the first two quarters of 2016. Lastly, we observed that the effect continued to spread evenly across all sectors starting from the last quarter of 2016.

In this research brief, we expanded on the previous briefs and tested the effects of minimum wage increase on low wage sectors compared to others using econometric methods and Household Labor Force Survey (HLFS) micro data. We examined the minimum wage effect on informal employment on the basis of gender in addition to sectoral analysis. The analyses using annual and quarterly HLFS data illustrated that the effect of minimum wage increase in informal employment was more likely to be found among men.

The reason behind this disparity is the gap between the educational levels of men and women (Appendix Table). It is known that in the Turkish labor market the number of low-wage workers among women is much lower than that of men since the education level is relatively higher for women compared to men. Thus, since women with no or little education join the workforce in fewer numbers, naturally the number of such female employees are lower than those of men, a situation encountered frequently in informality (Appendix Table). Taking all these factors into account, it is not surprising that the minimum wage increase does not affect the informality rate for women.

Why do we examine just wage-earners?

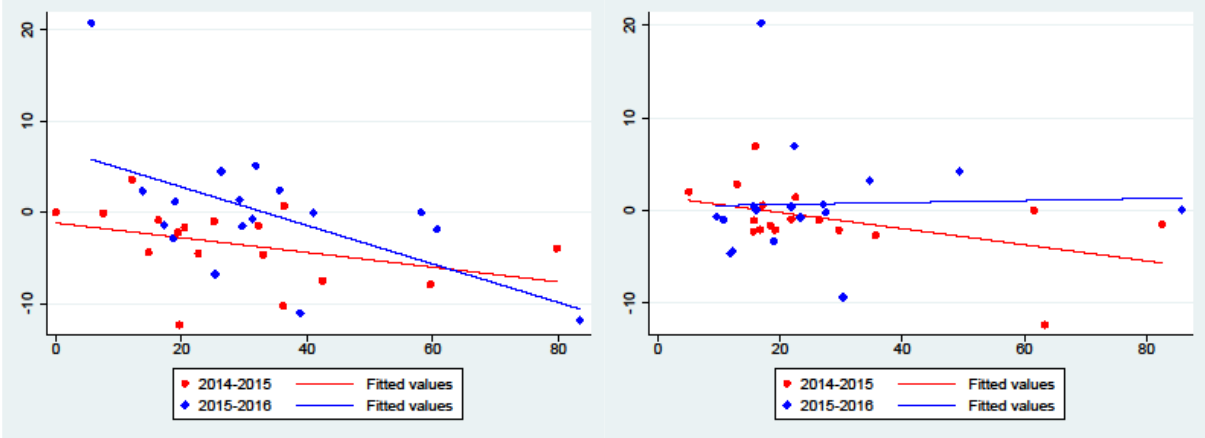
The findings in our previous briefs affirmed that the effect of informality increase was more penetrating among non-wage earners (employers and own account workers). We prefer to focus on only wage earners rather than all workers because of two reasons. Firstly, more than two thirds of all workers are wage earners (68 percent in 2016). Secondly, wage earners are directly affected from market regulations which modify the labor cost. Thus, we deal with only wage earners.

The effect of minimum wage increase on informal employment impacts men primarily

Figure 1 – Concerning the wage-earning women, the relationship between the changes in the proportion of informal employment and the proportion of those receiving low-wages during the 2014-2015 and 2015-2016 periods

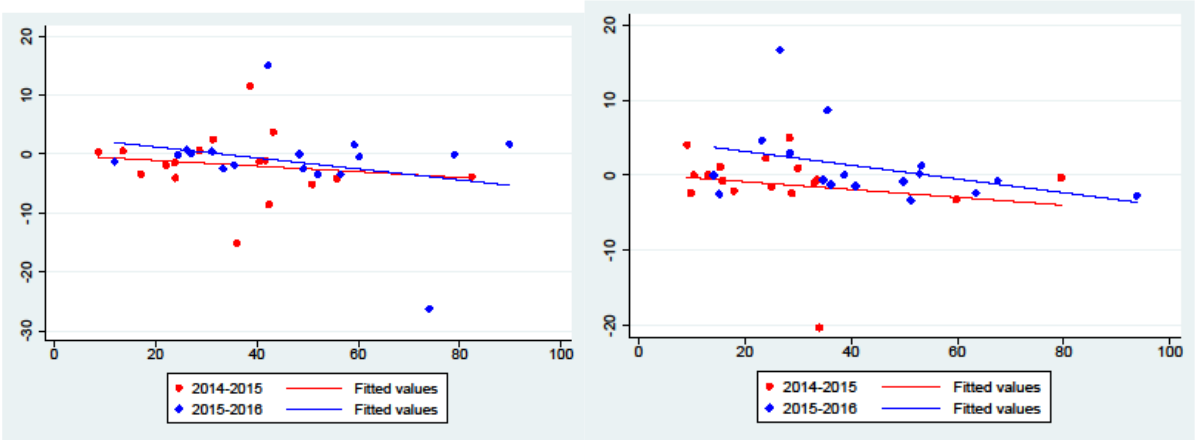
February

May



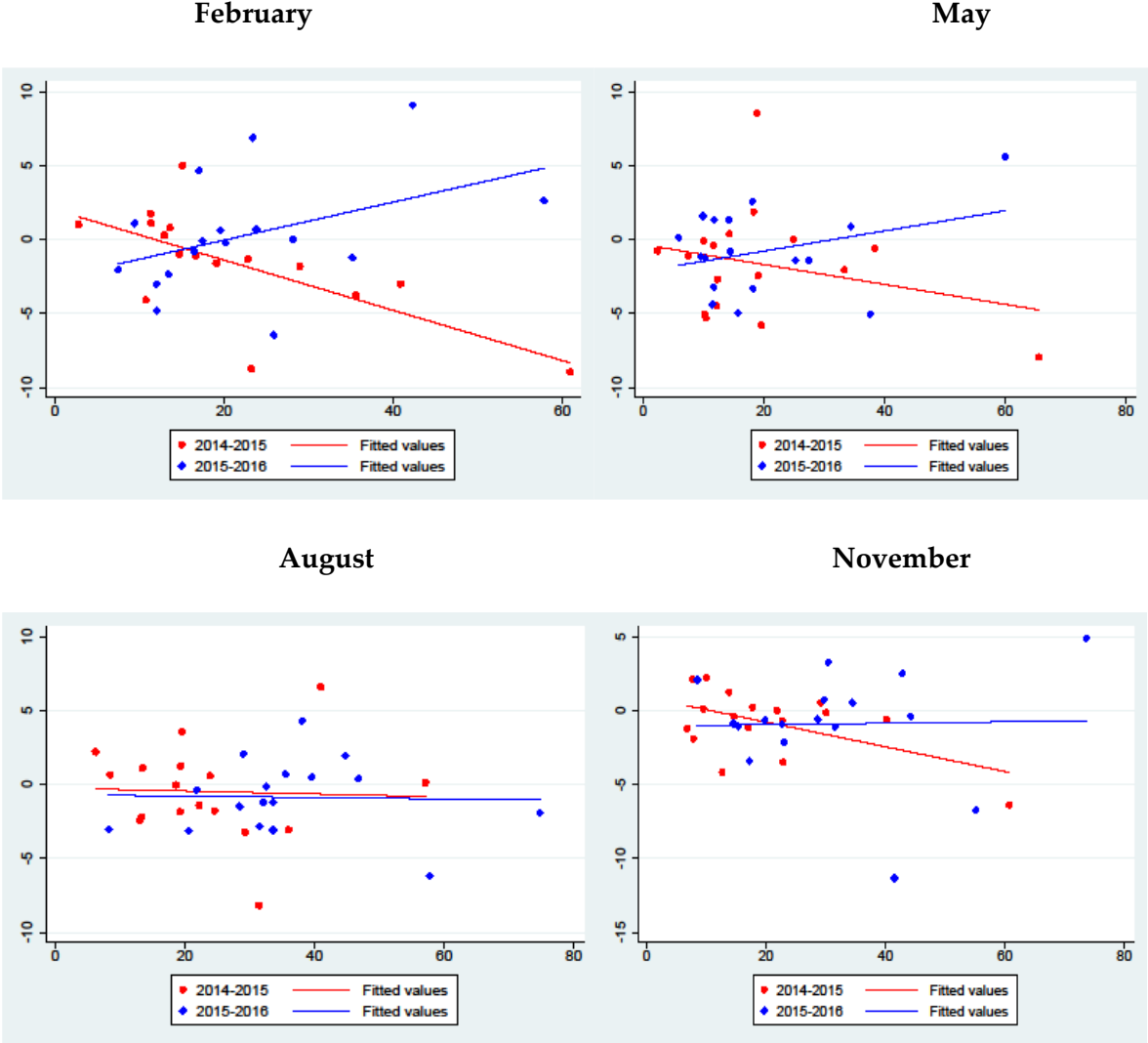
August

November



Source: Quarterly HLFS 2014-2016 micro data, Betam calculations. **Note 1:** The two charts at the top show the changes in the first and second quarter from left to right. **The two** charts at the bottom show the changes in the third and fourth quarter from left to right. **Note 2:** The horizontal axis represents the ratio of low-paid employees at sectoral level (2014 for the period of 2014-2015, 2015 for the period of 2015-2016). The vertical axis represents the changes in the rate of informal working for the periods of 2014-2015 and 2015-2016.

Figure 1: The relationship between the changes of the rate of low paid workers and total informal employment for male wage earners during the 2014-2015 and 2015-2016 periods



Source: Quarterly HLFS 2014-2016 micro data, Betam calculations. **Note:** Two charts at the top show the changes in the first and second quarters from left to right. Two charts at the bottom show the changes in the third and fourth quarters from left to right. **Note 2:** The horizontal axis represents the ratios of low-paid employees at sectoral level (2014 for the period 2014-2015, 2015 for the period 2015-2016). The vertical axis represents the changes in the rate of informal working for the period of 2014-2015 and 2015-2016.

We examined the effects of the changes in the rate of low-wage workers on informal employment on the basis of gender by using HLFS data. We interpreted this change as **“the effect of minimum wage increase on each sector”**. Figure 1 and Figure 2 exhibit the relationship between the change of the informal employment rate and the rate of low wage workers for each sector in the periods of 2014-2015 and 2015-2016.¹ The horizontal axis

¹ As The Household Budget Surveys compiled also by TurkStat categorizes workers as part time and full-time according to the usual working hours in the core job. If the weekly regular working hours of

represents the ratios of low-paid employees at sectoral level (2014 for the period 2014-2015, 2015 for the period 2015-2016). The vertical axis represents the changes in the rates of informal working for the periods of 2014-2015 and 2015-2016.

According to Figure 1, the informal working decreased in the period of both 2014-2015 and 2015-2016 when the number of women working for low wages grew in a sector. The only exception to this case was the second quarter of 2015-2016. In this quarter, we did not observe the relationship between the change of informal employment and the rate of low wage workers. According to Figure 1, minimum wage shock in January 2016 did not have an increasing effect on the informal employment of women.

Figure 2 shows the relationship between the rate of low wage workers and the ratio of informal employment for male wage earners. The contradiction between men and women is clear. There was a negative correlation between the rates of low wage workers and informal employment in the first and second period of 2014-2015 (with the exception of the third quarter) while there was a positive correlation in the first and second period of 2015-2016. Recalling that the minimum wage shock was in January 2016, it makes sense for the increases in informal employment rates experienced in low wage sectors to occur in the first two quarters of 2016. We notice-that the positive correlation disappeared and slopes of the graph took a horizontal shape during the third and fourth quarters of 2016.

Econometric analysis

Our econometric analysis is based on the difference in differences approach. A typical example widely found in textbooks may be based on the comparison of two groups and two periods. When we apply this typical approach to our example, the sectors which have a high proportion of low wage workers can be interpreted as the treatment group and the other sectors can be perceived as the control group. The informality rates of these two groups will be assessed both before and after the minimum wage increase. We expect to find differences in the rate of informal employment between the two groups before the minimum wage increase for numerous reasons. We know that informality among wage earners decreases due to structural reasons. It is expected to find the trends in informality of the two groups remain the same if the minimum wage increase affects them similarly, as there is no reason why the ongoing informality trends in both groups alter without any external intervention. If our assumption

the individual is over 35 hours or more, the individual is considered full-time. Therefore, as the rates of low-wage earners were calculated for 18 sectors, those who received positive remuneration, those who worked 35 hours or more per week (full-time), those who are paid minimum wage monthly were processed.

is justified, the minimum wage increase will result in a severe increase of informal employment in the treatment group (sectors with high rate of low wage workers).

Even though a typical example is similar to the one presented above, we are making a few minor changes when applying the difference in differences approach. The first change is to use the rate of low wage workers in each sector before the minimum wage increase as treatment intensity rather than considering the sectors as two separate groups. The second change is to compute the difference in differences estimator using a regression model rather than basic averages. In this way, it is possible to distinguish the effect of the minimum wage on informal economy from the effects of other factors that may have altered between the two periods and have also impacted informal economy. We summarize our econometric model as below.

$$y_{ist} = \alpha_s + \delta_t + X_{ist}\beta + \theta R_{st} + \varphi M_{st} + u_{ist} \quad (1)$$

y_{ist} refers the informal employment of the person i in sector s at time t . α_s and δ_t are the sector and time dummy variables respectively. X_{ist} shows the characteristic variables of the individual (age, education level, marital status). R_{st} encompasses variables at sectoral level, signifying the productivity of the sector. On the other hand, the central variable we are interested in the equation is M_{st} and the coefficient of interest, the estimator of difference in differences, is φ . The variable M_{st} is the product of the treatment intensity (Z_s) and the dummy variable which is 0 before treatment and 1 after treatment, (D_t), so $M_{st} = Z_s \cdot D_t$. We calculate the treatment intensity Z_s as the rate of low wage workers in the same sector in previous year when both annual and quarterly data were used. On the other hand, D_t is 1 in treatment and post-treatment periods (year or quarters) and 0 for pre-treatment periods.

The vital point in the difference in differences approach is the hypothesis of “parallel trend”. For testing this hypothesis, we use the approach known as placebo test in literature. The main idea can be summarized as follows: if the minimum wage increase really affected the low wage sectors, this effect should have been contained within the year 2016 which had quite a high minimum wage increase and no such effect should have taken place in 2015. Indeed, we performed this test by using graphs rather than regression in the previous note (Betam Research Note 18/222 “The effect of minimum wage hike on informal economy is concentrated on low-wage sectors”); moreover, we visually showed that expected effect was observed only in 2016. In this note, we replicated the same process more analytically by regression analysis.

When the regressions were conducted with annual and quarterly data using only female wage earners, we found no significant effect of minimum wage increase on informality. This result confirmed the findings in Figures 1 and 2 that effect of minimum wage shock on informality was based on the rate of low wage workers at sectoral level; however, this effect was limited to male workers. Thus, we would like to discuss the regression results based on the subsample of male workers.

a.) Annual data

Figure 1 shows the regression results which are obtained by using annual HLFS data during the 2009-2016 period released by TURKSTAT. The interaction variable $M_{st} = Z_s \cdot D_t$ in regression is represented in Table 1 below with the variables "sh15y16" and "sh14y15". In fact, "sh15y16" is the interaction of two variables: the rate of low wage workers by using 2015 data ("sh15") and the dummy variable of 2016 ("y16"). Similarly, the interaction variable "sh14y15" is obtained from the rate of low wage workers by using 2014 data ("sh14") and the dummy variable of 2015 ("y15").

If the effect of minimum wage increase on January 1, 2016 on informal employment was observed only in 2016 and only in the sectors with high rate of low wage workers, the interaction variable "sh15y16" should be significant and positive. It was expected that coefficients of interaction variable "sh14y15" would be statistically insignificant since there is was not a minimum wage increase in 2015. When the interaction variable "sh15y16" measured the treatment effect, "sh14y15" assumed the role of a placebo test. The regression results in Table 1 indicated that no positive and significant effects for any model were observed. When annual data is examined, it can be argued that there has not been any significant effect of the last minimum wage shock on informal employment.

Table 1: The effect of minimum wage increase on informal employment for male wage-earners (2009-2016, annual data)

	(1)	(2)
sh15y16	-0.00353 (0.00424)	-0.00478 (0.00467)
sh14y15	-0.00133 (0.00696)	-0.00225 (0.00794)
Constant	1.422*** (0.0395)	2.797 (2.444)
Observations	525,548	525,548

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Annual HLFS 2009-2016 micro data, BETAM calculations. **Note:** In all models, dependent variable is the categorical variable that shows the informal employment status. Thus, logistic regression is preferred for model estimation. The first model includes the independent variables of sector and year dummy in addition to variables in table. The second model includes some personal characteristics (experience, education, marital status), NUTS 2 regional dummy variable and the level of sectoral labor productivity in addition to those of model 1.

b.) Quarterly data

There are some drawbacks for using annual HLFS data when examining the effect of minimum wage effect on informal employment. The first drawback is about measurement. Some years had one minimum wage like in 2016; however, some years had two or three minimum wage

levels like in 2014 and 2015.² In some cases, it was not known for certain that members' wages were below or above the minimum wages in years with two minimum wages since the survey month was not valid in annual data. For instance, the net minimum wages in 2014 were 846 TL and 891 TL. In the month of January, 850 TL referred to a figure above the minimum wage and in July, the person who earned 850 TL in July remained below the minimum wage. This ambivalence disappears when quarterly data is used since periods of three months are taken into account.

The regression results in Table 2 were obtained by using quarterly HLFs data. The rate of low wage workers in each sector can be reliably calculated since every quarter is known individually. Due to reasons mentioned above quarterly data should be used for a proper regression analysis.

Table 2 shows the results of quarterly data. The interaction variable ($\mathbf{M}_{st} = \mathbf{Z}_s \cdot \mathbf{D}_t$) is named as "sh15y16q1", "sh15y16q2" etc. following the same naming as in the annual data. Let's examine the variable "sh15y16q1" in order to understand the meaning of interaction variables. The first part ("sh15") refers to the rate of low wage workers in a sector in 2015 and the second part ("y16q1") refers to the dummy variable for the first quarter of 2016. If the minimum wage shock escalates the informal employment in low wage sectors, interaction variables in quarters of 2016 ("sh15y16q1", "sh15y16q2", "sh15y16q3", "sh15y16q4") would be statistically significant and positive while the ones in 2015 ("sh14y15q1", "sh14y15q2", "sh14y15q3", "sh14y15q4") would be insignificant. This prediction was only partially confirmed. Only the interaction variables of the second and third quarter of 2016 and the third quarter of 2015 were positive and significant. As we mentioned before this was the expected result for the interaction variables of 2016. What was unexpected was the rise in the informality ratio in low wage sectors during the third quarter of 2015.

Table 2: The effects of minimum wage increase on informal employment for male wage earners: Regression results (2009-2016, quarterly data)

	(1)	(2)
sh14y15q1	-0.00793*** (0.00267)	-0.00973*** (0.00277)
sh14y15q2	0.00195 (0.00207)	-0.000220 (0.00210)
sh14y15q3	0.00786***	0.00536**

²In January and July 2014, net minimum wages stood at 846 TL and 891 TL respectively. In 2015, these wages were increased to 849 TL and 1000TL. The minimum wages in 2014 and 2015 were based on the average wages of January and July since there was no information about that period in annual data. (865,5 TL for 2014 and 975 TL for 2015). In the period of 2016 and 2017, there existed one minimum wage: 1301 TL and 1404 TL, respectively.

	(0.00249)	(0.00253)
sh14y15q4	-0.00204	-0.00370
	(0.00223)	(0.00230)
sh15y16q1	-0.000668	-0.00120
	(0.00275)	(0.00288)
sh15y16q2	0.00914***	0.00818***
	(0.00239)	(0.00245)
sh15y16q3	0.00872***	0.00678***
	(0.00249)	(0.00261)
sh15y16q4	0.000386	-0.000210
	(0.00239)	(0.00246)
Constant	1.725***	0.0361
	(0.0306)	(0.472)
Observations	453,984	453,984
Robust standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Source: Quarterly HLFS 2014-2016 micro data, Betam calculations. **Note:** In all models, dependent variable is categorical variable that shows the informal employment status. Thus, logistic regression was preferred for model estimation. The first model incorporates the independent variables of sector and year dummy in addition to variables in table. The second model comprises variables expressing experience, education, marital status and the level of sectoral labor productivity.

Another important drawback about annual HLFS data is attrition problem. It is necessary to recall the sampling design of HLFS in order to conceive attrition problem. It was intended that HLFS data should be collected by visiting households 4 times. But, HLFS covered some households twice while it includes others only once, for various reasons (moving etc.), since a period of 6 months should have passed between the first and last visit (Tunalı, 2009). There were important differences in terms of qualifications between households who were eliminated from the sample and the ones who stayed in the sample. It is expected that especially households who did not have a regular job and steady income or who were unemployed would change their accommodations more frequently. Tunalı (2009) presented the findings about this case. The results derived from annual data might be biased since the probability of formal employment was high for households who were observed twice. The reason is that the households observed only once were likely to have different characteristics compared to new households included in the survey in lieu of households who attrited.

One way to realize the second correction is to use only the data of the same quarters of each year. In this way, the rate of low wage workers at sectoral level will be calculated much more reliably. In addition, bias because of attrition can be eradicated. In our opinion, the results of this approach are more reliable. Table 3 encompasses the regression results for male wage earners estimated from related quarterly data. According to the table, the interaction variable “sh14y15” was not significant in any quarter. On the other hand, the interaction variable “sh15y16” was significant in the second and third quarters. Taking all results into consideration, the probability of informal employment was higher in the sectors which had a high rate of low wage workers before the minimum wage increase in 2016 compared to sectors

with the low rate of low wage workers. The rate of low wage worker was not a determinant in 2015. According to the results in Table 3, no positive and significant effect for the first and last quarter of 2016 were observed. These results are compatible with the hypothesis that effect of shock does not spread to economy immediately; moreover, it comes with some delay and expires after a while.

Table 3: The effects of minimum wage increase on informal employment for male wage earners: Regression results (2009-2016, quarterly data, with attrition correction)

	Q1	Q2	Q3	Q4
sh14y15	-0.00380 (0.00298)	-0.00242 (0.00223)	0.00299 (0.00267)	-0.00430* (0.00246)
sh15y16	0.00348 (0.00301)	0.00631** (0.00259)	0.00588** (0.00274)	-0.00180 (0.00261)
Constant	-1.042 (0.968)	-0.818 (0.935)	1.778* (0.937)	0.531 (0.939)
Observations	107,343	115,952	115,926	114,763

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Source: Quarterly HLFS 2014-2016 micro data, Betam calculations. **Note:** In all models, dependent variable is categorical variable that shows the informal employment status. Thus, logistic regression is preferred for model estimation. Q1-Q4 shows the quarters respectively. The regression model includes some characteristic variables of individuals (experience, education, marital status), and the level of sectoral labor productivity in addition to sector variable and year dummy as explanatory variable.

General evaluation, conclusion and remarks

The results of this research brief and two previous related research briefs confirm the thesis that the increase in minimum wage on January 1, 2016 (from 1000 TL to 1300 TL) increased the informal employment especially for male wage earners in low wage sectors. We explained that this effect is peculiar to male workers only on account of the higher education level of female workers relative to males. The apparent cause of this case is that females mainly work at formal jobs. This research brief is not involved with the verification of this statement. However, when the strong relationship between education level and formality is considered, such an observation is not surprising.

Another critical limitation of the econometric analysis is that the sample used for regression analysis includes only wage earners. In our previous two descriptive research briefs, we established the presence of an increase in informal rate because the minimum wage increase is more compelling for non-salaried workers. Similar regression analysis for all workers may also be conducted; however, we preferred to explore the ramifications of minimum wage on informality for wage earners since they are subject to labor market relations.

We claimed that analysis with quarterly HLFS data was more reliable than those with annual HLFS data. However, the quarterly HLS contains information about only 18 sectors and no regional information at NUTS 1 or NUTS 2 level was provided. There is no doubt that repeating the analysis with more sectoral (for instance, two digits, 88 sectors) and regional data will be more informative.

The common finding of three research briefs we promulgated (Research Briefs 18/220, 18/222 and 18/231) is that any increase in minimum wage impinges on informal employment negatively. This hardly qualifies as a condition for social welfare. Although the increase in informality due to higher minimum wage adversely affects social welfare, it does provide opportunities for fighting poverty, reduction of income inequality, enhancement of educational investments. Betam's research briefs focus on only the negative effects in the first group. The only reason behind this choice is that current data allows the examination of the relationship between minimum wage and informality. The positive effects of minimum wage increase in the medium and long term are not significant and not worth to investigate should not be construed from such a choice.

Sources:

Tunalı, İ. (2009). TÜİK Hanehalkı İşgücü Anketlerinde 2000-2002 dönemi kayıpranma örüntülerinin analizi, ODTÜ Gelişme Dergisi, 36, 217-252.

Appendix Table: Education level of female and male wage earners

	2014		2015		2016	
	Male	Female	Male	Female	Male	Female
Under the high school	53.7	41.4	52.5	40.6	51.5	39.7
General high school	11.5	11.2	11.2	10.3	11.0	10.0
Vocational high school	12.6	9.9	12.9	10.1	13.1	9.9
University	22.2	37.5	23.4	39.0	24.4	40.4
Total	100	100	100	100	100	100

Source: Annual HLFS 2014-2016 micro data, Betam calculations.