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ECONOMIC RESEARCH FORUM

منتدى البحوث الاقتصادية

Firm-level Effects of Minimum Wages*

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Abstract

What are the supply-side effects of minimum wages? Our paper exploits the quasi-natural experiment that Turkish government introduced an increase to minimum wages by 33.5% in 2016. This sudden event provides a unique opportunity to study the effects of cost-related shocks on firm outcomes that can be directly passed. Using comprehensive product-level PRODCOM data covering manufacturing industry firms that employ more than twenty employees, we first document the unit price effects. Our findings show that while minimum wage shock passes through into weighted firm-level prices by about 1.8% on average against 10% minimum wage share increase, this effect disappears after two consequent years. These findings are also similar when price pass-through model at firm-product level is estimated. In addition, the more firms operate in competitive industries, the less they pass their cost to the prices. Second, we explore broader economic consequences on sales, production, employment, and profit. We find that unlike the prices these outcomes negatively persist after minimum wage shock. Finally, profit rate decrease is stronger in industries with relatively high market power.

Keywords: minimum wage, prices, sales, profits, employment, Turkey, difference-in-differences

JEL Classification: C26, I25, J24, J61

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1 Introduction

This paper investigates the firm-level effects of minimum wages, focusing on the significant minimum wage increase of 33.5% introduced by the Turkish government in 2016. This abrupt policy change provides a unique opportunity to explore the repercussions of cost-related shocks on firm-level outcomes, such as prices profit rates, sales, and employment.
According to standard economic theory, minimum wages in a competitive market, where firms are price-takers, should reduce employment to maintain high profit margins. However, the empirical consequences of minimum wages on employment are contentious, a debate ignited by the seminal work of Card and Krueger (1993), which suggested that the introduction of a higher minimum wage in New Jersey led to an increase in employment relative to Pennsylvania [1]. Beyond employment, other firm-level outcomes like profitability and pricing may also be influenced by changes in minimum wages. A survey by Lemos (2008) reviewing 30 studies found that a 10% increase in minimum wage typically raises prices by no more than 0.4% [2]. Profitability effects are mixed; while Lemos (2008) and Mayneris et al. (2018) found no significant impact on profits, Draca et al. (2011) and Bossler et al. (2020) noted a profit decline, particularly among firms with market power.
The aim of this paper is to determine how the minimum wage increase affects unit prices and other firm-level outcomes such as profits, sales, production, and employment. The PRODCOM dataset provides detailed product-level production and sales information for Turkish firms in the manufacturing sector with 20 or more employees.
While there are studies that have focused solely on the employment effects of minimum wage in Turkey (Bakis et al., 2015; Işık et al., 2020), those examining both inflation and employment effects often suffer from endogeneity issues due to the use of time series data (Günsoy and Tekeli, 2013; Bicerli and Kocaman, 2019). Additionally, these studies typically overlook the supply-side of the economy. According to our knowledge, study by Akgunduz et al. (2019) is the closest one that investigate export and export unit value effect of the same minimum wage shock in Turkey. They find that while minimum wage increase leads to lower employment and export, export price did not significantly change because exporters are price-takers in international markets.
This study represents the first attempt to comprehensively account for domestic and non-domestic firms using an exogenous labor cost shock shock. PRODCOM survey dataset collected by Turkish Statistical Institute (TurkStat) allows us covering all manufacturing firms with 20 and more employees and providing information on value and quantity sold and produced at firm-product level between 2009 and 2019. Using firm identifiers, we merge this dataset with administrative employer-employee data and balance sheet data to calculate minimum wage shares of firms in their total employment and costs as exposure,

[1] For a literature review on the employment effects of minimum wage and methodological discussions, see Neumark et al. (2007, 2014)

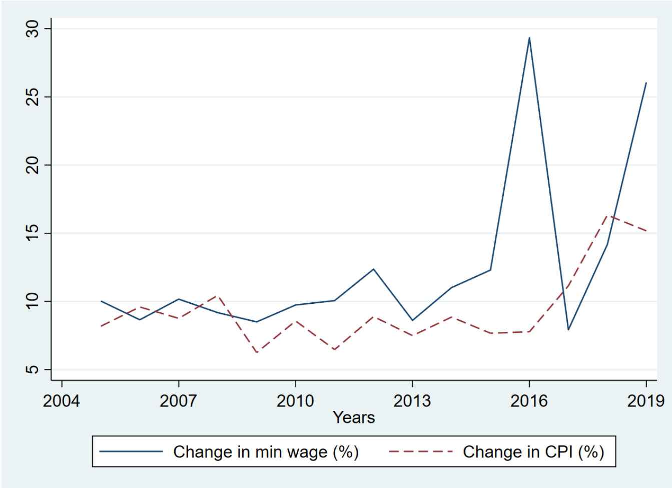
[2] Aaronson and French (2007); Renkin et al. (2022); Link (2022); Ashenfelter and Jurajda (2022); Kunaschk (2024) also report similar positive price effects.

and profit rate, respectively.
Our baseline results employing a difference-in-differences approach with a continuous framework indicate that the minimum wage shock results in an average pass-through into weighted firm-level prices of approximately 0.12% in our preferred specification. However, this effect diminishes and becomes negligible after two subsequent years, according to our event study estimates. This pattern holds when estimating the price pass-through model at the firm-product level and the quality-adjusted prices. Additionally, firms operating in more competitive industries exhibit a lesser tendency to pass increased costs onto prices. However, this finding fails when adjusted prices take account, strongly confirming the model developed by Draca et al. (2011).
Further analysis reveals broader economic impacts on sales, production, employment, and profits. Contrary to the temporary impact on prices, the negative effects on these outcomes persist longer following the minimum wage shock. Notably, the decrease in profit rates and employment are more pronounced in industries with relatively high market power.
Our paper is structured as follows: in section 2 we provide brief background on the minimum wage context in Turkey and sudden minimum wage increase in 2016. Section 3 presents the model to be estimated. The datasets used in the paper are described in section 4. In section 5 we estimate the impact on prices and other firm-level outcomes. Section 6 concludes.

2 Background

Legal basis of minimum wage fixing in Turkey has its roots in 1936, although the first implementation by local commissions occurred in 1951. In 1967, the central government established a minimum wage commission (Korkmaz, 2004), which considered regional disparities when setting the minimum wage. This commission includes representatives from labor unions, employer unions, and government agencies (Akgunduz et al., 2019). Beginning in 1974, the minimum wage was set separately for industry and agriculture sectors, moving away from a regional basis. Since 1989, a uniform minimum wage setting approach has been adopted for all adults.
While the minimum wage is a labor market institution that involves a bargaining process among representatives and takes into account economic and demographic indicators such as the poverty line, starvation line, and household structure, its primary determinant in settings such as Turkey, which has historically experienced high inflation rates, is the price level. As illustrated in Figure 1, minimum wage increases have generally been slightly above inflation rates and have moved in tandem with them until 2016. However, in that year, the net minimum wage sharply increased from TRY 1,000 to TRY 1,300, marking a 33.5% rise. Concurrently, the government reduced some of the social security payments

Figure 1: Gross minimum wage vs. CPI change (%)



required from employers, effectively reducing their cost increase to 26%, as depicted in the figure. We see another high minimum wage increase in 2019 due to the high depreciation in Turkish lira (so-called currency crisis) but the difference between minimum wage increase and inflation is only half of the 2016 increase.

The significant increase in the minimum wage in 2016 was largely driven by political motives, particularly evident in the election year of 2015. During this period, all political parties competed against each other, with the minimum wage level being a central issue (Akgunduz et al., 2019). The ruling party, Justice and Development Party, promised to raise the net minimum wage to TRY 1,300 effective January 1, 2016. This promise was made despite internal debates within the party regarding the timing of the implementation[3], and the party was subsequently reelected.

3 Identification

We employ a difference-in-difference approach with continuous treatment framework, which, unlike the commonly used binary treatment design, considers varying levels of exposure among units to document the net effect of a policy shock on an outcome variable after controlling for unit- and time-specific shocks. Accordingly, our analysis requires a latent variable that differentiates firms experiencing a stronger impact from the minimum wage shock. We use the share of minimum wage in total employment and wage bills in 2015—the year preceding the minimum wage shock—as this variable.
Firstly, we estimate the price effect of the minimum wage shock using a firm-product level sample. Let f, p, and t represent firms, products, and time respectively, the following

[3] `https://www.hurriyet.com.tr/ekonomi/asgari-ucret-ocak-ayinda-1-300-tl-oluyor-40009029`

equation is estimated:

$$\Delta \log(price_{fpt}) = \alpha + \beta \text{exposure}_f \times D_{\text{year}>2015} + D_f + D_t + D_{fp} + D_{pt} + D_{kt} + D_{rt} + \varepsilon_{fpt} \quad (1)$$

where $\Delta \log(\text{price}_{fpt})$ represents the log change in the unit price of product p from firm f at time t. Fixed effects D_f and D_t capture shocks related to unobservable firm characteristics and time, while D_{fp} accounts for firm-product pair specific comparative advantages. D_{kt} and D_{rt} capture year spesific industry (k) and province (r) level shocks, respectively. The coefficient β shows the impact of the 2016 minimum wage shock on prices. Two approaches are adopted to measure the exposure variable: the employment approach, which counts the minimum wage earners in 2015 and proportions them to total workers, and the gap approach, commonly used in literature, which calculates the ratio of the sum of daily wages below the 2016 daily minimum wage to the gross wage bill for each firm [4]. The potential price effect of minimum wage, as specified in Equation (1), may reflect changes in quality. To isolate this effect, we utilize the methodology following Khandelwal et al. (2013). This approach relies on the estimation of the equation below[5]:

$$\log(\text{quantity}_{fpt}) + \sigma_s \log(\text{price}_{fpt}) = \alpha_p + \gamma_t + \varepsilon_{fpt} \quad (2)$$

Here, σ_s represents the elasticity of substitution between the four-digit chapters of the ten-digit products, which are provided by Broda and Weinstein (2008). The residuals ε_{fpt} represent the quality indices. By subtracting the log of these quality indices from the log price, we obtain the adjusted prices at the firm-product level.

Secondly, we document the firm-level price effects of the minimum wage shock. The reason why we aggregate the firm-product level data to firm level is that we lack information on which production processes the workers are employed in. Moreover, we investigate firm level effects beyond price. The following equation is estimated:

$$y_{ft} = \alpha + \beta \text{exposure}_f \times D_{\text{year}>2015} + D_f + D_t + D_{kt} + D_{rt} + \varepsilon_{fpt} \quad (3)$$

where y_{ft} represents firm-level outcomes changes in log weighted unit prices, log sales, log value-added, log production value, log employment, and log profit. Prices at the firm level

[4] Adopting the methodology of Akgunduz et al. (2019) but applying it to daily wages, the latter can be formulated as:

$$\text{exposure}_f = \frac{\sum_{w=1} (\text{daily minimum wage}^{2016} - \text{daily minimum wage}^{2015}_{w<\text{min}2016}) - N_{w<85} \times 3.33}{\text{total labor cost}^{2015}}$$

Where w represents the worker, the first part in the numerator shows the positive difference between the new daily minimum wage in 2016 and the daily wage below the new minimum wage, the second part ($N_{w<85} \times 3.33$) reflects the government subsidy to reduce the social security contributions of firms. N is the number of employees in firm f earning less than double the daily minimum wage (TRY 85).

[5] Khandelwal et al. (2013) uses a firm-product-destination level trade data to calculate the adjusted price and quality series. Given that our data is at the firm-product level, we omit the destination indices in our equation.

are calculated as a weighted average where weights are the sales share of each product (p) produced by firm. [6].

D_f, D_t, D_{kt}, D_{rt} are fixed effects for firm, year, industry × year, and province × year, respectively. Additionally, we interact the variable of interest with industry concentration to observe whether firms in more concentrated industries exhibit different pricing behaviors in response to a labor cost shock.

4 Data

To conduct this study, we integrate one survey with three administrative data sources by merging them using firm identifiers and year markers. The PRODCOM survey, conducted by TurkStat, offers NACE ten-digit product level information on the monetary value and quantity of production and sales, as well as intermediate input usage intensity for all firms with 20 or more employees in broadly defined industry sectors (manufacturing and mining). Our sample spans from 2010 to 2019 and is restricted to manufacturing firms. Unit prices are calculated by dividing the total sales value by the quantity sold.

The second data source is employer-employee data covering all firms, obtained from the Social Security Institute (SGK). This dataset provides detailed monthly records of workdays, total earnings, and occupation information for all formal employees. It also enables us to track mobility across plants and firms.

The third dataset, Industry and Service Statistics, is used to ascertain four-digit NACE industry groupings and location information for all firms in non-agricultural industries. This dataset is provided by the Ministry of Treasury and Finance. Finally, balance sheet data is utilized to analyze profit rates. This dataset tracks all assets, liabilities, and equity over time and is also provided by the Ministry of Treasury and Finance.

5 Results

This section consists of two parts. Firstly, we document the price effect of minimum wage shock. Initially, we use firm-product level data to see how firms change their product prices against a such cost-related shock. Then we estimate this response using firm level weighted-prices and to reveal extent to which firms in industries with relatively high market power charge more price to mitigate the cost increase. Secondly we explore the

[6] If p represents the products, then the price formula is as follows:

$$\text{price}_{ft} = \sum_p \text{price}_{fpt} \times \frac{\text{Sales}_{fpt}}{\sum_p \text{Sales}_{fpt}}$$

other firm outcomes (employment, profit, sales and production) effects of minimum wage shock beyond price and reconcile the our results.

5.1 Impact on prices

5.1.1 Impact on firm-product level prices

Table 1 presents the results obtained from estimating Equation (1). The first column measures the impact of the minimum wage using the employment approach, while the second column applies the gap approach. Both columns report positive and significant coefficients, indicating that firms with a high share of minimum wage in their total wage bill in 2015 respond to a sudden labor cost shock by increasing prices. The magnitude of this response varies depending on the approach adopted. Quantitatively, the employment approach indicates that a 10% increase in the minimum wage share corresponds to a 3.2% increase in prices. This effect size escalates to 12% when using the gap approach. The possible reason why these results differentiate is that gap approach broadly includes the all potential workers affected by the policy shock than the employment approach does. As we see in the Section 3, while former uses the all workers in 2015 below the 2016 minimum wage, latter allows to involve only the employees earning around the minimum wage. Therefore, the gap approach is preferable specification.

Coefficients obtained from Table 1 reflects both the quality and price changes simultaneously. Adjusted price effect results that absorb the quality changes are documented in the Table 2. Compared to same specifications in Table 1, a slightly higher estimate is obtained in column 1. On the other hand, this gap is quietly large in the gap approach as seen in the Column 2. These findings implicate that firms with the higher share of minimum wage earner workers decrease quality level of their products. This strategy allows them prevent to reflect all labor-cost shock to their prices entirely.

How long does the price effects above persist? Event-study design allows us to see the yearly evolution labor cost pass-through of the over time. Following is dynamic difference-in-differences estimation equation that mimics the Equation 1:

$$\Delta \log(price_{fpt}) = \alpha + \text{exposure}_f \times \sum_{t \neq 2015; t=2010}^{2019} \theta_t + D_f + D_t + D_{fp} + D_{pt} + D_{kt} + D_{rt} + \varepsilon_{fpt} \quad (4)$$

Where θ is a coefficient vector that shows the yearly effects of exposure_f relative to pre-shock period (2015). This methodology also enables us to pre-test the parallel trends assumption. Observing pre-treatment differences in the trends (pre-trends) is a common practice in literature (Roth, 2022). Insignificant coefficients in the pre-treatment periods can imply the absence of pre-trends and parallel trends assumption holds.

Each graph in Figure 2 reports the yearly coefficients on the variable exposure_f for each

Table 1: Price effects of minimum wage shock using equation (1)

	(1)	(2)
Dependent Variable:	$\Delta log(price_{fpt})$	
Treatment measurement	Employment	Gap
exposure$_f$ $\times$ $D_{year>2015}$	0.0321***	0.1203**
	(0.0123)	(0.0559)
Fit statistics		
Observations	325,464	325,464
R^2	0.3117	0.3117

Notes: The table shows the impact of 2016 minimum wage shock on the log change of firm-product level prices using equation (1). While first column uses employment approach to measure the exposure$_f$, second column is the gap approach as we described in section 3. $D_{year>2015}$ is a dummy variable taking value of one if the year variable is greater than 2015. Both columns add firm, year, firm $\times$ product, product $\times$ year, industry $\times$ year and province $\times$ year fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are clustered at the firm level.

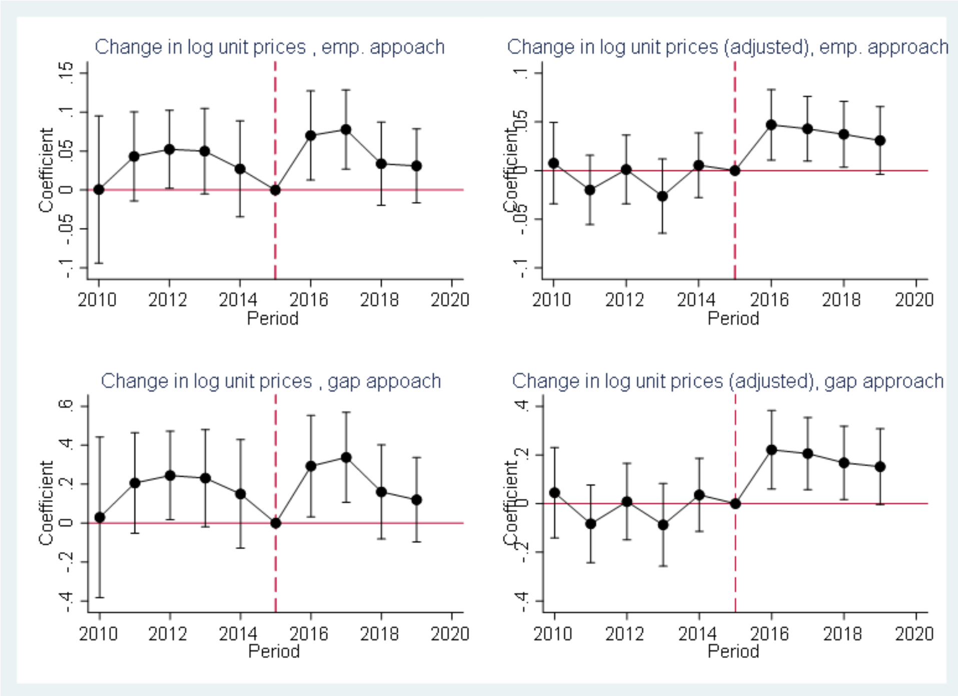
Table 2: Adjusted-price price effects of minimum wage shock using equation (1)

	(1)	(2)
Dependent Variable:	$\Delta log(price_{fpt})$	
Treatment measurement	Employment	Gap
exposure$_f$ $\times$ $D_{year>2015}$	0.0445***	0.1966***
	(0.0091)	(0.0447)
Fit statistics		
Observations	287,689	287,689
R^2	0.3764	0.3767

Notes: The table shows the impact of 2016 minimum wage shock on the log change of adjusted firm-product level prices using equation (1). While first column uses employment approach to measure the exposure$_f$, second column is the gap approach as we described in section 3. $D_{year>2015}$ is a dummy variable taking value of one if the year variable is greater than 2015. Both columns add firm, year, firm $\times$ product, product $\times$ year, industry $\times$ year and province $\times$ year fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are clustered at the firm level.

exposure and price definition. We see that all coefficients before 2015 are around zero, implying that there is no pre-trend before 2015. Post periods have striking implications, however. Despite of different magnitudes because of the reasons we put forward in the average effect results, all panels shows a sudden increase in the immediate period after the minimum wage shock but this price increase fades out over time. Even zero coefficient is obtained in last two years. These results reveal a temporary labor cost pass-through of minimum wage shock.

Figure 2: Minimum wage shock and unit prices of firm-product pairs: Coefficient estimates for each year, employment approach



Notes: These illustrate the regression coefficient for the annual impacts on change in log product prices of firms from 2010 to 2019. The dashed line represents the year immediately preceding minimum wage shock. Identification is equivalent to Equation (4).

5.1.2 Impact on firm-level prices

This section involves the firm-level weighted price effects of minimum wage increase using the Equation (3). Table 3 documents the model estimation results. While first and third columns show baseline results, second and fourth ones are the estimates with industry concentration heterogeneity. Former columns yield positive and significant estimates on exposure variable. However, as in the Table 1 we find that coefficient on the gap approach exposure is greater than that of the employment approach. Results with higher magnitudes are obtained when adjusted prices are chosen as outcome variable in Table 4. As we discuss in the firm-product sample results, these findings confirm that the firms with high intensity of minimum wage to total employment ratio lower the quality on average.
We can also plot the event study coefficients to see the evolution of the sudden labor cost shock. Therefore, the two-way fixed model below is estimated:

$$\Delta \log(price_{ft}) = \alpha + \text{exposure}_f \times \sum_{t\neq 2015; t=2010}^{2019} \theta_t + D_f + D_t + D_{kt} + D_{rt} + \varepsilon_{ft} \quad (5)$$

3 plots the event study estimates for adjusted prices using employment and gap approach. Obtaining insignificant coefficients in pre-treament period and shrinking effect after the

Table 3: Price effects of minimum wage shock using equation (3)

	(1)	(2)	(3)	(4)
Dependent Variable:	$\Delta log(price_{ft})$			
Treatment measurement	Employment		Gap	
exposure$_f$ $\times$ $D_{year>2015}$	0.0375***	0.0226	0.1795***	0.1131*
	(0.0137)	(0.0148)	(0.0622)	(0.0672)
exposure$_f$ $\times$ $D_{year>2015}$		0.4714***		2.105**
$\times$ HHI$_k$		(0.1822)		(0.8228)
Fit statistics				
Observations	164,827	164,827	164,827	164,827
R^2	0.1294	0.1294	0.1294	0.1294

Notes: The table shows the impact of 2016 minimum wage shock on the log change of weighted firm-level prices using equation (3). While column 1 and 2 use employment approach to measure the exposure$_f$, 3 and 4 are the gap approach as we described in section 3. $D_{year>2015}$ is a dummy variable taking value of one if the year variable is greater than 2015. In column 2 and 4 we interact exposure$_f$ with (Herfindahl-Hirschman index HHI$_k$) to see how market structure determines the firm responses along with the minimum wage shock. All columns add firm, year, industry $\times$ year and province $\times$ year fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are clustered at the firm level.

post treatment quietly resembles to firm-product level data estimations in Figure 2. Results are also robust to the different exposure and price definitions.

Does competition matter for passing the labor-cost shock into the prices? In second and fourth columns of Table 3 exposure variable is interacted by the NACE four-digit industry level Herfindahl-Hirschman index (HHI$_k$) using the firm revenues in 2015. Both exposure measurement $\times$ HHI$_k$ yield significantly positive results. In other words, firms in the industries with relatively high market power are more likely charge more prices to their products. However, this mechanism is not valid when dependent variable is adjusted prices. Same columns of Table 4 provides insignificant coefficients on the interacted variables.

5.2 Impact on other firm outcomes

In this section we present evidence on how other outcomes of firms is influenced by minimum wage shock. Sales, production, employment and net profit effects using Equation (3) are in Table 5 and 7 for employment and gap treatments, respectively. First column of both tables reveal that exposure variable negatively and significantly affects the total sales of firms. Quantitavely, 1 percentage point increase in the minimum wage employment share (labor cost) leads to 0.05% (0.20%) decrease in revenues. Production value effects are also found to be similar in the second columns.

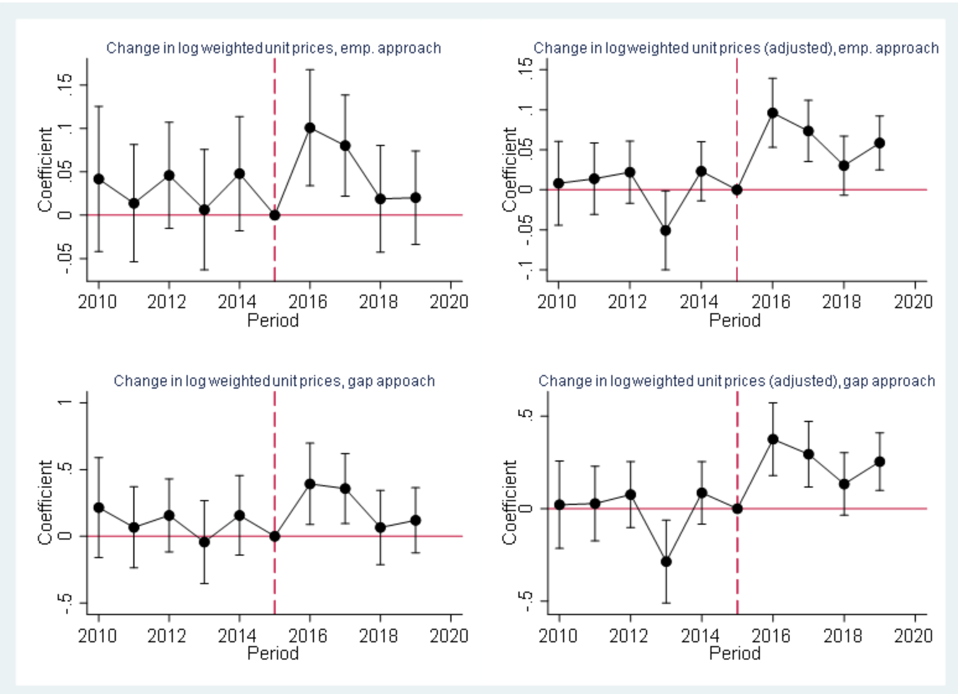
Employment responses of firms, which is the most debatable issue in the literature, can be seen in column 3 of both tables. Negative and significant effect have been found, arguing that displacement effect of labor is relevant as a result of the adjustment of firms having

Table 4: Adjusted-price of minimum wage shock using equation (3)

	(1)	(2)	(3)	(4)
Dependent Variable:	$\Delta log(price_{ft})$			
Treatment measurement	Employment		Gap	
$\text{exposure}_f \times D_{year>2015}$	0.0657***	0.0622***	0.2877***	0.2740***
	(0.0100)	(0.0108)	(0.0447)	(0.0486)
$\text{exposure}_f \times D_{year>2015}$		0.1094		0.4341
$\times$ HHI_k		(0.1437)		(0.6316)
Fit statistics				
Observations	145,953	145,953	145,953	145,953
R^2	0.1943	0.1943	0.1943	0.1943

Notes: The table shows the impact of 2016 minimum wage shock on the log change of weighted firm-level adjusted prices using equation (3). While column 1 and 2 use employment approach to measure the exposure_f, 3 and 4 are the gap approach as we described in section 3. $D_{year>2015}$ is a dummy variable taking value of one if the year variable is greater than 2015. In column 2 and 4 we interact exposure_f with (Herfindahl-Hirschman index HHI_k) to see how market structure determines the firm responses along with the minimum wage shock. All columns add firm, year, industry $\times$ year and province $\times$ year fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are clustered at the firm level.

Figure 3: Minimum wage shock and weighted unit prices of firms: Coefficient estimates for each year, employment approach



Notes: The graph illustrates the regression coefficient for the annual impacts on change in log weighted prices of firms from 2010 to 2019. The dashed line represents the year immediately preceding minimum wage shock. Identification is equivalent to equation (5).

more minimum wage earners. Finally, last columns show that these firms face a profit rate loss. In sum, these four finding point out that firms with high share of minimum

Table 5: Effects of minimum wage shock on other firm outcomes using equation (3), employment approach

	(1)	(2)	(3)	(4)
Dependent Variable:	$log(sales_{ft})$	$log(production\ value_{ft})$	$log(employment_{ft})$	$(profit/sales)_{ft}$
exposure$_f$ × $D_{year>2015}$	-0.0495***	-0.0566***	-0.1030***	-0.0060***
	(0.0126)	(0.0126)	(0.0087)	(0.0019)
Fit statistics				
Observations	217,771	217,268	217,604	200,480
R^2	0.8817	0.8754	0.8915	0.5275

Clustered (Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: Table shows the impact of 2016 minimum wage shock on the log sales (column 1), production value (column 2), employment (column 3) and profit rate (column 4) using equation (3). All columns use employment approach to measure the exposure$_f$ as we described in section 3. $D_{year>2015}$ is a dummy variable taking value of one if the year variable is greater than 2015. All columns add firm, year, industry × year and province × year fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are clustered at the firm level.

wage to total employment or cost ratio are more likely to reduce their production capacity, employment and profitability.

Figure 4 shows the pre-trend test and the persistence of the minimum wage shock using Equation (5). While employment and gap approach produces similar coefficients, they show no pre-trend structure, eliminating the potential threats regarding the identification. Contrary to price effects, dynamic firm level effects continue longer in post-period but begin to fade out in 2019.

Market structure also matters for the responses of firms. As in the previous firm-level price effect section, further analysis here interact exposure$_f$ with the HHI$_k$. The results, as shown in Table 6 and 8, indicate that null effect is found for sales and production value. On the other hand, It is worth noting that employment and net profit are significantly reduces by minimum wage shock as firms operate in the less competitive industries and have more minimum wage share employment. This finding is consistent with the simple model of Draca et al. (2011). Under the oligopoly markets, markups would fall if some of the labor costs is financed by firms. Even in the Cournot model minimum wage shock has more severe effect to firms with more low-skilled employment. Therefore these firms face a lower profitability. On the other hand, our case presents somewhat different implications. Even though firms charge higher prices according to Table 3, this could not keep the profit rate at the pre-shock level. However, adjusted price effect results in Table 4 shows insignificant results in interacted variable, pointing to a more consistent empirical evidence to this theoretical model.

Table 6: Effects of minimum wage on other firm outcomes shock using equation (3), competition interaction, employment approach

	(1)	(2)	(3)	(4)
Dependent Variable:	$log(sales_{ft})$	$log(production\ value_{ft})$	$log(employment_{ft})$	$(profit/sales)_{ft}$
exposure$_f$ $\times$ $D_{year>2015}$	-0.0437***	-0.0526***	-0.0940***	-0.0025
	(0.0140)	(0.0142)	(0.0096)	(0.0022)
exposure$_f$ $\times$ $D_{year>2015}$	-0.1819	-0.1230	-0.2761**	-0.1106***
$\times$ HHI$_k$	(0.2059)	(0.2056)	(0.1306)	(0.0303)
Fit statistics				
Observations	217,771	217,268	217,604	200,480
R^2	0.8817	0.8754	0.8915	0.5276

Clustered (Firm) standard-errors in parentheses
*Signif. Codes: ***: 0.01, **: 0.05, *: 0.1*

Notes: Table shows the impact of 2016 minimum wage shock on the log sales (column 1), production value (column 2), employment (column 3) and profit rate (column 4) using equation (3). All columns use employment approach to measure the exposure$_f$ as we described in section 3. $D_{year>2015}$ is a dummy variable taking value of one if the year variable is greater than 2015. In columns we interact exposure$_f$ with (Herfindahl-Hirschman index HHI$_k$) to see how market structure determines the firm responses along with the minimum wage shock. All columns add firm, year, industry $\times$ year and province $\times$ year fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are clustered at the firm level.

Table 7: Effects of minimum wage shock on other firm outcomes using equation (3), gap approach

	(1)	(2)	(3)	(4)
Dependent Variable:	$log(sales_{ft})$	$log(production\ value_{ft})$	$log(employment_{ft})$	$(profit/sales)_{ft}$
exposure$_f$ $\times$ $D_{year>2015}$	-0.2006***	-0.2525***	-0.4502***	-0.0233***
	(0.0564)	(0.0565)	(0.0391)	(0.0087)
Fit statistics				
Observations	217,771	217,268	217,604	200,480
R^2	0.8817	0.8754	0.8915	0.5275

Notes: Table shows the impact of 2016 minimum wage shock on the log sales (column 1), production value (column 2), employment (column 3) and profit rate (column 4) using equation (3). All columns use gap approach to measure the exposure$_f$ as we described in section 3. $D_{year>2015}$ is a dummy variable taking value of one if the year variable is greater than 2015. All columns add firm, year, industry $\times$ year and province $\times$ year fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are clustered at the firm level.

6 Conclusion

This study offers valuable insights for policymakers on how firms respond to sudden labor cost increases. This paper analyzes Turkish manufacturing firms' responses against a sudden minimum wage increase in 2016. By delineating the mechanisms of response in a developing country context, our research can inform policy decisions aimed at balancing firm competitiveness with worker welfare. Our results are threefold. Firstly, our findings reveal that minimum wage shock pushes all firms to increase their product prices. However, this inflationary effect seem short-lived: after two years of the minimum wage shock price effects are disappeared. Second, market structure might be an important factor to explain

Table 8: Effects of minimum wage on other firm outcomes shock using equation (3), competition interaction, gap approach

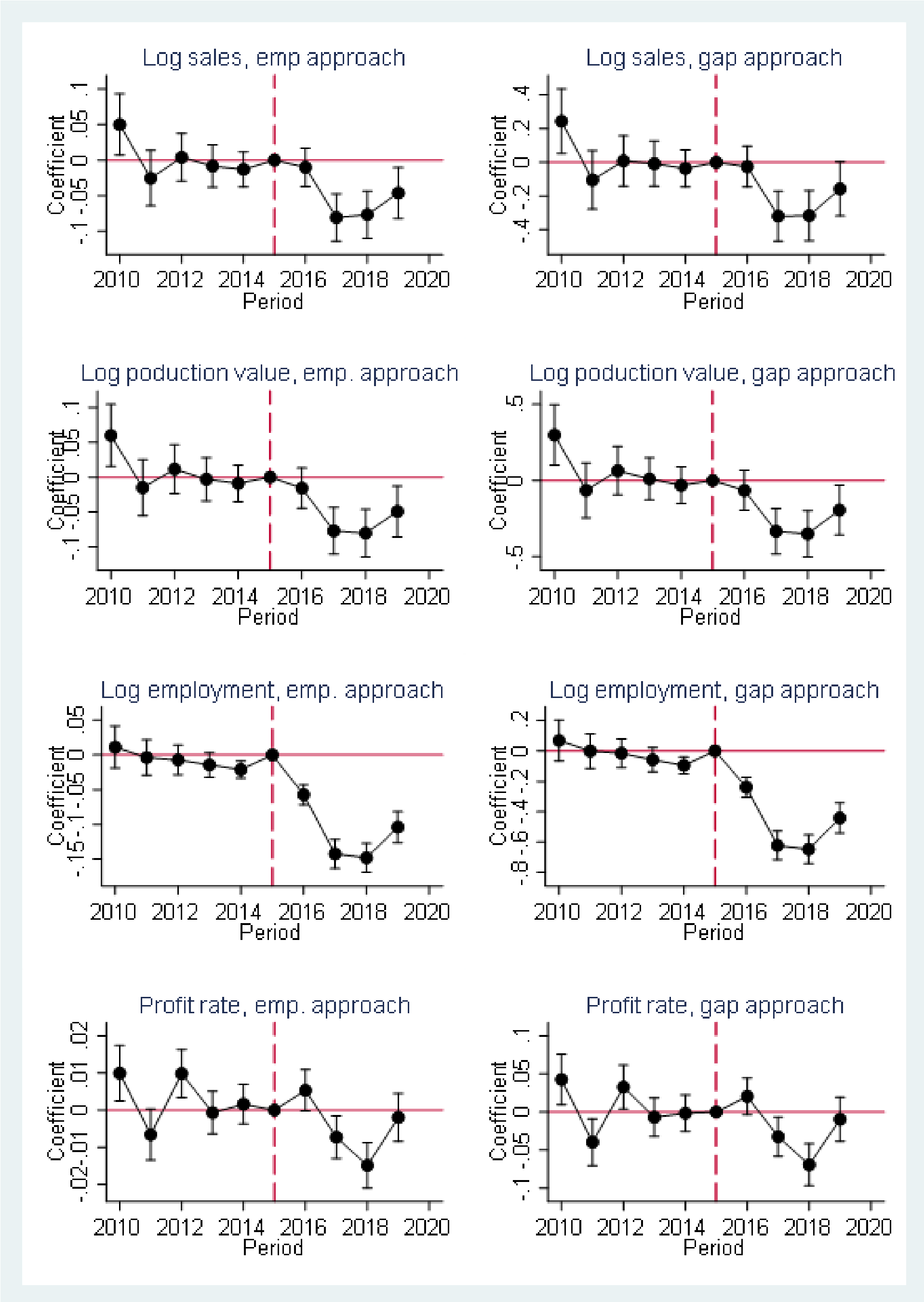
	(1)	(2)	(3)	(4)
Dependent Variable:	$log(sales_{ft})$	$log(production\ value_{ft})$	$log(employment_{ft})$	$(profit/sales)_{ft}$
exposure$_f$ × $D_{year>2015}$	-0.1777***	-0.2355***	-0.4038***	-0.0092
	(0.0633)	(0.0640)	(0.0438)	(0.0097)
exposure$_f$ × $D_{year>2015}$	-0.7113	-0.5271	-1.4430**	-0.4423***
× HHI$_k$	(0.9390)	(0.9481)	(0.6080)	(0.1349)
Fit statistics				
Observations	217,771	217,268	217,604	200,480
R^2	0.8817	0.8754	0.8915	0.5276

Notes: Table shows the impact of 2016 minimum wage shock on the log sales (column 1), production value (column 2), employment (column 3) and profit rate (column 4) using equation (3). All columns use gap approach to measure the exposure$_f$ as we described in section 3. $D_{year>2015}$ is a dummy variable taking value of one if the year variable is greater than 2015. In columns we interact exposure$_f$ with (Herfindahl-Hirschman index HHI$_k$) to see how market structure determines the firm responses along with the minimum wage shock. All columns add firm, year, industry × year and province × year fixed effects. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$. Standard errors are clustered at the firm level.

the labor-cost pass through. However, adjusted-prices did not show us the significance of the market power, pointing out the quality mechanism. Third, beyond the price effects, our analysis shows that minimum wage shock had significant repercussions on the production and profitability outcomes for the affected firms. In addition, employment and profit losses are stronger in the less competitive industries.

In conclusion, the enduring impacts on sales, production, and employment underscore the need for careful consideration of the timing and magnitude of minimum wage adjustments to mitigate unintended economic consequences.

Figure 4: Minimum wage shock and sales of firms: Coefficient estimates for each year



Notes: The graph illustrates the regression coefficient for the annual impacts on log sales of firms from 2010 to 2019. The dashed line represents the year immediately preceding minimum wage shock. Identification is equivalent to equation (5).

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