# Impact of Minimum Wages on Exporters: Evidence From a Sharp Minimum Wage Increase in Turkey

**Yusuf Emre Akgündüz** [*]
*Central Bank of the Republic of Turkey*

**Altan Aldan** [†]
*Central Bank of the Republic of Turkey*

**Yusuf Kenan Bağır** [‡]
*Central Bank of the Republic of Turkey*

**Huzeyfe Torun** [§]
*Central Bank of the Republic of Turkey*

May 2, 2018

**Abstract**

In January 2016, the Turkish government raised minimum wages by 30%. We investigate the impact of the increase in minimum wages on export value and prices of firms. We use administrative employee-employer matched firm and transaction level customs data for the analysis. We calculate the potential exposure of each firm to the minimum wage increase according to their 2015 employment records and estimate the effects using a difference-in-differences approach. We find that a 10% increase in the labor cost of a firm reduces its exports by 3.1% and export variety by 2% while having no significant effect on export prices.

*JEL codes:* J23, J38, F14
*Keywords:* Minimum wages, labor costs, exports

[*]yusufemre.akgunduz@tcmb.gov.tr. Structural Economic Research Department, Central Bank of the Republic of Turkey, Istiklal Cad. No:10, 06100 Ulus, Ankara, Turkey.

[†]altan.aldan@tcmb.gov.tr. Structural Economic Research Department, Central Bank of the Republic of Turkey, Istiklal Cad. No:10, 06100 Ulus, Ankara, Turkey.

[‡]yusufkenan.bagir@tcmb.gov.tr. Structural Economic Research Department, Central Bank of the Republic of Turkey, Istiklal Cad. No:10, 06100 Ulus, Ankara, Turkey.

[§]huzeyfe.torun@tcmb.gov.tr. Structural Economic Research Department, Central Bank of the Republic of Turkey, Istiklal Cad. No:10, 06100 Ulus, Ankara, Turkey.

# 1 Introduction

A large body of economic literature studies the effects of minimum wage regulations on outcomes ranging from employment to firm productivity. Even in the case of employment which has been extensively studied, the effects remain ambiguous and the debate contentious with continuing improvements in the empirical methodologies used to estimate effects (Dube et al., 2010; Neumark et al., 2014). The impact of minimum wage becomes even more relevant for developing countries where minimum wage is binding for a large proportion of employees in formal employment and the wage competitiveness of firms is an important advantage in international trade. Raising minimum wages in a middle income setting can therefore have a direct effect on the export performance of firms.

The minimum wages in Turkey rose by nearly 30% in January 2016 following campaign promises made by the governing party for the general elections in November 2015. This paper exploits this substantial increase in minimum wages to estimate the effects of rising wage costs on employment, exports and prices of exporting firms.

We use an administrative dataset that allows us to link international trade transactions of firms with their balance sheets and employment information drawn from social security records. Our data is available for the period 2013-2016 and we focus on firms that export throughout the period and make-up more than 80% of all Turkish exports during the period. We first examine the effect of the increase in minimum wages on employment and exports of firms. Then, we supplement the analysis using transaction level data from Turkish customs that identifies products at the 12 digit level to estimate the effects on prices. To identify the effects we calculate a potential labor cost increase induced by the 2016 minimum wage hike according to 2015 employment records and follow a difference-in-differences approach that had previously been used to study the impact of minimum wages on firm performance in the UK (Draca et al., 2011; Riley and Bondibene, 2017). The

treatment in 2016 is thus defined at the firm-level as the ratio of the hypothetical wage bill increase to the wage bill in 2015.

We report three sets of results. First, employment declines in exporting firms. A 10% increase in labor costs is associated with a 3% decline in employment. As expected average and total wages rise, with the former increasing more than the latter. Second, we find an economically and statistically significant decline in exports. A 10% increase in labor costs is found to reduce exports by 3.1%. This effect partially occurs through a decline in the variety of goods exported by firms. Finally, we find no positive effect on prices despite our initial expectations. This result seems to suggest that Turkish exporters are price-takers in international trade and producer costs have little effect on export prices in the short run.

Recent studies have extended the scope of minimum wage research from employment to firm performance indicators such as productivity, firm value and profitability (Draca et al., 2011; Riley and Bondibene, 2017; Bell and Machin, 2018). The international trade literature has paid attention to the theoretical analysis of the minimum wage in a general equilibrium framework long ago (Brecher, 1974; Neary, 1985; Flug and Galor, 1986; Davis, 1998). However, the empirical evidence on the effect of the minimum wage within the international trade context is more limited. Our paper is most closely related to the papers Gan et al. (2016) and Bai et al. (2018) that analyze the relationship between minimum wages and exports in China. Gan et al. (2016) identifies the effects of minimum wages on exports using changes in the minimum wages over time and across regions. They find that a 10% increase in the minimum wage is associated with a 0.9 percentage points reduction in the likelihood of export status, and a 0.9% reduction in the export value, conditional on exporting. Bai et al. (2018) first introduce a heterogeneous firm model under perfect competition in an Heckscher-Ohlin framework. Then, using the variation in minimum wages across years and over time, they test the predictions of the model. They find that an increase in minimum wages discourages exports, but less so for the firms in more skill or capital intensive sectors.

In both papers, the identification is based on over time and regional variation in minimum wages. Our research aims to improve on the causality claim through the use of a large, politically motivated minimum wage hike for which the identification of exposure is identified at the firm level. In addition, we have the advantage of using a comprehensive data set that combines balance sheet, employment and customs data through unique firm identifiers which may allow for more precise estimates.

Another strand of literature we contribute to is made up of the growing number of studies on export prices (Harrigan et al., 2015). Previous studies on export prices have largely focused on the effects of destination characteristics and transport costs, which suggests a gap in research on how producer costs affect export prices (Bastos and Silva, 2010; Manova and Zhang, 2012; Martin, 2012). The effect of producer costs is particularly relevant for developing countries where firms are more likely to be price-takers than price-setters, which may limit their ability to adjust prices in response to rising costs.

Finally, a more tangentially related group of studies have looked at the effects of exports on wages. The general finding of these studies is that exports raise wages and in particular the return to skills (Carluccio et al., 2015; Macis and Schivardi, 2016). This is in effect the reverse of the question we analyze. Taken together, the causal effects estimated from both wages to exports and exports to wages provides a more complete picture of the full interaction.

The remainder of the paper is structured as follows. Section 2 deals with the details of the minimum wage legislation and the extent to which minimum wages are binding in the Turkish economy. Section 3 details the difference-in-differences methodology we use. Section 4 introduces the data along with the relevant summary statistics. Section 5 presents the estimation results for employment, exports and variety, and export prices in that order. Section 6 concludes.

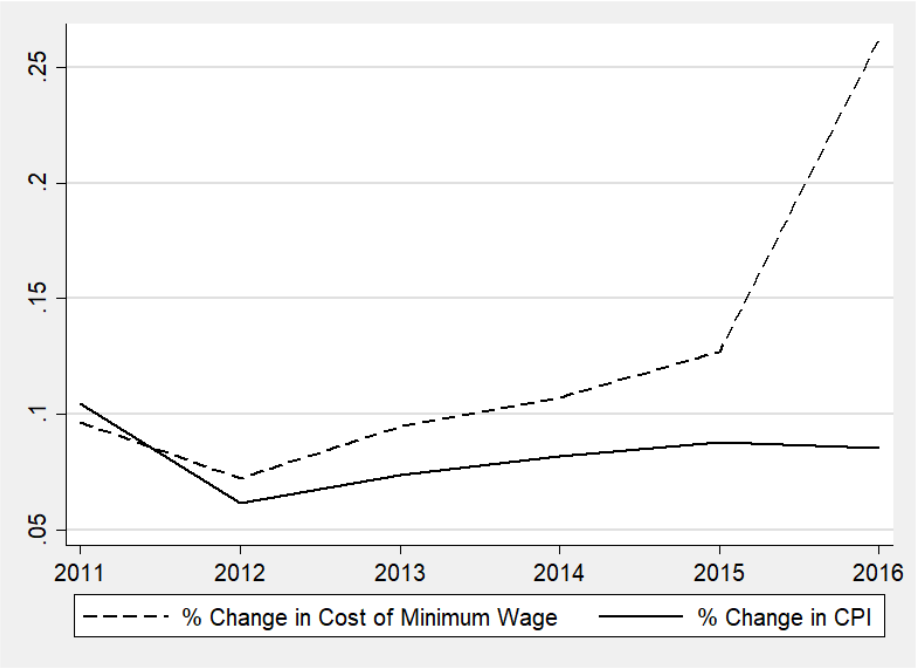
## 2 Institutional background

Minimum wage is being implemented in Turkey since 1974, with no variation among regions, industries or occupations (Gürcihan-Yüncüler and Yüncüler, 2016). It is determined by a commission which is composed of representatives of labor unions, employer unions and government. The Ministry of Labor and Social Security initiates the commission meetings and provides the initial offer for the minimum wage and the government plays the key role in the determination of the final level. The commission meets annually, generally in December, to determine the minimum wage of the next year. The amount of minimum wage can be set differently for the first and second half of a year or a single minimum wage can be implemented throughout a year.

The increases in the minimum wage were set in line with inflation in recent years except for 2016. Net minimum wage had been determined as 949.07 TL and 1000.54 TL for the first and second halves of 2015, respectively. In 2016, it was implemented as 1300.99 TL throughout the year; with a sharp increase of 33.5 percent compared to 2015 average. Government acknowledged the detrimental effects of the hike in the minimum wage and introduced a subsidy in January 2016 so that around 100 TL of employers' social security contributions for employees whose wages were below twice the minimum wage of 2015 were reimbursed by government in 2016. As a result, the cost of minimum wage to employers increased by 26.2 percent. Figure 1 presents the evolution of the average cost of employing a minimum wage earner for employers since 2011. While the cost of minimum wage had been rising alongside inflation until 2015, it increased sharply in 2016, well above the inflation level, even with the subsidy from the government.

The minimum wage hike of 2016 had largely political causes. All political parties promised sharp increase in the minimum wage in their campaigns before the November 2015 elections. The ruling Justice and Development Party (AK Party) promised net minimum wage of 1300 TL and was re-elected. Consequently, the

Figure 1: Cost of minimum wage and inflation




new minimum wage was set on the 31st of December 2015. The political process that led to the new minimum wage in 2016 suggests that the change was largely independent of the economic situation and can therefore be treated as an exogenous shock. Moreover, the rise was not discussed throughout 2015 and became likely only after the November elections. Even after the elections, there were ambiguities about the implementation of the hike. For example, firms were uncertain whether the minimum wage would increase sharply in January or gradually throughout 2016 and whether the promised minimum wages included a minimum living allowance.[1]

Structural transformation programs after 1980 converted Turkish economy to a liberal economy, after the collapse of the protectionism and import substitution regime of 1960s and 1970s. Consequently, exports increased dramatically thereafter; the ratio of exports of goods and services to GDP increased from 5.2 percent in 1980 to 22 percent in 2016. In a similar fashion, Turkey's share in world exports rose from 0.15 percent in 1980 to 0.90 percent in 2016 (World Bank, 2018). More-

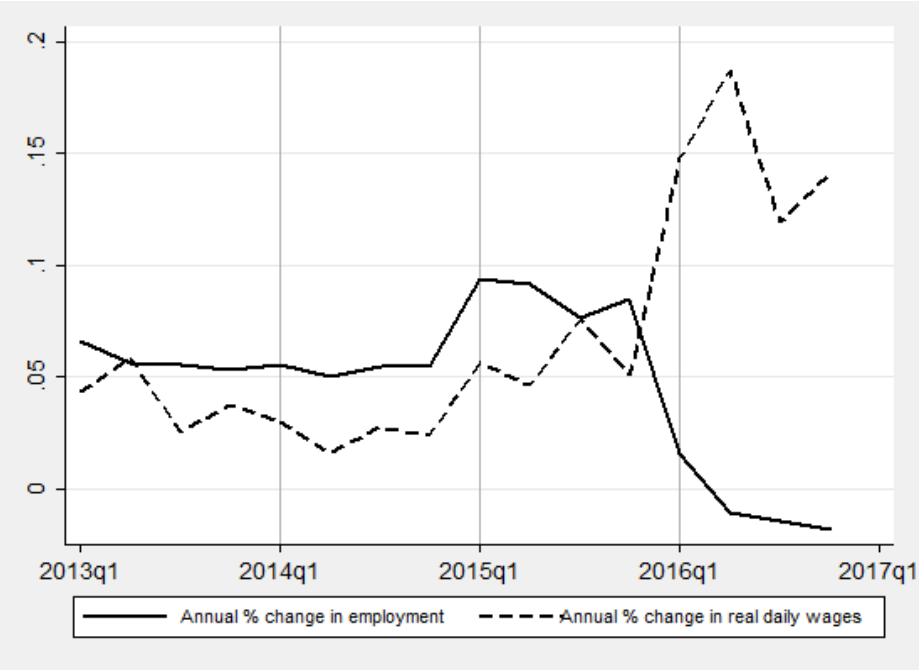
[1] A survey of firms by the NGO Human Resource Management Association (PERYON) demonstrates this uncertainty regarding the minimum wage legislation (PERYON, 2015).

over, the composition of exports changed dramatically; more than half of Turkish exports were agricultural products in 1980 whereas manufacturing constitutes almost 94 percent of all exports as of 2016 (Turkish Statistics, 2018).

Elasticity of labor demand with respect to wages may be high in liberal economies (Slaughter, 2001). Labor demand in Turkey is found to be elastic in Turkey though no significant increase in elasticity was found in the early stages of liberalization (Krishna et al., 2001). More recently, Papps (2012) finds that employment is sensitive to labor costs in Turkey using the minimum wage hike in 2004 and the change in social security taxes between 2002 and 2005. Figure 2 plots the annual percentage change in employment and average wages for each quarter between 2013 and 2016, using administrative data. There is a clear jump in wages and decline in formal employment following the minimum wage increase. The increase in average wages reaches 20% in the second quarter of 2016 which is unsurprising given that the share of minimum wage workers in the last quarter of 2015 was 36.4%. In terms of employment, the positive growth trend reverses with the sharp increase of the minimum wage. In summary, aggregate figures support the earlier findings that employment is sensitive to labor costs in Turkey.

A potential worry in studying the effect of minimum wage in Turkey is informality in the labor market for two reasons. First, the share of minimum wage earners among formal employees may not fully reflect the actual share of employees earning minimum wages. Hence, proxies for exposure to minimum wage legislation may be misleading. Second, firms may prefer employing informal workers in response to minimum wage increases. Enforcement of labor market regulations including minimum wages tends to drive workers to informal employment because formal employment becomes more costly for firms (Almeida and Carneiro, 2012). In 2015, informality rate among the private firms was calculated as 37.6% in the Turkish labor market. However, there is good reason to believe that this high rate of informality is not particularly crucial for our study. Unpaid workers

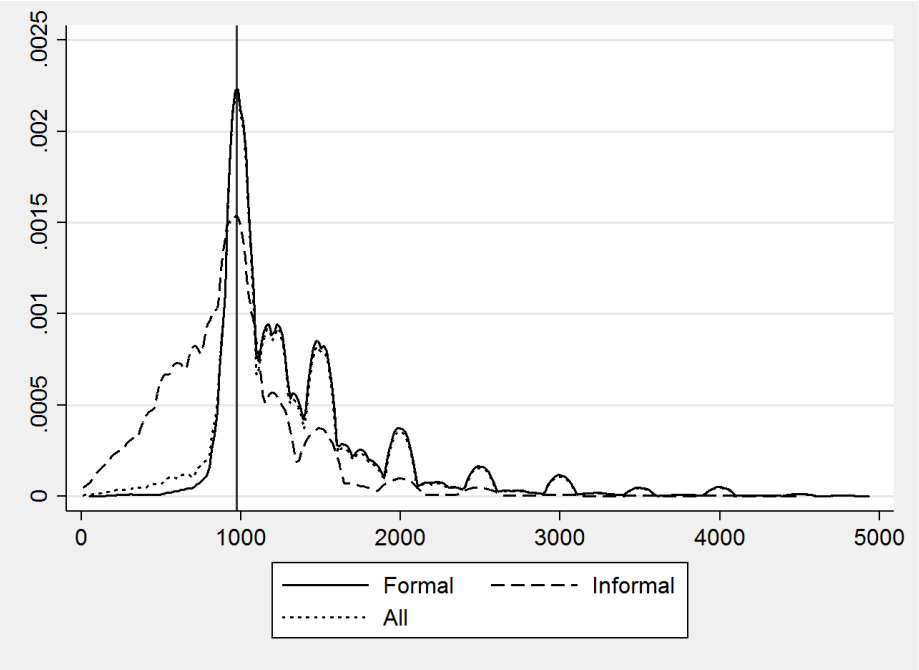
Figure 2: Average wages and employment over time




in agriculture and self-employed constitute the largest share in informality. When we restrict the sample to wage earners in private firms in the manufacturing industry, which constitute most of Turkish exporters, the share of informal workers reduces to 14.5%. Moreover, minimum wage is found to have lighthouse effect in fixing the wages of informal workers (Gürcihan-Yüncüler and Yüncüler, 2016). In summary, as Figure 3 based on the Labor Force Survey that includes both informal and formal workers suggests, minimum wage is binding in Turkey, including informal workers.

There are theoretical and empirical reasons to believe that informality is even lower in exporting firms compared to non-exporters. According to the well-known Melitz model, only most productive firms can enter into export markets and formal firms in Turkey are found to be more productive (Melitz, 2003; Taymaz, 2009). Second, informality among exporter firms can be detected more easily since foreign trade data is monitored by the government as is the case in other developing countries (Paz, 2014). If switching to informality is still an option for exporting firms in Turkey, the minimum wage hike will not be fully binding and our anal-

Figure 3: Distribution of wages in 2015 in private manufacturing firms - LFS




ysis will estimate the lower bound of the effect. Nevertheless, we design several robustness tests in an effort to test whether informality may bias our results.

## 3 Methodology

Our approach to estimation is similar to previous studies that analyze the impact of national minimum wage legislations on firm outcomes. The analysis is based on comparing firms that were more affected by the minimum wage legislation to those that were less affected within a difference-in-differences framework. The primary question is how to select firms for the treatment and control groups that are more or less affected by changes in minimum wages.

Previous studies studying the introduction of the National Minimum Wage in UK such as Draca et al. (2011) and Riley and Bondibene (2017) define their treatment and control groups based on the average labour cost of firms. The assumption, backed with survey data, is that firms with lower average labor costs are more likely to have a larger share of employees who would be affected by minimum wage legislations and can therefore be selected into the treatment group.

Since our dataset allows us to see the wage and employment records of all employees in firms each quarter, we define our treatment variable as a continuous indicator of the exposure of each firm to the minimum wage increase. Equation 1 calculates the hypothetical exposure to minimum wage increase for each firm in our sample according to the employment records of fourth quarter of 2015. The numerator in the equation represents the change in labor costs of firm $i$ induced by the minimum wage increase. The first part of the numerator sums up the employer cost increase for each employee $e$ earning below the new minimum wage ($min_{2016}$) and the second part subtracts the sum of 100 TL government subsidy in social security contributions for each employee earning less than double the minimum wage ($N_{w<2min_{2015}}$), which is also newly introduced to reduce the burden on firms.[2] The denominator is the total labor cost of the firm in the fourth quarter of 2015. The resulting $Exposure_i$ is the potential nominal increase in labor costs of firm $i$ induced by the new legislation if the firm does not make any adjustment to its employment structure in 2016.

$$Exposure_i = \frac{\sum_{e=1}^{E}(min_{2016} - W^{2015}_{e<min_{2016}}) - N_{i,w<2*min_{2015}} * 100}{TotCost_i^{2015}} \tag{1}$$

The primary model we employ in estimating the effects of the minimum wage increase on exports and the export variety is given by equation 2 where the outcome of interest is $Y_{it}$ and the parameter of interest is $\beta_1$. Firm fixed effects denoted by $f_i$ and year fixed effects $y_t$ are included in all specifications. The DD coefficient given by $\beta_1$ estimates the impact on 2016 exports of having higher exposure to minimum wage changes. While equation 2 shows our baseline model, we test the robustness of the results using a variety of different specifications that include region-year and sector-year fixed effects to control for shocks at the region and sector level that may be correlated with the minimum wage exposure of firms.

[2]It may be argued that the 100 TL social security contribution cut will not influence the behaviour of exporters as much as the minimum wage increase since it was announced as a temporary measure. When we calculate the exposure variable without taking this cut into account, we get qualitatively very similar results. The size of the estimated effects become slightly smaller since the variation of the exposure variable becomes larger.

$$Y_{it} = \beta_0 + \beta_1 Exposure_i * Year_{2016} + f_i + y_t + e_{it} \quad (2)$$

While we estimate the impact on exports and variety on an annual basis, we exploit the transaction level data to estimate the effect of the minimum wage increase on prices at the monthly level. We estimate the effects on prices using the regression equation 3. Price is calculated for each monthly transaction of firm $i$, good $j$, to country $c$ at month $t$ by dividing the value of the transaction with its volume. While the measurement unit of different goods varies, the difference in measurement should be captured by the goods fixed effect $g_j$, which is included at the 12 digit level. Since the dataset is monthly rather than annual we replace the year fixed effects with 47 year-month fixed effects given by $ym_t$. Finally, we control for the destination country by including country specific fixed effects $cnt_c$.

$$Price_{ijct} = \beta_0 + \beta_1 Exposure_i * Year_{2016} + f_i + ym_t + g_j + cnt_c + e_{ijct} \quad (3)$$

Serial correlation is well-known to cause underestimation of standard errors in DD models when using heteroskedasticity robust standard errors (Bertrand et al., 2004). We cluster the standard errors at the firm level in all regression models since our treatment variable varies at the firm level.

## 4 Data

All data used in this study are from the Entrepreneur Information System (EIS) obtained from the Ministry of Science, Industry, and Technology of Turkey. The EIS brings three confidential administrative data sets together for the period 2006-2016; (i) the balance sheet and income statement of all legal and real entities that keep accounting records on a balance sheet basis, excluding firms in financial sector and public sector, from the Ministry of Finance, (ii) employee data at individual level from the Social Security Administration, and (iii) entire customs data at

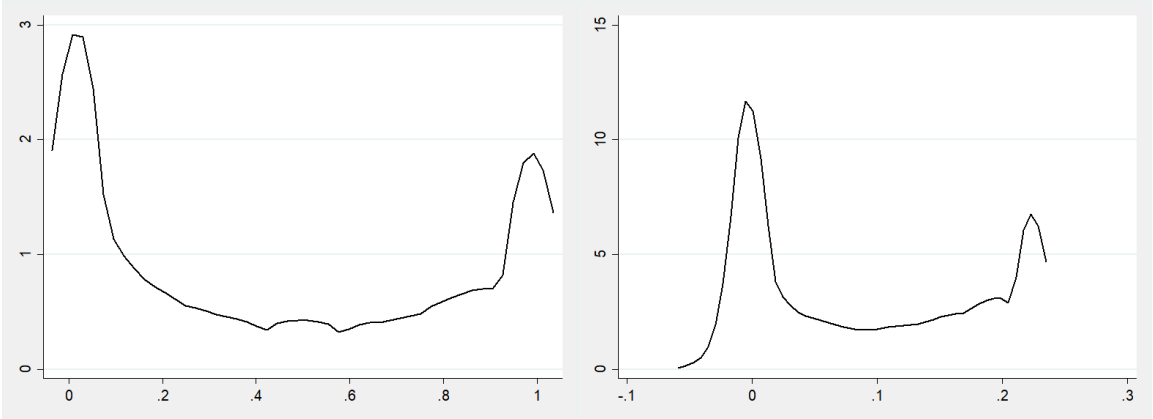
transaction level from the Ministry of Customs and Trade. We linked these three separate data sets using the firm identifiers provided by the data source.

Richness of the data set allows us to carry out an impact analysis of the minimum wage policy by identifying the exposure at firm-employee level and measuring the trade outcomes at firm-transaction level with information on the type of good at 12 digit classification and destination country.

We limited our sample period to 2013-2016 since the daily trade transaction data, which is required to calculate the export prices at firm level, is available only for these years. To ensure consistency throughout the analysis, we stick to the 2013-2016 sample period in estimating the effect on the other outcome variables as well .

In order to deal with the issues arising from informal employment and under-reporting of wages, we also limited our sample to those firms that exports continuously throughout the sample period and have at least have two employees. This limitation ensures that all relevant variables are available in all years and we have a balanced panel of firms. In case any informality or under-reporting remains, our results should be interpreted as the lower bound estimates of the minimum wage impact on Turkish exporters.

Figure 4a shows the distribution of minimum wage worker share across firms in our selected sample, as of 2015. There is bunching around 0 and 1 as expected but the distribution is close to a uniform shape for the rest and implies that the minimum wage increase is binding at varying ratios for the majority of exporting firms in Turkey. Figure 4b presents the distribution of the resulting exposure to minimum wage induced labor cost rise across firms. The exposure rate is ranging between -0.05 and 0.26 and bunches around zero and the maximum rate. The negative exposure is due to the monthly 100 TL per/employee government subsidy for the employer share of social security taxes, which was introduced alongside the minimum wage increase to alleviate the burden on employers. Since the subsidy is applied to all employees earning less than twice the minimum wage, firms



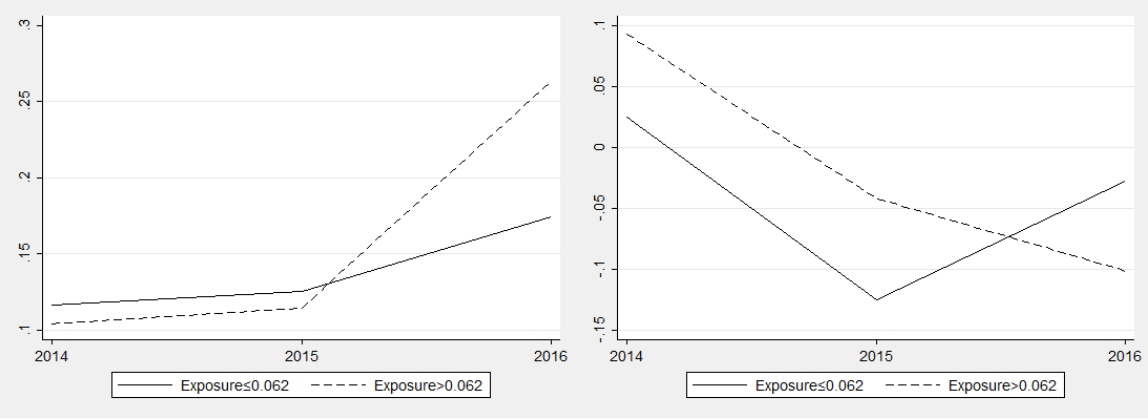

(a) Share of minimum wages

(b) Exposure

that have a small share of minimum wage employees benefited from this subsidy while being unaffected by the minimum wage increase.

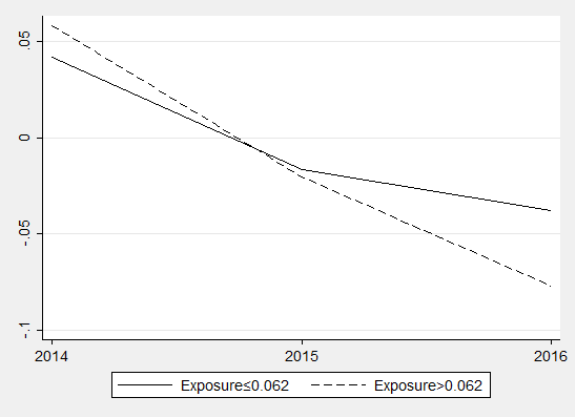
We are able to measure the treatment at firm level continuously therefore our treatment variable is not binary in the regression analysis. Nevertheless, figure 5 plots trends in our key outcome variables for two sub-groups of firms; low treatment firms versus high treatment firms to test if the pre-treatment parallel trends assumption is satisfied and whether an effect is visually apparent. The groups are formed by dividing firms around the median exposure rate (0.062). Figure 5a shows the annual changes in logarithm of average wage per employee, Figure 5b shows the annual change in logarithm of total exports, and Figure 5c shows the annual changes in the logarithm of export varieties over time. The impact of minimum wage increase is visually evident on each panel such that the growth rate trends are parallel prior to 2016 and diverge afterwards.

Table 1 reports the summary statistics of some key variables in our sample. The first two columns show the pre-treatment period averages and the log change in 2016 for the entire sample. Column 2 through 6 represent the same statistics for the sub-samples of firms by employment size. Self-reported Labor Force Survey data indicates that problems of informality and under-reporting are less of a concern for relatively larger manufacturing firms. Therefore we report both summary




(a) Change in annual wage per employee

(b) Change in annual exports




(c) Change in annual export variety

Figure 5: Main outcomes over time by treatment level

statistics and regression results for the entire sample as well as a sub-sample of firms with 10 or more employees as of the fourth quarter of 2015. The export and export variety variables are constructed using the customs data. Employment and wage per employee variables are from the social security records and are the annual average of the quarterly number of employees and gross wages.[3] The wage per employee variable that we use as an outcome does not include employers' social security contributions and are the gross wages paid to employees. Finally, information on fixed assets and profit margins of firms are obtained from the balance sheets.

Table 1: Summary statistics

| | All Firms | | Small Firms (2-9) | | Large Firms (≥10) | |
|---|---|---|---|---|---|---|
| | 2013-2015 Average | 2016 Log Change | 2013-2015 Average | 2016 Log Change | 2013-2015 Average | 2016 Log Change |
| Exports (Million USD) | 4.58 | -0.10 | 1.59 | -0.19 | 6.02 | -0.09 |
| Number of Export varities | 2.04 | -0.01 | 1.95 | -0.04 | 2.08 | 0.00 |
| Employment | 84.92 | 0.07 | 5.82 | -0.10 | 121.42 | 0.08 |
| Wage per employee | 2418.91 | 0.30 | 1488.71 | 0.34 | 2439.19 | 0.30 |
| Fixed asset (Million TL) | 17.88 | 0.29 | 0.44 | 0.29 | 26.18 | 0.29 |
| Profit margin | 0.06 | 0.14 | 0.03 | 0.09 | 0.06 | 0.14 |
| Minimum wage share | 0.43 | | 0.61 | | 0.34 | |
| Exposure rate | 0.09 | | 0.13 | | 0.07 | |
| Number of firms | 28,234 | | 9,193 | | 19,041 | |

Authors' calculations using EIS.

There are 28,234 firms in our selected sample and approximately 1/3 of them are small firms with less than 2-9 employees. Average minimum wage worker share and exposure rate are around 0.43 and 0.09, respectively. There are significant baseline differences between small and large firms. Both the average minimum wage worker share and exposure rate are much higher among small firms.

Annual average export value is about 4.58 million US Dollars for the period 2013- 2015 and declines by 10 percent in 2016. Average export is smaller among small firms but not as much as one would expected from a sample of firms with less than 10 employees. This is partly because of the wholesale exporters medi-

[3]Some firms have missing values in social security records in various quarters and the sample is therefore not balanced for employment outcomes. All firms in our sample are observed in the social security records in the last quarter of 2015 where we calculate the exposure variable.

ating between the actual manufactures and importers. In our regression analysis, we carried out robustness checks by excluding firms with very high per employee sales values (top 5 percentile) in order to control for possible biases that might be caused by such firms. We found very similar results once we excluded these firms.

Log differential change in exports and number of export varieties in 2016 is much higher among smaller exporters. Changes in average employment, per employee wages, and fixed assets value are similar between small and large firms.

We report our regression results first for the main sample of firms with at least 2 employees that exported each year between 2013 and 2016, and second for the sample of firms with 10 or more employees. Additionally, we report results for two sub-samples, first by dropping firms with all minimum wage employees, and second by also dropping firms that have no minimum wage employees. Both these samples are defined according to 2015 minimum wage shares. Doing so we aim to test if the results are being driven by firms at the tails of the minimum wage share distribution. Including firms who only have minimum wage employees may bias the results if there is significant informality in reporting wages and employment among firms that only report minimum wages. We further drop firms with no minimum wage employees in 2015 to test whether the results are driven by different trends of higher paying firms.

# 5 Results

## 5.1 Impact on wages and employment

Before moving on to export outcomes, we test the extent to which the employment structure of firms adjusted in response to the minimum wage increase. Panels A, B and C in Table 2 present the estimated effects on labor cost per employee, employment and total wage bill for the exporters in our sample. All three outcomes appear to be affected in the expected directions: wage per employee and total

Table 2: Impact on employment outcomes

| | (1) Employees>1 | (2) Employees>10 | (3) Employees>1& Min. share<1 | (4) Employees>1& 0>Min. share<1 |
|---|---|---|---|---|
| A- Wage per employee | | | | |
| Exposure | 0.3907*** | 0.4226*** | 0.4093*** | 0.3763*** |
| | (0.0096) | (0.0113) | (0.0125) | (0.0139) |
| B- Employment | | | | |
| Exposure | -0.2823*** | -0.2717*** | -0.3036*** | -0.3508*** |
| | (0.0280) | (0.0346) | (0.0364) | (0.0400) |
| C- Total wage bill | | | | |
| Exposure | 0.1084*** | 0.1509*** | 0.1057*** | 0.0255 |
| | (0.0287) | (0.0354) | (0.0370) | (0.0408) |
| N | 109,297 | 75,153 | 91,389 | 69,260 |
| Firms | 28,156 | 19,025 | 23,312 | 17,634 |

*** p<0.01, ** p <0.05, * p<0.1

*Note*: All models include firm and year fixed effects Standard errors are clustered at the firm level in all regressions. The wage per employee and total wage bill variables are in Turkish Liras and all three outcomes are log transformed.

wage bill rise while employment declines.

We find a statistically robust effect on the average wage per employee of 0.4% for every percentage point increase in labor costs caused by the minimum wage legislation and the effect is stable across different samples.[4] In turn, a percentage point increase in labor costs reduces employment by about 0.3%. This finding may be contextualized within the literature estimating the labor demand elasticity with respect to wages. Hamermesh (1993) provides a range of labor demand elasticity estimates between -0.15 and -0.75 while a more recent meta-analysis by Lichter et al. (2015) reports an average labor demand elasticity of nearly -0.2. Compared to these estimates, our findings suggest a larger than average effect on employment from increases in labor costs for Turkish exporters. The large response in employment also limits the increase in total wages which is a quarter of the increase in wage per employee at around 0.1%. In the fourth column sample that excludes all exporters with minimum wage shares of 1 and 0, the effect on total labor costs even turns statistically insignificant. In this sample, we also find a slightly larger effect on employment and slightly smaller effect on average wages per employee.

[4]For firms with only minimum wage employees in 2015, the wage increase corresponds to around 25%. The most affected firms are then estimated to be affected by a quarter of the treatment coefficient. In case of the wage per employee outcome, this corresponds to approximately a 10% increase.

While exporters appear to reduce their total employment to limit the increase in total labor costs, this does not necessarily translate into a decline in production since productivity and capital intensity of production may also be adjusted. Dustmann and Glitz (2015) suggest that firms make significant adjustments in their factors of production when facing labor supply shocks. We may expect similar mechanisms to be at work for Turkish exporters affected by the minimum wage increase that can limit the effects on exports.

### 5.2 Exports

Table 3 shows the effects of the minimum wage increase on the value of exports. In all samples we find a statistically significant effect and the coefficient ranges between approximately -0.33 and -0.22. For larger firms the impact appears to have been weaker since the coefficients are smaller in columns 2 compared to column 1. Also, when we drop the firms that had only minimum wage employees in 2015, the magnitude of the impact gets smaller in column 3 compared to column 1. The estimated impact becomes larger once firms with no minimum wage employees in 2015 are also excluded from the sample in column 4. If we consider the full sample regression in column 1 to be our baseline estimate, we find that a percentage point increase in labor costs due to minimum wage legislation reduces exports by 0.3%.[5]

Table 3: Impact on exports

| | (1) Employees>1 | (2) Employees>10 | (3) Employees>1& Min. share<1 | (4) Employees>1& 0>Min. share<1 |
|---|---|---|---|---|
| Exposure | -0.3149*** | -0.2358** | -0.2241** | -0.3265*** |
| | (0.0804) | (0.1073) | (0.1060) | (0.1224) |
| N | 112,936 | 76,164 | 93,344 | 70,604 |
| Firms | 28,234 | 19,041 | 23,336 | 17,651 |

*** p<0.01, ** p <0.05, * p<0.1

*Note*: All models include firm and year fixed effects. Standard errors are clustered at the firm level in all regressions. The export values are given in dollars and log transformed.

[5]Our firm level treatment variable defined as the increase in labor costs due to minimum wage legislation is three times as large as the estimate by Gan et al. (2016) find that a percentage point increase in minimum wages reduces exports of exporters by 0.09%. We may interpret our estimate as the average treatment effect for firms while interpreting the estimate of Gan et al. (2016) as an intention to treatment effect since their region level minimum wage treatment does not identify which firms are affected by the minimum wage legislation and to what extent.

The effects we find may very well be heterogeneous across sectors and regions. Worryingly, sector specific demand shocks or region level shocks such as the arrival of Syrian refugees in eastern Turkey where minimum wages are more binding due to lower average wages may influence our results. The latter concern is particularly relevant because the arrival of Syrian refugees in Turkey since 2012 has had significant effects on the informal labor markets in regions hosting them according to Tumen (2016) though it is not clear to what extent these effects would be seen for exporters. In Table 4, we estimate regressions for the baseline sample by including year specific fixed effects for 12 regions at the Nuts-1 level and goods exported by the firm at the two digit Standard International Trade Classification (SITC) level. We assigned firms to SITC categories according to their most exported good category. The results suggest that sector and region level heterogeneity is limited and the baseline estimates are not driven by shocks in sectors or regions that are correlated with high exposure to minimum wage legislation.

Table 4: Impact on exports - robustness tests

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Exposure | -0.3149*** | -0.2721*** | -0.3040*** | -0.2562*** |
| | (0.0804) | (0.0826) | (0.0838) | (0.0855) |
| Region x year FE | - | + | - | + |
| Sector x year | - | - | + | + |
| N | 112,936 | 112,936 | 112,936 | 112,936 |
| Firms | 28,234 | 28,234 | 28,234 | 28,234 |

*** p<0.01, ** p <0.05, * p<0.1

*Note*: All models include firm and year fixed effects. Standard errors are clustered at the firm level in all regressions. The export values are given in dollars and log transformed.

As with any difference-in-differences set-up, our identification relies on the presence of parallel trends between treated and control groups. The trends in export values of firms most affected by the minimum wage increase should not significantly differ from those firms for whom minimum wages are less binding. To test the validity of our estimates, we performed placebo tests by assuming that the reform and the associated labor cost increase had occurred in 2015 or 2014 rather than in 2016. The results of these placebo tests are presented by Table 5. None of the placebo estimates in pre-treatment years appear to be statistically significant,

which boosts the confidence in the validity of the baseline results.

Table 5: Placebo tests for export values

| | (1) Employees>1 | (2) Employees>10 | (3) Employees>1& Min. share<1 | (4) Employees>1& 0>Min. share<1 |
|---|---|---|---|---|
| A- 2015 Placebo | | | | |
| Exposure | -0.0904 | -0.0155 | -0.0712 | -0.0773 |
| | (0.0749) | (0.0992) | (0.0991) | (0.1156) |
| N | 84,702 | 57,123 | 70,008 | 52,953 |
| Firms | 28,234 | 19,041 | 23,336 | 17,651 |
| B- 2014 Placebo | | | | |
| Exposure | 0.0591 | 0.1041 | 0.0903 | 0.1603 |
| | (0.0805) | (0.1092) | (0.1062) | (0.1240) |
| N | 56,468 | 38,082 | 46,672 | 35,302 |
| Firms | 28,234 | 19,041 | 23,336 | 17,651 |

*** p<0.01, ** p <0.05, * p<0.1

*Note*: All models include firm and year fixed effects. Standard errors are clustered at the firm level in all regressions. Export values are given in dollars and are log transformed.

While the average effect of the minimum wage increase on exports appears large and consistent, the size of the firm may be an important determinant in its ability to absorb the increase in labor costs. Therefore, we divided our main sample into four quartiles based on the export value of firms in 2015 and estimated the effect for each sub-sample separately.[6] The results are shown by Panel A of Table 6 and suggest that the effect is hump-shaped in export value and is entirely driven by firms in the middle of the distribution. The lack of any significant effect on large exporters may be due to their ability to absorb short-term shocks in production costs with a view to adjust factors of production in the long-term without compromising their market share.

For smaller firms, a similar mechanism is unlikely to be possible and we would expect them to be either raising prices or lowering their mark-up in order to keep their export value stable. Alternatively, smaller firms may be more likely to stop exporting at all. Panel B presents the results from regressions where the dependent variable is defined as exporting in 2016 and the sample consists of firms that exported throughout 2013 and 2015. Since these models only apply to a single

[6]The quartiles are defined as following: the first quartile consists of firms that exported less than 80,000 USD, the second between 80,000 and 350,000 USD, the third between 350,000 and 1,500,000 USD and the fourth more than 1,500,000 USD. All values are approximates.

year, we included sector and region fixed effects rather than firm fixed effects. We find a negative effect from our exposure variable on the probability of exporting in 2016 and this effect appears to be driven entirely by small exporters.

Table 6: Impact on export values by 2015 export value quartiles

| | (1) All | (2) 1st Quartile | (3) 2nd Quartile | (4) 3rd Quartile | (5) 4th Quartile |
|---|---|---|---|---|---|
| A - Impact on export value | | | | | |
| Exposure | -0.3149*** | -0.2349 | -0.6205*** | -0.2959** | -0.0725 |
| | (0.0804) | (0.1896) | (0.1724) | (0.1473) | (0.1504) |
| N | 112,936 | 28,236 | 28,232 | 28,236 | 28,232 |
| Firms | 28,234 | 7,059 | 7,058 | 7,059 | 7,058 |
| B - Impact on exporting in 2016 | | | | | |
| Exposure | -0.3295*** | -0.2842*** | -0.0176 | -0.0035 | -0.0382 |
| | (0.0214) | (0.0498) | (0.0401) | (0.0311) | (0.0301) |
| Firms | 31,997 | 9,371 | 7,918 | 7,462 | 7,246 |

*** p<0.01, ** p <0.05, * p<0.1

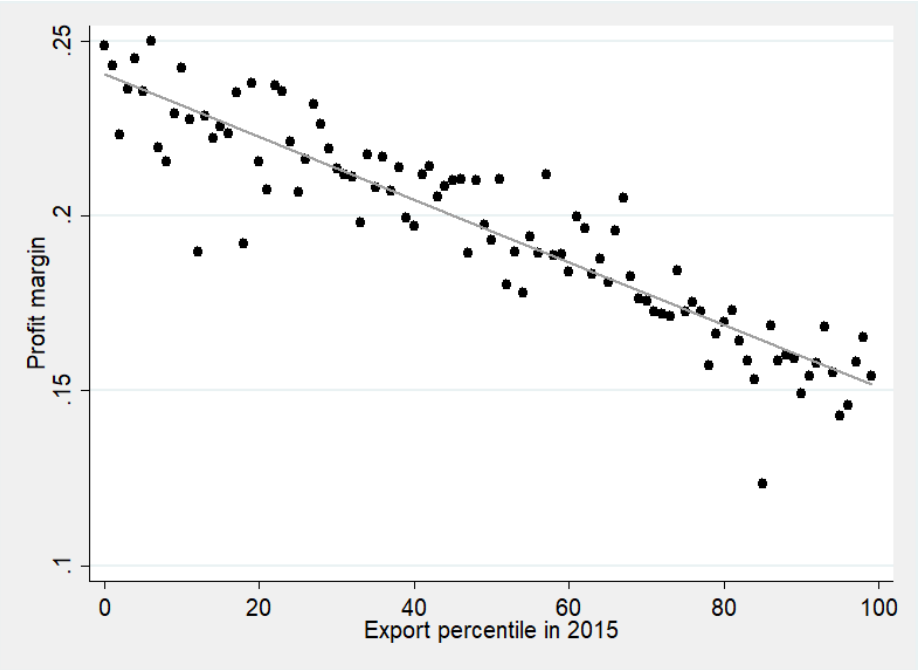
*Note*: All models in Panel A include firm and year fixed effects. The sample consists of firms that exported throughout 2013 and 2016. All models in Panel B include SITC and region fixed effects and the subsample consits of firms that exported throughout 2013 and 2015. Standard errors are clustered at the firm level in all regressions.

We additionally checked whether a mark-up based explanation is plausible for small exporters that neither stop exporting or lower their export value by plotting the export percentile of firms according to the 2015 export value distribution against the average profit margin of the firms in that percentile defined as the ratio of profits to sales.[7] Figure 6 shows that there is a remarkably linear negative correlation between the export percentile of a firm in 2015 and its profit margin in the same year. We may then speculate that smalls firms that continue to export are able to adjust their mark-ups rather than sales even if they are unable to adjust prices.

When the value of exports decline, firms may be expected to specialize to fewer goods for which they have the possibility of charging higher mark-ups. Table 7 presents estimates of the effect that the minimum wage increase had on the variety of goods exported by firms. Panel A defines a good type using the 6 digit SITC category while panel B defines each good type based on the 12 digit GTIP category used by Turkish customs. In both cases there is a statistically significant negative

[7] Figures on total sales are obtained from the balance sheets of firms and include both domestic and foreign sales made by the firm.

Figure 6: Profit margins and exports




effect on the variety of goods exported. A percentage point increase in labor costs lowers the variety of goods sold by a firm by 0.2%. The coefficients are slightly larger in panel B, which is unsurprising considering the greater detail of good characteristics captured by the 12 digit level. The increase in minimum wages may have increased the competitive pressure on Turkish exporters. Higher costs appear to force firms to behave in a manner described by Eckel and Neary (2010) as "leaner and meaner" and focus on products related to their core competencies. Our findings may also be interpreted within the framework of Mayer et al. (2014), who expect firms facing tougher competition to limit their exports to their best performing products.

### 5.3 Prices

Section 5.2 showed that firms affected by the minimum wage increase lowered their exports in 2016. In this section, we analyze to what extent Turkish exporters can pass-through the cost increase induced by minimum wage legislation to export prices. Table 8 presents the estimates obtained from the specification given by

Table 7: Impact on the number of types of goods

| | (1) Employees>1 | (2) Employees>10 | (3) Employees>1& Min. share<1 | (4) Employees>1& 0>Min. share<1 |
|---|---|---|---|---|
| A- 6 Digit | | | | |
| Exposure | -0.2053*** | -0.1898*** | -0.1908*** | -0.2496*** |
| | (0.0487) | (0.0633) | (0.0638) | (0.0734) |
| N | 112,936 | 76,164 | 93,344 | 70,604 |
| Firms | 28,234 | 19,041 | 23,336 | 17,651 |
| B- 12 Digit | | | | |
| Exposure | -0.2274*** | -0.2022*** | -0.1963*** | -0.2518*** |
| | (0.0499) | (0.0648) | (0.0654) | (0.0752) |
| N | 112,936 | 76,164 | 93,344 | 70,604 |
| Firms | 28,234 | 19,041 | 23,336 | 17,651 |

*** p<0.01, ** p <0.05, * p<0.1

*Note*: All models include firm and year fixed effects. Standard errors are clustered at the firm level in all regressions. The variety variables are log transformed.

equation 3, where each observation is the monthly trade of a 12 digit good by a firm to a given country. The results suggest that Turkish exporters do not adjust their prices in response to minimum wage increase and are likely to be price-takers in international trade. None of the coefficients are close to statistical significance. The lack of effects on prices may explain the large decline in export value. When exporters are faced by a cost shock and are unable to adjust prices, the decline in exports should be larger than in a setting where exporters can raise prices. Export prices are predicted to be rigid by De Blas and Russ (2015) when the exporting country's technology level is low relative to the destination country. Nearly half of Turkish exports are to EU-27 countries. We may expect on average that the relative technology of Turkish exporters is lower than that of the firms in their destination country which can help explain the lacking evidence for cost pass-through.

Table 8: Impact on export prices

| | (1) Employees>1 | (2) Employees>10 | (3) Employees>1& Min. share<1 | (4) Employees>1& 0>Min. share<1 |
|---|---|---|---|---|
| Exposure | 0.0654 | 0.0345 | 0.0479 | 0.0446 |
| | (0.0583) | (0.0753) | (0.0752) | (0.0867) |
| N | 28,764,337 | 23,508,612 | 26,939,202 | 19,948,631 |
| Firms | 28,234 | 19,041 | 23,336 | 17,651 |

*** p<0.01, ** p <0.05, * p<0.1

*Note*: All models include firm, destination country, good and year-month fixed effects Standard errors are clustered at the firm level in all regressions. Prices are defined as the log of the ratio of export value to export volume.

Similar to export values, we performed placebo tests for our price estimates to test the validity of the common trends assumption. The placebo estimates are shown by Table 6. While the baseline estimates are statistically insignificant in both 2015 and 2014, we find statistically significant positive effects when using alternative samples in 2015. This may suggest a risk of upward bias in the effects due to a higher average rise of prices of firms that are affected more by the minimum wage increase. The violation of the common trend assumption may be exclusive to 2015 when Turkish exports declined noticeably, in which case the results for 2016 would still be valid. However, even if we assume that our baseline estimates are biased upwards, it would only confirm our conclusion that prices did not rise in response to the minimum wage increase.

Table 9: Placebo tests for export prices

| | (1) Employees>1 | (2) Employees>10 | (3) Employees>1& Min. share<1 | (4) Employees>1& 0>Min. share<1 |
|---|---|---|---|---|
| A- 2015 Placebo | | | | |
| Exposure | 0.0809 | 0.173** | 0.182** | 0.212** |
| | (0.0590) | (0.0800) | (0.0779) | (0.0891) |
| N | 20,709,687 | 16,949,446 | 19,344,185 | 14,247,691 |
| Firms | 28,234 | 19,041 | 23,336 | 17,651 |
| B- 2014 Placebo | | | | |
| Exposure | -0.0073 | 0.0228 | 0.0307 | 0.00685 |
| | (0.0480) | (0.0603) | (0.0602) | (0.0665) |
| N | 13,169,207 | 10,779,845 | 12,304,870 | 9,017,972 |
| Firms | 28,234 | 19,041 | 23,336 | 17,651 |

*** p<0.01, ** p <0.05, * p<0.1

*Note*: : All models include firm, destination country, good and year fixed effects. Standard errors are clustered at the firm level in all regressions. Prices are defined as the log of the ratio of export value to export volume.

Similar to the analysis presented by Table 10 for exports, we tested whether we can detect any price effects for exporters with different sizes by dividing our sample into four quartiles based on 2015 exports of firms. The estimates given by Table 10 provide no evidence for heterogeneous effects on the prices of firms in different quartiles. Since we had found a very strong decline in export value for firms in quartiles 2 and 3, finding no effects on their prices is predictable. However, the lack of effects on export value of larger and smaller exporters suggest that

explanations such as the willingness of large exporters to bear short-term costs for long-term market share dominance and higher profit margins of small firms are necessary to reconcile the findings between prices and exports.

Table 10: Impact on export prices by 2015 export value quartiles

| | (1) All | (2) 1st Quartile | (3) 2nd Quartile | (4) 3rd Quartile | (5) 4th Quartile |
|---|---|---|---|---|---|
| Exposure | 0.0654 | -0.0884 | 0.0167 | 0.0863 | 0.0640 |
| | (0.0583) | (0.143) | (0.112) | (0.0894) | (0.0723) |
| N | 28,764,337 | 478,124 | 1,272,093 | 3,232,105 | 23,778,253 |
| Firms | 28,234 | 7,059 | 7,058 | 7,059 | 7,058 |

*** p<0.01, ** p <0.05, * p<0.1

*Note*: All models include firm and year fixed effects. Standard errors are clustered at the firm level in all regressions. Prices are defined as the log of the ratio of export value to export volume.

## 6 Conclusion

Wage competitiveness remains an important source of comparative advantage for developing countries in international trade. This paper studies the impact of a large increase in minimum wages in Turkey on exporters. The detailed administrative employee-employer matched dataset allows us to cleanly identify the impact of the minimum wage legislation at the firm level and contribute to the discussion on the effects of minimum wage legislation on exports by developing, open countries.

We find significant negative effects on employment, exports and export variety of exporting firms. A one percentage point increase in labor costs corresponds to declines of 0.4% in employment, 0.3% in exports and 0.2% in export variety. The negative effects on exports are driven by firms in the middle of the export value distribution. We find no evidence of a cost pass-through effect induced by minimum wage legislation on prices. The position of Turkish firms as price-takers in international trade may have contributed to the large declines in export outcomes.

Several caveats of our study shed light on both how the results should be interpreted and point to avenues for further research. First, our identification relies on a short-term effect, and adjustments in production inputs in the long-term may

dampen the size of the negative effects. Second, interpreting our findings as the impact of an exogenous increase in labor costs rather than the impact of an increase in minimum wages may be tempting. However, national minimum wage legislations may have general equilibrium implications through simultaneous effects on the labor market and an increase in purchasing power. While the present paper contributes to the understanding of how labor costs affect exports, the interpretation of the findings should be kept within a minimum wage legislation framework.

## References


Almeida R, Carneiro P. 2012. Enforcement of labor regulation and informality. *American Economic Journal: Applied Economics* **4**: 64–89.

Bai X, Chatterjee A, Krishna K, Ma H. 2018. *Trade and Minimum Wages in General Equilibrium: Theory and Evidence*. National Bureau of Economic Research No. 24456.

Bastos P, Silva J. 2010. The quality of a firm's exports: where you export to matters. *Journal of International Economics* **82**: 99–111.

Bell B, Machin S. 2018. Minimum wages and firm value. *Journal of Labor Economics* **36**: 159–195.

Bertrand M, Duflo E, Mullainathan S. 2004. How much should we trust differences-in-differences estimates? *The Quarterly Journal of Economics* **119**: 249–275.

Brecher RA. 1974. Minimum wage rates and the pure theory of international trade. *The Quarterly Journal of Economics* : 98–116.

Carluccio J, Fougere D, Gautier E. 2015. Trade, wages and collective bargaining: evidence from France. *The Economic Journal* **125**: 803–837.

Davis DR. 1998. Does european unemployment prop up american wages? national labor markets and global trade. *American Economic Review* : 478–494.

De Blas B, Russ KN. 2015. Understanding markups in the open economy. *American Economic Journal: Macroeconomics* **7**: 157–80.

Draca M, Machin S, Van Reenen J. 2011. Minimum wages and firm profitability. *American Economic Journal: Applied Economics* **3**: 129–51.

Dube A, Lester TW, Reich M. 2010. Minimum wage effects across state borders: Estimates using contiguous counties. *The Review of Economics and Statistics* **92**: 945–964.

Dustmann C, Glitz A. 2015. How do industries and firms respond to changes in local labor supply? *Journal of Labor Economics* **33**: 711–750.

Eckel C, Neary JP. 2010. Multi-product firms and flexible manufacturing in the global economy. *The Review of Economic Studies* **77**: 188–217.

Flug K, Galor O. 1986. Minimum wage in a general equilibrium model of international trade and human capital. *International Economic Review* : 149–164.

Gan L, Hernandez MA, Ma S. 2016. The higher costs of doing business in China: Minimum wages and firms' export behavior. *Journal of International Economics* **100**: 81–94.

Gürcihan-Yüncüler B, Yüncüler Ç. 2016. *Minimum Wage Effects on Labor Market Outcomes in Turkey*. Research and Monetary Policy Department, Central Bank of the Republic of Turkey.

Hamermesh D. 1993. *Labor demand*. Princeton, NJ.

Harrigan J, Ma X, Shlychkov V. 2015. Export prices of US firms. *Journal of International Economics* **97**: 100–111.

Krishna P, Mitra D, Chinoy S. 2001. Trade liberalization and labor demand elasticities: evidence from Turkey. *Journal of International Economics* **55**: 391–409.

Lichter A, Peichl A, Siegloch S. 2015. The own-wage elasticity of labor demand: A meta-regression analysis. *European Economic Review* **80**: 94–119.

Macis M, Schivardi F. 2016. Exports and wages: rent sharing, workforce composition, or returns to skills? *Journal of Labor Economics* **34**: 945–978.

Manova K, Zhang Z. 2012. Export prices across firms and destinations. *The Quarterly Journal of Economics* **127**: 379–436.

Martin J. 2012. Markups, quality, and transport costs. *European Economic Review* **56**: 777–791.

Mayer T, Melitz MJ, Ottaviano GI. 2014. Market size, competition, and the product mix of exporters. *American Economic Review* **104**: 495–536.

Melitz MJ. 2003. The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica* **71**: 1695–1725.

Neary JP. 1985. International factor mobility, minimum wage rates, and factor-price equalization: A synthesis. *The Quarterly Journal of Economics* **100**: 551–570.

Neumark D, Salas JI, Wascher W. 2014. Revisiting the minimum wage—employment debate: Throwing out the baby with the bathwater? *ILR Review* **67**: 608–648.

Papps KL. 2012. The effects of social security taxes and minimum wages on employment: Evidence from Turkey. *ILR Review* **65**: 686–707.

Paz LS. 2014. The impacts of trade liberalization on informal labor markets: A theoretical and empirical evaluation of the brazilian case. *Journal of International Economics* **92**: 330–348.

PERYON. 2015. *Minimum Wage, Maximum Uncertainity*. PERYON Publications. URL `http://www.peryon.org.tr/wp-content/uploads/2015/12/Asgari_Ucret.pdf`

Riley R, Bondibene CR. 2017. Raising the standard: Minimum wages and firm productivity. *Labour Economics* **44**: 27–50.

Slaughter MJ. 2001. International trade and labor–demand elasticities. *Journal of International Economics* **54**: 27–56.

Taymaz E. 2009. Informality and productivity: Productivity differentials between formal and informal firms in Turkey. *Country Economic Memorandum (CEM)* .

Tumen S. 2016. The economic impact of Syrian refugees on host countries: Quasi-experimental evidence from Turkey. *American Economic Review* **106**: 456–60.

Turkish Statistics. 2018. *Foreign Trade Database 2018*. TURKSTAT.

World Bank. 2018. *World Development Indicators 2018*. The World Bank.