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RESEARCH ARTICLE

ASSESSING THE DISTRIBUTIVE EFFECTS OF MINIMUM WAGE: EVIDENCE FROM TURKEY

Sinem SEFİL TANSEVER*

Abstract

This study explores the effects of the 2016 minimum wage hike in Turkey on wage distribution up to 2022 by using a difference-in-differences methodology. This approach employs unconditional quantile regressions by utilizing variation in the bite of the minimum wage across NUTS2 regions in Turkey and utilizes data from the Turkish Household Labor Force Survey (HLSF). The findings indicate that the 2016 minimum wage increase positively affects wages in the lower quantiles while having a negative impact on wages in the higher quantiles. Consequently, this leads to a wage compression effect, ultimately resulting in a reduction in wage inequality, as supported by descriptive analysis.

Keywords: Minimum wage, Inequality, Wages
JEL codes: J31, J38

1. Introduction

The impact of minimum wage policies on different worker groups has been a widely debated topic in the economic literature, with thorough reviews conducted by numerous researchers, including Card and Krueger (1995), Brown (1999), Machin and Manning (1997), Rubery (2003), Manning (2011), Neumark and Wascher (2008), and Levin-Waldman (2018). The minimum wage can potentially reduce wage inequality due to its diverse impact across the wage distribution. When the minimum wage increases, the lowest earners witness a significant boost in their income, while middle-income individuals experience a moderate gain and high earners encounter only a minimal or negligible rise. Simultaneously, employment and overall economic output experience only a slight decline as workers tend to shift to more productive firms (Engbom and Moser, 2022). Research from developed countries (; Butcher et al. 2012; Machin and Manning 1994; Teulings 2003; Card and Krueger 1994; DiNardo et al. 1996; Lee 1999; Dickens and Manning 2004; Stewart 2012; Autor et al. 2008; Autor et al. 2016, Caliendo et al. 2017; Fortin and Lemieux 2000; Vandekerckhove et al. 2018; Bossler and Shank 2023) showed that minimum wages have a substantial impact on reducing wage inequality. In developing countries, the effect of minimum

* Istanbul Ticaret University, Department of Economics (in English), E-mail: ssefil@ticaret.edu.tr, ORCID: 0000-0001-7124-8618

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wages on wage inequality is often unclear due to segmented labor markets and weak enforcement. However, an increasing body of research, such as the studies conducted by Bosch and Manacorda (2010) in Mexico, Lin and Yun (2016) in China, Engbom and Moser (2022) and Sotomayor (2021) in Brazil, Khurana et al. (2023) in India, and Lombardo et al. (2022) in Latin American countries, has demonstrated that raising minimum wages has the potential to result in a decrease in wage inequality in emerging economies.

Turkey exhibits numerous similarities with other developing economies, such as having a large informal sector and increasing reliance on informal employment, weak labor institutions lacking effective law enforcement, an economy with low allocation efficiency characterized by a significant presence of small, low-productivity firms, and low productivity of labor attributed to insufficient levels of human capital among employees. Consequently, a substantial portion of the workforce comprises low-wage employees who receive minimum wage compensation, a characteristic commonly observed in many developing-country economies (Bossavie et al., 2019). Hence, examining Turkey's case broadens our currently limited understanding of how minimum wages impact wage inequality in developing countries characterized by these labor market features. The distributional effects of Turkey's 2016 minimum wage increase demand special attention because it was driven mainly by exogenous political competition ahead of the 2015 elections rather than being a consequence of the economy's internal dynamics. Following this increase, In the period following 2016, the Turkish economy witnessed a notable decline in institutional autonomy driven by increased authoritarianism. This era has also seen the revival of reactive ad-hoc policies, macroeconomic instability, and the challenging external conditions stemming from the post-2015 US Federal Reserve tightening period. In conjunction with rising inflation, this economic landscape prompted the government to adopt a proactive minimum wage policy, leading to a rise in the real minimum wage, surpassing the average real wages after 2016.

In recent years, considerable attention has been dedicated to studying the effects of the minimum wage on Turkey's labor market, with particular attention given to employment outcomes rather than its impact on wage inequality. However, the available evidence in the literature concerning labor market outcomes of minimum wage in Turkey is notably varied. Güven et al. (2011) found no relationship between the minimum wage and employment in the Turkish manufacturing industry throughout 1969-2008. Pelek (2015) investigated whether the national minimum wage has influenced employment rates of workers aged 15-29 by taking regional disparities into account and found no disemployment effect for this age group. Gürcihan-Yüncüler and Yüncüler (2016) explored the consequences of the 2004 minimum wage increase on labor market outcomes, discovering a favorable impact on working hours and informality. Dağlıoğlu and Bakır (2015) revealed a positive correlation between the minimum wage and employment, showing distinct effects on men and women. Aslan (2019) demonstrated a reduction in informality within Turkey's market attributable to the minimum wage increases between 2003 and 2017. Notwithstanding these findings, several studies have identified adverse impacts of the minimum wage on employment in Turkey. Öztürk (2007) investigated the effect of the minimum wage on the Turkish labor market before the 2000s and found that it has a detrimental impact on employment

among low-productivity workers and the number of part-time jobs. Papps (2012) examined the effect of the 2004 minimum wage increase on employment, revealing a decline in the likelihood of formal employees retaining their jobs. Bakis et al. (2015) demonstrated that the minimum wage hike in 2004 motivated teenagers to pursue schooling and decreased their participation in the labor force. Bossevie et al. (2019) showed that the 2016 minimum wage increase resulted in a significant rise in the destruction of formal firms, especially small ones characterized by low productivity levels, ultimately reducing the total number of formal enterprises in the economy. Gürsel et al. (2018) discovered a strong positive relationship between the minimum wage rise in 2016 and the proportion of informal employment within the labor market.

While the number of studies examining the influence of minimum wage on wage inequality in Turkey is limited, their findings are notably consistent, suggesting that the minimum wage has a decreasing effect on wage inequality. Pelek (2013) examined the impact of the 2004 minimum wage increase on wages by decomposing the wage differences and trends in wage dispersion prior to and afterward the rise and found that the minimum wage has been instrumental in diminishing wage inequality among male and female wage earners. Bakis and Polat (2015) examined the evolution of wage inequality using the decomposition approach between 2002 and 2010 and showed that the 2004 minimum wage increase played a significant role in decreasing wage inequality. Bakis and Polat (2015) conducted a decomposition analysis to examine the changes in wage inequality from 2002 to 2010. Their findings highlighted that the 2004 minimum wage increase played a significant role in decreasing wage inequality. Ekşi and Kırdar (2015) attributed the decline in wage inequality from 2002 to 2011 to the 2004 minimum wage increase. Gürcihan-Yüncüler and Yüncüler (2016) demonstrated that the 2004 minimum wage increase contributed to a reduction in wage inequality using a quasi-experimental approach. Tamkoç and Torul (2020) explored the role of minimum wage hikes in reducing wage inequality by conducting a counterfactual analysis. Işık et al. (2020) showed the positive effects of the 2016 minimum wage increase on wages of most demographic groups and informal workers by employing a difference-in-differences approach. Bakış and Polat (2023) revealed that the minimum wage increases in 2004 and 2016 contributed to reducing the wage disparity between the upper and lower percentiles by employing a decomposition approach.

The results of this study are consistent with the limited prior research on the effects of the 2016 minimum wage increase on wage disparity, indicating a reduction in wage inequality. This research examines the impact of the 2016 minimum wage increase along the wage distribution up to 2022 using a difference in differences (DID) approach, applying unconditional quantile regressions to data from the Turkish Household Labor Force Survey (HLSF). The study reveals that the 2016 minimum wage increase positively impacts wages in the lower quantiles while it negatively impacts wages in the higher quantiles. This results in a wage compression effect, ultimately leading to an improvement in wage dispersion, as corroborated by descriptive analysis. As far as our knowledge extends, the primary contribution of this study is its pioneering attempt to investigate the impact of the 2016 minimum wage increase on different quantiles of the wage distribution while extending the analysis until 2022.

The rest of the study is structured as follows: Section 2 offers insights into the Institutional framework and the Minimum Wage Increase in 2016. Section 3 examines the evolution of minimum wage and wage Inequality in Turkey between 2004 and 2022. Section 4 describes the data and difference-in-differences methodology employed in the study. Section 5 presents the empirical results, and Section 6 concludes.

2. The Institutional Framework and the Minimum Wage Increase in 2016

Figure 1 provides an overview of the historical evolution of Turkey's minimum wage legislation. Despite the introduction of modern minimum wage legislation in Turkey in 1936, the onset of adverse conditions resulting from the Second World War delayed the implementation of minimum wage until the 1950s. The minimum wage was determined by regional commissions between 1951 and 1967. Considering local or regional characteristics in determining the minimum wage has not been adequately reflected in practice. Since there has not been sufficient harmony between local minimum wage commissions, significant minimum wage differences have occurred between very close or distant regions within the same period, even in regions with similar economic and social structures. A central committee was instituted to determine minimum wage rates for specific sectors and regions in 1967. From 1969 to 1973, minimum wage rates were exclusively set for the industrial sector. Subsequently, in 1973, a separate minimum wage was introduced for individuals working in agriculture and forestry. Between 1969 and 1974, the central minimum wage was determined regionally, and the national minimum wage was officially introduced in 1974. In 1989, the practice of varying minimum wage rates between industry, agriculture, and forestry was abandoned. Since then, the country has consistently maintained a uniform minimum wage nationwide without distinctions based on regions or sectors (Yolvermez, 2020, 244).

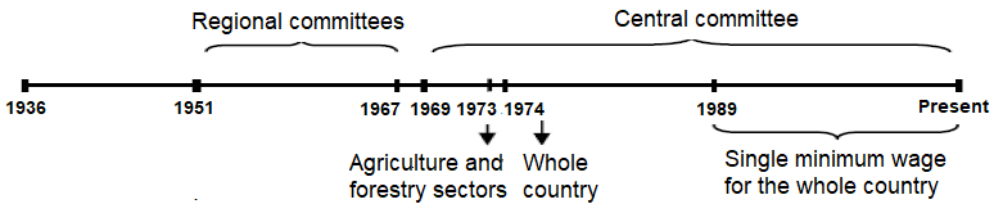

Figure 1. Historical Evolution of Minimum Wage Legislation in Turkey
Source: Yılmaz-Eser and Terzi (2008, 131)

As specified in the Minimum Wage Law of 2004, the central committee consists of 15 members, including two representatives from the Ministry of Labor and Social Security, one representative from the Turkish Statistical Institute (Turkstat), one representative from the Undersecretariat

of Treasury, one representative from the Ministry of Development, five representatives to be elected by the highest labor organization that has the largest number of workers for different branches of business, and five representatives to be elected by the employer organization that has the largest number of employers for other branches of industry. Although the current law stipulates a minimum wage determination period of at least every two years, the minimum wage has been adjusted annually or biannually over the past two decades. Between 2004 and 2015, the committee disclosed separate minimum wage rates for the initial and latter halves of the upcoming year each December. This decision, taking inflation expectations into account, meant that the revised minimum wage rates would be enforced on January 1 and July 1 of the following year. Between 2016 and 2021, the committee established a single minimum wage level for the entire year. However, in 2022 and 2023, due to elevated inflation rates, the committee reverted to setting the minimum wage biannually.

A minimum wage is regarded as setting an external wage floor within labor markets. It is often considered as a form of collective bargaining, particularly in countries with significantly limited labor union representation and weak labor market institutions, such as Turkey. This approach directly or indirectly influences a significant portion of the workforce (Kahveci and Pelek, 2021). Isık et al. (2020) highlighted three crucial characteristics of the Turkish labor market that should be considered when assessing the impact of the minimum wage on labor market outcomes. These characteristics, including high informality levels, gender-based disparities in labor force participation, unemployment, wages favoring men, and regional disparities in unemployment and labor force participation rates, collectively intensify the influence of the minimum wage in labor markets. Furthermore, the low level of unionization and reduced coverage of collective bargaining agreements in Turkey make the minimum wage a primary indicator in the labor market. In 2019, Turkey's collective bargaining coverage was only 8.5%, significantly lower than the OECD average of 32.1% for the same year.

During the 2000s, the most significant hike in minimum wage occurred in 2016, resulting in a 33% nominal and 25% real increase. In contrast, previous increases in the minimum wage were characterized by gradual and smaller changes, typically falling within the range of approximately 5% to 8% in nominal terms. This significant increase in the minimum wage was primarily a result of the electoral competition in 2015. Before the November 2015 elections, all political parties committed to significantly raising the minimum wage as part of their campaign promises, engaging in a competitive stance to offer the most substantial increase. Consequently, following the election, the national minimum wage was established at 1300 TL on January 1, 2016. The emergence of the new minimum wage through the political process indicates that the change was primarily influenced by external political factors rather than internal economic dynamics. The significant magnitude and the externally driven nature of the 2016 minimum wage increase provide a robust experimental setting for investigating the causal effects of the increase on wage distribution.

3. Evolution of Minimum Wage and Wage Inequality in Turkey

Figure 2 depicts the trends in the share of employees earning the minimum wage and below-average real wages and real minimum wages. While real minimum wages and average real wages exhibited similar trends up until 2016, a substantial divergence between the two has become evident in subsequent years. After the minimum wage increase in 2016, the growth in the real minimum wage has consistently surpassed the growth in the average real wage. This can be attributed to two main factors: the growing share of workers paid minimum wage and below and the depreciation of average nominal wages relative to inflation. As illustrated in Figure 1, the percentage of employees earning minimum wage and below has consistently remained high, averaging 28.6% between 2004 and 2015 and notably increasing to an average of 41.1% between 2016 and 2022. The highest share was observed in 2019, reaching 46.25%. In contrast, the percentage of workers receiving wages at or below the minimum wage in the European Union (EU-27) for the same year was 15% (ILO, 2021). These indicators from Figure 2 alone paint a picture of Turkey becoming a nation of minimum wage earners.

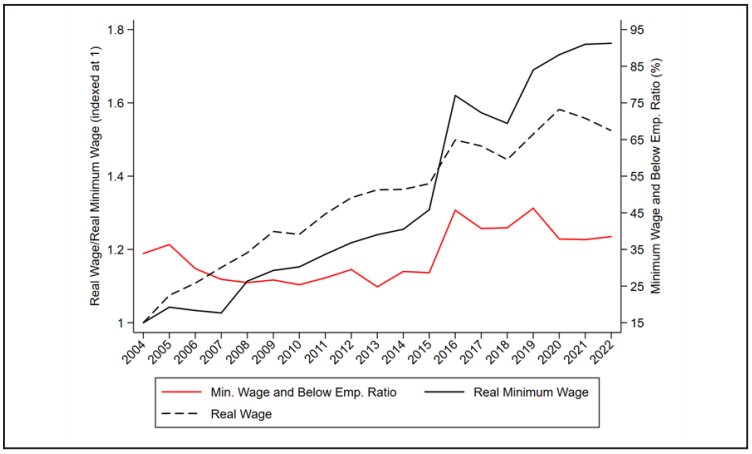

Figure 2. Evolution of Real Wage, Real Minimum Wage, Indicators for Minimum Wage

Source: Author's calculations based on data from HLSF and Ministry of Labor and Social Security of Turkey.
Note: Real wage and Below Employment Ratio are calculated using HLSF data

In Figure 3, the variance of log wages and the log differences of wage percentiles are used to analyze the overall wage disparity between 2004 and 2022, which is assessed through the log wage variance. It seems that wage inequality initially decreased until the global crisis of 2008, but then it rose until 2010. Subsequently, it diminished until the end of the period, with the decreasing trend briefly interrupted by a slight increase between 2016 and 2020. Panel b of Figure 2 presents the wage inequality measured by the log differences of various percentiles. The wage disparity at the higher end of the distribution, exemplified by the gap between the 90th and the 50th percentile, experienced an increase following the 2008 global financial crisis. This increase stabilized until 2016 when a decline was observed; from then on, it remained relatively constant.

Dispersion in the lower half of the wage distribution, as depicted by the gaps between p50 and p20, p50 and p15, and p50 and p5, demonstrates a declining trend over the given period. The measures in Figure 3 show that wage inequality at the end of the period is lower than at the beginning, except for log differences of p90-p50, which have almost the same value at the two endpoints of the analysis period.

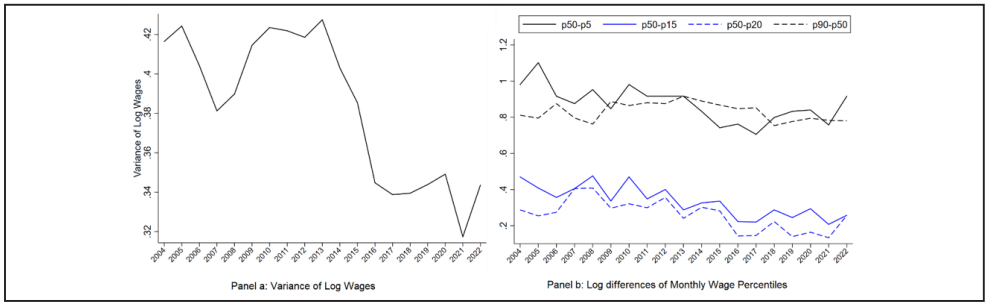

Figure 3. Evolution of the Wage Disparity

Source: Author's calculations based on HLSF data.

As shown in Figure 4, the proportion of the minimum wage to the median wage in Turkey is significant and exhibits an upward trend. Since 2007, it has demonstrated an upward trajectory, reaching a peak of 89% by 2022. This ratio stands at 54.7% for full-time workers across 32 OECD countries. The percentage of the minimum wage to mean wage exhibits a similar trend, although it is smaller than the percentage of the minimum wage to the median wage. The period between 2009 and 2015 shows a relatively stable trend for the minimum wage to mean wage ratio, followed by a sharp increase in 2016 and a gradual rise until the period's end. In 2022, it reached its highest point at 0.71%, while the average for 32 OECD countries was 43.2% for the same year. Despite being lower than the ratio of minimum wage to average wage, the percentage of minimum to 90th percentile wage follows a similar trend.

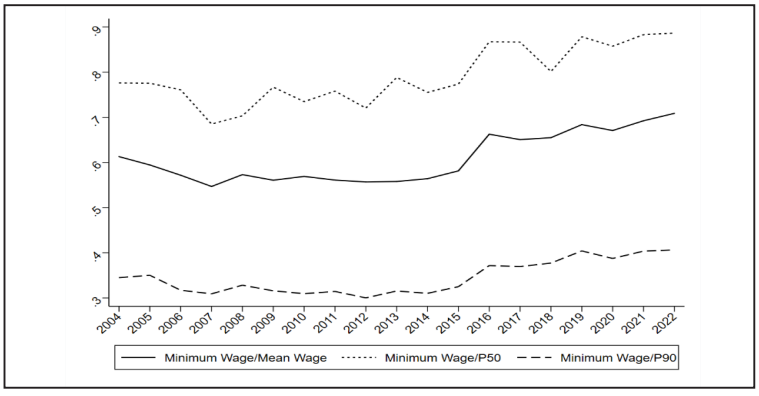

Figure 4. Minimum Wage Statistics for Turkey

Source: Author's calculations based on data from HLSF and the Ministry of Labor and Social Security of Turkey.

Kernel density plots are utilized to understand better the impact of the 2016 minimum wage increase on wage distribution, as they are practical tools for visualizing wage levels and highlighting the parts affected by the minimum wage changes. Figure 5 displays the Kernel estimates of the real monthly wages of wage earners in 2015 and 2016. As expected, wage distribution exhibits a right skew, with the mean being higher than the median each year. The minimum wage truncates the wage earners' distribution, resulting in spikes at the minimum wage level for both years. The most notable change from 2015 to 2016 is a leftward shift of the lower end of the distribution, while the right segment has sustained a relatively stable pattern. In other words, a significant wage increase occurred at the bottom of the wage distribution. In contrast, the wages at the top of the wage distribution remained substantially stable between the two years.

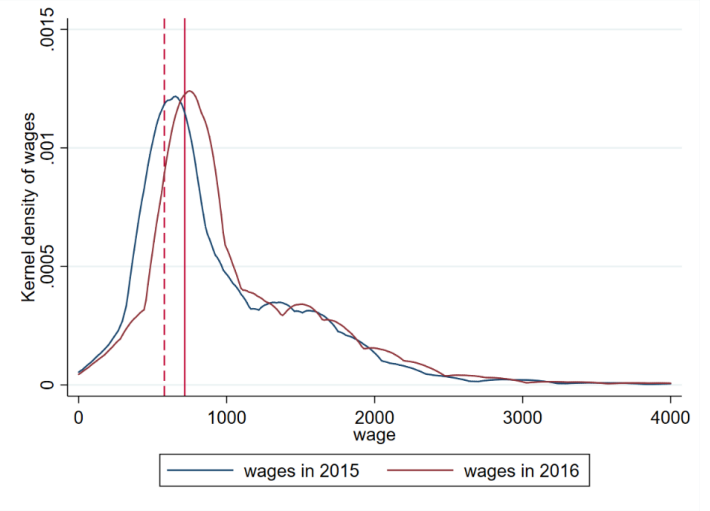

Figure 5. Real Monthly Wage Distributions in 2015 and 2016

Source: Author's calculations based on data from HLSF

Notes: Vertical dash line and solid line indicate the real minimum wages in 2015 (578.5 TL) and 2016 (716.4 TL), respectively.

The HLFS, 2003 and 2005, own calculations

Table 1 presents an alternative perspective on the influence of the minimum wage, showing growth in the real monthly wage (calculated as the log-point differences) over various wage distribution bins. This approach follows the methodology outlined by Stewart (2012) and Bossler and Schank (2023). The 2015-2016 period stands out significantly from the previous periods due to the magnitude of the growth rate in each bin. From 2015 to 2016, the growth of each wage bin was at least ten times larger than the growth rates observed in previous periods, highlighting the significant impact of the 2016 minimum wage increase on the wage distribution. Yet, wage growth increases slightly before the actual change, which could be attributed to an upward wage movement at the lower deciles or a minor anticipation effect.

The first row of Table 1 shows that individuals initially located at the very low end of the wage distribution undergo the most significant wage growth. More robust wage growth at the lowest segment of the distribution is expected due to the concept of mean reversion in wages, which suggests that workers with lower incomes can experience more substantial wage growth than those with higher incomes. From 2015 to 2016, individuals receiving wages between 100% and 110% of the minimum wage also saw notable wage growth. However, it was 1.6 times smaller in magnitude than the wage growth observed in the 'below minimum wage' group. While this effect diminishes when moving up the wage distribution (row 2 and beyond), significant increases in wage growth can be observed across the wage distribution. This suggests an upward wage shift attributed to the 2016 minimum wage increase, extending to individuals not directly impacted by the change.

Table 1. Wage Growth by Wage Distribution Bins

	(1)	(2)	(3)	(4)
	wage growth in the periods			
Initial Wage Bin	2012-2013	2013-2014	2014-2015	2015-2016
below minimum wage	-0.056	0.044	0.051	0.479
100% - 110% minimum wage	0.015	0.016	0.031	0.284
110% - 120% minimum wage	0.030	0.020	0.030	0.257
120% - 130% minimum wage	0.029	0.007	0.028	0.237
130% - 140% minimum wage	0.016	0.010	0.016	0.215
140% - 150% minimum wage	0.020	0.026	0.017	0.208
≥ 200% minimum wage	0.043	-0.017	-0.006	0.181

Source: Author's calculations based on HLSF data.

4. Data and Methodology

The data employed in this study is individual-level cross-sectional data from the Household Labor Force Survey (HLFS) conducted by the Turkish Statistical Institute (TurkStat) covering 2004 to 2022. The HLFS complies with the definitions and concept standards established by The European Union Statistics Office (Eurostat) and collects data on various aspects of the labor force structure in Turkey, including wage, economic activity, occupation, employment status, working hours, as well as information on the duration of unemployment and the type of occupation sought by the unemployed. The HLSF covers the non-institutional population, a minimum of 366,000 households per year between 2004 and 2022. The sample in this study covers employees aged between 15 and 65. It intentionally incorporates all employees with different statuses, including part-time and temporary, without imposing restrictions based on gender to ensure that the groups that the minimum wage is most likely to have a significant influence on are not excluded from the analysis.

The wage variable in the data is the monthly wage earned from the individual's main job activity, including all wage supplements. The monthly wage is adjusted for inflation with the base year

set as 2008. In the study, the OLS (Ordinary Least Squares) and quantile regression analyses utilize the natural logarithm of real monthly wages. Additionally, regional variations are taken into account at the NUTS2 level, consisting of 26 statistical regions as defined and published by Turkstat.

The impact of the January 2016 minimum wage increase on different parts of the wage distribution is investigated using the difference in differences (DID) specification employing unconditional quantile regressions, which utilize regional differences in the bites of the rise in the minimum wage. Defining y_{it} as the natural logarithm (log) of the monthly wages for an individual i at the time t, Firpo et al. (2009, 2018) formulated The RIF (re-centered influence function) of y_{it} for various deciles τ, and the variance of y_{it}, σ^2 as follows:

$$RIF\ (y_{it}, \tau) = y_\tau - \frac{\tau - I[y \leq = y_\tau]}{f_Y(y_\tau)} \quad (1)$$

$$RIF(y_{it}, \sigma^2) = (y_{it} - \mu)^2 \quad (2)$$

In a linear regression context, Firpo et al. (2009) explained that employing the RIF of y_{it} as the dependent variable leads to the generation of unconditional quantile regression. The coefficients derived from the RIF regressions are the average marginal impact on y_{it} at the specified percentile, τ.. The definition of "bite" holds significant importance in this analysis, so the literature explores various alternatives. The most notable is the Kaitz index, the ratio between the minimum and regional average wages. A greater Kaitz value suggests that the minimum wage has a more significant effect. However, it's worth noting that changes in the Kaitz index are not solely driven by shifts resulting from the minimum wage; fluctuations in other segments of the wage distribution also influence this indicator. Another bite measure, "fraction," focuses on the percentage of workers directly impacted by minimum wage increases. It illustrates how much the minimum wage impacts the eligible working population by showing how many of them are affected by the change. A higher proportion of employees earning less than the minimum wage prior to its rise indicates a significant number of workers whom the minimum wage change will impact. Several studies such as Card (1992), Stewart (2002), Dolton et al. (2015), Caliendo et al. (2018), Bossler and Schank (2023), and Wittbrodt (2022) employ the "fraction" bite measure, which is calculated as the proportion of the employed individuals receiving wages less than the minimum wage. Bossler and Schank (2023) explain the primary benefit of utilizing regional variation as its ability to capture spillover effects caused by adjustments in the minimum wage in a specific region. For instance, if one employee experiences a wage increase while some other's wage is reduced in remuneration, the overall wage effect within the labor market remains neutral, regardless of which of the two employees is being considered. This study calculates the bites as the proportion of individuals paid below the minimum wage level before the increase in 2016 in 26 NUTS2 statistical subregions of Turkey. Figure 6 depicts the "bite measure" variation across NUTS2 regions in Turkey, highlighting a diverse impact among different geographical areas. However, the minimum wage increase has the most pronounced effect on the southern-east region of Turkey.

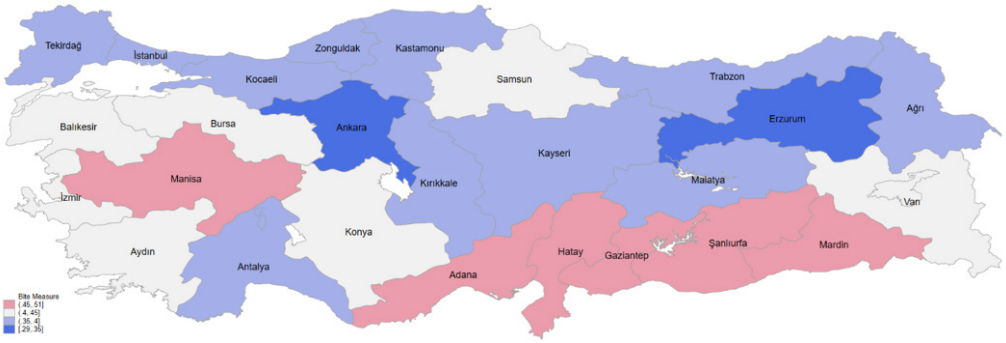

Figure 6. Dispersion of The Bites Across NUTS2 Regions in Turkey

Source: Author's calculations based on HLSF data.

The following difference-in-differences specification from Bossler and Schank (2023) was used in this study:

$$RIF(y_{it},\tau) = \phi * Bite_r + \pi * Bite_r * Trend_t + \sum_{t=2015}^{2022} \delta_t * Bite_r * Year_t + \sum_{t=2014}^{2022} \lambda_t * Year_t + +\epsilon_{it}, \quad (3)$$

where y_{it} represents the natural logarithm (log) of the monthly wages for an individual i at the time t. The dependent variable of the specification is the RIF of y_{it} computed for various deciles of the distribution, τ, the variance of y_{it}, σ^2. Equation 3 comprises treatment effect interaction terms for the years after the 2016 increase in the minimum wage, as well as for 2015, to capture any anticipatory effects. The specification also includes common time effects, the effect of the bite capturing constant level differences over the years, and an interaction between a time trend and the bite variable to capture an existing bite-specific trend. This specification makes it possible to identify the average impact of the minimum wage bite at various points along the unconditional distribution of log monthly wages following the change in the minimum wage policy in 2016. Standard errors are calculated with bootstrap (50 replications) and clustered at the regional level.

An important consideration regarding the empirical specification of this study is to decide whether to include a bite-specific trend ($Bite_r * Trend_t$) in the model. Although t-tests justify the presence of the interaction term in the specification, a graphical examination is conducted to examine how the coefficients' trends differ between models that include the bite-specific trend and those that do not, in line with the approach outlined by Bossler and Schank (2023). Following unadjusted DID specification which does not control for the term ($Bite_r * Trend_t$) is estimated:

$$RIF(y_{it},\tau,unadjusted) = \phi * Bite_r + \sum_{t=2014}^{2022} \delta_t * Bite_r * Year_t + \sum_{t=2014}^{2022} \lambda_t * Year_t + +\epsilon_{it}, \quad (4)$$

Figure 7 displays the estimated δ_t values along the wage distribution for the unadjusted and trend-adjusted models. The unadjusted treatment effects graph (panel A) shows notably positive time trends, particularly evident at the lower end of the wage distribution. This suggests a more pronounced rise in low wages within regions experiencing higher bite measures compared to low wages in areas with lower minimum wage impacts. The trend-adjusted graph (panel b) reveals a suppressed trend at the bottom and middle of the wage distribution, especially after the minimum wage increase in 2016. On the other hand, the high end of the wage distribution (70th and 90th percentiles) has a more pronounced negative trend, particularly evident after 2016. This graphical examination justifies the bite-specific trend along with the statistically significant t-test results for the bite-specific trend in the specification.

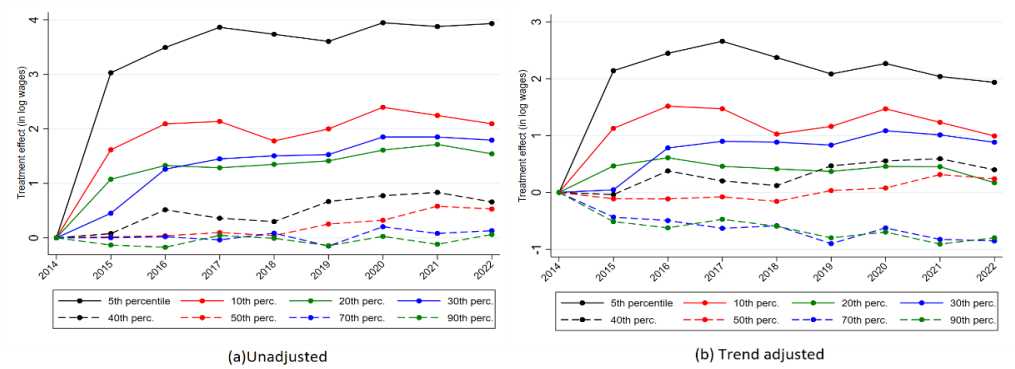

Figure 7. Treatment Effects (coefficients of interaction terms for bite and each year)
Source: Author's calculations based on HLSF data.
Note: The reference year is 2014

5. Findings

The primary results for Equation 3 are displayed in Table 2. Column (1) shows the OLS results, and the presence of statistically insignificant interaction terms suggests the necessity to investigate the effects of the minimum wage increase across the wage distribution. The following columns provide details on the effects of the minimum wage increase on the (RIF) of log wages, covering the 5th to 90th percentiles. At the 5th percentile, the size of the treatment effect interactions ranges from 2 to 2.7, indicating that a 10% increase in the bite results in a minimum 20% increase in monthly wages. The interaction term for 2015 exhibits a less pronounced positive effect than 2016, which can be interpreted as an indicator of anticipation. The wage effect increases to 2.45 in 2016, when the minimum wage significantly increased, suggesting that a 10% increase in the

regional bite causes a 24.45% increase in wages at the 5th percentile. In 2017, the impact of the bite reaches its highest level, with a 26.6% increase in response to a 10% increase in the regional bite. In the subsequent years, the magnitude of the effect gradually diminishes, reaching 20.4% in 2021, and it attains statistical significance in 2022. At the 10th percentile, the magnitude of wage effects is approximately half of what is observed at the 5th percentile, ranging between 1 and 1.48. Like the situation observed at the 5th percentile, a significant interaction term for 2015 indicates anticipation of the minimum wage increase in 2016. A 10 percent increase in the regional bite results in an 11% rise in the wage level in the 10th percentile in 2015, while the wage effect increases to 15.2% in 2016. Following the minimum wage increase, the wage effect of the regional bite experienced a decline in the two subsequent years, namely 2017 and 2018, then followed a similar trend to that observed at the 5th percentile. No statistically significant wage effect is attributable to the regional bite at the 20th percentile. However, positive wage effects can be observed at the 30th and 40th percentiles with no significant anticipation effects. Examining treatment effect interactions for each year, the magnitudes of the significant wage effects diminish from the 5th to the 40th percentiles. The impact of minimum wage bites is not statistically significant at the 50th and 60th percentiles, but adverse effects are evident in the higher segments of the wage distribution. In 2017, following the minimum wage increase, the negative wage impact of the bite becomes statistically significant at the 70th percentile. Throughout 2022, the adverse impact varies between 6 % and 8.5 % for every 10 % increase in the minimum wage bite. At the 90th percentile, the anticipation effect is evident, resulting in a 5 % wage decrease in 2016. the adverse wage impact of the regional bite stands at 6%, but it decreases to 4.7% in the subsequent year. The negative wage effect of a 10% increase in the regional bite ranges between 4.7 % and 9% at the 90th percentile.

The RIF quantile results, which show that the regional bite has a positive wage impact at the lower percentiles and a negative wage impact at the higher percentiles, imply that the minimum wage increase in 2016 decreased wage dispersion. Column (11) presents the effect of the 2016 minimum wage increase on the variance of log wages. The anticipation effect is observable in 2015 as a 6% decrease in the variance of log wages. In the year of the minimum wage increase and the subsequent years, the treatment effect is about 10%. This suggests that a 10 percent increase in the regional bite results in a corresponding 10% reduction in the variance of log wages. The decrease in the variance of log wages due to an increase in the regional bite aligns with the RIF quantile findings, which indicate a reduction in wage inequality resulting from the minimum wage increase in 2016. These findings are supported by the declining trend in the variance of log wages, as depicted in Figure 3. To assess the robustness of the observed reduction in inequality resulting from the minimum wage increase in 2016, a sensitivity analysis regarding the sample definition is conducted, as outlined in Bossler and Schank (2023).

Table 2. The "DID" Results for The Impact of the 2016 Minimum Wage Increase

Dependent Variable	(1) Ln(w)	(2) RIF($\tau_{5\%}$)	(3) RIF($\tau_{10\%}$)	(4) RIF($\tau_{20\%}$)	(5) RIF($\tau_{30\%}$)	(6) RIF($\tau_{40\%}$)	(7) RIF($\tau_{50\%}$)	(8) RIF($\tau_{60\%}$)	(9) RIF($\tau_{70\%}$)	(10) RIF($\tau_{90\%}$)	(11) RIF(σ^2)
Explanatory Variables											
Bite	-1.733***	-4.424***	-2.757***	-1.866***	-2.392***	-1.343***	-1.241***	-1.436***	-1.240***	-0.699***	1.016***
	(0.203)	(1.322)	(0.794)	(0.348)	(0.341)	(0.069)	(0.112)	(0.254)	(0.313)	(0.244)	(0.332)
Bite*trend	0.076***	0.158***	0.087***	0.109***	0.072***	0.021***	0.023***	0.045***	0.078***	0.068***	-0.022**
	(0.003)	(0.026)	(0.024)	(0.021)	(0.009)	(0.005)	(0.009)	(0.009)	(0.009)	(0.006)	(0.010)
D2014	-0.029***	-0.078**	-0.007	0.021	0.006	0.002	-0.007	0.012	-0.052***	-0.035	0.009
	(0.009)	(0.037)	(0.027)	(0.044)	(0.034)	(0.014)	(0.016)	(0.013)	(0.016)	(0.024)	(0.012)
D2015	-0.054	-0.907**	-0.460**	-0.162	-0.071	0.077	0.053	-0.011	0.107	0.166***	0.260***
	(0.070)	(0.354)	(0.191)	(0.107)	(0.138)	(0.064)	(0.098)	(0.121)	(0.107)	(0.060)	(0.098)
D2016	-0.012	-1.101***	-0.595***	-0.224**	0.006	0.177**	0.137	0.165	0.087	0.203***	0.415***
	(0.059)	(0.419)	(0.211)	(0.105)	(0.117)	(0.069)	(0.136)	(0.109)	(0.183)	(0.072)	(0.109)
D2017	-0.067	-1.201***	-0.614***	-0.224**	-0.027	0.039	0.091	0.157	0.135	0.089	0.385***
	(0.049)	(0.400)	(0.216)	(0.112)	(0.123)	(0.079)	(0.106)	(0.121)	(0.126)	(0.079)	(0.122)
D2018	-0.094	-1.181**	-0.545**	-0.250**	-0.072	0.037	0.105	0.060	0.070	0.089	0.393***
	(0.061)	(0.491)	(0.221)	(0.120)	(0.138)	(0.075)	(0.096)	(0.075)	(0.137)	(0.062)	(0.131)
D2019	-0.064	-1.125**	-0.583**	-0.258**	-0.086	0.124**	0.056	0.206*	0.274	0.213**	0.399***
	(0.077)	(0.442)	(0.232)	(0.113)	(0.127)	(0.058)	(0.112)	(0.109)	(0.176)	(0.095)	(0.103)
D2020	-0.096	-1.226***	-0.714***	-0.339***	-0.174	0.083	0.131	0.145**	0.154**	0.183*	0.469***
	0.089)	(0.443)	(0.244)	(0.112)	(0.123)	(0.051)	(0.100)	(0.067)	(0.077)	(0.104)	(0.101)
D2021	-0.101	-1.202***	-0.657***	-0.354***	-0.154	0.073	0.138	0.172**	0.148	0.186**	0.514***
	(0.069)	0.439)	(0.238)	(0.113)	(0.114)	(0.052)	80.127)	(0.076)	(0.152)	(0.073)	(0.105)
D2022	-0.134**	-1.273***	-0.636***	-0.330***	-0.177	-0.005	0.068	0.100	0.142	0.122**	0.492***
	(0.061)	(0.438)	(0.224)	(0.115)	(0.112)	(0.048)	(0.072)	(0.085)	(0.116)	(0.054)	(0.114)
Bite*D2015	0.036	2.141**	1.127**	0.466	0.046	-0.038	-0.112	-0.150	-0.434	-0.514***	-0.655**
	(0.188)	(0.885)	(0.467)	(0.327)	(0.367)	(0.174)	(0.275)	(0.258)	(0.267)	(0.128)	(0.256)
Bite*D2016	0.122	2.447**	1.517***	0.610	0.783**	0.379*	-0.114	-0.370	-0.495	-0.623***	-1.092***
	(0.153)	(1.082)	(0.534)	(0.371)	(0.332)	(0.230)	(0.360)	(0.287)	(0.364)	(0.184)	(0.284)
Bite*D2017	0.159	2.659***	1.472***	0.459	0.899**	0.202	-0.078	-0.407	-0.631**	-0.473***	-1.015***
	(0.111)	(0.999)	(0.527)	(0.395)	(0.354)	(0.210)	(0.288)	(0.294)	(0.289)	(0.180)	(0.315)
Bite*D2018	0.091	2.373*	1.027*	0.413	0.884**	0.120	-0.157	-0.318	-0.587**	-0.595***	-1.024***
	(0.141)	(1.232)	(0.591)	(0.409)	(0.377)	(0.214)	(0.279)	(0.211)	(0.261)	(0.157)	(0.349)
Bite*D2019	0.062	2.084*	1.161**	0.369	0.833**	0.468***	0.033	-0.434	-0.901***	-0.799***	-0.979***
	(0.181)	(1.126)	(0.542)	(0.432)	(0.368)	(0.165)	(0.334)	(0.283)	(0.346)	(0.210)	(0.306)
Bite*D2020	0.178	2.267*	1.470**	0.457	1.085***	0.554***	0.078	-0.236	-0.625***	-0.697***	-1.086***
	(0.203)	(1.178)	(0.604)	(0.427)	(0.345)	(0.140)	(0.321)	(0.176)	(0.136)	(0.238)	(0.299)
Bite*D2021	0.116	2.039*	1.233**	0.452	1.012***	0.593***	0.314	-0.357*	-0.826***	-0.909***	-1.257***

	(0.154)	(1.173)	(0.599)	(0.462)	(0.343)	(0.145)	(0.302)	(0.216)	(0.236)	(0.193)	(0.316)
Bite*D2022	0.020	1.936	0.993*	0.171	0.882**	0.398***	0.239	-0.322	-0.853***	-0.798***	-1.146***
	(0.154)	(1.176)	(0.507)	(0.459)	(0.340)	(0.139)	(0.231)	(0.250)	(0.220)	(0.151)	(0.348)
Constant	7.380***	7.514***	7.176***	7.023***	7.223***	6.983***	7.088***	7.350***	7.537***	7.774***	0.000
	(0.088)	(0.542)	(0.313)	(0.129)	(0.137)	(0.030)	(0.052)	(0.106)	(0.144)	(0.098)	(0.135)
Observations	1,770,236	1,770,236	1,770,236	1,770,236	1,770,236	1,770,236	1,770,236	1,770,236	1,770,236	1,770,236	1,770,236
Cluster	26	26	26	26	26	26	26	26	26	26	26

Source: Author's calculations based on HLSF data.

Notes: Bootstrap clustered robust standard errors are reported in parentheses (clustered at NUTS2 regional levels). *p<0.1,**p<0.05,***p<0.01. Data is limited to employees between 15 and 65 years old.

Table 3. The "DID" Results for The Impact of the 2016 Minimum Wage Increase Within – Restricted Samples

	(1)	(2)	(3)	(4)	(5)
Dependent Variable	RIF(σ^2)	RIF(σ^2)	RIF(σ^2)	RIF(σ^2)	RIF(σ^2)
Explanatory Variables					
Bite	1.016***	0.743**	0.642**	0.430*	-0.012
	(0.332)	(0.311)	(0.313)	(0.238)	(0.153)
Bite*trend	-0.022**	-0.018***	-0.024***	-0.010	0.006
	(0.010)	(0.006)	(0.006)	(0.006)	(0.004)
D2014	0.009	0.009	0.010	0.000	0.002
	(0.012)	(0.009)	(0.006)	(0.008)	(0.007)
D2015	0.260***	0.261***	0.256***	0.206***	0.151**
	(0.098)	(0.093)	(0.090)	(0.074)	(0.063)
D2016	0.415***	0.364***	0.349***	0.303***	0.265**
	(0.109)	(0.081)	(0.087)	(0.061)	(0.049)
D2017	0.385***	0.340***	0.304***	0.255***	0.207***
	(0.122)	(0.110)	(0.111)	(0.091)	(0.075)
D2018	0.393***	0.328***	0.281**	0.244***	0.198**
	(0.131)	(0.115)	(0.112)	(0.087)	(0.083)
D2019	0.399***	0.291***	0.277***	0.228***	0.188***
	(0.103)	(0.089)	(0.080)	(0.065)	(0.070)
D2020	0.469***	0.400	0.401***	0.357***	0.274***
	(0.101)	(0.084)	(0.097)	(0.070)	(0.054)
D2021	0.514***	0.478***	0.441***	0.390***	0.303***
	(0.105)	(0.092)	(0.088)	(0.087)	(0.070)
D2022	0.492***	0.463***	0.402***	0.351***	0.266***
	(0.114)	(0.111)	(0.100)	(0.088)	(0.079)
Bite*D2015	-0.655**	-0.647***	-0.627***	-0.543***	-0.400***
	(0.256)	(0.233)	(0.224)	(0.190)	(0.151)
Bite*D2016	-1.092***	-0.934***	-0.876***	-0.795***	-0.690***
	(0.284)	(0.203)	(0.221)	(0.159)	(0.122)
Bite*D2017	-1.015***	-0.877***	-0.764***	-0.688***	-0.569***
	(0.315)	(0.270)	(0.273)	(0.224)	(0.183)
Bite*D2018	-1.024***	-0.840***	-0.695**	-0.670***	-0.580***
	(0.349)	(0.286)	(0.282)	(0.220)	(0.208)
Bite*D2019	-0.979***	-0.674***	-0.611***	-0.576***	-0.522***
	(0.306)	(0.234)	(0.210)	(0.173)	(0.179)
Bite*D2020	-1.086***	-0.839***	-0.814***	-0.808***	-0.656***
	(0.299)	(0.217)	(0.239)	(0.164)	(0.119)
Bite*D2021	-1.257***	-1.097***	-0.951***	-0.960***	-0.788***
	(0.316)	(0.241)	(0.226)	(0.227)	(0.175)
Bite*D2022	-1.146***	-1.024***	-0.827***	-0.853***	-0.700
	(0.348)	(0.284)	(0.255)	(0.226)	(0.201)
Constant	0.000	0.060***	0.068	0.153	0.306***
	(0.135)	0.126)	(0.130)	(0.097)	(0.065)

Restrictions					
Males Only		Yes	Yes	Yes	Yes
Full-Time Only			Yes	Yes	Yes
Permanent Jobs Only				Yes	Yes
Prime Age Only					Yes
Observations	1,770,236	1,261,707	1,293,112	1,147,717	950,589

Source: Author's calculations based on HLSF data

Notes: Bootstrap clustered robust standard errors are reported in parentheses (clustered at NUTS2 regional levels) *p<0.1,**,p<0.05,***,p<0.01.

Considering that much of the prior literature has primarily concentrated on full-time male workers within their prime working age range, typically between 25 and 55 years, a stepwise approach in limiting the sample to encompass these specific demographics is followed. This approach is designed to systematically assess the applicability of the above findings within the well-established framework of existing literature. Given that prime-age male employees in full-time and permanent positions are less likely to be significantly impacted by changes in the minimum wage, narrowing the sample to include these groups exclusively may not yield results consistent with the baseline findings of this study.

Hence, this robustness check could uncover how much the 2016 minimum wage change influenced the Turkish labor market. Table 3 displays the corresponding results derived from the restricted samples, the dependent variable of which is the variance of log wages. Column (1) presents the primary results from Table 2, while the subsequent columns show the results obtained by applying sample constraints incrementally. Findings from the restricted samples consistently indicate that the adverse effect of the 2016 minimum wage increase on wage inequality persists, albeit gradually decreasing in magnitude after introducing additional sample restrictions.

6. Conclusion

This study examines the impact of the significant minimum wage increase in 2016 on wage distribution in Turkey from difference-in-differences estimation, taking into account the variations in the minimum wage bite across Turkey's NUTS2 regions. This specification applied to the unconditional wage distribution of real monthly wages using data from the HLFS. The dataset encompasses all employees, regardless of their employment status, including part-time and temporary workers, both men and women. This approach ensures that the analysis includes groups most likely to be significantly affected by the minimum wage. The bite of the minimum wage is calculated as the fraction of workers paid below the minimum wage level before the increase in 2016 in 26 NUTS2 statistical subregions of Turkey. The graphical examination of the bite measure across the regions reveals a diverse impact among NUTS2 regions, highlighting that the minimum wage rise in 2016 has the most pronounced effect on the southern-east part of Turkey. Prior to the difference-in-differences estimation, a series of descriptive analyses is

undertaken to understand the impact of the minimum wage rise in 2016 on the wage distribution. The comparison of the Kernel estimates of the real monthly wages of wage earners in 2015 and 2016 reveals a significant wage increase occurred at the bottom of the wage distribution while the top of the wage distribution remained substantially stable between the two years. As an alternative way to examine the change in the wage distribution, growth rates in the real monthly wage across different distribution bins are calculated. Examining wage bin growth reveals that the 2015-2016 period differs significantly from previous periods due to the magnitude of the growth rate in each bin, with diminishing growth rates as one moves up the wage distribution, which is consistent with the Kernel estimates comparisons of 2016 and 2016. Additional descriptive analyses of the evolution of the minimum wage and wage inequality from 2004 to 2022 reveal that, following the minimum wage increase in 2016, the growth in the real minimum wage has consistently surpassed the growth in the average real wage, which can be attributed to two main factors: the growing share of workers paid minimum wage and below and the depreciation of average nominal wages relative to inflation. In other words, since 2016, there has been a convergence of average real wages toward the real minimum wage in Turkey, coinciding with the increasing number of minimum wage earners. This trend reflects the growing influence of the minimum wage in labor markets, further accentuating deteriorating macroeconomic conditions since 2016. The results of the difference-in-differences analysis indicate that the 2016 minimum wage increase positively affected wages in the lower quantiles while negatively impacting wages in the higher quantiles. This led to a wage compression effect, resulting in reduced wage inequality. This conclusion is supported by a significant decrease in the variance of log wages, which dropped by approximately 10 to 12 percent annually after the introduction of the minimum wage until 2022, in addition to the descriptive analyses conducted in the study. Robustness checks, including restrictions by gender, age, and employment status, confirmed the enduring impact of the minimum wage increase on reducing wage inequality. This study's results align with the findings of the limited previous literature on the distributive effects of the 2016 minimum wage rise in Turkey. This study contributes to the existing literature as a pioneering attempt to investigate the impact of the 2016 minimum wage increase on various quantiles of wage distribution while extending the analysis up to 2022.

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