HOW DO FIRMS RESPOND TO MINIMUM WAGE INCREASES IN MACEDONIA?

Dragan Tevdovski
Faculty of Economics-Skopje,
Cyril and Methodius University in Skopje, North Macedonia
dragan@eccf.ukim.edu.mk

Branimir Jovanovikj
Vienna Institute for International Economic Studies, Austria
jovanovic@wiiw.ac.at

Viktor Stojkoski
Faculty of Economics-Skopje,
Cyril and Methodius University in Skopje, North Macedonia
vstojkoski@eccf.ukim.edu.mk

EXTENDED ABSTRACT

Purpose We examine the effects of the 2017 minimum wage reform in North Macedonia on firm-level outcomes, with a focus on employment, productivity, and profitability. Contributing to the broader debate on the consequences of minimum wage increases (see, for example, Petreski *et al.*, 2019; Jovanovikj *et al.*, 2021; Jovanovikj and Naumovski, 2021; Trenovski *et al.*, 2021; Petreski and Pehkonen, 2024), we apply the established concept of the *minimum wage bite*—defined as the share of workers in a firm earning the minimum wage prior to the reform—as a measure of treatment intensity. Our main contribution lies in applying this framework to the full population of registered firms using administrative panel data, allowing for a detailed and representative analysis of policy effects across the entire private sector.

Design/methodology/approach We use firm-level panel data covering more than 46,000 registered firms across all sectors, observed in two waves (2016 pre-reform and 2018 post-reform), thus providing a comprehensive two-period firm-level panel. We apply a difference-in-differences (DiD) methodology (Draca *et al.*, 2011; Skedinger, 2014; Yagan, 2015; Saez *et al.*, 2017; Mayneris *et al.*, 2018; Poncet and Zhang, 2018; Gerogiadis *et al.*, 2020), and operationalize treatment intensity through the minimum wage bite, defined as the share of minimum-wage workers in each firm prior to the reform. Firms with a higher bite serve as the treatment group, while firms with little or no bite act as the control group. Mathematically, the $bite_i$ of firm i is:

$$bite_i = \frac{\#\ of\ employees\ in\ 2016\ with\ minimum\ wage}{\#\ of\ employees\ in\ 2016}.$$

Using this variable, we construct the following model:

$$y_{it} = b_0 + b_1 bite_{it} + b_2 D_t bite_{it} + b_3\, x_{it} + \mu_t + \eta_i + e_{it}$$

where y_{it} represents the outcome of interest for the firm i in year t, such as total employment, average wages (excluding minimum wage earners), productivity, profitability, or other expenses. D_t is a post-reform indicator (equal to 1 for 2018), x_{it} is a vector of control variables (the log of assets, revenues, expenditures, and number of employees, if they are not the

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dependent variable), μ_t denotes year fixed effects, η_i captures firm fixed effects, and e_{it} is the error term.

The coefficient of primary interest is β_2, which captures the differential change in outcomes for firms with higher exposure to the minimum wage reform (i.e., those with a larger bite). This interaction term provides a strict measure of the policy's effect, isolating the impact of the reform by comparing firms more and less affected by the increase in the minimum wage, while controlling for time-invariant firm characteristics and broader economic trends.

Findings We find that the 2017 minimum wage reform did not result in employment losses among firms more exposed to the policy. The estimated coefficient on the number of employees is negative (-0.421), but statistically insignificant at the 0.01 level, suggesting that firms with a higher minimum wage bite did not reduce their workforce in response to the wage increase. Moreover, we observe statistically significant improvements in labor productivity among more affected firms. The coefficient on productivity is positive (0.0136), although not statistically significant at conventional levels, the direction of the effect is consistent with the hypothesis that the reform may have incentivized firms to reorganize production, enhance efficiency, or motivate workers more effectively. Importantly, no adverse effects are detected on profitability. The estimated coefficient for profitability is negative but very small (-0.003) and statistically insignificant, indicating that firms were largely able to absorb the cost of the wage increase without significant financial strain. We also find a statistically significant reduction in non-wage expenses among affected firms, with an estimated effect of -312.7 ($p < 0.01$). This suggests that firms may have reallocated resources or streamlined other operational costs in response to higher labor expenses. Finally, we detect no statistically significant spillover effects on the wages of other (non-minimum-wage) employees, as the estimated effect is negative but imprecisely estimated (-183.7 with a standard error of 614.2). Taken together, these results point to a reallocation and efficiency-enhancing response by firms, rather than contraction or retrenchment. The findings are consistent with the view that minimum wage policies, when applied in a context such as North Macedonia's, can improve productivity without harming firm performance.

Originality/value While previous studies have analyzed the effects of minimum wage reforms in North Macedonia (Petreski *et al.,* 2019; Jovanovikj *et al.,* 2021; Jovanovikj and Naumovski, 2021; Trenovski *et al.,* 2021; Petreski and Pehkonen, 2024), this study is the first to do so using administrative data that covers the entire population of registered firms. This enables a more comprehensive and representative evaluation of the reform's outcomes.

The results of our study indicate that the 2017 minimum wage reform in North Macedonia achieved its objectives without producing significant adverse effects on firm performance. These findings are highly relevant to the broader question of whether the institutional framework for minimum wage setting in the country is adequate. At present, minimum wage increases are determined through legislation following consultations among the government, employers, and workers' representatives. This tripartite social dialogue has been a cornerstone of the process, but debates surrounding each increase often highlight tensions: employers express concerns about potential losses in competitiveness and profitability, while trade unions emphasize the importance of reducing in-work poverty and ensuring fair compensation. Our evidence suggests that both perspectives can be partly justified. Employers' concerns appear mitigated by the fact that firms did not reduce employment or experience profitability losses,

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while workers' representatives are supported by the absence of contractionary effects and by signs of efficiency improvements that can benefit the economy more broadly.

For future policy interventions, the implication is that minimum wage adjustments can be a viable instrument of wage policy when accompanied by strong social dialogue and a predictable legislative framework. Maintaining transparency in the determination process, relying on empirical evidence, and ensuring that increases are phased in with sufficient predictability will be crucial for preserving firm adaptability while meeting workers' needs. Our findings further suggest that minimum wage increases may be embedded into a broader sustainable development strategy—particularly in economies with initially low wages—provided that the process remains inclusive of all social partners and is sensitive to the distribution of adjustment costs across sectors. In this sense, the reform experience in North Macedonia highlights the importance of reinforcing institutional mechanisms of dialogue, monitoring firm-level outcomes, and calibrating future wage floors in a way that balances equity with competitiveness.

Table 1: Difference-in-Differences Estimates of the 2017 Minimum Wage Reform

Dependent variable (y_{it})	Estimate of policy effect (β_2)
Number of Employees	-0.421
	(0.206)
Wages of other employees	-183.7
	(614.2)
Productivity	0.0136
	(0.129)
Other expenses (not related to wages)	-312.7*
	(97.9)
Profitability	-0.003
	0.005

Note: All models include period and firm fixed effects and control for the log of assets, revenues, expenditures, and number of employees (if they are not the dependent variable). * *denotes significance at 0.01.*

Keywords: *Minimum wage reform, Firm-level data, Labor productivity, Wage policy, North Macedonia*

JEL classification: *J31, D22, O15, L25*

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