Minimum Wages and Optimal Redistribution: The Role of Firm Profits*

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Abstract

Is the minimum wage a desirable tool for redistributing profits? I study this question in models with efficient labor markets and corporate and labor income taxes. A minimum wage is welfare-improving when it redistributes profits more efficiently than corporate taxes, a case that prevails when the economy is sufficiently capital-intensive and society puts relatively low welfare weights on affected capitalists. This condition is strengthened when affected industries are relatively more labor-intensive, as minimum wages help governments to implement industry-specific profit taxes that alleviate distortions in unaffected capital-intensive industries. I derive a tractable sufficient statistics formula to evaluate marginal minimum wage reforms that captures effects on wages, employment, participation, spillovers to non-minimum wage jobs, profits, and firm entry. An application based on stacked event studies that leverage variation in US state-level minimum wages and publicly available data suggests welfare gains from raising the US minimum wage.

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1 Introduction

An extensive positive literature examines the effects of the minimum wage on employment, earnings, and several other outcomes for firms and workers (Dube and Lindner, 2024). By contrast, the normative question of the desirability of the minimum wage, especially when policymakers can affect welfare through other policies like taxes and transfers, has received significantly less attention. Earlier work has primarily focused on comparing the minimum wage to labor income taxes and government transfers (Hungerbühler and Lehmann, 2009; Lee and Saez, 2012; Cahuc and Laroque, 2014; Lavecchia, 2020; Gerritsen, 2025a,b). This paper takes a different approach by studying a relatively overlooked distributional rationale for the minimum wage: the efficient redistribution of profits. While this argument has not been studied in depth in the modern economics literature, its intuition dates back to Mill (1884):

> "The simplest expedient which can be imagined for keeping the wages of labor up to the desirable point would be to fix them by law; [...] the ground of decision being, not the state of the labor market, but natural equity; to provide that the workmen shall have reasonable wages, and the capitalist reasonable profits."

There are equity gains from redistributing profits because they are concentrated at higher incomes. Modern governments redistribute profits with corporate taxes at an efficiency cost. Can a minimum wage redistribute profits more efficiently than a marginal increase in corporate taxes?

I study this question by modeling the problem of a utilitarian social planner who chooses a minimum wage, a non-linear labor income tax and transfer schedule, and a linear corporate tax to maximize social welfare. I present results using two models of the labor market. I first consider a simple neoclassical model with limited heterogeneity and perfect competition. I then extend the model to allow for search and matching frictions, wage posting, firm entry, and rich two-sided heterogeneity. While the simple model parsimoniously shows the main intuition of the analysis, the richer model features additional empirically relevant mechanisms through which the minimum wage can affect welfare and provides tractable formulas suitable for sufficient statistics analysis. The decentralized equilibrium is efficient in both models, allowing me to focus on redistributive tradeoffs by excluding Pigouvian rationales for the minimum wage.

The neoclassical framework with perfect competition considers equally productive workers who make extensive margin labor supply decisions and a representative capitalist who allocates capital between a domestic firm with decreasing returns to scale and a foreign investment opportunity with a fixed after-tax return. While stylized, this framework contains the main ingredients for the analysis: firm profits, corporate tax distortions, labor supply responses, and general equilibrium effects.

In this model, a minimum wage increase redistributes profits to workers, yielding equity gains when the planner values workers' utility more than that of firm owners. However, the minimum wage generates efficiency costs proportional to its employment effects and a negative fiscal externality in corporate tax revenue proportional to the corporate tax rate and the profit response. While ambiguous, the net benefits of increasing the minimum wage are found to be decreasing in the corporate tax: higher corporate taxes shrink the equity gains of the minimum wage and amplify the fiscal externality, suggesting that minimum wages are more likely to be desirable when exogenous forces such as capital mobility and international tax competition prevent governments from enforcing high corporate taxes.

After characterizing the welfare effects of a minimum wage increase, I study whether the planner can achieve similar equity gains more efficiently by using the tax system alone. I show that the net benefits of a binding minimum wage are positively related to the distortions of the corporate tax. As distortions introduced by corporate taxation grow, complementing the tax system with a binding minimum wage can increase social welfare by helping the social planner make overall redistribution more efficient.

The intuition can be obtained from the following thought experiment. Starting from an equilibrium allocation, consider the following reform: a small minimum wage increase, an equal-sized reduction in transfers to minimum wage workers (so that their consumption is held constant), and a corporate tax cut that offsets the minimum wage's effect on labor demand (so that employment is held constant). Workers' welfare is unaffected: consumption and employment are constant. However, the reduction in transfers generates fiscal savings, while the corporate tax cut reduces corporate tax revenue. If the corporate tax induces *large* distortions, then a *small* corporate tax cut will be sufficient to offset the reduced labor demand caused by the minimum wage increase. The resulting effect on corporate tax revenue will be correspondingly *small*, making it more likely that the net fiscal externality is positive. In contrast, if the corporate tax is close to non-distortionary, the tax cut needed to keep employment constant will have to be *large*, making for a significant negative fiscal externality and weakening the case for a minimum wage. In the limiting case where corporate taxes do not distort employment, this reform is never desirable, regardless of the employment effects of the minimum wage.

The natural question that follows is: when are corporate taxes relatively more distortionary than minimum wages? A parametrized version of the model shows that the relative corporate tax distortion increases with capital intensity: since corporate taxes distort production through the allocation of capital, the distortion increases with the relative importance of capital in the production technology. This finding implies that the interactions between the minimum wage and the corporate tax become more important in the presence of firm heterogeneity. Concretely, I show that the minimum wage may be desirable as a kind of industry-specific corporate tax especially when unaffected industries are particularly capital-intensive (and therefore more responsive to corporate taxes). To see why, consider the US case, where the minimum wage primarily affects labor-intensive services industries, unlike corporate taxes which affect all industries, including capital-intensive sectors such as manufacturing. A corporate tax that "averages" its effects across industries will likely be sub-optimal for taxing profits in services but above optimal for taxing them in manufacturing. In these circumstances, governments can benefit from using the minimum wage to "tax" profits in services to relax corporate tax distortions in manufacturing.

One shortcoming of the stylized neoclassical model is that it oversimplifies the effects of the minimum wage on the labor market. The emerging consensus is that labor markets have frictional competitive structures (Manning, 2021b; Card, 2022; Kline, 2025) that mediate the effects of the minimum wage on wages and employment, even affecting workers who earn more than the minimum wage (Dube and

Lindner, 2024). As a consequence, the stylized model provides useful high-level intuition but is limited for conducting quantitative analyses. Motivated by this reflection, I extend the framework to a richer labor market model that accommodates more general patterns of heterogeneity and realistic predictions of minimum wage reforms, which, while inherently less tractable, allows me to derive an empirically relevant sufficient statistics expression for evaluating the welfare effects of marginal minimum wage reforms.

The model features directed search and two-sided heterogeneity. A population of workers with heterogeneous skills and costs of participating in the labor market decides whether to enter the labor market and which jobs to apply to. A corresponding population of capitalists with heterogeneous productivities and technologies decides whether to create firms, how to allocate capital between domestic and foreign activities, how many vacancies to post, and the wages attached to those vacancies. Search frictions yield involuntary unemployment. Minimum wages affect workers' application strategies, which, in turn, affect the posting behavior of firms (Holzer et al., 1991; Escudero et al., 2025). Application responses can lead to limited employment effects and wage and employment spillovers to non-minimum wage jobs. Decentralized allocations are shown to be constrained efficient (as in standard directed search models, e.g. Moen, 1997), so the analysis keeps the attention on the redistributive role of the minimum wage.

Using this model, I derive a condition to evaluate marginal minimum wage reforms for given tax systems. While the general formula illustrates how several margins of adjustment interact in equilibrium after changes in the minimum wage, I demonstrate that the condition for assessing the desirability of a marginal minimum wage increase admits a sufficient statistics representation in the spirit of Chetty (2009) and Kleven (2021). I show that all the responses that affect the welfare of low-skill workers–including changes in wages, employment, participation, and spillovers to non-minimum wage jobs–can be aggregated into a single aggregate macro elasticity which can be estimated with weak data requirements: changes in the average post-tax earnings of active low-skill workers (i.e., including the unemployed) are shown to be sufficient for computing the effect of small minimum wage reforms on low-skill workers' welfare, a result that has been elusive in the debate because of the lack of a framework for aggregating different behavioral margins. The sufficient statistics expression also considers welfare effects on high-skill workers (summarized by an analogue elasticity), welfare effects on capitalists (which are shown to be bounded from above by macro elasticities on domestic pre-tax profits), and several fiscal externalities.

To illustrate the empirical appeal of the result, I use the sufficient statistics representation and stacked event study estimates to evaluate whether a marginal increase in the US minimum wage would increase or decrease social welfare. The empirical analysis closely follows the research design of Cengiz et al. (2019, 2022) based on variation in minimum wages across US states from 1997 to 2019. Using publicly available data, I show that minimum wages in the US have increased average pre-tax earnings of active low-skill workers (accounting for potential employment effects), have not affected high-skill workers, have decreased government expenses on income maintenance benefits, and have reduced average profits in exposed industries (food and accommodation, retail trade, and low-skill health services). Given these estimates, I find that a plausible range of relative social marginal welfare weights between low-skill workers and capitalists implies that raising the minimum wage would increase social welfare. When the welfare weight on capitalists is less than one-third of the economy-wide average, any positive welfare weight on low-skilled workers suffices. When the capitalists' welfare weight equals the economy-wide average, the low-skill workers' welfare weight must be at least twice that of the capitalists'. The estimation data yield a mean annual post-tax earnings of low-skill workers of $\approx \$20,000$ and a mean after-tax profits per exposed establishment of $\approx \$135,000$. These numbers imply that log social welfare functions would suggest a low-skill workers' welfare weight over six times that of capitalists, making the reform desirable. I hope this illustrative exercise motivates researchers with access to more detailed firm- and worker-level data to implement more comprehensive and robust analyses of the desirability of minimum wage reforms.

Related literature. This paper contributes to the normative analysis of the minimum wage by incorporating profits and corporate taxes into the discussion. The existing literature has mostly focused on the interaction between the minimum wage and labor income taxes and transfers; hence, it often imposes zero-profit conditions or assumes that profits can be taxed without efficiency costs. Allen (1987), Guesnerie and Roberts (1987), Boadway and Cuff (2001), and Marceau and Boadway (1994) provide mixed results on the desirability of the minimum wage that depend on assumptions about the class of labor supply response and the distribution of types. Hungerbühler and Lehmann (2009) and Lavecchia (2020) use random search models and focus on congestion inefficiencies. Gerritsen and Jacobs (2020) consider the incentives that the minimum wage generates on skill formation. Few papers in this tradition assess the robustness of the results to the inclusion of profits. Lee and Saez (2012) use a perfectly competitive model with two skill types and find that the minimum wage can be desirable under optimal taxes when rationing is efficient. The authors mention that their logic is robust to the inclusion of pure profits. Cahuc and Laroque (2014) contest Lee and Saez (2012) results using a neoclassical monopsony model with a continuum of skill types. The authors extend their analysis to a model with endogenous firm entry and a corresponding entry distortion of the corporate tax and find that their results are unaffected. Gerritsen (2025a,b) finds support for the minimum wage when preference heterogeneity induces dispersion in hours conditional on wages and shows that the case for the minimum wage is strengthened when profits cannot be fully taxed. As far as I am aware, my paper is the first to explore in depth the interaction between the minimum wage, the redistribution of profits, and the corporate tax. Importantly, this rationale for the minimum wage is independent of previous arguments developed around in-work benefits like the Earned Income Tax Credit (EITC) (e.g., Lee and Saez, 2012). While I derive a generalization of Lee and Saez (2012) result that allows for firm profits and distortionary corporate taxes, this logic is orthogonal (hence complementary) to the rationale related to its interaction with the corporate tax.[1]

This paper also contributes to the literature on optimal redistribution. A theoretical literature explores deviations from production efficiency (Diamond and Mirrlees, 1971a,b). Naito (1999) developed an argument for production inefficiency (extended in Saez, 2004, Scheuer, 2014, Gomes et al., 2018, and Costinot and Werning, 2023) based on technological constraints and missing instruments. My argument

[1] A different literature studies the welfare consequences of the minimum wage using quantitative analyses based on structural models, mainly emphasizing efficiency rationales (Flinn, 2006; Ahlfeldt et al., 2023; Wu, 2024; Berger et al., 2025; Drechsel-Grau, 2025; Hurst et al., 2025). These papers do not consider interactions with distortionary corporate taxes. Other work exploring efficiency arguments include Robinson (1933), Burdett and Mortensen (1998), and Acemoglu (2001).

for production inefficiency focuses on the existence of profits whose taxation is costly (Auerbach and Hines, 2002). This paper also contributes to the literature that explores whether the combination of different policy instruments can improve the aggregate efficiency of redistribution (e.g., Atkinson and Stiglitz, 1976; Saez, 2002; Ho and Pavoni, 2020; Ferey, 2022; Gaubert et al., 2025).

Finally, this paper adds to the vast positive literature on the minimum wage. The directed search model contributes to a theoretical literature that tries to rationalize minimum wage evidence (e.g., Engbom and Moser, 2022, Ahlfeldt et al., 2023, Berger et al., 2025, Drechsel-Grau, 2025, Haanwinckel, 2025, Vogel, 2025). In addition, the empirical results add to a large literature that studies the effects of minimum wages on different outcomes of firms and workers (Dube and Lindner, 2024).

Structure of the paper. Section 2 presents results using the stylized neoclassical model. Section 3 extends the analysis to a model with worker- and firm-level heterogeneity and directed search. Section 4 presents the sufficient statistics analysis. Section 5 concludes. All proofs are presented in Appendix A.

2 Minimum wage policy in a frictionless labor market

I first analyze a stylized model of the labor market with perfect competition and limited heterogeneity to generate results that capture the central intuition of the analysis. Section 3 extends the analysis to a richer model of the labor market with more realistic predictions on the effects of minimum wages.

2.1 Setup

There is a population of equally productive workers normalized to 1 and a representative capitalist. Workers make extensive margin labor supply decisions, so the terms "wage," "income," and "earnings" are interchangeable throughout the paper. The capitalist allocates her capital between a domestic firm with decreasing returns to scale (DRS) and a foreign investment with a fixed after-tax return. Domestic firms are price takers in the product and labor markets. There are no labor market frictions, so all workers who decide to participate in the labor market end up employed.

Workers. Workers are characterized by a scalar cost of participating in the labor market given by $c \in \mathcal{C} = [0, C] \subset \mathbb{R}$, which is distributed with cdf F and pdf f. The participation cost c is dollar-valued and can be interpreted as the disutility of labor supply or as other opportunity costs such as home production. If a type c worker works, she gets utility $u_1 = y_1 - c = w - T_1 - c$, where $y_1 = w - T_1$ is after-tax income (consumption), w is the wage, and T_1 is the total tax (net of transfers) paid by employed workers. If a type c worker does not work, she gets utility $u_0 = y_0 = -T_0$, where $-T_0 \geq 0$ is a government transfer. Workers work if their utility from working u_1 is at least as high as their utility from not working u_0, that is, if $u_1 \geq u_0 \Leftrightarrow \Delta y = y_1 - y_0 = w - T_1 + T_0 \geq c$. Then, aggregate labor supply is given by $L^S(w, T_0, T_1) = F(w - T_1 + T_0) = F(w - \Delta T)$, where $\Delta T = T_1 - T_0$.

Capitalist. The capitalist is endowed with a fixed capital stock $\overline{k}$ which she allocates between a domestic firm and a foreign investment. The domestic revenue function with DRS is denoted by $\phi(n, k)$, with n employment, k capital, $\phi_n > 0$, $\phi_k > 0$, $\phi_{nn} < 0$, and $\phi_{kk} < 0$. Domestic profits are taxed with a linear corporate tax t and the firm's output price is normalized to 1, so domestic after-tax profits are given by $(1-t)\pi(n,k) = (1-t)\left(\phi(n,k) - wn\right)$. The foreign investment yields a fixed after-tax return r^* and cannot be deducted from the domestic corporate tax base. The capitalist's optimization problem is to maximize the return on her capital stock:

$$\max_{n,k} \left[(1-t)\left(\phi(n,k) - wn\right) + \left(\overline{k} - k\right) r^*\right].$$

This formulation is qualitatively equivalent to one with no fixed capital stock $\overline{k}$ and no foreign investment but a rental market for domestic capital with no capital cost deductibility. The results below hold under partial deductibility but change if capital costs are fully deductible, as in that case the domestic corporate tax would be a tax of pure profits and, therefore, non-distortionary (Hall and Jorgenson, 1967).

Assuming an interior solution, the first-order conditions yield $\phi_n = w$ and $(1-t)\phi_k = r^*$. These equations implicitly define a labor demand function $L^D(w, 1-t)$ and a domestic capital supply function $K^S(w, 1-t)$. The capitalist's value function is given by:

$$U^K = (1-t)\Pi(w, 1-t) + \left(\overline{k} - K^S(w, 1-t)\right) r^*,$$

where $\Pi(w, 1-t) = \pi(L^D(w, 1-t), K^S(w, 1-t)) = \phi(L^D(w, 1-t), K^S(w, 1-t)) - wL^D(w, 1-t)$ denote optimal pre-tax domestic profits. DRS imply that $\Pi(w, 1-t)$ is positive. Because of the envelope theorem, $dU^K/dw = -(1-t) \cdot L^D$ and $dU^K/d(1-t) = \Pi(w, 1-t) - (1-t) \cdot L^D \cdot [dw/d(1-t)]$. When a binding minimum wage is in place, $[dw/d(1-t)] = 0$, so the expression simplifies to merely the mechanical effect: $dU^K/d(1-t) = \Pi(w, 1-t)$.

Equilibrium. Without a minimum wage, the labor market clears. The labor market equilibrium is given by $L^S(w, T_0, T_1) = L^D(w, 1-t) = L$, with L total employment. This market clearing condition determines the equilibrium wage w given taxes $(T_0, T_1, 1-t)$. Changes in the labor income tax (T_0, T_1) shift the labor supply curve, while changes in the net-of-corporate tax $1-t$ shift the labor demand curve. With a binding minimum wage $\overline{w}$ there is excess labor supply, which implies that equilibrium employment is determined by labor demand: $L = L^D(\overline{w}, 1-t)$. With a minimum wage, the c-composition of employed workers depends on the rationing mechanism, that is, the assignment of workers to employment given excess labor supply. The propositions below do not rely on any particular rationing assumption.

Elasticity concepts. The following elasticity concepts play a central role in the results below:

$$\eta_{1-t} = \frac{d \log L^D(w, 1-t)}{d \log(1-t)}, \qquad \eta_w = -\frac{d \log L^D(w, 1-t)}{d \log w}, \tag{1}$$

$$\epsilon_{1-t} = \frac{d \log \Pi(w, 1-t)}{d \log(1-t)}, \qquad \epsilon_w = -\frac{d \log \Pi(w, 1-t)}{d \log w}. \tag{2}$$

Equation (1) shows labor demand elasticities η_x, while equation (2) shows domestic pre-tax profits elasticities ϵ_x, for $x \in \{1-t, w\}$, both defined to be positive to have an absolute value interpretation.

Three remarks are in order. First, these are macro elasticities that incorporate general equilibrium effects. However, the relevant corporate tax elasticities η_{1-t} and ϵ_{1-t} will not consider indirect effects on wages as they will be evaluated in settings with binding minimum wages and, therefore, no wage incidence. Second, DRS and the capital allocation distortion imply that the corporate tax elasticities η_{1-t} and ϵ_{1-t} are likely positive and finite. Third, while the results below are expressed in terms of the elasticities described in equations (1) and (2), the four elasticities are structurally related. Labor demand elasticities affect pre-tax profit elasticities, and elasticities for wages and corporate taxes are related through the revenue function ϕ. After presenting the propositions, I study a parametric version that adds structure to the revenue function ϕ to explore the role of these interactions.

Planner's problem. The social planner chooses the tax system $(T_0, T_1, 1-t)$ and the minimum wage $\overline{w}$ to maximize a (generalized) utilitarian social welfare function (SWF). Given the degenerate wage distribution and the lack of intensive margin responses, the pair (T_0, T_1) defines a non-linear income tax schedule that depends only on earnings. The assumption of a linear corporate tax makes profit taxation distortionary and reflects the implementation of corporate taxation in practice.[2] The SWF is given by:

$$SWF \quad = \quad (1-L)G(y_0) + \int_{c \in \mathcal{C}_1} G(y_1 - c)dF(c) + G(U^K),$$

where $\mathcal{C}_1 = \{c \in \mathcal{C} : \text{individual is working}\} \subset \mathcal{C}$, and G is an increasing and concave function which summarizes social preferences for redistribution. The first, second, and third terms account for the welfare of non-employed workers, employed workers, and the capitalist, respectively. When choosing taxes and the minimum wage, the planner internalizes that the employment rate L, the capitalist's utility U^K, and (if the minimum wage $\overline{w}$ does not bind) the wage w are equilibrium objects endogenous to policy. $\mathcal{C}_1$ is also endogenous to policy choices. When $\overline{w}$ does not bind, workers are on their labor supply curve and $\mathcal{C}_1 = [0, \Delta y]$. When $\overline{w}$ binds, the rationing mechanism determines $\mathcal{C}_1$.

Assuming no exogenous revenue requirement, the government budget constraint is given by:

$$(1-L)T_0 + LT_1 + t\Pi = 0. \tag{3}$$

Let γ be the budget constraint multiplier. The average social marginal welfare weight (WW) of non-employed workers, employed workers, and the capitalist, are defined respectively as:

$$g_0 = \frac{G'(y_0)}{\gamma}, \qquad g_1 = \frac{\int_{\mathcal{C}_1} G'(y_1 - c)dF(c)}{L\gamma}, \qquad g_K = \frac{G'\left(U^K\right)}{\gamma}.$$

WWs represent the social value of the marginal utility of consumption normalized by the social cost of raising public funds, thus measuring the social value of redistributing one dollar uniformly across a group of individuals (Saez, 2001). At the optimum, the planner is indifferent between giving one more dollar to an individual i or having g_i more dollars of public funds. I also denote by g_1^M the social value of the

[2]Non-linear taxation of profits has proven challenging because firms can strategically avoid the progressivity of the corporate tax (e.g., Onji, 2009; Best et al., 2015; Agostini et al., 2018; Bachas and Soto, 2021; Lobel et al., 2024).

utility loss of rationed workers, whose exact value or formula depends on the rationing mechanism. In words, g_1^M measures the social welfare cost associated with the employment losses of marginally employed workers that are displaced by a binding minimum wage.

2.2 Characterizing the desirability of the minimum wage

Using this framework, I characterize conditions under which increasing the minimum wage is welfare-improving. I proceed by perturbing equilibrium allocations with different minimum wage reforms in the spirit of Saez (2001), Kaplow (2006), and Gerritsen (2024). These perturbations are valid to study both the introduction of a binding minimum wage starting from an allocation with no minimum wage and a minimum wage increase that starts from an already binding minimum wage, and for any baseline tax system, including the optimal. Proposition 1 simply perturbs a baseline equilibrium with a minimum wage increase to characterize all the potential effects of its increase in a "sufficient statistics" spirit (Chetty, 2009; Kleven, 2021). Propositions 2 and 3 pair the minimum wage increase with related tax reforms to better understand the tradeoffs between the minimum wage and the tax system.

Proposition 1. *Consider a baseline allocation with taxes (T_0, T_1, t) and wage w. Introducing a binding minimum wage $\overline{w} = w + d\overline{w}$ with $d\overline{w} > 0$ small (or, alternatively, increasing an already binding minimum wage from w to $\overline{w} = w + d\overline{w}$) is desirable if:*

$$g_1 > \frac{\eta_w}{w}\left(g_1^M + \Delta T\right) + g_K(1-t) + \frac{\Pi}{Lw}\epsilon_w t. \tag{4}$$

All objects in equation (4) are normalized by L so they have a per-employed-worker interpretation. The left-hand side (LHS) summarizes the welfare benefits of employed workers stemming from higher wages, valued in g_1. The right-hand side (RHS) has three terms. The first term summarizes the welfare costs driven by employment losses (proportional to the wage elasticity of labor demand η_w), which equals the sum of the utility costs for displaced workers, valued in g_1^M, and a fiscal externality that depends on the sign of ΔT. The second term is the welfare effect on the capitalist, valued in g_K, which, because of the envelope theorem, is proportional to the mechanical effect of higher labor costs. The third term is the negative fiscal externality on corporate tax revenue, which is proportional to the wage elasticity of profits ϵ_w and the corporate tax rate t. The minimum wage increase is desirable as long as the welfare gain for workers exceeds the associated welfare costs and fiscal externalities.

To better understand the distributional tradeoffs involved in the minimum wage increase, consider the case where employment effects are negligible. If $\eta_w \to 0$, then $\epsilon_w \to Lw/\Pi$ (i.e., profit effects only comprise the mechanical effects from higher wages), and equation (4) reduces to:

$$g_1 > g_K(1-t) + t. \tag{5}$$

Expression (5) shows that the desirability of the minimum wage increase is not guaranteed even in the absence of employment effects: the reform is desirable as long as the extra dollar of consumption gained by employed workers has a higher social value than the corresponding net-of-tax decrease in the capitalist's consumption plus the unit of additional corporate tax revenue. The desirability of the minimum wage increase depends on the corporate tax since t affects both g_K and the size of the fiscal externality. If $g_K < 1$, the concavity of G implies that the RHS of equation (5) is increasing in t, meaning that the minimum wage increase is more desirable when corporate taxes are low, both because of larger equity benefits from redistributing profits and smaller corporate tax revenue losses. This latter insight implies that a binding minimum wage is more likely to increase social welfare when exogenous forces such as international tax competition prevent governments from implementing high corporate taxes.

Proposition 1 perturbs the baseline allocation assuming taxes (optimal or sub-optimal) are fixed. As such, it does not inform about the policy tradeoffs that emerge from the interaction between the minimum wage and the tax system. Mimicking a joint optimization procedure, I now focus on reforms that pair the minimum wage increase with tax reforms that hold certain aspects of the status quo allocation fixed to develop intuition on the optimal interactions between the minimum wage and the tax system.

Improving efficiency. I first study a reform that holds fixed the welfare of employed workers and the capitalist, thus exploring whether the minimum wage enables the social planner to implement the same allocation with lower costs, internalizing both potential effects on employment and fiscal externalities.

The reform is as follows. Starting from the baseline allocation, consider a minimum wage increase paired with an increase in taxes on employed workers of similar magnitude. The labor income tax change generates a positive fiscal effect while leaving labor supply and employed workers' welfare constant. Consider also a decrease in the corporate tax to compensate the capitalist for the minimum wage increase, so her utility is constant. The corporate tax cut may affect labor demand and corporate tax revenue. Then, the reform will be desirable if these effects do not fully offset the positive fiscal externality on the workers' income tax. The following proposition formalizes this condition.

Proposition 2. *Consider a baseline allocation with taxes (T_0, T_1, t) and wage w. Consider the following reform package: (1) a minimum wage introduction $\overline{w} = w + d\overline{w}$ with $d\overline{w} > 0$ small (or, alternatively, increasing an already binding minimum wage from w to $\overline{w} = w + d\overline{w}$), (2) an equally-sized increase in the tax for employed workers $dT_1 = d\overline{w}$, and (3) a corporate tax cut $d(1-t) > 0$ such that the capitalist is compensated for the minimum wage increase, so $dU^K = 0$. This reform is desirable if:*

$$1 - (1-t) + \frac{\Delta T + g_1^M}{w} \left(-\eta_w + \frac{Lw}{\Pi} \eta_{1-t} \right) + t \left(-\frac{\Pi \epsilon_w}{Lw} + \epsilon_{1-t} \right) > 0. \tag{6}$$

When the planner is constrained to hold fixed the welfare of employed workers and the capitalist, the minimum wage increase affects the baseline allocation through the following channels. The first two terms in equation (6) are the mechanical fiscal externalities. First, there is a per-worker fiscal gain from the increase in T_1, normalized to 1. Second, because of the envelope theorem, the corporate tax cut generates a mechanical fiscal loss of $1 - t$ per worker because the tax cut exactly compensates for the mechanical increase in labor costs. The third and fourth terms are behavioral effects. The third term represents the costs of employment changes (in terms of fiscal externalities and displaced workers' welfare), whose sign and magnitude depend on the relative size of the negative effect driven by the minimum wage increase (mediated by the wage elasticity of labor demand η_w) and the positive effect driven by the corporate tax cut (mediated by the elasticity of labor demand with respect to the net-of-corporate rate η_{1-t}). The fourth term represents the fiscal externality in corporate tax revenue, which increases with the response of profits to wages ϵ_w but is attenuated by the profit response to taxes ϵ_{1-t}. The relative distortions between the minimum wage and the corporate tax are key to the desirability of the minimum wage increase since they determine both the sign and magnitude of these fiscal externalities. If the corporate tax is highly distortionary, this reform could eventually generate positive effects on employment and profits.

Proposition 2 can be thought of as a generalization of the results in Lee and Saez (2012) to a setting with profits and distortionary corporate taxation. If there is no corporate taxation ($t = 0$), no response of profits or labor demand to taxation ($\eta_{1-t} = \epsilon_{1-t} = 0$), and the reform perturbs an allocation with no minimum wage and efficient rationing ($g_1^M = 0$), then equation (6) is reduced to $\Delta T < 0$, exactly in line with Lee and Saez (2012) result: the minimum wage can improve welfare through fiscal externalities if the underlying tax system considers in-work benefits.[3] With no minimum wage, transfers to workers increase labor supply and therefore decrease the pre-tax wage in general equilibrium (Rothstein, 2010; Zurla, 2024; Gravoueille, 2025). This response implies that in-work benefits also subsidize profits. With a minimum wage, labor supply responses are muted, enabling the planner to more efficiently transfer resources to employed workers. The minimum wage can, therefore, make the transfer more efficient by shifting the incidence of the policy. This mechanism does not work if $\Delta T > 0$: when positive taxes are in place, labor supply shrinks and, therefore, the pre-tax wage increases. Then, the minimum wage does not affect this behavioral response. Proposition 2 incorporates into this intuition the additional effects that arise from the presence of distortionary profit taxation, generalizing Lee and Saez (2012) result.

Improving allocations. The reform analyzed in Proposition 2 holds fixed the welfare of employed workers and the capitalist, constraining the role of the minimum wage to improve welfare only through beneficial fiscal externalities. I now examine whether the minimum wage allows the implementation of preferred allocations by exploring whether the minimum wage may affect the capitalist's welfare in the socially desired direction in cases where it is too costly to do so using the corporate tax.

To this end, I analyze the following reform. As before, I consider a minimum wage increase paired with an equally-sized increase in taxes on employed workers, so their welfare is fixed. This reform also considers a corporate tax cut, but now to compensate for labor demand, so employment is constant. Then, there is no change in the welfare of the whole population of workers. The relative sizes of the minimum wage increase and the corporate tax cut will affect the capitalist's welfare and corporate tax revenue. Then, the reform will be desirable if these potential costs do not offset the positive fiscal externality on the workers' income tax. The following proposition formalizes this condition.

Proposition 3. *Consider a baseline allocation with taxes (T_0, T_1, t) and wage w. Consider the following*

[3] Efficient rationing means that the workers who lose their jobs as a consequence of the minimum wage are the ones with the least surplus from working (i.e., with the highest c), so that $g_1^M = 0$. Lee and Saez (2012) assumes efficient rationing in their result, an assumption that has proven controversial (e.g., Mankiw, 2013).

reform package: (1) a minimum wage introduction $\overline{w} = w + d\overline{w}$ with $d\overline{w} > 0$ small (or, alternatively, increasing an already binding minimum wage from w to $\overline{w} = w + d\overline{w}$), (2) an equally-sized increase in the tax for employed workers, $dT_1 = d\overline{w}$, and (3) a corporate tax cut, $d(1-t) > 0$, such that labor demand is compensated for the minimum wage increase, so $dL = 0$. This reform is desirable if:

$$1 > g_K(1-t) + \frac{\Pi}{Lw}\left((1-t)(1-g_K)\frac{\eta_w}{\eta_{1-t}} + t\left(\epsilon_w - \epsilon_{1-t}\frac{\eta_w}{\eta_{1-t}}\right)\right). \tag{7}$$

Proposition 3 also shows that the desirability of the minimum wage increase depends on the relative distortions of the minimum wage and the corporate tax. If the corporate tax is highly distortionary (i.e., η_w/η_{1-t} is small), a small corporate tax cut will be sufficient to hold labor demand constant, so the fiscal externality in corporate tax revenue will be small and, therefore, the net fiscal externality will likely be positive. Also, a small corporate tax cut implies that the capitalist's welfare likely decreases as a result of the minimum wage increase. In this case, substituting the corporate tax with the minimum wage is more likely to increase social welfare when g_K is relatively low (i.e., when redistributing profits is desirable). This instrument substitution with no employment effects is feasible because the planner is not committed to keeping the capitalist's welfare constant: it can generate positive fiscal externalities at a welfare cost for the capitalist, which becomes less relevant as g_K decreases. On the contrary, if the corporate tax is close to non-distortionary, the corporate tax cut needed to keep labor demand constant after the introduction of the minimum wage will be substantial, making the substitution between the minimum wage and the corporate tax very costly in terms of both fiscal externalities and welfare transfers to the capitalist.[4]

To build more intuition, note from equation (7) that, if the wage elasticity of labor demand η_w is positive but labor demand and profits are unresponsive to corporate taxation ($\eta_{1-t} = \epsilon_{1-t} = 0$), then the RHS diverges and, therefore, the reform is never desirable. Intuitively, with $\eta_{1-t} \to 0$, the planner is unrestricted in collecting revenue from profits. In this situation, there is no gain in substituting corporate taxation for the minimum wage. Alternatively, when $\eta_{1-t} > 0$ but the employment effects of the minimum wage are negligible, so $\eta_w \to 0$ and $\epsilon_w \to Lw/\Pi$, the condition reduces to:

$$(1-t)(1-g_K) > 0.$$

Similar to Proposition 1, the desirability of the minimum wage is not guaranteed if the employment effects of the minimum wage are zero, as the planner still bears the cost of affecting the capitalist's welfare. The reform requires that redistributing profits has social value ($g_K < 1$). If taxes are optimized, corporate tax distortions are sufficient for $g_K < 1$. However, with no corporate tax distortions, $g_K = 1$ under optimal taxes. Then, even if the minimum wage has no employment effects, some distortion from corporate taxation is necessary to justify the reform under the optimal tax scheme. When the planner does not value the capitalist's welfare ($g_K \to 0$), $\eta_w = 0$ implies that the introduction of the minimum wage is desirable as long as $t < 1$, a condition that will hold at the optimum if corporate taxes are distortionary.

[4] Since $dL = 0$, equation (7) does not depend on g_1^M, meaning that it holds for any labor rationing scheme.

Firm heterogeneity. So far, the analysis assumes a representative capitalist. This assumption is restrictive because the incidence of the minimum wage and the corporate tax is likely uneven when firms pay different wages. To fix ideas, consider the existence of two industries, with one paying higher wages than the other. The minimum wage only affects firms in the low-wage industry but the corporate tax affects all industries if the social planner cannot set industry-specific corporate taxes. This feature may be important for considering the relative merits of corporate taxation and minimum wages if industries that pay the minimum wage differ from those that do not in terms of their responses to corporate taxes.

I explore the high-level implications of this uneven incidence by introducing firm heterogeneity in a very stylized fashion. The workers and the firm described above constitute a segmented labor market of low-skill workers working for a representative firm in a low-skill industry. Denote the low-skill market primitives and equilibrium objects with superscript l. Consider a second segmented labor market of high-skill workers working for a representative firm in a high-skill industry with primitives and equilibrium objects denoted with superscript h. Because of segmentation, these two industries are independent: all behavioral responses and equilibrium relations hold separately by industry. Assume that $w^h > w^l$, so the minimum wage $\overline{w}$ does not bind in the high-skill industry. The planner's policy objects consist of (T_0, T_1^l, T_1^h, t) and $\overline{w}$, where T_1^l are net taxes paid by low-skill employed workers, T_1^h are net taxes paid by high-skill workers, and $\Delta T^s = T_1^s - T_0$, for $s = \{l, h\}$. The key constraint on the planner is that the corporate tax applies to both industries. Industries are therefore connected through the government budget constraint, despite workers and firms behaving independently because of segmentation.

Firm heterogeneity introduces additional fiscal externalities and welfare effects for the reforms discussed in Propositions 2 and 3. To see why, recall that these reform packages pair a minimum wage increase with an income tax increase and a corporate tax cut. The changes in the minimum wage and the income tax do not affect the high-skill industry, but the corporate tax cut does: it affects high-skill employment, wages, profits, and, therefore, labor income and corporate tax revenue. Formally, in Appendix A.1, I show that the LHSs of equations (6) and (7) are augmented by a term proportional to:

$$\frac{d(1-t)}{1-t} \cdot \left(g_1^h L^h w^h \mathcal{W}_{1-t}^h + L^h \eta_{1-t}^h \Delta T^h - (1 - g_K^h)(1-t)\Pi^h + t\Pi^h \epsilon_{1-t}^h \right), \tag{8}$$

where $d(1-t) > 0$ is the corporate tax cut (which varies between propositions), g_1^h is the WW on employed high-skill workers, and $\mathcal{W}_{1-t}^h = d \log w^h / d \log(1-t) > 0$ is the high-skill wage elasticity with respect to the net-of-corporate tax. The first term is a welfare effect on high-skill workers given the change in wages, valued in g_1^h. The second term is a fiscal externality governed by the change in high-skill employment due to higher labor demand, which is positive if $\Delta T^h > 0$. The third term is a mechanical negative effect on corporate tax revenue, attenuated by the welfare gains to the high-skill capitalist. Finally, the fourth term is the positive behavioral effect on pre-tax profits that attenuates the fiscal cost in corporate tax revenue. The (properly normalized) expression depicted in equation (8) appears in the LHS of equations (6) and (7), so the larger it is, the more likely the proposed reforms will be welfare improving.

One key insight that emerges from this extension is that minimum wages are more desirable when the corporate tax is highly distortionary in the high-wage industry. Mathematically, the beneficial effects depicted in equation (8) increase with η^h_{1-t} and ϵ^h_{1-t}, provided $\Delta T^h > 0$: higher corporate tax distortions in unaffected industries make up for larger fiscal externalities from wage and employment spillovers and lower fiscal costs in corporate tax revenue (as the profit response attenuates the mechanical effect). The argument goes further when factoring in the potential optimality of baseline taxes. A corporate tax that "averages" its effects across industries will likely be sub-optimal for taxing profits in the "low distortion" industry but above optimal for taxing the profits of the "high distortion" industry. In these circumstances, governments can benefit from using the minimum wage to "tax" profits in the low distortion sectors to relax distortions in the rest of the economy, because the corporate tax cuts sketched in the argument above would generate a sizable positive externality in the unaffected sector. Then, the minimum wage can work as an industry-specific corporate tax that increases the efficiency of redistribution.

2.3 Parametric example

The results above show that minimum wages are more likely to be desirable when corporate taxes are relatively more distortionary, and especially so when unaffected sectors are more responsive to corporate taxes. The natural question that follows is: when are corporate taxes relatively more distortionary than minimum wages? The results above treat the key elasticities as independent sufficient statistics. However, each of these elasticities is determined (and, hence, restricted) by the revenue functions ϕ^s for $s \in \{l, h\}$ in ways that are not explicit in the propositions. Therefore, the results above do not provide economic intuition on the practical cases (if any) that would favor the conditions for the minimum wage desirability.

To make progress in the characterization of these elasticities, I study a simple parametric example. Assume that revenue functions take a Cobb-Douglas form: $\phi^s(n,k) = \psi_s \left(n^{1-a_s} k^{a_s}\right)^{b_s}$, where $\psi_s > 0$ is a scalar productivity shifter, $a_s \in (0,1)$ is a measure of capital intensity, and $b_s \in (0,1)$ is a measure of returns to scale, for $s \in \{l, h\}$. While Cobb-Douglas functions restrict the elasticity of substitution to be equal to 1, they allow for closed-form expressions of the elasticities η^s_w, ϵ^s_w, η^s_{1-t}, and ϵ^s_{1-t} as a function of structural primitives. Concretely, in Appendix A.1 I derive the following analytical expressions for the key elasticities of labor demand and pre-tax profits:

$$\eta^s_{1-t} = \frac{a_s b_s}{1-b_s}, \qquad \eta^s_w = \frac{1-a_s b_s}{1-b_s}, \qquad \epsilon^s_{1-t} = \frac{a_s b_s}{1-b_s}, \qquad \epsilon^s_w = \frac{(1-a_s)b_s}{1-b_s}.$$

Under this parametrization, the relative distortions between the minimum wage and the corporate tax are mediated by the degree of capital intensity: responses to corporate taxes $(\eta^s_{1-t}, \epsilon^s_{1-t})$ are increasing in a_s, while responses to minimum wages (η^s_w, ϵ^s_w) are decreasing in a_s. This prediction is consistent with the recent empirical literature that finds larger real responses to corporate taxes in capital-intensive firms or industries (see Swonder and Vergara, 2024 for a discussion). This finding is perhaps not surprising: as labor intensity increases, the corporate tax approximates a tax on pure profits.[5]

[5] Appendix A.1 also shows that, under this parametric assumption, $\Pi^s/L^s w^s = (1-(1-a_s)b_s)/(1-a_s)b_s$, so the ratio of domestic pre-tax profits to pre-tax labor income is also increasing in capital intensity.

This simple parametric structure provides powerful insights: capital-intensive firms are more distorted by the corporate tax, while labor-intensive firms are more distorted by the minimum wage. This implies that the instrument substitutions sketched in the propositions above are more likely to be desirable when economies are more capital-intensive. For example, consider Proposition 3 (equation (7)) evaluated at $g_K = 0$ in the one-sector case. Under the Cobb-Douglas parametrization, the reform package that increases the minimum wage and decreases the corporate tax increases social welfare if $a > (1-t)(1-b)/bt$. That is, for given corporate taxes and returns to scale, increasing the minimum wage to reduce corporate taxes is welfare-improving if the economy is sufficiently capital-intensive.

This insight also has implications for the case with firm heterogeneity. As discussed above, the minimum wage is more likely to be desirable when unaffected sectors are relatively more responsive to corporate taxes. Under the Cobb-Douglas parametrization, this condition prevails when low-wage sectors are relatively more labor-intensive and high-wage sectors are relatively more capital-intensive. This case likely applies to the US, where the minimum wage primarily affects labor-intensive service industries like food and accommodation, retail, and low-skill health services, unlike corporate taxes that affect all industries, including relatively more capital-intensive sectors such as manufacturing.

Numerical simulations under optimal taxes. Appendix B presents numerical simulations using the Cobb-Douglas revenue function and further parametric assumptions to get additional intuition on the conditions that would make minimum wage reforms desirable. I focus on the introduction of a minimum wage starting from an allocation with no minimum wage. The main objective of this numerical exercise is to explore whether the conditions derived in propositions 1, 2, and 3 hold when taxes are set optimally at baseline. Intuitively, these propositions depend on taxes and WWs, which are endogenous when the planner can choose the tax system. Therefore, while the propositions are valid for any tax system, and in the real world taxes might be fixed at suboptimal levels, it still can be illustrative to explore how the propositions behave numerically under the implicit restrictions imposed by the optimal tax system. I warn that, while this numerical exercise is informative on the qualitative mechanics of the results, it is too stylized to provide quantitative insights, so it has to be interpreted with caution. The sufficient statistics analysis of Section 4 provides a more rigorous, informative, and policy-relevant quantitative exercise.

In the simulations, I consider different values of (a_l, a_h) and then calibrate the remaining parameters to ensure that wages and labor supply elasticities are the same in the baseline equilibrium with optimal taxes but no minimum wage across parametrizations. Optimal taxes are solved numerically in each parametrization (see Appendix A.1 for the optimality conditions that characterize optimal taxes in the absence of a binding minimum wage). Details on the model's calibration are presented in Appendix B. The results are presented in Figure B.1 of Appendix B and discussed in more depth in Appendix B.

In this stylized simulation, the optimal tax system considers positive net taxes on minimum wage workers, making a weaker case for the minimum wage because employment effects generate negative fiscal externalities. Because of that, the condition in Proposition 1 does not hold when taxes at baseline are optimal: the minimum wage is unable to generate positive fiscal externalities. The conclusions change when evaluating propositions 2 and 3: the re-optimization of the tax system after the minimum wage introduction generally makes the minimum wage introduction welfare improving, especially when the unaffected sector is relatively more capital-intensive than the affected sector ($a_h > a_l$). Because corporate tax distortions are increasing in capital intensity, the optimal corporate tax is too high in the capital-intensive sector and too low in the labor-intensive sector. Using the minimum wage to implement sector-specific taxes increases social welfare for almost all (a_l, a_h) combinations when using the reform of Proposition 2, and for all (a_l, a_h) combinations (and by a much larger margin) when using the reform of Proposition 3. Intuitively, when capital intensity is large across the board, optimal corporate taxes are smaller and, therefore, the redistribution of profits becomes socially desirable. Then, the implementation of reforms that generate fiscal gains at the cost of the capitalists' welfare are more desirable.

These simulation results confirm the intuitions developed so far. When corporate taxes are distortionary, uniform corporate taxes may not optimally redistribute profits in labor-intensive sectors because of their stronger consequences for capital-intensive sectors. The minimum wage arises as a useful complement to the optimal tax system when affected industries are relatively labor-intensive. This comparative static is policy relevant in the context of the US economy, where minimum wage sectors like food and accommodation, retail, and low-skill health services are, indeed, relatively more labor-intensive.

3 Minimum wage policy in a richer model of the labor market

The analysis in Section 2 uses a model that oversimplifies the effects of the minimum wage in the labor market. This section extends the analysis to a frictional labor market model with richer heterogeneity and additional margins of adjustment that can accommodate limited employment effects and spillovers to non-minimum wage jobs following minimum wage increases. The decentralized equilibrium remains (constrained) efficient in this extension despite the frictions. Hence, the analysis in this section also abstracts from efficiency rationales and maintains the focus on the redistributive properties of the minimum wage. The main result of this section is a sufficient statistic representation of the welfare effects of minimum wage reforms (i.e., a generalization of Proposition 1) that I empirically implement in Section 4.

3.1 Setup

As before, the model is static and features two populations: workers and capitalists. Workers now differ on two dimensions: skills and costs of participating in the labor market. For simplicity, I assume workers are either low-skill or high-skill. The representative capitalist is now replaced by a continuous population of capitalists which vary on two dimensions: productivity and technology.

The labor market is no longer perfectly competitive. Labor market interactions are modeled following a directed search approach (Moen, 1997). Capitalists decide whether to create firms based on expected profits. Conditional on creating a firm, they post wages and vacancies, with all vacancies posted at a given wage forming a *sub-market*. Labor markets are segmented, meaning that wages and vacancies are skill-specific. Workers observe wages and vacancies and make their labor market participation and application decisions. In equilibrium, there is a continuum of sub-markets indexed by m, characterized by skill-specific wages w_m^s, vacancies V_m^s, and applicants L_m^s, with $s \in \{l, h\}$ indexing skill.

Matching technology. There are standard matching frictions in each sub-market. The number of matches within a sub-market is given by the skill-specific matching function $\mathcal{M}^s(L_m^s, V_m^s)$, with $\mathcal{M}^s$ continuously differentiable, increasing and concave, and possessing constant returns to scale. Under these assumptions, the sub-market skill-specific job-finding rate can be written as:

$$p_m^s = \frac{\mathcal{M}^s(L_m^s, V_m^s)}{L_m^s} = \mathcal{M}^s(1, \theta_m^s) \equiv p^s(\theta_m^s),$$

with $\partial p^s(\theta_m^s)/\partial \theta_m^s \equiv p_\theta^s > 0$, where $\theta_m^s = V_m^s / L_m^s$ is the sub-market skill-specific vacancies to applicants ratio, also denoted as *sub-market tightness*. Intuitively, the higher the ratio of vacancies to applicants, the more likely that an applicant will be matched with one of those vacancies. Likewise, the sub-market skill-specific job-filling rate can be written as:

$$q_m^s = \frac{\mathcal{M}^s(L_m^s, V_m^s)}{V_m^s} = \mathcal{M}^s\left(\frac{1}{\theta_m^s}, 1\right) \equiv q^s(\theta_m^s),$$

with $\partial q^s(\theta_m^s)/\partial \theta_m^s \equiv q_\theta^s < 0$. Intuitively, the lower the ratio of vacancies to applicants, the more likely that the firm will be able to fill the vacancy with a worker. Neither workers nor firms internalize that their behavior affects equilibrium tightness, so they take p_m^s and q_m^s as given when making their decisions.

Workers. The population of workers is normalized to 1. Workers' skills are exogenous, and the shares of low- and high-skill workers are given by α_l and α_h, respectively, with $\alpha_l + \alpha_h = 1$. As in Section 2, conditional on skill, each worker draws a parameter $c \in \mathcal{C} = [0, C] \subset \mathbb{R}$ that represents the cost of participating in the labor market which is distributed with skill-specific cdf F_s and pdf f_s.

Workers derive (ex-post) utility from the after-tax wage (consumption) net of labor market participation costs. As in Section 2, I focus on extensive margin labor market participation. However, the analysis below differs from that of Section 2 in that workers may participate in the labor market but still end up employed or unemployed because of the matching frictions. The utility of not entering the labor market is $u_0 = y_0 = -T(0)$, where $-T(0) \geq 0$ is a government transfer paid to non-employed individuals, with T the (possibly non-linear) income tax schedule.[6] When entering the labor market, workers apply for jobs. Following Moen (1997), I assume workers can apply to jobs in only one sub-market. Conditional on employment, skill-specific after-tax wages in sub-market m are given by $y_m^s = w_m^s - T(w_m^s)$. Then, the expected utility of entering the labor market for a worker of type (s, c) is given by:

$$u_1(s,c) \quad = \quad \max_m \{p_m^s y_m^s + (1 - p_m^s) y_0\} - c,$$

because workers apply to the sub-market that gives the highest expected after-tax wage, internalizing that the application results in employment with probability p_m^s and unemployment with probability $1 - p_m^s$.

[6]Because the wage distribution is no longer degenerate, the non-linear tax system is now modeled as a function $T(.)$.

Individuals take the job finding rate p_m^s as given, but it is endogenously determined by aggregate application behavior. This implies that, in equilibrium, all markets yield the same expected utility, i.e., $p_{i_1}^s y_{i_1}^s + (1 - p_{i_1}^s) y_0 = p_{i_2}^s y_{i_2}^s + (1 - p_{i_2}^s) y_0 = \max_m \{p_m^s y_m^s + (1 - p_m^s) y_0\}$, for all pairs (i_1, i_2); otherwise, workers would have incentives to shift their applications toward markets with higher expected values, pushing downward the job-filling probabilities and restoring the equilibrium. This means that workers face a tradeoff between wages and employment probabilities because it is more difficult to secure a job in a sub-market that pays higher wages. In what follows, I define $U^s = \max_m \{p_m^s y_m^s + (1 - p_m^s) y_0\}$ so the expected utility of entering the labor market is $u_1(s, c) = U^s - c$. Workers participate in the labor market if $u_1(s, c) \geq u_0 \Leftrightarrow U^s - y_0 \geq c$, which implies that the mass of active workers of skill s is given by $L_A^s = \alpha_s F_s(U^s - y_0)$. The mass of inactive workers is given by $L_I = L_I^l + L_I^h = 1 - L_A^l - L_A^h$. Denote by L_m^s the mass of individuals of skill s applying to jobs in sub-market m, so $L_A^s = \int L_m^s dm$. I assume that application decisions conditional on participating in the labor market are independent of c.

The expression $U^s = p_m^s y_m^s + (1 - p_m^s) y_0$ implies that θ_m^s can be written as a function of w_m^s and U^s, for all m (Moen, 1997). Formally, $\theta_m^s = \theta_m^s(w_m^s, U^s)$, with $\partial \theta_m^s / \partial w_m^s < 0$ and $\partial \theta_m^s / \partial U^s > 0$.[7] This feature simplifies the analysis because it implies that, conditional on wages, equilibrium behavior can be summarized by the scalars U^s without needing to characterize the continuous sequence of θ_m^s.

The fact that U^s is a skill-specific equilibrium object that summarizes complex interactions between wages, tightness, and applications across sub-markets has a key implication: although U^s is a function of hard-to-measure objects and several behavioral responses, below I show that U^s is equal to a skill-level aggregate moment that is feasible to estimate. This feature will help me derive and implement a tractable "sufficient statistics" analysis of the impacts of minimum wage increases on workers' welfare.

Capitalists. There is a continuous population of capitalists of size $\mathcal{K}$. Each capitalist draws a parameter $\psi \in \Psi = [\underline{\psi}, \overline{\psi}] \subset \mathbb{R}^+$ which represents firm productivity. Capitalists also draw a technology $j \in \mathcal{J} = \{1, 2, ..., J\}$, which accounts for, for example, factor shares and returns to scale. Let o_j and O_j be the conditional pdf and cdf of ψ given j, respectively. The pmf of j is denoted by σ_j, with $\sum_{j \in \mathcal{J}} \sigma_j = 1$.

Capitalists observe (ψ, j) and choose whether to create a firm. Firms are price-takers in the output market, with the output price normalized to 1. Technology depends on ψ, low- and high-skill workers (n^l, n^h), and capital k, so a firm of type (ψ, j) that hires (n^l, n^h) workers and employs k capital generates revenue $\phi^j(\psi, n^l, n^h, k)$, with ϕ^j twice differentiable, $\phi_\psi^j > 0$, $\phi_{n^s}^j > 0$, $\phi_{n^s n^s}^j < 0$, $\phi_k^j > 0$, and $\phi_{kk}^j < 0$.

As in Section 2, capitalists are endowed with a capital stock $\overline{k}$ which they allocate between the domestic firm and a foreign investment with after-tax return r^*. When setting up a firm, capitalists choose skill-specific wages w^s and vacancies v^s. While firms take job-filling probabilities as given, they internalize that paying higher wages increases the job-filling probabilities. Using the workers' equilibrium application strategies, I write job-filling probabilities as $\tilde{q}^s(w^s, U^s) = q(\theta^s(w^s, U^s))$, with $\tilde{q}_w^s = q_\theta^s(\partial \theta^s / \partial w^s) > 0$, so $n^s = \tilde{q}^s(w^s, U^s) v^s$. Posting v^s vacancies has a cost $\eta^s(v^s)$, with $\eta_v^s > 0$ and $\eta_{vv}^s > 0$. Then, the

[7] Since $U^s = p^s(\theta_m^s)(w_m^s - T(w_m^s)) + (1 - p^s(\theta_m^s)) y_0$, then $dU^s = p_\theta^s d\theta_m^s y_m^s + p_m^s(1 - T'(w_m^s)) dw_m^s$. Recalling that $p_\theta^s > 0$ and asssuming $T'(w_m^s) < 1$ yields the result.

optimization problem of a capitalist that sets up a firm is given by:

$$\max_{w^l,w^h,v^l,v^h,k}\left[(1-t)\pi^j\left(w^l,w^h,v^l,v^h,k;\psi\right)\right]+(\bar{k}-k)r^*, \tag{9}$$

where domestic pre-tax profits for a capitalist of type (ψ,j) are given by revenue net of labor costs:

$$\begin{aligned}\pi^j\left(w^l,w^h,v^l,v^h,k;\psi\right) &= \phi^j\left(\psi,\tilde{q}^l(w^l,U^l)v^l,\tilde{q}^h(w^h,U^h)v^h,k\right)\\ &\quad-\left(w^l\tilde{q}^l(w^l,U^l)v^l+\eta^l(v^l)\right)-\left(w^h\tilde{q}^h(w^h,U^h)v^h+\eta^h(v^h)\right).\end{aligned} \tag{10}$$

Optimized domestic pre-tax profits are given by $\Pi^j(\psi,1-t)=\max_{w^l,w^h,v^l,v^h}\pi^j\left(w^l,w^h,v^l,v^h,k;\psi\right)$. To establish firms, capitalists pay a fixed cost ξ. When inactive, capitalists receive a lump-sum transfer t_0 and reallocate the optimal capital $k^j(\psi,1-t)$ to the foreign investment. Therefore, capitalists of type (ψ,j) create firms when $(1-t)\Pi^j(\psi,1-t)\geq\xi+t_0+r^*k^j(\psi,1-t)$. Since, conditional on j, the value function of equation (9) is increasing in ψ, the entry rule defines a j-specific productivity threshold ψ_j^* implicitly determined by $(1-t)\Pi^j(\psi_j^*,1-t)=\xi+t_0+r^*k^j(\psi_j^*,1-t)$ such that j-type capitalists create firms only if $\psi\geq\psi_j^*$. Consequently, the mass of active capitalists is given by $K_A=\mathcal{K}\sum_{j\in\mathcal{J}}\sigma_j\left(1-O_j(\psi_j^*)\right)$, and the mass of inactive capitalists is given by $K_I=\mathcal{K}\sum_{j\in\mathcal{J}}\sigma_jO_j(\psi_j^*)$, with $K_A+K_I=\mathcal{K}$.

The effects of policies on the capitalists' welfare are less direct than in the model of Section 2 because the equilibrium effects of policy changes affect application strategies and, therefore, the equilibrium utilities of active workers U^s and, with that, the job-filling probabilities for capitalists $\tilde{q}^s(w^s,U^s)$. Therefore, mechanical effects are no longer sufficient for quantifying welfare effects. Concretely, the value function for active capitalists of type (ψ,j) is given by:

$$U^{Kj}(\psi,1-t)=(1-t)\Pi^j(\psi,1-t)+(\bar{k}-k^j(\psi,1-t))r^*-\xi. \tag{11}$$

The envelope theorem implies that:

$$\frac{\partial U^{Kj}}{\partial(1-t)}=\Pi^j(\psi,1-t)+(1-t)\underbrace{\left(\frac{\partial\Pi^j(\psi,1-t)}{\partial U^l}\frac{\partial U^l}{\partial(1-t)}+\frac{\partial\Pi^j(\psi,1-t)}{\partial U^h}\frac{\partial U^h}{\partial(1-t)}\right)}_{\text{Micro elasticity:}\frac{\partial\Pi^j(\psi,1-t)}{\partial(1-t)}}, \tag{12}$$

where $\partial\Pi^j(\psi,1-t)/\partial U^s$ is the partial derivative of equation (10) with respect to U^s, ignoring effects through endogenous variables, and evaluated at the optimal decisions. That is, this is a micro elasticity that does not coincide with the macro elasticity relevant for the fiscal externality $d\Pi^j(\psi,1-t)/d(1-t)$ which also includes effects on vacancies, capital, and posted wages.[8] In this case, the welfare effect is not merely the mechanical effect because of potential general equilibrium effects that affect job-filling

[8]Because of the envelope theorem, effects on vacancies and wages do not induce first-order differences between micro and macro elasticities, as both are chosen to maximize domestic profits. However, capital responses do, as capital is chosen to maximize domestic profits plus foreign returns: the macro elasticity incorporates effects on domestic capital but the micro elasticity does not as the capitalists get utility for the extra capital invested abroad. I come back to this discussion below.

probabilities even conditional on first order conditions.[9] For inactive capitalists, $U^{Kj}(\psi, 1-t) = \overline{k}r^* + t_0$, so $\partial U^{Kj}/\partial(1-t) = 0$. Envelope conditions regarding the minimum wage are discussed below.

Conditional on (ψ, j), firms are homogeneous. The solution to the firm's problem can therefore be characterized by functions $w^{sj}(\psi, 1-t)$, $v^{sj}(\psi, 1-t)$, and $k^j(\psi, 1-t)$. Appendix A.2 derives first-order conditions and shows that firm heterogeneity leads to dispersion in wages conditional on skill, with wages *marked down* relative to the marginal productivities. Given t, m indexes sub-markets as well as the (ψ, j) values of capitalists that create firms, so $w_m^s = w^{s\widetilde{j}}\left(\widetilde{\psi}, 1-t\right)$, $v_m^s = v^{s\widetilde{j}}\left(\widetilde{\psi}, 1-t\right)$, and $V_m^s = \mathcal{K} v^{s\widetilde{j}}\left(\widetilde{\psi}, 1-t\right)\sigma_{\widetilde{j}} o_{\widetilde{j}}\left(\widetilde{\psi}\right)$, for some $\left(\widetilde{\psi}, \widetilde{j}\right) \in \left\{(\psi, j) \in \Psi \times \mathcal{J} : \psi \geq \psi_j^*\right\}$.[10]

Equilibrium. I formally characterize the labor market equilibrium in Appendix A.2. The equilibrium objects are U^l, U^h, $\left\{\psi_j^*\right\}_{j=1}^{J}$, the sub-market skill-specific wages, vacancies, and applicants, (w_m^s, v_m^s, L_m^s), for all m and s, and the sequence of capital allocations, $k^j(\psi, 1-t)$, for all (ψ, j) combinations. The equilibrium objects simultaneously solve (1) worker- and firm-level participation constraints, (2) firms' first order conditions regarding wages, vacancies, and capital, and (3) the across sub-market equilibrium condition that determines the distribution of workers' applications.

Discussion. Before introducing a minimum wage, I highlight four properties of the model. First, directed search models generate efficient outcomes in terms of search and posting behavior (Moen, 1997; Wright et al., 2021). That is, these models do not exhibit inefficient mixes of applicants and vacancies which can arise in random search models (e.g., Hosios, 1990). In Appendix A.2, I show that the proposed model satisfies this property. As in Section 2, this result indicates that the policy analysis below focuses on distributional rationales.[11] Second, while search and posting behavior is constrained efficient, the model admits monopsony power through wage-dependent job-filling probabilities that have a similar spirit to the standard monopsony intuition of upward-sloping firm-specific labor supply curves (Robinson, 1933; Card et al., 2018). Firms internalize that paying higher wages leads to more applicants, so wages are *marked down* relative to marginal productivity, and firm-specific labor supply elasticities are endogenous and finite because of matching frictions and convex vacancy creation costs. Appendix A.2 shows that the standard markdown equation can be derived from the firm's first-order conditions. Third, since workers care about expected utility, rationing assumptions do not play a role in the welfare analysis. Intuitively, rationing assumptions are second-order for the welfare analysis below because the social planner maximizes the sum of expected utilities (see below), which are ex-ante equal for all active workers within a skill type regardless of their final employment status. This feature is appealing as rationing assumptions have been controversial in previous literature (e.g., Mankiw, 2013). Fourth, the model reproduces stylized facts

[9] This distinction between micro and macro elasticities resembles discussions in related literature, where micro elasticities hold certain aspects of the allocation fixed, while macro elasticities consider all equilibrium effects (see, for example, Scheuer and Werning, 2017; Landais et al., 2018b,a; Kroft et al., 2020; Lavecchia, 2020).

[10] There could be more than one (ψ, j) pair yielding the same w_m^s. In those cases, firms' FOCs imply that they will also post the same vacancies since the functions q^s and η^s do not vary with j (see Appendix A.2). For those cases, define $\mathcal{I}(s, m) \subset \left\{(\psi, j) \in \Psi \times \mathcal{J} : \psi \geq \psi_j^*\right\}$ as the set of combinations that optimally post the same wage w for workers of skill s, w_m^s. Let ι index elements in $\mathcal{I}(s, m)$. Then, $V_m^s = \mathcal{K} \sum_{\iota \in \mathcal{I}(s,m)} v^{s\widetilde{j}_\iota}\left(\widetilde{\psi}_\iota, 1-t\right)\sigma_{\widetilde{j}_\iota} o_{\widetilde{j}_\iota}\left(\widetilde{\psi}_\iota\right)$.

[11] This logic is also present in Hungerbühler et al. (2006) who explore optimal redistributive labor income taxation in a random search model that imposes the Hossios condition.

about low-wage labor markets. The model features wage dispersion for similar workers (Card et al., 2018; Kline, 2024); wage posting rather than bargaining, which has been found to be more prevalent in low-wage jobs (Hall and Krueger, 2012; Caldwell and Harmon, 2019; Lachowska et al., 2022); and can rationalize bunching in the wage distribution at the minimum wage (Cengiz et al., 2019).

Introducing a minimum wage. I now introduce a minimum wage $\overline{w}$ to explore how the model predictions relate to those in the literature. Details on derivations can be found in Appendix A.2.

Assume $\overline{w}$ binds for low-skill workers in the lowest-wage sub-market. An increase in $\overline{w}$ makes minimum wage jobs more attractive, thus attracting new applicants and pushing the sub-market tightness downwards until the across sub-market equilibrium is restored. The decrease in tightness depresses the job-finding probability. Therefore, the overall effect of introducing a minimum wage on expected utility $dU^l/d\overline{w}$ is ambiguous and depends on whether wage or employment effects dominate. Because expected utility is equal across sub-markets, introducing a minimum wage affects not only the minimum wage sub-market, but also low-skill sub-markets that pay more than the minimum wage. Two forces mediate these spillover effects. First, the change in applicant flows between sub-markets affects employment probabilities in all sub-markets. Second, as discussed below, firms can also respond to changes in applicants by posting different wages and vacancies. Regarding high-skill sub-markets, the model allows for spillovers across worker skill levels, which are mediated by the production function. These spillovers arise because demand for high-skill workers may be contingent on low-skill workers, depending on the structure of ϕ^j.[12]

As for capitalists, firms for which the minimum wage binds optimize low-skill vacancies, high-skill wages and vacancies, and capital, taking low-skill wages as given. The effect of the minimum wage on low-skill vacancy posting is ambiguous. On one hand, an increase in the minimum wage raises labor costs, decreasing the expected value of posting a vacancy. However, the increase in applicants increases the job-filling probabilities. This effect raises the value of posting a vacancy and helps to attenuate potential disemployment effects. Firms for which the minimum wage does not bind also react by adapting their posted wages and vacancies to changes in their sub-market tightness given the reshuffling of applicants. Wages and vacancies are correlated at the firm and skill level, so when firms change wages, they also change posted vacancies. Then, employment spillovers are also possible in this model.

Minimum wages also affect profits. Firms for which the minimum wage binds face a reduction in profits due to mechanical effects and the corresponding reoptimization of the capital allocation problem. Moreover, the general equilibrium effects on applications affect job-filling probabilities, which in turn affect equilibrium profits. This latter effect also affects firms that are not constrained by the minimum wage. The reduction in profits for minimum wage firms leads marginal firms to exit the market.

Similar to the discussion above regarding changes in corporate taxes (see equation (12)), the welfare effects on capitalists of a minimum wage increase are less direct than in the model of Section 2 because

[12] Changes in U^s can also affect labor market participation. Recall that $L^s_A = \alpha_s F_s(U^s - y_0)$, so $dL^s_A/d\overline{w} = \alpha_s f_s(U^s - y_0)\,(dU^s/d\overline{w})$. Then, if $dU^s/d\overline{w} \neq 0$, minimum wage hikes affect labor market participation. The behavioral response, however, is scaled by $f_s(U^s)$, which may be negligible. This may result in positive impacts on expected utilities for inframarginal workers with modest participation effects at the aggregate level (Cengiz et al., 2022).

wages are choice variables and, also, they affect job-filling probabilities (both directly and indirectly through U^s). For inactive capitalists, $\partial U^{K_j}/\partial \overline{w} = 0$. However, for active capitalists:

$$\frac{\partial U^{K_j}}{\partial \overline{w}} = (1-t)\frac{\partial \Pi^j(\psi, 1-t)}{\partial \overline{w}}, \tag{13}$$

where, as in equation (12), this is a micro elasticity that ignores the effects of the minimum wage on endogenous variables: vacancies, capital, and unconstrained wages. For firms constrained by the minimum wage, equation (13) considers the direct effects of $\overline{w}$ on labor costs (mechanical effect) and on the job-filling probabilities $\tilde{q}^l(\overline{w}, U^l)$, both through $\overline{w}$ and $\partial U^s/\partial \overline{w}$. For unconstrained firms, the minimum wage still affects their utility but only through the general equilibrium effects on U^s (see Appendix A.2 for detailed formulas). Below I show that the macro elasticity of profits $d\Pi^j(\psi, 1-t)/d\overline{w}$ that includes all general equilibrium effects including those on endogenous variables is a useful upper bound for the micro elasticity that quantifies welfare effects on capitalists, facilitating a sufficient statistics exercise.

These predictions align with recent evidence on the effects of the minimum wage (Dube and Lindner, 2024). Minimum wage hikes generate positive wage effects with "elusive" disemployment effects (Manning, 2021a). The effect may extend to non-minimum wage jobs, both within and between firms (Cengiz et al., 2019; Dustmann et al., 2022; Engbom and Moser, 2022; Giupponi and Machin, 2024; Vogel, 2025). Finally, Draca et al. (2011), Harasztosi and Lindner (2019), and Drucker et al. (2021) document negative effects on profits. In the model, the main mediator of these responses is the endogenous response of workers' applications to minimum wage changes (and, more generally, to utility differentials across jobs), which attenuates employment responses, generates spillovers to non-minimum wage jobs, and affects profits. Evidence in Holzer et al. (1991) and Escudero et al. (2025) suggest this is an empirically-relevant channel.

Planner's problem. Following other optimal tax analyses with matching frictions (e.g., Hungerbühler et al., 2006; Kroft et al., 2020; Lavecchia, 2020), I assume the planner maximizes a (generalized) utilitarian SWF based on expected utilities:

$$\begin{aligned} SWF \quad = \quad & \left(L_I^l + L_I^h\right) G(y_0) + K_I G(t_0 + \overline{k}r^*) + \alpha_l \int_0^{U^l - y_0} G(U^l - c) dF_l(c) \\ & + \alpha_h \int_0^{U^h - y_0} G(U^h - c) dF_h(c) + \mathcal{K} \sum_{j \in \mathcal{J}} \sigma_j \int_{\psi_j^*}^{\overline{\psi}} G\left(U^{Kj}(\psi, 1-t)\right) dO_j(\psi), \end{aligned} \tag{14}$$

where $(\overline{w}, T, t_0, 1-t)$ are the policy parameters and G is defined as in Section 2. The first two terms of equation (14) represent the utility of inactive workers and capitalists, respectively. The third and fourth terms of equation (14) represent the expected utility of active low- and high-skill workers, respectively. Finally, the last term represents the utility of active capitalists.[13]

The planner maximizes the SWF subject to incentive compatibility constraints and a government budget constraint. Participation constraints are included in the limits of integration because the planner internalizes that the policy parameters affect U^l, U^h, and ψ_j^* which, in turn, mediate extensive margin

[13] Appendix A.2 provides further intuition by relating equation (14) with the average welfare by group.

responses. Additionally, due to the across sub-market equilibrium condition, the planner internalizes that U^s must be equivalent to equation (17), which disciplines the intensive margin decisions of firms. The planner also internalizes that, for active capitalists, $U^{Kj}(\psi, 1-t)$ is given by equation (11). Finally, the natural extension of the budget constraint defined in equation (3) is given by:

$$\begin{aligned} \left(L_I^l + L_I^h + \rho^l L_A^l + \rho^h L_A^h\right) y_0 + K_I t_0 \quad &= \quad \int \left(E_m^l T(w_m^l) + E_m^h T(w_m^h)\right) dm \\ &\quad + t\mathcal{K} \sum_{j \in \mathcal{J}} \sigma_j \int_{\psi_j^*}^{\overline{\psi}} \Pi^j(\psi, 1-t) dO_j(\psi), \end{aligned} \tag{15}$$

where $E_m^s = p_m^s L_m^s$ is the mass of employed workers of skill s in sub-market m and ρ^s is the skill-specific unemployment rate. Equation (15) establishes that the transfer paid to individuals with no market income must be funded by the tax collection on employed workers and active capitalists. As in Section 2, if γ is the budget constraint multiplier, the WWs of inactive workers, inactive capitalists, active workers of skill type s, and active capitalists of type (ψ, j) are defined as $g_0 = G'(y_0)/\gamma$, $g_0^K = G'(t_0 + \overline{k}r^*)/\gamma$, $g_1^s = \alpha_s \int_0^{U^s - y_0} G'(U^s - c) dF_s(c)/\gamma L_A^s$, and $g_\psi^j = G'(U^{Kj}(\psi, 1-t))/\gamma$, respectively.

3.2 Characterizing the desirability of the minimum wage

I now assess the desirability of marginal minimum wage reforms. I first derive an extension of Proposition 1 to describe the overall effects of a minimum wage increase in a "sufficient statistics" spirit (Chetty, 2009; Kleven, 2021) and discuss which empirical objects can be used to quantify the condition. This result can be used to assess the welfare effects of introducing a minimum wage or to evaluate a minimum wage increase starting from an already binding minimum wage, for any fixed tax system (optimal or suboptimal). I then discuss how the logic of Propositions 2 and 3, which explore interactions between the minimum wage and the corporate tax, extends to the richer model presented in this section.

Proposition 4. *Consider a baseline equilibrium allocation with taxes (T, t, t_0). Introducing a binding minimum wage (or increasing an already binding minimum wage) is desirable if:*

$$\begin{aligned} & L_A^l g_1^l \frac{dU^l}{d\overline{w}} + L_A^h g_1^h \frac{dU^h}{d\overline{w}} + \mathcal{K} \sum_{j \in \mathcal{J}} \sigma_j \int_{\psi_j^*}^{\overline{\psi}} g_\psi^j \frac{dU^{Kj}(\psi, 1-t)}{d\overline{w}} dO_j(\psi) \\ & + \int \left(\frac{dE_m^l}{d\overline{w}} \left(T\left(w_m^l\right) + y_0 \right) + E_m^l T'\left(w_m^l\right) \frac{dw_m^l}{d\overline{w}} \right) dm \\ & + \int \left(\frac{dE_m^h}{d\overline{w}} \left(T\left(w_m^h\right) + y_0 \right) + E_m^h T'\left(w_m^h\right) \frac{dw_m^h}{d\overline{w}} \right) dm \\ + t\mathcal{K} \sum_{j \in \mathcal{J}} \sigma_j & \int_{\psi_j^*}^{\overline{\psi}} \frac{d\Pi^j(\psi, 1-t)}{d\overline{w}} dO_j(\psi) + \sum_j \frac{dK_A^j}{d\overline{w}} \left(t\Pi^j(\psi_j^*, 1-t) + t_0\right) \quad > \quad 0. \end{aligned} \tag{16}$$

The first line in equation (16) summarizes welfare effects for active low-skill workers, active high-skill workers, and active capitalists, respectively, governed by the terms $dU^l/d\overline{w}$, $dU^h/d\overline{w}$, $dU^{Kj}(\psi, 1-t)/d\overline{w}$, their corresponding WWs, and their population sizes. Welfare effects are changes in utility levels for inframarginal individuals: transitions between active and inactive states for workers and capitalists do not generate first-order welfare effects as marginal agents are initially indifferent between states. As discussed above, the vector $(U^l, U^h, U^{Kj}(\psi, 1-t))$ represents equilibrium objects that, in turn, summarize several behavioral responses, such as effects on employment and wages across the wage distribution, participation, profits, and capital. Appendix A.2 leverages these equilibrium conditions to express equation (16) in terms of all these different sets of behavioral elasticities to develop further intuition on the complex interplay between behavioral responses in general equilibrium. However, the main analysis focuses on this more parsimonious condition because, as shown below, equation (16) can be implemented empirically using sufficient statistics without needing to characterize the complete set of behavioral responses.

The second, third, and fourth lines in equation (16) represent fiscal externalities on low-skill workers, high-skill workers, and capitalists, respectively. Changes in wages and employment affect net tax liabilities at each earnings level depending on the structure of the tax system. Participation responses do not directly affect the planner's budget because the planner pays transfers to individuals without any market income regardless of whether they are inactive or active but unemployed, so employment effects are sufficient. Finally, fiscal externalities on capitalists include two components. First, changes in profits affect corporate tax revenue. Second, while the exit of marginal firm-owners does not generate welfare effects, exits may generate fiscal externalities because these capitalists transition from paying taxes to receiving transfers.

Proposition 4 constitutes an important generalization of Proposition 1 as it accounts for endogenous participation, involuntary unemployment, wage and employment spillovers, and endogenous firm entry. Proposition 4 also improves upon Proposition 1 by considering a richer degree of heterogeneity with key economic implications. First, the incorporation of worker skill heterogeneity makes explicit that the minimum wage may affect not only the distribution between workers and capitalists but also the distribution between low- and high-skill workers, depending on the strength of the spillovers to high-skill workers. Second, by featuring heterogeneous capitalists, the result highlights the importance of characterizing the full distribution of profit responses, which may be heterogeneous across firms with different wage levels and technologies. Because WWs vary by capitalist type, the correlation between profit elasticities and WWs matters for aggregating welfare effects. The welfare cost on capitalists is less relevant for the planner whenever profit responses are concentrated in capitalists with low WWs. Likewise, the fiscal externality is larger when firms with larger profits are the ones with larger responses. This suggests that empirical evidence on the heterogeneous impacts of minimum wages on firm profits is an important avenue of future research (e.g., Drucker et al., 2021; Rao and Risch, 2025).

Empirical implementation. Proposition 4 is a function of $dU^l/d\overline{w}$, $dU^h/d\overline{w}$, $dU^{Kj}(\psi, 1-t)/d\overline{w}$, and several fiscal externalities. These are equilibrium objects that depend on many sub-market-specific behavioral elasticities and structural objects which might be difficult (maybe impossible) to estimate. However, below I show that these terms can be measured (or bounded) by aggregate macro-elasticities that are feasible to estimate with relatively weak data requirements.

Consider first the term $dU^s/d\overline{w}$. Recall that, in equilibrium, $U^s = p^s_m y^s_m + (1-p^s_m)y_0$, for all m.

Multiplying both sides by the sub-market mass of applicants L_m^s, and integrating over m, yields:

$$U^s = \frac{\int E_m^s(w_m^s - T(w_m^s) - y_0)dm}{L_A^s} + y_0 = \frac{\int E_m^s w_m^s dm}{L_A^s} - \frac{\int E_m^s(T(w_m^s) + y_0)dm}{L_A^s} + y_0. \tag{17}$$

Equation (17) shows how to empirically measure the effect of minimum wage changes on the expected utility of participating in the labor market $dU^s/d\overline{w}$ without specifying the entire structure of the model and the underlying behavioral responses. The first term represents the average pre-tax wage among active workers, which equals the average wage conditional on employment times the employment rate: $\int E_m^s w_m^s dm/L_A^s = (1-\rho^s)\mathbb{E}_m[w_m^s] + \rho^s \cdot 0 = (1-\rho^s)\mathbb{E}_m[w_m^s]$, with ρ^s the skill-specific unemployment rate, and $\mathbb{E}_m[w_m^s] = \int \nu_m^s w_m^s dm$ the average wage, with $\nu_m^s = E_m^s / \int E_m^s dm$ and $\int \nu_m^s dm = 1$. Similarly, the second term represents the average tax liabilities net of transfers among active workers. Both terms include both the employed and the unemployed, so estimations of $dU^s/d\overline{w}$ using equation (17) can comprehensively account for direct and spillover minimum wage effects on participation, wages, and employment. In the public debate, there is an unresolved discussion over the appropriate aggregation of these margins for welfare analysis. By focusing on expected utilities, my proposed framework offers a resolution for aggregating labor market effects into a single elasticity: the change in the average post-tax earnings of workers of skill s is sufficient for assessing their welfare changes.

Regarding $dU^{Kj}(\psi, 1-t)/d\overline{w}$, equation (13) shows it is proportional to the micro elasticity of profits, which can be difficult to estimate as it requires holding fixed all endogenous variables (vacancies, capital, and unconstrained wages). However, changes in vacancies and unconstrained wages do not generate a wedge between micro and macro profit elasticities because of the envelope theorem: they are chosen to maximize domestic profits given a level of capital. This is, however, not true for the capital response because the reallocation of capital from the domestic firm to the foreign investment affects domestic profits (and, therefore, the macro elasticity) but has no first-order welfare effects on the capitalists' utility (because of the envelope theorem). Therefore, the micro elasticity of profits (relevant for computing $dU^{Kj}/d\overline{w}$) and the macro elasticity of profits (relevant for the fiscal externality and feasible to estimate) are related through the following equation:

$$\frac{d\Pi^j(\psi, 1-t)}{d\overline{w}} = \frac{\partial \Pi^j(\psi, 1-t)}{\partial \overline{w}} + \frac{r^*}{1-t}\frac{dk^j(\psi)}{d\overline{w}}. \tag{18}$$

Then, based on equation (18), $\partial U^{Kj}(\psi, 1-t)/\partial\overline{w}$ is bounded by the macro profit elasticity if estimates of capital responses $dk^j(\psi)/d\overline{w}$ are not available. Assuming that the capital response is negative (i.e., that an increase in the minimum wage reallocates capital from the domestic firm to the foreign investment), then the macro elasticity of profits constitutes an upper bound for the welfare effects on capitalists that can be used for conducting a conservative quantification of the desirability of minimum wage reforms.[14]

Finally, the quantification of fiscal externalities is straightforward. Although the second and third

[14] The assumption on $dk^j(\psi)/d\overline{w} < 0$ implicitly restricts the elasticity of substitution between capital and labor to not be "too large": if capital and labor are extremely substitutable, an increase in the minimum wage may yield substitution effects that dominate scale effects, increasing optimal capital.

lines of equation (16) detail that fiscal externalities on workers are governed by employment and wage effects that vary by sub-market, what is relevant for the desirability of the minimum wage reform is the integral of all these effects across the wage distribution. That is, what is needed to calibrate equation (16) is the total effects of the minimum wage on net labor income tax liabilities, but not its decomposition across margins and workers. On the other hand, capitalist-level fiscal externalities depend on the macro elasticity of profits (the same object that can be used to bound the welfare effects on capitalists) and on the macro elasticity of the number of active capitalists, both of which can be estimated.

I illustrate the empirical appeal of these results in the next section.

Interactions with the corporate tax. Proposition 4 is the natural generalization of Proposition 1. How would the generalizations of Propositions 2 and 3–which explore the interaction between the minimum wage and the corporate tax–look like in this richer model of the labor market? To simplify the exposition of the argument, I assume that the planner can enforce skill-specific labor income tax schedules $T_s(w_m^s)$. Note that, following standard production efficiency arguments, this assumption should, if anything, work against the desirability of the minimum wage.

Recall that $U^l = p_m^l(w_m^l - T_l(w_m^l) - y_0) + y_0$, for all m, including the sub-market that pays the minimum wage $\overline{w}$. Index this sub-market by $m = 1$. As in Propositions 2 and 3, I proceed with a perturbation that has no effect on U^l but that may have positive effects on welfare through fiscal externalities. Starting from a baseline equilibrium with taxes, with or without a binding minimum wage, consider a marginal increase in the minimum wage $d\overline{w}$ paired with an equally-sized increase in the net tax liabilities for minimum wage workers $dT_l(\overline{w}) = d\overline{w}$. The utility of being employed in the minimum wage sub-market is constant. However, the increase in $\overline{w}$ depresses low-skill vacancy creation in the minimum wage sub-market, negatively affecting the employment probability p_1^l and, therefore, the expected utility of applying to a minimum wage job. To counteract this effect, the planner implements a corporate tax cut chosen so that $dp_1^l = 0$. Then, the expected utility of applying to a job in the minimum wage sub-market is unchanged. However, the corporate tax cut generates positive effects in all sub-markets: it increases vacancy creation and wages in all sub-markets, for low- and high-skill workers. This spillover perturbs the equilibrium condition, as now sub-markets other than $m = 1$ are more attractive to low-skill workers and, therefore, attract additional applications, eventually affecting the minimum wage sub-market. To neutralize this effect, so that we can be sure that the expected utility across sub-markets is constant, the planner can implement a sequence of tax perturbations $dT_l(w_m^l) > 0$ for all $m \neq 1$ to neutralize the increase in vacancies and wages of these sub-markets. This reform, then, implies that $dU^l = 0$.

Is this reform desirable? The planner gets a positive fiscal externality in terms of low-skill labor income tax revenue (across the entire income distribution). High-skill workers also benefit, positively affecting social welfare in proportion to g_1^h. However, corporate tax revenue falls because of the corporate tax cut. As in the previous analysis, this reform will be more likely to be desirable when the corporate tax is highly distortionary, as a small corporate tax cut will be sufficient to neutralize employment effects and, therefore, the negative fiscal externality will be minimal. Then, all the high-level intuitions developed in the previous section remain valid in this richer model of the labor market.

4 Sufficient statistics analysis

Proposition 4 provides a general formula (equation (16)) for evaluating marginal minimum wage reforms that can be empirically implemented with sufficient statistics, in the spirit of Chetty (2009) and Kleven (2021). This section illustrates the empirical applicability of the derived formula by examining whether a marginal increase in the US minimum wage would be welfare-improving. First, I estimate the sufficient statistics using US state-level variation in minimum wages and publicly available data, closely following the research design of Cengiz et al. (2019, 2022). Then, I use the estimates to calibrate equation (16) to characterize conditions under which a minimum wage increase in the US would be welfare improving. I acknowledge that this exercise is only illustrative as my estimates rely on (imperfect and noisy) aggregate data. However, researchers with access to rich administrative datasets could replicate and extend this exercise to develop a more precise and comprehensive welfare analysis.

4.1 Sufficient statistics estimation

I provide empirical evidence of the effects of minimum wages on the key inputs to Proposition 4: $dU^l/d\overline{w}$, $dU^h/d\overline{w}$, $dU^{Kj}(\psi, 1-t)/d\overline{w}$, and the different fiscal externalities. I first describe the empirical strategy and then discuss the data used to build the key outcome variables. Appendix C contains additional details on the regressions, data sources, and sample restrictions, as well as additional results.

Empirical strategy. The analysis closely follows Cengiz et al. (2019, 2022). I use US state-level variation in minimum wages to estimate stacked event studies. State-level minimum wage data covering 1997–2019 is sourced from Vaghul and Zipperer (2016). An event is defined as a state-level real hourly minimum wage increase of at least \$0.25 (in 2016 dollars) in a state with at least 2% of the employed population affected. These restrictions are imposed to focus on minimum wage increases that are likely to affect the labor market. I also restrict attention to events where treated states do not experience other events in the three years previous to the event and whose timing allows me to observe the outcomes from three years before to four years after the event. This results in 50 "valid" state-level events.[15]

With these events, I estimate stacked event studies, which address multiple treatment challenges and potential biases driven by treatment effect heterogeneity (Cengiz et al., 2019, 2022; Baker et al., 2022). I implement the stacked event studies as follows. For each event, I set a time window that goes from 3 years before the event to 4 years after. All states that do not experience events in the event-specific time window define an event-specific control group. The event-specific treatment and control groups constitute an event-specific dataset. I append all event-specific datasets and use the resulting data to estimate a

[15]See Figure C.1 and Table C.1 for the state and year distribution of the events considered. As in Cengiz et al. (2019, 2022), small state-level or binding federal minimum wage increases are not recorded as events, however, regressions flexibly control for small state-level and federal minimum wage increases (see Appendix C). The average minimum wage increase in the "valid" events is approximately 11% (see first stage in Tables 2, 3, and 4, and Figure C.2).

standard event study with event-specific fixed effects according to the following estimating equation:

$$\log Y_{ite} = \sum_{\tau=-3}^{4} \beta_\tau D_{i\tau e} + \alpha_{ie} + \gamma_{te} + X_{it}'\rho_e + \epsilon_{ite}, \tag{19}$$

where i, t, and e index state, year, and event, respectively, Y_{ite} is an outcome of interest, $D_{i\tau e}$ are event indicators with τ the distance from the event (in years), α_{ie} are state-by-event fixed effects, γ_{te} are year-by-event fixed effects, and X_{it} are time-varying controls that include small state-level minimum wage increases and binding federal minimum wage increases, whose effect is allowed to vary by event e. Standard errors are clustered at the state level and regressions are weighted by the state-by-year average total population. When the outcome varies at the state-by-industry level, I allow for state-by-industry-by-event fixed effects, time fixed effects that vary by census division (which allows me to better control for time-varying confounders that differentially affect states and industries while limiting the variation used for identification), cluster standard errors at the state-by-industry level, and weight observations using the average state-by-industry employment in the pre-period.[16]

I also report pooled difference-in-difference estimations to summarize the average treatment effect:

$$\log Y_{ite} = \beta T_{ie}\text{Post}_{te} + \alpha_{ie} + \gamma_{te} + X_{it}'\rho_e + \epsilon_{ite}, \tag{20}$$

where T_{ie} is an indicator variable that takes value 1 if state i is treated in event e, Post_{te} is an indicator variable that takes value 1 if year t is larger or equal than the treatment year in event e, and all other variables are defined as in equation (19). Finally, to provide estimates of elasticities $d\log Y_{ite}/d\log \text{MW}_{ite}$, I also report IV coefficients from two-stage regressions that instrument $\log \text{MW}_{ite}$ with $T_{ie}\text{Post}_{te}$.

Outcomes and data. Outcome variables are state or state-by-industry annual aggregates for the period 1997–2019 computed using publicly available data.

To build the sufficient statistics for workers' welfare U^s, I use the NBER Merged Outgoing Rotation Group of the CPS to compute average pre-tax hourly wages of employed workers, and the Basic CPS monthly files to compute employment rates, both at the state-by-year level, separately for low- and high-skill workers. I designate workers without a college degree as low-skill workers, and workers with a college degree as high-skill workers. Following equation (17), the pre-tax part of the sufficient statistic U^s is the average wage of active workers including the unemployed, which equals the average wage conditional on employment times the employment rate. In building these averages, I drop individuals aged 15 or less, self-employed, veterans, and low-skill workers whose hourly wage is in the upper half of the wage distribution when employed.[17] To compute the post-tax part of the sufficient statistic U^s, as well as to

[16] Table 4 shows that results hold across specifications with year-by-event, census region-by-year-by-event, and census division-by-year-by-event fixed effects. However, as shown in Appendix C, while the effects on workers' outcomes and transfers are very consistent across models, specifications based on industry-by-state data display differential pre-trends in some cases when using the less flexible time fixed effects, suggesting that controlling by census division time trends is the preferred specification in these regressions.

[17] Figure C.6 shows that the results are robust to relaxing this restriction except when including the top decile of the wage distribution, which attenuates the wage effects. This result is consistent with wage spillovers that are decreasing in

estimate worker-level fiscal externalities of minimum wage reforms, I use different fiscal variables from the Bureau of Economic Analysis (BEA). To proxy for transfers disbursed to low-skill workers at the state-by-year level, I use data on income maintenance benefits, which include Supplemental Security Income (SSI) benefits, the EITC, the Additional Child Tax Credit, and Supplemental Nutrition Assistance Program (SNAP) benefits, among other minor assistance benefits. I also use data on medical benefits and gross federal income taxes, the latter of which is likely relevant for high-skill workers.

To compute the sufficient statistic for capitalists U^{K_j} and the related fiscal externalities, I construct aggregate measures of firm profits, focusing on the average profits per establishment at the industry-by-state-by-year level. I use the Gross Operating Surplus (GOS) estimates from the BEA as a proxy for state-by-industry aggregate profits and divide them by the average number of private establishments reported at the state-by-industry level in the Quarterly Census of Employment and Wages (QCEW). Because minimum wage workers are distributed unevenly across industries, I divide industries into two large groups: exposed and non-exposed industries. Exposed industries include food and accommodation, retail trade, and low-skill health services.[18] One caveat of the analysis is that, because of data limitations, I cannot explore capitalist-level heterogeneity. This is an important avenue for future research.

Table 1 presents state-level descriptive statistics of the non-stacked sample for the period 1997–2019 (51 states $\times$ 23 years). All values are annual and in 2016 dollars. The average annual pre-tax income of low-skill workers (including the unemployed) is \$19,396. Average income maintenance benefits per working-age individual are \$1,051, roughly 5% of low-skill workers' pre-tax income. The average annual pre-tax income of high-skill workers (including the unemployed) is \$61,401, around 3 times larger than that of low-skill workers because of more hours worked, higher employment rates, and, especially, higher hourly wages. Assuming that gross federal income taxes are mostly paid by high-income workers attenuates differences in utility between low- and high-skill workers. Average pre-tax profits per establishment are substantially larger than incomes for workers: in exposed industries, the average pre-tax profit per establishment is almost 9 times the average pre-tax income of low-skill workers, suggesting equity gains from redistributing profits. Those differences shrink when considering post-tax incomes: assuming that low-skill workers consume all income maintenance benefits and that capitalists pay the statutory corporate tax (21%) on average profits implies average post-tax profits per establishment of around 6.5 times the average post-tax income of low-skill workers. Note, finally, that exposed industries are much more labor-intensive than non-exposed industries, with average labor shares of 0.67 and 0.45, respectively.

Results. Figure 1 plots the estimated event study coefficients $\{\beta_\tau\}_{\tau=-3}^{4}$ of equation (19) with their corresponding 95% confidence intervals. Tables 2, 3, and 4 report the corresponding estimated β coefficients of equation (20) and the implied elasticities with respect to the change in the minimum wage.

Panel (a) of Figure 1 and Panel (a) of Table 2 show the effects of minimum wage reforms on the

the distance from the minimum wage, implying that the very top wages should not be affected by minimum wage reforms.

[18]A large empirical literature in the US characterizes food and accommodation and retail as the main exposed industries; see, for example, Dube et al. (2010) and Cengiz et al. (2019). Low-skill health and social services, such as the nursing home sector, are also highly exposed to the minimum wage; see, for example, Gandhi and Ruffini (2022) and Ruffini (2024).

Table 1: Descriptive statistics

	Number of Obs.	Mean	Std. Dev.	Min	Max
Low-skill workers:					
Pre-tax wage including the unemployed (annualized)	1,173	19,397	1,226	16,176	24,002
Hourly wage	1,173	11.55	0.62	9.74	13.99
Weekly hours worked	1,173	34.83	1.57	29.84	38.50
Employment rate	1,173	0.93	0.03	0.79	0.97
Participation rate	1,173	0.61	0.05	0.47	0.72
High-skill workers:					
Pre-tax wage including the unemployed (annualized)	1,173	61,401	7,771	42,370	89,742
Hourly wage	1,173	29.73	3.87	20.70	43.24
Weekly hours worked	1,173	40.85	0.89	37.56	44.02
Employment rate	1,173	0.97	0.01	0.92	1.00
Participation rate	1,173	0.78	0.04	0.65	0.88
Taxes and transfers (per working-age individual):					
Income maintenance benefits	1,173	1,057	329	402	2,194
Medical benefits	1,173	4,541	1,388	1,691	9,536
Gross federal income taxes	1,173	7,179	2,092	3,780	16,346
Capitalists:					
Profit per establishment (Exposed)	1,173	170,217	50,459	95,477	539,061
Establishments (Exposed)	1,173	70,314	103,291	5,397	914,454
Labor share (Exposed)	1,173	0.67	0.04	0.57	0.79
Profit per establishment (Non-exposed)	1,173	1,014,998	269,346	423,976	1,826,289
Establishments (Non-exposed)	1,173	63,709	69,305	5,818	464,462
Labor share (Non-exposed)	1,173	0.45	0.04	0.29	0.62

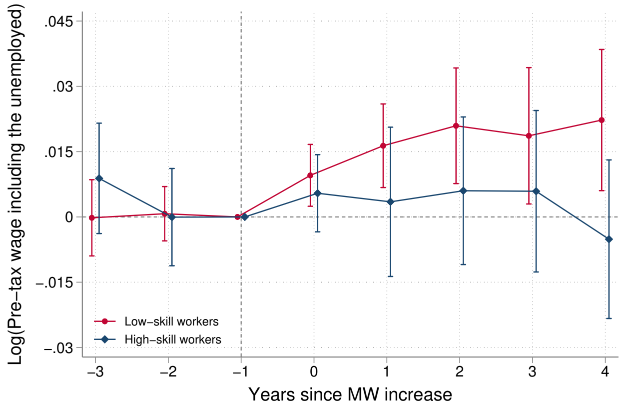
Notes: This table shows descriptive statistics for the non-stacked panel. The unit of observation is a state-year pair. Nominal values are transformed to 2016 dollars using the R-CPI-U-RS index including all items. The average pre-tax wage including the unemployed is annualized by computing Average Hourly Wage × Average Weekly Hours × Average Employment Rate × 52. Worker-level aggregates are computed using the CPS-MORG data and the Basic Monthly CPS files. Fiscal variables are taken from the BEA regional accounts. Profit per establishment corresponds to the gross operating surplus taken from the BEA regional accounts normalized by the number of private establishments reported in the QCEW data. The labor share corresponds to the compensation of employees over the compensation of employees plus taxes on production and imports net of subsidies plus gross operating surplus, all taken from the BEA regional accounts. Exposed industries include food and accommodation, retail trade, and low-skill health services.

pre-tax component of the worker-level sufficient statistic–the average pre-tax wage of active workers (i.e., including the unemployed)–separately for low- and high-skill workers. State-level minimum wage increases have raised the average wages of active low-skill workers but have had no detectable effects on the average pre-tax wages of active high-skill workers. Figure C.3 and Table 2 show that the results are consistent across specifications with different year fixed effects. The implied elasticity for low-skill workers, depending on the included fixed effects, ranges between 0.11 and 0.15. Figure C.4 and Table C.2 show that the overall effect on low-skill workers is driven by an increase in the average wage conditional on employment, with no detectable effects on employment, hours, or participation. Figure C.5 also shows that the effect is homogeneous across subgroups of low-skill workers.[19]

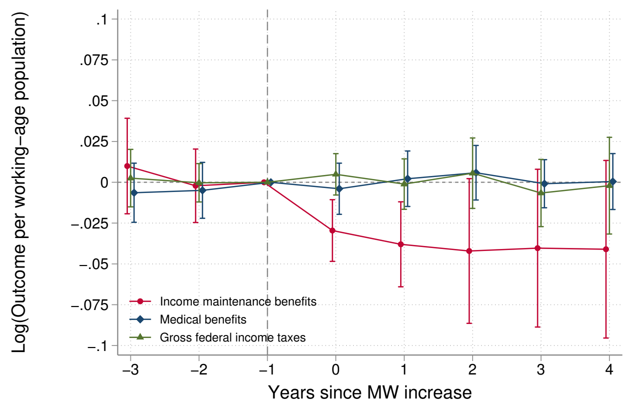
Panel (b) of Figure 1 and Panel (a) of Table 3 show the results for different worker-level fiscal outcomes, again, with consistent results across specifications with different sets of fixed effects (see also Figure C.7). Log income maintenance benefits per working-age individual decrease following state-level minimum wage

[19]While consistent, my results differ from those of Cengiz et al. (2019, 2022) in two respects. First, I focus on a broader group (low-skill workers) that is not exclusively composed of minimum wage workers. Second, I provide results that focus on the combined effect on wages and employment rather than the pure employment effect. More generally, these results are consistent with the evidence on wage effects with elusive employment effects (Manning, 2021a; Dube and Lindner, 2024).

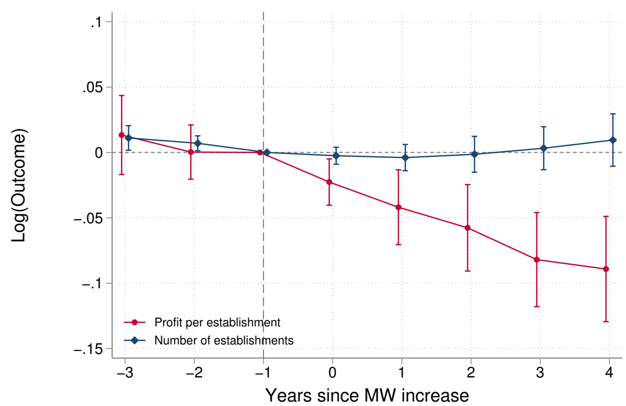
Figure 1: Effects of state-level minimum wage reforms on workers, fiscal outcomes, and capitalists



(a) Pre-tax wage including the unemployed



(b) Worker-level fiscal outcomes (taxes and transfers)



(c) Exposed capitalists' outcomes

Notes: These figures plot the estimated β_τ coefficients of equation (19) with their corresponding 95% confidence intervals. Panel (a) uses the log of the average pre-tax wage of active workers including the unemployed, equal to the average wage conditional on employment times the employment rate, as the dependent variable. The red curve plots results for low-skill workers; the blue curve plots results for high-skill workers. Panel (b) uses the log of fiscal outcomes per working-age population as the dependent variable. The red curve plots results income maintenance benefits; the blue curve plots results for medical benefits; the green curve plots results for gross federal income taxes. Panel (c) uses the log of capitalists' outcomes as the dependent variable, focusing on exposed industries. The red curve plots results for the average profit per establishment; the blue curve plots results for the total number of establishments. The analyses in Panels (a) and (b) are at the state-by-year level, include year-by-event fixed effects, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population. The analyses in Panel (c) are at the state-by-industry-by-year level, include year-by-census division-by-event fixed effects, standard errors are clustered at the state-by-industry level, and regressions are weighted by the average pre-period state-by-industry-by-year employment. Exposed industries include food and accommodation, retail trade, and low-skill health services.

increases. The implied elasticity is between -0.35 and -0.45, generating a positive fiscal externality that partly offsets low-skill workers' gains in pre-tax wages. The decrease in mean tested transfers is in line with the results of Reich and West (2015), Dube (2019), and Giupponi et al. (2024). On the contrary, I estimate precise zero effects on medical benefits and gross federal income taxes, which suggests that worker-level fiscal externalities are mediated by targeted transfers based on pre-tax income levels.

Finally, Panel (c) of Figure 1 and Panel (a) of Table 4 report results on exposed capitalists' outcomes.

Table 2: Difference-in-difference results: Pre-tax wages including the unemployed

(a) Main results

	Low-skill workers			High-skill workers		
$\hat{\beta}$	0.017	0.013	0.015	0.000	-0.003	0.002
	(0.006)	(0.006)	(0.005)	(0.007)	(0.006)	(0.008)
Year FE	Y	N	N	Y	N	N
Year x CR FE	N	Y	N	N	Y	N
Year x CD FE	N	N	Y	N	N	Y
Obs.	10,300	10,300	9,653	10,300	10,300	9,653
Elasticity estimate:						
First stage ($\log \mathrm{MW}$)	0.114	0.117	0.109	0.114	0.117	0.109
	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)
F-test	80.039	83.904	88.700	80.039	83.904	88.700
Second stage (elasticity)	0.148	0.110	0.139	0.002	-0.026	0.015
	(0.045)	(0.045)	(0.037)	(0.062)	(0.050)	(0.077)

(b) Including controls for additional tax reforms

	Low-skill workers			High-skill workers		
$\hat{\beta}$	0.016	0.017	0.020	-0.002	-0.003	-0.002
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)	(0.011)
Year FE	Y	N	N	Y	N	N
Year x CR FE	N	Y	N	N	Y	N
Year x CD FE	N	N	Y	N	N	Y
Obs.	9,996	9,984	9,330	9,996	9,984	9,330
Elasticity estimate:						
First stage ($\log \mathrm{MW}$)	0.110	0.123	0.118	0.110	0.123	0.118
	(0.012)	(0.010)	(0.009)	(0.012)	(0.010)	(0.009)
F-test	79.156	143.181	170.706	79.156	143.181	170.706
Second stage (elasticity)	0.144	0.140	0.174	-0.017	-0.023	-0.015
	(0.054)	(0.048)	(0.052)	(0.055)	(0.048)	(0.097)

Notes: This table shows the estimated β coefficient from equation (20) with corresponding standard errors reported in parentheses. All columns represent different regressions using different dependent variables (all in logarithms) and fixed effects. All regressions control for small and federal binding minimum wage reforms; only regressions in Panel (b) control for state-level reforms in personal income taxes, corporate taxes, EITC, and sales taxes (see Appendix C). Within each panel, Columns (1) to (3) use the average pre-tax wage of low-skill workers workers including the unemployed (the average wage conditional on employment times the employment rate). Columns (4) to (6) use the average pre-tax wage of high-skill workers workers including the unemployed (the average wage conditional on employment times the employment rate). Year FE means that the regression includes year-by-event fixed effects. Year x CR FE means that the regression includes census region-by-year-by-event fixed effects. Year x CD FE means that the regression includes census division-by-year-by-event fixed effects. $\Delta \log \mathrm{MW}$ is the average change in the log of the real state-level minimum wage across events as estimated from an analogue of equation (20) that uses $\log \mathrm{MW}_{ite}$ as the dependent variable. The elasticity is computed by dividing the point estimate by $\Delta \log \mathrm{MW}$, which corresponds to the second stage of the instrumental variables estimation. The analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population.

Average profits per establishment have decreased in exposed industries (food and accommodation, retail trade, and low-skill health services) after minimum wage reforms, with an implied elasticity between -0.49 and -0.55. Conversely, I find no detectable effect on the total number of establishments in exposed industries, suggesting that profit effects are driven by intensive margin responses. As discussed in the previous section, these macro elasticities govern both the welfare effect on capitalists and their related fiscal externalities.[20] While the magnitude of the profit elasticities is larger than that of the ones found

[20]The effect on firm owners can, in principle, generate fiscal externalities in other parts of the tax system. Figure C.9 provides little support to these alternative fiscal externalities. I estimate no effects on business income per income tax return or on dividend income per income tax return, as reported in the Statistics of Income (SOI) state-level tables, and also no

Table 3: Difference-in-difference results: Worker-level fiscal outcomes (taxes and transfers)

(a) Main results

	Income maintenance benefits			Medical benefits			Gross federal income taxes		
$\hat{\beta}$	-0.040	-0.049	-0.050	0.004	0.001	0.006	0.004	0.001	0.006
	(0.015)	(0.012)	(0.015)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Year FE	Y	N	N	Y	N	N	Y	N	N
Year x CR FE	N	Y	N	N	Y	N	N	Y	N
Year x CD FE	N	N	Y	N	N	Y	N	N	Y
Obs.	10,300	10,300	9,653	10,300	10,300	9,653	10,300	10,300	9,653
Elasticity estimate:									
First stage (log MW)	0.114	0.117	0.109	0.114	0.117	0.109	0.114	0.117	0.109
	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)
F-test	80.039	83.904	88.700	80.039	83.904	88.700	80.039	83.904	88.700
Second stage (elasticity)	-0.352	-0.415	-0.453	0.034	0.008	0.051	0.034	0.008	0.051
	(0.128)	(0.116)	(0.148)	(0.077)	(0.075)	(0.085)	(0.077)	(0.075)	(0.085)

(b) Including controls for additional tax reforms

	Income maintenance benefits			Medical benefits			Gross federal income taxes		
$\hat{\beta}$	-0.053	-0.061	-0.041	0.002	-0.000	-0.001	0.002	-0.000	-0.001
	(0.018)	(0.017)	(0.013)	(0.009)	(0.009)	(0.010)	(0.009)	(0.009)	(0.010)
Year FE	Y	N	N	Y	N	N	Y	N	N
Year x CR FE	N	Y	N	N	Y	N	N	Y	N
Year x CD FE	N	N	Y	N	N	Y	N	N	Y
Obs.	9,996	9,984	9,330	9,996	9,984	9,330	9,996	9,984	9,330
Elasticity estimate:									
First stage (log MW)	0.110	0.123	0.118	0.110	0.123	0.118	0.110	0.123	0.118
	(0.012)	(0.010)	(0.009)	(0.012)	(0.010)	(0.009)	(0.012)	(0.010)	(0.009)
F-test	79.156	143.181	170.706	79.156	143.181	170.706	79.156	143.181	170.706
Second stage (elasticity)	-0.486	-0.495	-0.345	0.015	-0.004	-0.009	0.015	-0.004	-0.009
	(0.169)	(0.147)	(0.107)	(0.080)	(0.071)	(0.084)	(0.080)	(0.071)	(0.084)

Notes: This table shows the estimated β coefficient from equation (20) with corresponding standard errors reported in parentheses. All columns represent different regressions using different dependent variables (all in logarithms) and fixed effects. All regressions control for small and federal binding minimum wage reforms; only regressions in Panel (b) control for state-level reforms in personal income taxes, corporate taxes, EITC, and sales taxes (see Appendix C). Within each panel, Columns (1) to (3) use income maintenance benefits per working-age individual. Columns (4) to (6) use medical benefits per working-age individual. Columns (7) to (9) use gross federal income taxes per working-age individual. Year FE means that the regression includes year-by-event fixed effects. Year x CR FE means that the regression includes census region-by-year-by-event fixed effects. Year x CD FE means that the regression includes census division-by-year-by-event fixed effects. $\Delta \log \mathrm{MW}$ is the average change in the log of the real state-level minimum wage across events as estimated from an analog of equation (20) that uses $\log \mathrm{MW}_{ite}$ as the dependent variable. The elasticity is computed by dividing the point estimate by $\Delta \log \mathrm{MW}$, which corresponds to the second stage of the instrumental variables estimation. The analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population.

in the related literature (e.g., Draca et al., 2011; Harasztosi and Lindner, 2019; Drucker et al., 2021), my results should be interpreted with caution given their reliance on noisy aggregate data. In fact, different from the other two sets of results, the support for the parallel trends assumption is weaker and more sensitive to the inclusion of different sets of time fixed effects.[21]

Other tax reforms. Minimum wage events can coincide with reforms in state-level personal income taxes, corporate taxes, EITC supplements, or other taxes affecting firms, such as sales taxes, which in

effects on taxes on production and imports net of subsidies, as reported by the BEA.

[21]See Figure C.8. Outcomes for non-exposed capitalists also display differential trends, for all sets of time fixed effects, but with no discernible break at the event time.

Table 4: Difference-in-difference results: Exposed capitalists' outcomes

(a) Main results

	Profits per establishment			Number of establishments		
$\hat{\beta}$	-0.057	-0.065	-0.063	-0.000	-0.003	-0.005
	(0.012)	(0.011)	(0.012)	(0.010)	(0.006)	(0.005)
Year FE	Y	N	N	Y	N	N
Year x CR FE	N	Y	N	N	Y	N
Year x CD FE	N	N	Y	N	N	Y
Obs.	254,692	254,692	254,692	256,612	256,612	256,612
Elasticity estimate:						
First stage ($\log \text{MW}$)	0.116	0.121	0.114	0.116	0.121	0.114
	(0.012)	(0.012)	(0.010)	(0.012)	(0.012)	(0.010)
F-test	97.718	108.492	120.718	97.718	108.492	120.718
Second stage (elasticity)	-0.488	-0.539	-0.554	-0.003	-0.024	-0.043
	(0.101)	(0.100)	(0.107)	(0.085)	(0.047)	(0.046)

(b) Including controls for additional tax reforms

	Profits per establishment			Number of establishments		
$\hat{\beta}$	-0.052	-0.057	-0.060	0.003	0.000	-0.001
	(0.013)	(0.012)	(0.012)	(0.007)	(0.005)	(0.006)
Year FE	Y	N	N	Y	N	N
Year x CR FE	N	Y	N	N	Y	N
Year x CD FE	N	N	Y	N	N	Y
Obs.	249,491	249,491	249,491	250,853	250,853	250,853
Elasticity estimate:						
First stage ($\log \text{MW}$)	0.110	0.124	0.119	0.110	0.124	0.119
	(0.011)	(0.009)	(0.007)	(0.011)	(0.009)	(0.007)
F-test	96.493	205.281	287.374	96.493	205.281	287.374
Second stage (elasticity)	-0.476	-0.456	-0.503	0.030	0.000	-0.010
	(0.128)	(0.099)	(0.103)	(0.066)	(0.040)	(0.052)

Notes: This table shows the estimated β coefficient from equation (20) with corresponding standard errors reported in parentheses. All columns represent different regressions using different dependent variables (all in logarithms) and fixed effects. All regressions control for small and federal binding minimum wage reforms; only regressions in Panel (b) control for state-level reforms in personal income taxes, corporate taxes, EITC, and sales taxes (see Appendix C). Within each panel, Columns (1) to (3) use the average profit per establishment. Columns (4) to (6) use the number of establishments. I only report the coefficient on exposed industries, which include food and accommodation, retail trade, and low-skill health services. Year FE means that the regression includes year-by-event fixed effects. Year x CR FE means that the regression includes census region-by-year-by-event fixed effects. Year x CD FE means that the regression includes census division-by-year-by-event fixed effects. $\Delta \log \text{MW}$ is the average change in the log of the real state-level minimum wage across events as estimated from an analog of equation (20) that uses $\log \text{MW}_{ite}$ as the dependent variable. The implied elasticity is computed by dividing the point estimate by $\Delta \log \text{MW}$, which corresponds to the second stage of the instrumental variables estimation. The analysis is at the state-by-industry-by-year level, standard errors are clustered at the state-by-industry level, and regressions are weighted by the average pre-period state-by-industry-by-year employment.

turn could affect the outcomes of interest. To address this concern, I use data collected by Robinson and Tazhitdinova (2025) on US state-level policies to assess whether the results remain robust after controlling flexibly for other policy reforms. I consider reforms to state-level top marginal personal income taxes, corporate income taxes, EITC generosity (relative to the federal scheme), and sales taxes, separately considering tax increases and tax cuts, using the same strategy of Cengiz et al. (2019) to control for small and federal binding minimum wages (see Appendix C). Panels (b) of Tables 2, 3, and 4, and Figures C.3, C.7, and C.8 reassuringly show similar results after controlling by additional tax reforms, providing support that the estimated results are indeed caused by changes in the state-level minimum wage policy.

4.2 Calibrating the sufficient statistics formula

The goal of this final exercise is to use the estimated elasticities to calibrate equation (16) to assess the welfare effects of marginally increasing the US minimum wage. The empirical results allow me to simplify equation (16) in several ways. First, I can ignore welfare effects on high-skill workers, given the lack of effects on their aggregate moments. Second, worker-level fiscal externalities can be summarized by the effects on income maintenance benefits, given the lack of effects on other fiscal outcomes. Third, the profit elasticity is sufficient to calibrate both the welfare effects on capitalists (as it constitutes an upper bound on that effect) and the associated fiscal externalities, given the absence of extensive margin responses. In addition to these simplifications, the lack of firm-level data restricts my analysis to aggregate effects on exposed and non-exposed capitalists (with no estimated effects on the latter), thereby ignoring distributional considerations within these groups.

Denote by Π^E, K^E, and g_K^E the average profit of exposed capitalists, the number of exposed capitalists, and their average WWs, respectively. Also, denote by U_{pre}^l the average pre-tax wage of active low-skill workers (i.e., the pre-tax component of the sufficient statistic) and by U_{post}^l the income maintenance benefits, so that $dU^l = dU_{pre}^l + dU_{post}^l$. Then, I can simplify equation (16) to:

$$\underbrace{L_A^l g_1^l \left(\frac{dU_{pre}^l}{d\overline{w}} + \frac{dU_{post}^l}{d\overline{w}}\right) + K^E g_K^E (1-t)\frac{d\Pi^E}{d\overline{w}}}_{\text{Welfare effects}} + \underbrace{\left(-\frac{dU_{post}^l}{d\overline{w}} + tK^E\frac{d\Pi^E}{d\overline{w}}\right)}_{\text{Fiscal externalities}} > 0. \tag{21}$$

From Tables 2, 3, and 4, I can recover the semi-elasticities $\epsilon_{U_{pre}} = d\log U_{pre}^l/d\overline{w} = 0.015$ (Column (3) of Table 2), $\epsilon_{U_{post}} = d\log U_{post}^l/d\overline{w} = -0.05$ (Column (3) of Table 3), and $\epsilon_{\Pi^E} = d\log \Pi^E/d\overline{w} = -0.063$ (Column (3) of Table 4), where I focus on the specification with census-division-specific time fixed effects, which are the fixed effects that provide better-behaved estimates for capitalist-level outcomes. Under these values, equation (21) reduces to:

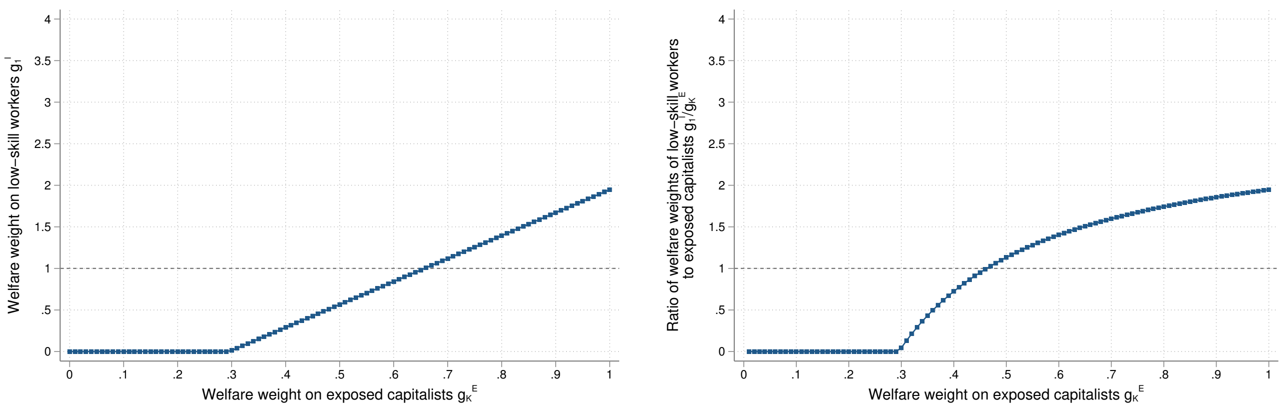
$$L_A^l\left(0.015U_{pre}^l - 0.05U_{post}^l\right)g_1^l - K^E 0.063(1-t)\Pi^E g_K^E + L_A^l 0.05U_{post}^l - K^E t0.063\Pi^E > 0. \tag{22}$$

where $(L_A^l U_{pre}^l, L_A^l U_{post}^l, K^E\Pi^E)$ are aggregates (total wages, total transfers, and total profits) that are directly observed in the estimation data. I calibrate them by computing population-weighted averages across states for the year 2019.[22] Also, I set $t = 21\%$ (the current statutory rate in the US).

Given these calibration decisions, the only missing elements to assess whether equation (22) holds are the WWs of active low-skill workers g_1^l and exposed capitalists g_K^E. I characterize them using an inverse-optimum logic (Bourguignon and Spadaro, 2012; Lockwood and Weinzierl, 2016; Hendren, 2020). For a given value of g_K^E, I compute the minimum value of g_1^l that makes the LHS of equation (22) positive, which coincides with the value of g_1^l for which equation (22) holds with equality. I compute this critical

[22] $L_A^l U_{pre}^l$ comes from multiplying the annualized average pre-tax sufficient statistic by the working-age population and the share of low-skill workers. $L_A^l U_{post}^l$ and $K^E\Pi^E$ are observed directly in the raw data.

Figure 2: Sufficient statistics analysis: Minimum welfare weights that justify the minimum wage increase



(a) Minimum welfare weight on low-skill workers g_1^l

(b) Minimum ratio of welfare weights of low-skill workers to exposed capitalists g_1^l/g_K^E

Notes: These figures plot the results of the sufficient statistics calibration exercise. Panel (a) plots the minimum welfare weight on low-skill workers g_l^1 to justify the minimum wage increase as a function of the welfare weight on exposed capitalists g_K^E, while Panel (b) displays results in terms of the welfare weight ratio g_1^l/g_k^E. In each panel, the computations are based on equation (22).

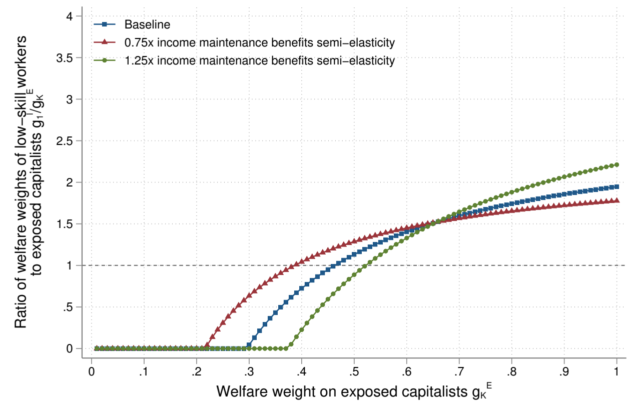
value for a fine grid for $g_K^E \in [0, 1]$ to assess the sensitivity of the analysis to this parameter.

Figure 2 shows the results. Panel (a) plots the critical WW on active low-skilled workers g_1^l as a function of the WW on exposed capitalists g_K^E, while Panel (b) reports the results in terms of the critical ratio of these two quantities g_1^l/g_K^E. When $g_K^E < 0.3$, any positive WW on active low-skill workers makes a minimum wage increase desirable. When $g_K^E \geq 0.3$, the model restricts social preferences to justify the policy. The critical WW on low-skill workers g_1^l increases linearly with the WW on capitalists g_K^E because, as g_K^E increases, the profit elasticity not only generates fiscal externalities but also higher welfare costs. If active low-skill workers are valued as the average agent in the economy, i.e., $g_1^l = 1$, then the WW on capitalists g_K^E must be at most 0.65 to justify a minimum wage increase. Otherwise, welfare costs from profit reductions combined with the negative fiscal externality make the minimum wage increase undesirable. When exposed capitalists are valued as the average agent in the economy, i.e., $g_K^E = 1$, then the planner must value active low-skill workers' utility almost twice as much to justify the policy.

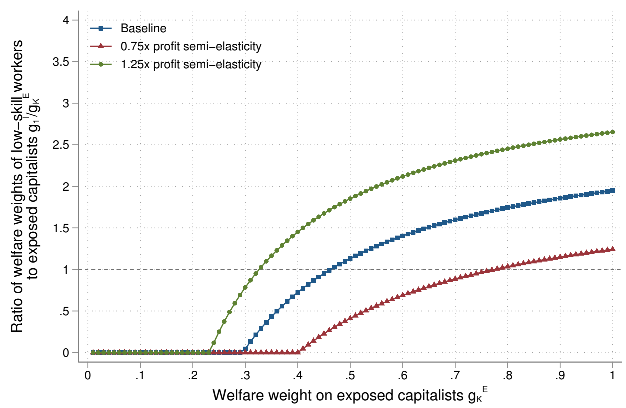
Because the estimated semi-elasticities are imprecise, I assess the robustness of the calibration to different values. Figure 3 shows the results, focusing on the critical WW ratio to justify a marginal minimum wage reform g_l^1/g_K^E. In each figure, the red curve considers a lower semi-elasticity (75%) while the blue curve considers a higher one (125%). Panel (a) considers different semi-elasticities for the average pre-tax wage of active low-skill workers $\epsilon_{U^l_{pre}}$. When pre-tax benefits for low-skill workers are 75% of the baseline estimate, the minimum ratio increases substantially, as the smaller welfare gains for workers need to be highly valued to compensate for the associated costs. Panel (b) considers different semi-elasticities for income maintenance benefits $\epsilon_{U^l_{post}}$. Results are not particularly sensitive to this

Figure 3: Sufficient statistics analysis: Different semi-elasticities

(a) Minimum ratio of welfare weights of low-skill workers to exposed capitalists g_1^l/g_K^E, different values of $\epsilon_{U_{pre}}$



(b) Minimum ratio of welfare weights of low-skill workers to exposed capitalists g_1^l/g_K^E, different values of $\epsilon_{U_{post}}$



(c) Minimum ratio of welfare weights of low-skill workers to exposed capitalists g_1^l/g_K^E, different values of ϵ_{Π^E}

Notes: These figures replicate the exercise of Panel (b) of Figure 2 based on equation (22) for different values of the estimated semi-elasticities. In each figure, blue curves represent baseline estimates, red curves represent estimates with smaller (75%) semi-elasticities, and green curves represent estimates with larger (125%) semi-elasticities. Panel (a) considers different pre-tax wage of active low-skill workers semi-elasticities $\epsilon_{U_{pre}}$. Panel (b) considers different income maintenance benefits semi-elasticities $\epsilon_{U_{post}}$. Panel (c) considers different profit semi-elasticities ϵ_{Π^E}.

elasticity, as it generates effects in opposite directions: a higher effect on transfers induces welfare costs to low-skill workers but larger fiscal externalities to the government. Finally, Panel (c) considers different semi-elasticities for average profits of exposed capitalists ϵ_{Π^E}. The desirability of the minimum wage decreases with the profit effect as larger responses generate larger fiscal externalities and welfare costs. Interestingly, although results change in the expected direction, the calibration suggests that orders of magnitude to assess the desirability of the minimum wage remain in a comparable range.

How large is the ratio of welfare weights g_1^l/g_K^{exp} empirically? Using the values displayed in Table 1, we see that the average post-tax profit per establishment in exposed industries is more than 6.5 times larger than the average annual post-tax incomes of low-skill workers. If we assume that the SWF is logarithmic, $G(.) = \log(.)$, this implies that $g_1^l/g_K^E \approx 6.6$, which substantially exceeds the critical welfare ratio ranges depicted in all panels of Figure 3. This result suggests that increasing the minimum wage in the US could lead to welfare gains.

This simple analysis foregrounds distributional considerations in assessing the minimum wage desirability, so that minimum wage reforms can be comprehensively assessed considering both redistribution and fiscal externalities. As noted above, this analysis is based on imperfect data and should be interpreted only as suggestive. There are several opportunities for improvement in future research with better microdata. First, the analysis abstracts from within-capitalist heterogeneity. Second, it provides a coarse approximation of the worker-level fiscal externalities that could be expanded into different margins. Third, it uses the statutory corporate tax, which could overestimate the capitalist-level fiscal externality if effective taxes are smaller due to deductions and tax avoidance strategies.

5 Conclusion

Despite its ubiquity, the desirability of the minimum wage has been a controversial policy question for decades. The large and growing evidence of its effects on wages, employment, and other outcomes, such as profits, has encouraged economists to conceptually revisit its role as a tool for governments intending to redistribute resources. Potential complementarities between tax efficiency and minimum wages are a central consideration in this debate. While the debate has mainly compared the minimum wage to tax-based transfers for low-income workers like the Earned Income Tax Credit, this paper finds that the desirability of the minimum wage can be motivated by its role in redistributing firm profits.

The analysis uncovers the relevance of the relatively overlooked interaction between the minimum wage and corporate tax policy. Using two theoretical frameworks, this paper finds that the desirability of the minimum wage increases when corporate taxes are distortionary. When industries exposed to minimum wage workers are particularly labor-intensive–as is the case in the US–the desirability of the minimum wage is enhanced, as it allows industry-specific corporate taxation that taxes more heavily labor-intensive services with the minimum wage while allowing decreases in general corporate taxes that especially benefit capital-intensive industries. Event study evidence suggests that the tradeoff analyzed in this paper is empirically relevant. A simple sufficient statistics analysis reveals that increasing the minimum wage in the US today could lead to welfare gains.

The theoretical analysis shows that empirical estimates of the profit effects of the minimum wage are key for assessing its desirability. Understanding heterogeneity in the impact of the minimum wage across the firm-type distribution would be particularly informative. Is the profit incidence of the minimum wage concentrated in small firms owned by relatively low earners, or does it affect large and profitable firms? This question carries implications for the appropriate relative welfare weights on exposed capitalists and active low-skill workers, which are revealed to be key by the sufficient statistics analysis.

The theoretical analysis could also be extended in multiple directions. First, I work with efficient frameworks to focus on the redistributive properties of the minimum wage. Related literature has studied rationales for the minimum wage to solve market inefficiencies such as inefficient monopsony power or misallocation. Extending the optimal policy framework to allow for labor market inefficiencies can shed light on policy tradeoffs or complementarities when dealing with both objectives simultaneously. Second, income tax schedules are not perfectly enforced and are costly to administer due to tax evasion, tax avoidance, and imperfect benefit take-up (Slemrod, 2019). A more general analysis could consider the relative enforcement and administrative costs of the two instruments (Clemens and Strain, 2022; Stansbury, 2025).[23] Third, national minimum wages may coexist with industry- or region-specific minimum wages. My results provide a first-order approximation to understand the rationale of such schemes. The analysis, however, is incomplete because heterogeneous minimum wages may induce additional behavioral responses in terms of, for example, sectoral reallocation or location decisions of firms and households. A comprehensive assessment of these schemes would require modeling these additional distortions. Finally, the model could be extended to include additional margins of adjustment to the minimum wage, such as the pass-through of minimum wages to output prices and their effects on worker- and firm-level productivity (Dube and Lindner, 2024). Likewise, the model might be extended to include dynamics, informality, and non-wage amenities. These extensions may illuminate additional distributional tradeoffs relevant to the optimal policy problem.

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[23] Abstracting from tax evasion also rules out additional complementarities between the minimum wage and the tax system. For example, if workers underreport their incomes, then the minimum wage can increase tax collection by setting a floor on reported labor income (Bíró et al., 2022; Feinmann et al., 2025).

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Minimum Wages and Optimal Redistribution: The Role of Firm Profits

Online Appendix

A Theory appendix

A.1 Section 2

Proof of Proposition 1. Let the minimum wage increase be $d\overline{w} > 0$. $d\overline{w}$ generates welfare effects and fiscal externalities. $d\overline{w}$ generates a welfare effect on employed workers equal to $g_1 L d\overline{w}$. $d\overline{w}$ generates a welfare loss for marginally displaced workers, equal to $g_1^M [dL/dw] d\overline{w} = -L g_1^M [\eta_w/w] d\overline{w}$. $d\overline{w}$ generates a welfare loss for capitalists equal to $g_K[\partial U^K/\partial w] d\overline{w} = -g_K(1-t) L d\overline{w}$, where I used the envelope theorem. In terms of fiscal externalities, there is a change in income tax collection proportional to the behavioral responses in employment $[dL/dw]\Delta T d\overline{w} = -L[\eta_w/w]\Delta T d\overline{w}$. Finally, the behavioral response in domestic pre-tax profits generates a fiscal loss in corporate tax revenue $t[d\Pi/dw]d\overline{w} = -t[\Pi/w]\epsilon_w d\overline{w}$. $d\overline{w}$ is desirable if the sum of all effects is positive. Adding all these effects yields equation (4).

Proof of Proposition 2. The reform package does not affect T_0. The welfare of employed workers is unaffected since $d(w - T_1) = d\overline{w} - d\overline{w} = 0$. Then, there are no changes in labor supply. Also, by design, the capitalist's welfare is unaffected since $d(1-t)$ is chosen such that $dU^K = 0$. Finally, the reform package affects labor demand and, therefore, equilibrium employment. Changes in employment may generate welfare effects depending on the rationing assumption. In addition, the reform package generates three fiscal effects. The net effect determines the desirability of the reform package. First, there are fiscal savings driven by the change in the tax for employed workers, dT_1. This fiscal effect is equal to $L d\overline{w}$. Second, changes in employment generate a fiscal externality that depends on the relative tax liabilities between employed and unemployed workers. This fiscal effect is equal to $dL\Delta T$. If employment falls, and the earnings of the employed workers are taxed ($T_1 > T_0$), this fiscal externality is costly for the social planner, and vice versa. The employment effect also generates a welfare cost equal to $dL g_1^M$. Note that:

$$dL = \frac{dL^D}{dw} d\overline{w} + \frac{dL^D}{d(1-t)} d(1-t) = L\left(-\frac{\eta_w}{w} d\overline{w} + \frac{\eta_{1-t}}{1-t} d(1-t)\right).$$

Third, there is a fiscal cost in corporate tax revenue driven by the tax cut dt. Corporate tax revenue is given by $t\Pi$. Then, the corporate tax revenue cost is given by:

$$\begin{aligned} d\left[t\Pi\right] = -d(1-t)\Pi + td\Pi &= -d(1-t)\Pi + t\left(\frac{d\Pi}{dw} d\overline{w} + \frac{d\Pi}{d(1-t)} d(1-t)\right), \\ &= -d(1-t)\Pi + t\left(-\frac{\Pi}{w}\epsilon_w d\overline{w} + \frac{\Pi}{1-t}\epsilon_{1-t} d(1-t)\right). \end{aligned}$$

Then, the reform is therefore desirable if:

$$L d\overline{w} + L\left(-\frac{\eta_w}{w} d\overline{w} + \frac{\eta_{1-t}}{1-t} d(1-t)\right)(\Delta T + g_1^M) - d(1-t)\Pi + t\left(-\frac{\Pi}{w}\epsilon_w d\overline{w} + \frac{\Pi}{1-t}\epsilon_{1-t} d(1-t)\right) > 0.$$

Recall that $d(1-t)$ is chosen such that $dU^K = 0$. Using the envelope theorem, we have that $dU^K = d(1-t)\Pi - (1-t)Ld\overline{w} = 0$, which implies that $d(1-t)\Pi = (1-t)Ld\overline{w}$. Replacing in the expression above, we conclude that the reform is desirable if:

$$\frac{\Delta T + g_1^M}{w}\left(-\eta_w + \frac{Lw}{\Pi}\eta_{1-t}\right) + t\left(1 - \frac{\Pi\epsilon_w}{Lw} + \epsilon_{1-t}\right) > 0.$$

Proof of Proposition 3. The reform package does not affect T_0. The welfare of employed workers is unaffected since $d(w - T_1) = d\overline{w} - d\overline{w} = 0$. Then, there are no changes in labor supply. Also, by design, employment is unaffected since $d(1-t)$ is chosen such that labor demand is constant. Then, the reform generates three effects: two fiscal effects and a welfare effect on the capitalist. First, there are fiscal savings driven by the change in the tax for employed workers, dT_1. This fiscal effect is equal to $Ld\overline{w}$. Second, there is a fiscal cost in corporate tax revenue driven by the tax cut $d(1-t)$ and the minimum wage change $d\overline{w}$. Corporate tax revenue is given by $t\Pi$. Then, the fiscal externality is given by:

$$\begin{aligned} d\left[t\Pi\right] = -d(1-t)\Pi + td\Pi &= -d(1-t)\Pi + t\left(\frac{d\Pi}{dw}d\overline{w} + \frac{d\Pi}{d(1-t)}d(1-t)\right), \\ &= -d(1-t)\Pi + t\left(-\frac{\Pi}{w}\epsilon_w d\overline{w} + \frac{\Pi}{1-t}\epsilon_{1-t}d(1-t)\right). \end{aligned}$$

Third, there is a welfare effect on capitalists valued in g_K equal to $g_K dU^K = g_K\left[d(1-t)\Pi - (1-t)Ld\overline{w}\right]$, where I used the envelope theorem. Then, the reform is desirable if:

$$\begin{aligned} Ld\overline{w} - d(1-t)\Pi + t\left(-\frac{\Pi}{\overline{w}}\epsilon_w d\overline{w} + \frac{\Pi}{1-t}\epsilon_{1-t}d(1-t)\right) + g_K\left[d(1-t)\Pi - (1-t)Ld\overline{w}\right] &> 0 \\ \Leftrightarrow \quad Ld\overline{w}\left(1-(1-t)g_K\right) - d(1-t)\Pi(1-g_K) + t\left(-\frac{\Pi}{\overline{w}}\epsilon_w d\overline{w} + \frac{\Pi}{(1-t)}\epsilon_{1-t}d(1-t)\right) &> 0. \end{aligned}$$

Recall that $d(1-t)$ is chosen such that $dL = 0$. Then $dL = [dL/dw]d\overline{w} + [dL/d(1-t)]d(1-t) = -L[\eta_w/w]d\overline{w} + L[\eta_{1-t}/(1-t)]d(1-t) = 0$, which implies that $d(1-t) = [(1-t)\eta_w/w\eta_{1-t}]d\overline{w}$. Replacing in the expression above, we conclude that the reform is desirable if:

$$1-(1-t)g_K > \frac{\Pi}{L\overline{w}}\left((1-t)(1-g_K)\frac{\eta_w}{\eta_{1-t}} + t\left(\epsilon_w - \epsilon_{1-t}\frac{\eta_w}{\eta_{1-t}}\right)\right).$$

Additional terms in the two-skill two-industry model. Consider a corporate tax cut $d(1-t) > 0$. The corporate tax cut will generate an increase in high-skill labor demand. The increase in labor demand generates both an increase in high-skill employment and high-skill wages:

$$dL^h = \frac{dL^h}{d(1-t)}d(1-t) = \frac{L^h\eta_{1-t}^h}{1-t}d(1-t), \qquad dw^h = \frac{dw^h}{d(1-t)}d(1-t) = \frac{w^h\mathcal{W}_{1-t}^h}{1-t}d(1-t).$$

By differentiating the labor market clearing condition, we can get a structural representation of $\mathcal{W}_{1-t}^h$ as a function of labor demand and labor supply elasticities (see the derivation of optimal taxes below). The employment effect does not generate a welfare effect on high-skill workers because of the envelope theorem (marginal high-skill workers are initially indifferent between states). The wage effect, however, generates a welfare effect on inframarginal high-skill employed workers equal to $g_1^h L^h dw^h$. The employment effect, however, generates a fiscal externality, since marginal workers switch from paying T_0 to paying T_1^h. The fiscal externality is, therefore, given by $dL^h \Delta T^h$. The corporate tax cut also affects the capitalist's welfare and the corporate tax revenue:

$$dU^{K_h} = \Pi^h d(1-t), \qquad d[t\Pi^h] = -\Pi^h d(1-t) + td\Pi^h = -\Pi^h d(1-t) + \frac{t\Pi^h \epsilon_{1-t}^h}{1-t} d(1-t).$$

The welfare effect is simplified by the envelope theorem and valued in g_K^h. The fiscal externality contains both a mechanical effect from the smaller taxes and a behavioral effect from the pre-tax profit responses.

The sum of all these terms leads to equation (8). These effects are incorporated in the propositions as follows. For Proposition 2, we set $d(1-t) = (1-t)L^l d\overline{w}/\Pi^l$ and normalize the expression by $1/L^l d\overline{w}$. For Proposition 3, we set $d(1-t) = (1-t)\eta_w^l d\overline{w}/w\eta_{1-t}^l$ and normalize the expression by $1/L^l d\overline{w}$.

Closed-form solutions for the Cobb-Douglas case. Consider the case where $\phi(n,k) = \psi\left(n^{1-a}k^a\right)^b = \psi n^\alpha k^\beta$, with $\alpha + \beta = b < 1$. The first-order conditions of the capitalist are given by $\psi \alpha n^{\alpha-1} k^\beta = w$ and $(1-t)\psi\beta n^\alpha k^{\beta-1} = r^*$, which yields $k = n\left[w(1-t)\beta/\alpha r^*\right] \equiv n\Omega(w, 1-t)$. Solving for $L^D(w, 1-t)$ yields:

$$L^D(w,1-t) \quad = \quad \psi^{\frac{1}{1-\alpha-\beta}} \left(\frac{\alpha}{w}\right)^{\frac{1-\beta}{1-\alpha-\beta}} \left(\frac{(1-t)\beta}{r^*}\right)^{\frac{\beta}{1-\alpha-\beta}}.$$

Since $\Pi(w,1-t) = \phi\left(L^D(w,1-t), L^D(w,1-t)\Omega(w,1-t)\right) - wL^D(w,1-t)$, note that:

$$\begin{aligned}\Pi(w,1-t) &= \psi L^D(w,1-t)^{\alpha+\beta}\Omega(w,1-t)^\beta - wL^D(w,1-t),\\ &= L^D(w,1-t)\left[\psi L^D(w,1-t)^{\alpha+\beta-1}\Omega(w,1-t)^\beta - w\right] = L^D(w,1-t)w\frac{1-\alpha}{\alpha}.\end{aligned}$$

This implies that:

$$\begin{aligned}\log L^D(w,1-t) &= A_L - \frac{1-\beta}{1-\alpha-\beta}\log w + \frac{\beta}{1-\alpha-\beta}\log(1-t),\\ \log\Pi(w,1-t) &= \log L^D(w,1-t) + \log w + \log\left(\frac{1-\alpha}{\alpha}\right),\end{aligned}$$

where $A_L = \log\left(\psi^{\frac{1}{1-\alpha-\beta}}\alpha^{\frac{1-\beta}{1-\alpha-\beta}}\left(\frac{\beta}{r^*}\right)^{\frac{\beta}{1-\alpha-\beta}}\right)$. It follows that (imposing $dw = 0$ in the elasticities with respect to $1-t$, as they are evaluated under a binding minimum wage):

$$\begin{aligned}\eta_w &= \frac{1-\beta}{1-\alpha-\beta} = \frac{1-ab}{1-b}, \qquad \eta_{1-t} = \frac{\beta}{1-\alpha-\beta} = \frac{ab}{1-b},\\ \epsilon_w &= \eta_w - 1 = \frac{\alpha}{1-\alpha-\beta} = \frac{(1-a)b}{1-b}, \qquad \epsilon_{1-t} = \eta_{1-t} = \frac{\beta}{1-\alpha-\beta} = \frac{ab}{1-b},\\ \frac{\Pi}{Lw} &= \frac{1-\alpha}{\alpha} = \frac{1-(1-a)b}{(1-a)b}.\end{aligned}$$

Optimal taxes with no minimum wage. The Lagrangian is given by:

$$\begin{aligned}\mathcal{L}(T_0, \Delta T^l, \Delta T^h, 1-t, \gamma) &= (2 - L^l - L^h)G(-T_0) + \int_0^{w^l - \Delta T^l} G(w^l - \Delta T^l - T_0 - c)dF_l(c) \\ &\quad \int_0^{w^h - \Delta T^h} G(w^h - \Delta T^h - T_0 - c)dF_h(c) + G(U^{K_l}) + G(U^{K_h}) \\ &\quad +\gamma \left[2T_0 + L^l \Delta T^l + L^h \Delta T^h + t(\Pi^l + \Pi^h)\right].\end{aligned}$$

Conditional on $(\Delta T^l, \Delta T^h)$, T_0 does not affect labor supply and, therefore, employment or wages. Then:

$$\begin{aligned}\frac{d\mathcal{L}}{dT_0} &= -(2 - L^l - L^h)G'(-T_0) - \int_0^{w^l - \Delta T^l} G'(w^l - \Delta T^l - T_0 - c)dF_l(c) \\ &\quad - \int_0^{w^h - \Delta T^h} G'(w^h - \Delta T^h - T_0 - c)dF_h(c) + 2\gamma = 0,\end{aligned}$$

which can be rewritten as $(2 - L^l - L^h)g_0 + L^l g_1^l + L^h g_1^h = 2$. The FOC w.r.t. ΔT^l is given by:

$$\begin{aligned}\frac{d\mathcal{L}}{d\Delta T^l} &= -\frac{dL^l}{d\Delta T^l}G(-T_0) + G(-T_0)f_l(w^l - \Delta T^l)\left(\frac{dw^l}{d\Delta T^l} - 1\right) \\ &\quad + \int_0^{w^l - \Delta T^l} G'(w^l - \Delta T^l - T_0 - c)dF_l(c)\left(\frac{dw^l}{d\Delta T^l} - 1\right) \\ &\quad - G'(U^{K_l})(1-t)L^l \frac{dw^l}{d\Delta T^l} + \gamma \frac{dL^l}{d\Delta T^l}\Delta T^l + \gamma L^l + \gamma t \frac{d\Pi^l}{dw^l}\frac{dw^l}{d\Delta T^l} = 0,\end{aligned}$$

where I used the envelope theorem on U^{K_l}. Since $L^l = F_l(w^l - \Delta T^l)$, $dL^l/d\Delta T^l = f_l(w^l - \Delta T^l)(dw^l/d\Delta T^l - 1)$. Then, the first two terms cancel and the FOC can be written as:

$$\frac{d\mathcal{L}}{d\Delta T^l} = L^l g_1^l \left(\frac{dw^l}{d\Delta T^l} - 1\right) - g_K^l (1-t)L^l \frac{dw^l}{d\Delta T^l} - \frac{L^l \eta_w^l}{w^l}\frac{dw^l}{d\Delta T^l}\Delta T^l + L^l - t\frac{\Pi^l \epsilon_w^l}{w^l}\frac{dw^l}{d\Delta T^l} = 0.$$

Because of labor market segmentation, a similar argument yields:

$$\frac{d\mathcal{L}}{d\Delta T^h} = L^h g_1^h \left(\frac{dw^h}{d\Delta T^h} - 1\right) - g_K^h (1-t)L^h \frac{dw^h}{d\Delta T^h} - \frac{L^h \eta_w^h}{w^h}\frac{dw^h}{d\Delta T^h}\Delta T^h + L^h - t\frac{\Pi^h \epsilon_w^h}{w^h}\frac{dw^h}{d\Delta T^h} = 0.$$

The FOC w.r.t. $(1-t)$ is given by:

$$\begin{aligned}\frac{d\mathcal{L}}{d(1-t)} &= -\frac{dL^l}{d(1-t)}G(-T_0) + G(-T_0)f_l(w^l - \Delta T^l)\frac{dw^l}{d(1-t)} \\ &\quad + \int_0^{w^l - \Delta T^l} G'(w^l - \Delta T^l - T_0 - c)dF_l(c)\frac{dw^l}{d(1-t)} \\ &\quad - \frac{dL^h}{d(1-t)}G(-T_0) + G(-T_0)f_h(w^h - \Delta T^h)\frac{dw^h}{d(1-t)} \\ &\quad + \int_0^{w^h - \Delta T^h} G'(w^h - \Delta T^h - T_0 - c)dF_h(c)\frac{dw^h}{d(1-t)}\end{aligned}$$

$$
\begin{aligned}
&+G'(U^{K_l})\left(\Pi^l-(1-t)L^l\frac{dw^l}{d(1-t)}\right)+G'(U^{K_h})\left(\Pi^h-(1-t)L^h\frac{dw^h}{d(1-t)}\right)\\
&+\gamma\frac{dL^l}{d(1-t)}\Delta T^l+\gamma\frac{dL^h}{d(1-t)}\Delta T^h-\gamma(\Pi^l+\Pi^h)\\
&+\gamma t\left(\frac{d\Pi^l}{d(1-t)}+\frac{d\Pi^l}{dw^l}\frac{dw^l}{d(1-t)}+\frac{d\Pi^h}{d(1-t)}+\frac{d\Pi^h}{dw^h}\frac{dw^h}{d(1-t)}\right)=0,
\end{aligned}
$$

where I used the envelope theorem on U^{K_l} and U^{K_h}. Since $L^l=F_l(w^l-\Delta T^l)$ and $L^h=F_h(w^h-\Delta T^h)$, $dL^l/d(1-t)=f_l(w^l-\Delta T^l)(dw^l/d(1-t))$ and $dL^h/d(1-t)=f_h(w^h-\Delta T^h)(dw^h/d(1-t))$. Then, the FOC can be written as:

$$
\begin{aligned}
\frac{d\mathcal{L}}{d(1-t)} &= L^l g_1^l\frac{dw^l}{d(1-t)}+L^h g_1^h\frac{dw^h}{d(1-t)}+g_K^l\left(\Pi^l-(1-t)L^l\frac{dw^l}{d(1-t)}\right)+g_K^h\left(\Pi^h-(1-t)L^h\frac{dw^h}{d(1-t)}\right)\\
&+\left(\frac{L^l\eta_{1-t}^l}{1-t}-\frac{L^l\eta_w^l}{w^l}\frac{dw^l}{d(1-t)}\right)\Delta T^l+\left(\frac{L^h\eta_{1-t}^h}{1-t}-\frac{L^h\eta_w^h}{w^h}\frac{dw^h}{d(1-t)}\right)\Delta T^h\\
&-\Pi^l-\Pi^h+t\left(\frac{\Pi^l\epsilon_{1-t}^l}{1-t}-\frac{\Pi^l\epsilon_w^l}{w^l}\frac{dw^l}{d(1-t)}+\frac{\Pi^h\epsilon_{1-t}^h}{1-t}-\frac{\Pi^h\epsilon_w^h}{w^h}\frac{dw^h}{d(1-t)}\right)=0.
\end{aligned}
$$

Note that $F_l(w^l-\Delta T^l)=L_l^D(w^l,1-t)$. Then:

$$
f_l(w^l-\Delta T^l)\left(dw^l-d\Delta T^l\right)=\frac{dL_l^D}{dw^l}dw^l+\frac{dL_l^D}{d(1-t)}d(1-t).
$$

It follows that:

$$
\begin{aligned}
\frac{dw^l}{d\Delta T^l} &= \frac{f_l(w^l-\Delta T^l)}{f_l(w^l-\Delta T^l)+\frac{\eta_w^l L^l}{w^l}}>0,\\
\frac{dw^l}{d(1-t)} &= \frac{\frac{L^l\eta_{1-t}^l}{1-t}}{f_l(w^1-\Delta T^l)+\frac{\eta_w^l L^l}{w^l}}>0.
\end{aligned}
$$

Similar expressions can be written for $dw^h/d\Delta T^h$ and $dw^h/d(1-t)$.

A.2 Section 3

Proof of Proposition 4. Using $\rho^s L_A^s=L_A^s-\int E_m^s dm$ and $L_I^l+L_I^h+L_A^l+L_A^h=1$, I can write the Lagrangian of the planner as follows:

$$
\begin{aligned}
\mathcal{L} &= \left(L_I^l+L_I^h\right)G\left(y_0\right)+K_I G\left(t_0+\overline{k}r^*\right)+\alpha_l\int_0^{U^l-y_0}G\left(U^l-c\right)dF_l(c)+\alpha_h\int_0^{U^h-y_0}G\left(U^h-c\right)dF_h(c)\\
&+\mathcal{K}\sum_{j\in\mathcal{J}}\sigma_j\int_{\psi_j^*}^{\overline{\psi}}G\left(U^{Kj}(\psi,1-t)\right)dO_j(\psi)+\gamma\left[\int\left(E_m^l\left(T\left(w_m^l\right)+y_0\right)+E_m^h\left(T\left(w_m^h\right)+y_0\right)\right)dm\right.\\
&\left.+t\mathcal{K}\sum_{j\in\mathcal{J}}\sigma_j\int_{\psi_j^*}^{\overline{\psi}}\Pi^j(\psi,1-t)dO_j(\psi)-y_0-t_0K_I\right].
\end{aligned}
$$

Increasing the minimum wage is desirable if $d\mathcal{L}/d\overline{w} > 0$. The total derivative is given by:

$$\begin{aligned}
\frac{d\mathcal{L}}{d\overline{w}} \;=\;& \left(\frac{dL_I^l}{d\overline{w}} + \frac{dL_I^h}{d\overline{w}}\right) G\left(y_0\right) + \frac{dK_I}{d\overline{w}} G\left(t_0 + \overline{k}r^*\right) \\
&+\alpha_l \int_0^{U^l - y_0} G'\left(U^l - c\right) \frac{dU^l}{d\overline{w}} dF_l(c) + \alpha_l G(y_0) f_l\left(U^l - y_0\right) \frac{dU^l}{d\overline{w}} \\
&+\alpha_h \int_0^{U^h - y_0} G'\left(U^h - c\right) \frac{dU^h}{d\overline{w}} dF_h(c) + \alpha_h G(y_0) f_h\left(U^h - y_0\right) \frac{dU^l}{d\overline{w}} \\
&+\mathcal{K} \sum_{j\in\mathcal{J}} \sigma_j \int_{\psi_j^*}^{\overline{\psi}} G'\left(U^{Kj}(\psi, 1-t)\right) \frac{dU^{Kj}(\psi, 1-t)}{d\overline{w}} dO_j(\psi) - \mathcal{K} \sum_{j\in\mathcal{J}} \sigma_j G\left(U^{Kj}(\psi_j^*, 1-t)\right) o_j(\psi_j^*) \frac{d\psi_j^*}{d\overline{w}} \\
&+\gamma \left[\int \left(\frac{dE_m^l}{d\overline{w}}\left(T\left(w_m^l\right) + y_0\right) + E_m^l T'\left(w_m^l\right)\frac{dw_m^l}{d\overline{w}}\right) dm\right. \\
&+ \int \left(\frac{dE_m^h}{d\overline{w}}\left(T\left(w_m^h\right) + y_0\right) + E_m^h T'\left(w_m^h\right)\frac{dw_m^h}{d\overline{w}}\right) dm \\
&\left.+t\mathcal{K} \sum_{j\in\mathcal{J}} \sigma_j \int_{\psi_j^*}^{\overline{\psi}} \frac{d\Pi^j(\psi, 1-t)}{d\overline{w}} dO_j(\psi) - t\mathcal{K} \sum_j \sigma_j \Pi^j(\psi_j^*, 1-t) o_j(\psi_j^*) \frac{d\psi_j^*}{d\overline{w}} - t_0 \frac{dK_I}{d\overline{w}}\right].
\end{aligned}$$

Note that $L_I^s = \alpha_s - L_A^s = \alpha_s\left(1 - F_l(U^l - y_0)\right)$. Then, $dL_I^s = -\alpha_s f_l(U^s - y_0)(dU^s/d\overline{w})$. Then, the first two terms in the first line cancel out with the second terms on the second and third lines. Similarly, note that $K_I = \mathcal{K}\sum_{j\in\mathcal{J}} \sigma_j O_j(\psi_j^*)$ so $dK_I/d\overline{w} = \mathcal{K}\sum_{j\in\mathcal{J}} \sigma_j o_j(\psi_j^*)(d\psi_j^*/d\overline{w})$. Noting that $U^{Kj}(\psi_j^*, 1-t) = t_0 + \overline{k}r^*$, then the second term in the first line cancels out with the fifth line. Defining $dK_I^j/d\overline{w} = \sigma_j o_j(\psi_j^*)(d\psi_j^*/d\overline{w})$, so $\sum_j (dK_I^j/d\overline{w}) = dK_I/\overline{w}$, noting that $dK_A^j = -dK_I^j$, and using the WWs definitions, we have that:

$$\begin{aligned}
\frac{1}{\gamma}\frac{d\mathcal{L}}{d\overline{w}} \;=\;& L_A^l g_1^l \frac{dU^l}{d\overline{w}} + L_A^h g_1^h \frac{dU^h}{d\overline{w}} + \mathcal{K} \sum_{j\in\mathcal{J}} \sigma_j \int_{\psi_j^*}^{\overline{\psi}} g_\psi^j \frac{dU^{Kj}(\psi, 1-t)}{d\overline{w}} dO_j(\psi) \\
&+ \int \left(\frac{dE_m^l}{d\overline{w}}\left(T\left(w_m^l\right) + y_0\right) + E_m^l T'\left(w_m^l\right)\frac{dw_m^l}{d\overline{w}}\right) dm \\
&+ \int \left(\frac{dE_m^h}{d\overline{w}}\left(T\left(w_m^h\right) + y_0\right) + E_m^h T'\left(w_m^h\right)\frac{dw_m^h}{d\overline{w}}\right) dm \\
&+t\mathcal{K} \sum_{j\in\mathcal{J}} \sigma_j \int_{\psi_j^*}^{\overline{\psi}} \frac{d\Pi^j(\psi, 1-t)}{d\overline{w}} dO_j(\psi) + \sum_j \frac{dK_A^j}{d\overline{w}} \left(t\Pi^j(\psi_j^*, 1-t) + t_0\right).
\end{aligned} \tag{A.1}$$

Additional intuition in terms of "structural" macro elasticities. Consider the following macro elasticity concepts:

$$\mathcal{E}_E^{s,m} = \frac{d\log E_m^s}{d\log \overline{w}}, \quad \mathcal{E}_W^{s,m} = \frac{d\log w_m^s}{d\log \overline{w}}, \quad \mathcal{E}_L^s = \frac{d\log L_A^s}{d\log \overline{w}}, \tag{A.2}$$

$$\mathcal{P}_\Pi^{\psi,j} = \frac{d\log \Pi^j(\psi, 1-t)}{d\log \overline{w}}, \quad \mathcal{P}_k^{\psi,j} = \frac{d\log k^j(\psi, 1-t)}{d\log \overline{w}}, \quad \mathcal{P}_{K_A}^{\psi,j} = \frac{d\log K_A^j}{d\log \overline{w}}. \tag{A.3}$$

Elasticities in equation (A.2) –denoted by $\mathcal{E}$– mediate welfare effects and fiscal externalities related to workers' outcomes: employment, wages, and participation. Elasticities in equation (A.3) –denoted by $\mathcal{P}$– mediate welfare effects and fiscal externalities related to capitalists' outcomes: profits, capital, and number of firms, where K_A^j is the number of active firms with technology j, with $\sum_j K_A^j = K_A$. All of these are *macro* elasticities, meaning that they incorporate all general equilibrium effects.

Differentiating equation (17) yields:

$$\begin{aligned} L_A^s \frac{dU^s}{d\overline{w}} &= \int \left(\frac{dE_m^s}{d\overline{w}} \left(w_m^s - T\left(w_m^s\right) - y_0 \right) + E_m^s \frac{dw_m^s}{d\overline{w}} \left(1 - T'\left(w_m^s\right) \right) \right) dm \\ &\quad - \frac{1}{L_A^s} \frac{dL_A^s}{d\overline{w}} \int E_m^s \left(w_m^s - T\left(w_m^s\right) - y_0 \right) dm. \end{aligned}$$

Using the elasticity concepts defined in equations (A.2) and (A.3), the expression equals:

$$\begin{aligned} \overline{w} L_A^s \frac{dU^s}{d\overline{w}} &= \int \left(E_m^s \mathcal{E}_E^{s,m} \left(w_m^s - T\left(w_m^s\right) - y_0 \right) + E_m^s w_m^s \mathcal{E}_W^{s,m} \left(1 - T'\left(w_m^s\right) \right) \right) dm \\ &\quad - \mathcal{E}_L^s \int E_m^s \left(w_m^s - T\left(w_m^s\right) - y_0 \right) dm. \end{aligned}$$

Also, in this Appendix, below I show that:

$$\begin{aligned} \frac{dU^{Kj}(\psi, 1-t)}{d\overline{w}} &= (1-t) \left(\frac{d\Pi^j(\psi, 1-t)}{d\overline{w}} - \frac{r^*}{1-t} \frac{dk^j(\psi, 1-t)}{d\overline{w}} \right), \\ &= (1-t) \frac{\Pi^j(\psi, 1-t)}{\overline{w}} \mathcal{P}_\Pi^{\psi,j} - r^* \frac{k^j(\psi, 1-t)}{\overline{w}} \mathcal{P}_k^{\psi,j}. \end{aligned}$$

Replacing these expressions in equation (A.1) implies that increasing the minimum wage is welfare-improving if:

$$\begin{aligned}
&\textbf{(Wl)} \quad L_A^l g_1^l \int \frac{E_m^l}{L_A^l} \left(\left(\mathcal{E}_E^{l,m} - \mathcal{E}_L^{l,m} \right) \left(w_m^l - T\left(w_m^l\right) - y_0 \right) + w_m^l \mathcal{E}_W^{l,m} \left(1 - T'\left(w_m^l\right) \right) \right) dm \\
&\textbf{(Wh)} \quad + L_A^h g_1^h \int \frac{E_m^h}{L_A^h} \left(\left(\mathcal{E}_E^{h,m} - \mathcal{E}_L^{h,m} \right) \left(w_m^h - T\left(w_m^h\right) - y_0 \right) + w_m^h \mathcal{E}_W^{h,m} \left(1 - T'\left(w_m^h\right) \right) \right) dm \\
&\textbf{(Wk)} \quad + \mathcal{K} \sum_{j \in \mathcal{J}} \sigma_j \int_{\psi_j^*}^{\overline{\psi}} g_\psi^j \left((1-t) \Pi^j(\psi, 1-t) \mathcal{P}_\Pi^{\psi,j} - r^* k^j(\psi, 1-t) \mathcal{P}_k^{\psi,j} \right) dO_j(\psi) \\
&\textbf{(Fl)} \quad + \int \left(E_m^l \mathcal{E}_E^{l,m} \left(T\left(w_m^l\right) + y_0 \right) + E_m^l T'\left(w_m^l\right) w_m^l \mathcal{E}_W^{l,m} \right) dm \\
&\textbf{(Fh)} \quad + \int \left(E_m^h \mathcal{E}_E^{h,m} \left(T\left(w_m^h\right) + y_0 \right) + E_m^h T'\left(w_m^h\right) w_m^h \mathcal{E}_W^{h,m} \right) dm \\
&\textbf{(Fk)} \quad + t \mathcal{K} \sum_{j \in \mathcal{J}} \sigma_j \int_{\psi_j^*}^{\overline{\psi}} \Pi^j(\psi, 1-t) \mathcal{P}_\Pi^{\psi,j} dO_j(\psi) + \sum_j K_A^j \mathcal{P}_{K_A}^{\psi,j} \left(t\Pi^j(\psi_j^*, 1-t) + t_0 \right) > 0
\end{aligned} \tag{A.4}$$

To highlight the tradeoffs in the planner's problem, terms in equation (A.4) are grouped between welfare effects and the corresponding fiscal externalities, separately for workers and capitalists.

- *Welfare effects on active workers*: The first line of equation (A.4)–denoted by **Wl**–summarizes the welfare effects on active low-skill workers, which are mediated by two effects. First, the minimum wage affects the employment probabilities in each sub-market for a given distribution of employment rents. This effect is governed by $\mathcal{E}_E^{l,m} - \mathcal{E}_L^{l,m}$ because the size of employment relative to labor market participants determines the ex-ante likelihood of securing a job conditional on applying. Second, the minimum wage affects the wage distribution, and, therefore, the rent of being employed, for a given distribution of employment probabilities. This effect is governed by $\mathcal{E}_W^{l,m}$. Importantly, the expected utility of labor market participation depends on the complete distribution of effects across sub-markets. Therefore, wage and employment spillovers affect the welfare effect. Note that the minimum wage incentivizes marginal participants to enter or exit the labor market (depending on the net change in expected utility), however, those switches do not have first-order welfare impacts because of the envelope theorem. The second line of equation (A.4)–denoted by **Wh**–summarizes the welfare effects on active high-skill workers. The interpretation is analogous to line **Wl**.

- *Welfare effects on capitalists*: The third line of equation (A.4)–denoted by **Wk**–summarizes welfare effects on capitalists, which are governed by $\mathcal{P}_\Pi^{\psi,j}$ and $\mathcal{P}_k^{\psi,j}$. Capitalists are worse off because introducing a minimum wage reduces their profits. The welfare effect, however, is attenuated by the extra return obtained from the capital that is reallocated abroad. Marginal capitalists may become inactive as a consequence of the minimum wage increase, but the envelope theorem implies that marginal firm closures do not have first-order welfare effects.

- *Fiscal externalities of workers*: The fourth line of equation (A.4)–denoted by **Fl**–summarizes the fiscal externalities of low-skill workers. Changes in wages and employment affect net tax liabilities at each earnings level depending on the structure of the tax system. The fifth line of equation (A.4)–denoted by **Fh**–summarizes the fiscal externalities for high-skill workers, which has an analog interpretation to line **Fl**. One subtle detail in these expressions is that participation responses do not directly affect the planners' budget because the planner pays transfers to individuals without any market income regardless of whether they are inactive or active but unemployed.

- *Fiscal externalities of capitalists*: Finally, the sixth line of equation (A.4)–denoted by **Fk**–summarizes the fiscal externalities for capitalists. The first term is the behavioral effect on corporate tax revenue. The second term measures fiscal externalities driven by firm exits, governed by $\mathcal{P}_{K_A}^{\psi,j}$. While the exit of marginal firm-owners does not generate welfare effects, exits may generate fiscal externalities because these capitalists transition from paying taxes to receiving transfers.

Firm's problem. To simplify exposition, I omit the superscript j from revenue and profit functions. The first-order conditions of firms are given by:

$$w^s: \qquad (\phi_s - w^s)\,\tilde{q}_w^s = \tilde{q}^s, \tag{A.5}$$

$$v^s: \qquad (\phi_s - w^s)\,\tilde{q}^s = \eta_v^s, \tag{A.6}$$

$$k: \qquad (1-t)\phi_k = r^*, \tag{A.7}$$

for $s \in \{l, h\}$, where $\phi_s = \partial\phi/\partial n^s$ and arguments are omitted from functions to simplify notation. Is direct from the FOCs that wages are below the marginal productivities, that is, that $\phi_s > w^s$. Moreover, defining the firm-specific labor supply elasticity as $\varepsilon^s = (\partial n^s/\partial w^s)(w^s/n^s) = \tilde{q}^s_w w^s/\tilde{q}^s$, we can rearrange equation (A.5) and write $\phi_s/w_s = 1/\varepsilon^s + 1$, which is the standard markdown equation (Robinson, 1933). In this model, ε^s is endogenous and finite because of the matching frictions and the vacancy costs.

Combining the FOCs of w^s and v^s yields $\tilde{q}^{s2} = \eta^s_v \tilde{q}^s_w$. Differentiating and rearranging terms yields:

$$\frac{dw^s}{dv^s} = \frac{\eta^s_{vv}\tilde{q}^s_w}{2\tilde{q}^s\tilde{q}^s_w - \eta^s_v\tilde{q}^s_{ww}} > 0,$$

provided $\tilde{q}^s_{ww} < 0$.[1] Also, differentiating equation (A.6) yields:

$$\left(d\phi_s - dw^s\right)\tilde{q}^s + \left(\phi_s - w^s\right)\tilde{q}^s_w dw^s \quad = \quad \eta^s_{vv} dv^s. \tag{A.8}$$

Note that:

$$d\phi_s \quad = \quad \phi_{ss}\left(\tilde{q}^s_w dw^s v^s + \tilde{q}^s dv^s\right) + \phi_{s,-s}\cdot\left(\tilde{q}^{-s}_w \cdot dw^{-s}\cdot v^{-s} + \tilde{q}^{-s}\cdot dv^{-s}\right), \tag{A.9}$$

where $-s$ is the other skill type. Replacing equations (A.5) and (A.9) in equation (A.8), yields:

$$\left(\phi_{ss}\cdot\left[\tilde{q}^s_w \cdot dw^s \cdot v^s + \tilde{q}^s \cdot dv^s\right] + \phi_{sj}\cdot\left[\tilde{q}^j_w \cdot dw^j \cdot v^j + \tilde{q}^j \cdot dv^j\right]\right)\cdot\tilde{q}^s = \eta^s_{vv}\cdot dv^s. \tag{A.10}$$

Rearranging terms gives:

$$\frac{dv^s}{dv^{-s}} \quad = \quad \left[\phi_{s,-s}\left(\tilde{q}^{-s}_w \cdot \frac{dw^{-s}}{dv^{-s}} v^{-s} + \tilde{q}^{-s}\right)\right]^{-1}\left[\frac{\eta^s_{vv}}{\psi\tilde{q}^s} - \phi_{ss}\left(\tilde{q}^s_w\frac{dw^s}{dv^s}v^s + \tilde{q}^s\right)\right],$$

which, given equation (A.10), implies that $\operatorname{sgn}\left(dv^s/dv^{-s}\right) = \operatorname{sgn}\phi_{s,-s}$.

Notion of equilibrium. Define by $\Gamma : \left\{(\psi, j) \in \Psi \times \mathcal{J} : \psi \geq \psi^*_j\right\} \to [\underline{m}, \overline{m}]$ the function that maps active firm types to equilibrium wages that are indexed by sub-markets. The pre-image of Γ does not need to be single-valued (i.e., Γ is not necessarily a one-to-one function) since different (ψ, j) types may

[1] Ignoring the skill superscripts, note that $\tilde{q}_w = q_\theta(\partial\theta/\partial w)$, which is positive in equilibrium since U is fixed. Then:

$$\tilde{q}_{ww} = q_{\theta\theta}\left(\frac{\partial\theta}{\partial w}\right)^2 + q_\theta\frac{\partial^2\theta}{\partial w^2}.$$

In principle, the sign of $\tilde{q}_{ww}$ is ambiguous, since $q_{\theta\theta} > 0$ and $\partial^2\theta/\partial w^2 > 0$. I assume that the second term dominates so $\tilde{q}_{ww} < 0$. If $\mathcal{M}(L, V) = L^\delta V^{1-\delta}$, $\operatorname{sgn}\left[\tilde{q}_{ww}\right] = \operatorname{sgn}\left[\frac{-(1-T'(w))^2}{1-\delta} - T''(w)\right]$, so the condition holds as long as the tax system is not "too concave". For the result above, $\tilde{q}_{ww} < 0$ is a sufficient but not necessary condition, that is, $\tilde{q}_{ww}$ is allowed to be *moderately* positive, which is plausible since the opposite forces in $\tilde{q}_{ww}$ are interrelated. $q_{\theta\theta} > 0$ follows from the concavity and constant returns to scale of the matching function. To see why $\partial^2\theta/\partial w^2 > 0$, recall that $dU = p_\theta d\theta_m(w_m - T(w_m) - y_0) + p_m(1 - T'(w))dw_m$. Setting $dU = 0$ and differentiating again yields:

$$0 \quad = \quad \left(y_m p_{\theta\theta}\frac{\partial\theta_m}{\partial w_m} + 2p_\theta(1 - T'(w_m))\right)\frac{\partial\theta_m}{\partial w_m} + p_\theta y_m\frac{\partial^2\theta_m}{\partial w_m^2} - p_m T''(w_m),$$

which implies that $\partial^2\theta/\partial w^2 > 0$ as long as the tax system is not "too concave".

generate similar w^s values. Since matching functions and vacancy costs do not vary with j, then it follows from the FOCs of the firm that whenever two firms post the same wage, they also post the same vacancies. Then, given Γ, we can index wages and vacancies by m or (ψ, j) pairs. For each pair (s,m), let $I(s,m) \subset \left\{(\psi, j) \in \Psi \times \mathcal{J} : \psi \geq \psi_j^*\right\}$ be the (possibly singleton) set of (ψ, j) pairs that induce the same wage, w^s. Let ι be the index of elements within that set. An equilibrium of the model is given by:

$$\left\{U^l, U^h, \{\psi_j^*\}_{j=1}^J, \{v_m^s\}_{s\in\{l,h\}, m\in[\underline{m},\overline{m}]}, \{w_m^s\}_{s\in\{l,h\}, m\in[\underline{m},\overline{m}]}, \{L_m^s\}_{s\in\{l,h\}, m\in[\underline{m},\overline{m}]}, \left\{k^j(\psi)\right\}_{j=1,\psi\in\Psi}^J\right\},$$

where $[\underline{m}, \overline{m}]$ is the mass of active sub-markets that are mapped from the distribution of active types (ψ, j) such that $\psi \in [\psi_j^*, \overline{\psi}]$. The equilibrium objects solve the following equations:

- **Firm optimality**: we can partition the set $\{k^j(\psi)\}$ into values for $\psi \in [\underline{\psi}, \psi_j^*)$ and $\psi \in [\psi_j^*, \overline{\psi}]$. For the first set, we fix $k^j(\psi) = 0$. For the second set, we define k_m analogously to (w_m^s, v_m^s). Then, the set $\left(v_m^l, v_m^h, w_m^l, w_m^h, k_m\right)$ solves the FOCs of firms of type $(\psi, j) \in \Gamma^{-1}(m)$ (equations (A.5)-(A.7)), taking $\{\psi_j^*\}$, U^l, and U^h as given, for all $m \in [\underline{m}, \overline{m}]$.

- **Capitalists' participation constraint**: the vector ψ_j^* solves:

$$(1-t)\pi^j\left(w^{lj}(\psi_j^*), w^{hj}(\psi_j^*), v^{lj}(\psi_j^*), v^{hj}(\psi_j^*), k^j(\psi_j^*); \psi_j^*\right) - r^* k^j(\psi) = \xi + t_0,$$

  taking $\{\left(v_m^l, v_m^h, w_m^l, w_m^h\right)\}$, $\{k^j(\psi)\}$, U^l, and U^h as given, for all $j \in \mathcal{J}$, where $x^j(\psi)$ are mapped to x_m as described above, for $x \in \{w^l, w^h, v^l, v^h, k\}$.

- **Across sub-markets equilibrium condition**: the set L_m^s solves $U^s = p_m^s y_m^s + (1 - p_m^s) y_0$, taking U^l, U^h, v_m^s, and w_m^s as given, for $s \in \{l,h\}$ and for all $m \in [\underline{m}, \overline{m}]$, where $y_m^s = w_m^s - T(w_m^s)$ and $p_m^s = p^s(\theta_m^s) = p^s\left(\frac{\mathcal{K} v_m^s \sum_{\iota \in \mathcal{I}(s,m)} \sigma_{j_\iota} o_{j_\iota}(\psi_\iota)}{L_m^s}\right)$.

- **Workers' participation constraint**: U^s solves $\int L_m^s dm = F_s(U^s - y_0)$, taking $\{L_m^s\}$ as given, for $s \in \{l,h\}$.

Efficiency properties of the decentralized equilibrium. Without loss of generality, consider a case where there is a unique skill type and a unique j-type; the argument naturally extends given the segmented markets assumption and the fixed portions α_s and σ_j of types. A social planner who only cares about efficiency decides on sequences of vacancies, applicants, and capital to maximize the total output net of costs for firms and workers (including opportunity costs), internalizing the existence of matching frictions. The objective function is given by:

$$\mathcal{V} \;=\; \mathcal{K}\int_{\psi^*}^{\overline{\psi}} \left[\phi\left(\psi, n, k_\psi\right) - \eta(v_\psi) - \xi - k_\psi r^*\right] dO(\psi) - \alpha\int_0^{c^*} c dF(c), \tag{A.11}$$

and the restrictions are given by:

$$n = q\left(\frac{\mathcal{K}v_\psi o(\psi)}{L_\psi}\right)v_\psi, \tag{A.12}$$

$$\int_{\psi^*}^{\overline{\psi}} L_\psi d\psi = \alpha F(c^*), \tag{A.13}$$

where $\{c^*, \psi^*\}$ are the thresholds for workers and firms to enter the labor market, and $\{v_\psi, k_\psi, L_\psi\}$ are the sequences of vacancies, capital, and applicants, with $\theta_\psi = (\mathcal{K}v_\psi o(\psi))/L_\psi$. The planner chooses $\{c^*, \psi^*\}$ and $\{v_\psi, k_\psi, L_\psi\}$ to maximize (A.11) subject to (A.12) (matches are endogenous to the number of applicants and vacancies) and (A.13) (the distribution of applicants across firms has to be consistent with the number of active workers). The Lagrangian is given by:

$$\begin{aligned}\mathcal{L} &= \mathcal{K}\int_{\psi^*}^{\overline{\psi}}\left[\phi\left(\psi, q\left(\frac{\mathcal{K}v_\psi o(\psi)}{L_\psi}\right)v_\psi, k_\psi\right) - \eta(v_\psi) - \xi - k_\psi r^*\right]dO(\psi)\\ &\quad -\alpha\int_0^{c^*} c dF(c) + \mu\left[\alpha F(c^*) - \int_{\psi^*}^{\overline{\psi}} L_\psi d\psi\right],\end{aligned}$$

where μ is the multiplier. The first order conditions with respect to v_ψ, k_ψ, L_ψ, and c^* are given by:

$$v_\psi: \qquad \phi_n\left(q_\theta\theta_\psi + q\right) = \eta_v, \tag{A.14}$$

$$k_\psi: \qquad \phi_k = r^*, \tag{A.15}$$

$$L_\psi: \qquad -\theta_\psi^2 q_\theta \phi_n = \mu, \tag{A.16}$$

$$c^*: \qquad -\alpha c^* f(c^*) + \mu\alpha f(c^*) = 0. \tag{A.17}$$

First, we note that equation (A.15) coincides with the decentralized first order condition for capital when $t = 0$ (see equation (A.7)). Then, the decentralized equilibrium is efficient in terms of capital.

Equation (A.17) implies that $\mu = c^*$. Using that and combining equations (A.14) and (A.16) yields:

$$q\phi_n - \frac{c^*}{\theta_\psi} = \eta_v. \tag{A.18}$$

To assess the efficiency of vacancy posting decisions and application decisions, I check whether equation (A.18) is consistent with the decentralized equilibrium. In the absence of taxes, the threshold for workers' entry is given by $U = p(\theta_\psi)w_\psi$, which holds for any ψ. We also know, from the properties of the matching function, that $p(\theta_\psi) = \theta_\psi q(\theta_\psi)$. Replacing in equation (A.18) yields $q(\phi_n - w_\psi) = \eta_v$, which coincides with the decentralized first order condition of the firms for vacancies (see equation (A.6)). Then, the decentralized equilibrium is efficient in terms of vacancy postings and applications.

The first order condition with respect to ψ^* is given by:

$$\psi^*: \qquad -\mathcal{K}\left(\phi\left(\psi^*, q\left(\theta_{\psi^*}\right)v_{\psi^*}, k_{\psi^*}\right) - \eta\left(v_{\psi^*}\right) - \xi - k_{\psi^*}r^*\right)o\left(\psi^*\right) - \mu L_{\psi^*} = 0. \tag{A.19}$$

Equation (A.19) can be written as:

$$\phi\left(\psi^{*}, q\left(\theta_{\psi^{*}}\right) v_{\psi^{*}}, k_{\psi^{*}}\right)-\eta\left(v_{\psi^{*}}\right)-\frac{\mu L_{\psi^{*}}}{\mathcal{K}o\left(\psi^{*}\right)} \quad = \quad \xi+k_{\psi} r^{*}.$$

Note that $\mu L_{\psi^*}/\mathcal{K}o\left(\psi^*\right) = c^* v_{\psi^*}/\theta_{\psi^*}$. Then, $c^* = p\left(\theta_{\psi^*}\right) w_{\psi^*}$ and $p(\theta_{\psi^*}) = \theta_{\psi^*} q(\theta_{\psi^*})$ imply that $c^* v_{\psi^*}/\theta_{\psi^*} = w_{\psi^*} q(\theta_{\psi^*}) v_{\psi^*}$, which implies that equation (A.19) is equivalent to $\Pi\left(\psi^*\right) = \xi + k_\psi r^*$, which coincides with the decentralized equilibrium in the absence of taxes. Therefore, the decentralized equilibrium is (constrained) efficient.

Responses to changes in the minimum wage. I first analyze the effects of minimum wage changes on worker-level objects. Consider first the sub-population of low-skill workers. In equilibrium, $U^l = p^l(\theta^l_m) y^l_m + (1 - p^l(\theta^l_m)) y_0$, for all sub-markets m. Let i_1 be the sub-market for which the minimum wage is binding, so $w^l_{i_1} = \overline{w}$. Differentiating yields:

$$\frac{dU^l}{d\overline{w}} \quad = \quad p^l_\theta \frac{d\theta^l_{i_1}}{d\overline{w}}(\overline{w} - T(\overline{w}) - y_0) + p^l(\theta^l_{i_1})(1 - T'(\overline{w})). \tag{A.20}$$

Since $p^s(\theta^l_{i_1}) > 0$, and assuming $T'(\overline{w}) < 1$, $dU^l/d\overline{w} = d\theta^l_{i_1}/d\overline{w} = 0$ is not a feasible solution to equation (A.20). This implies that changes in $\overline{w}$ necessarily affect the equilibrium values of U^l, $\theta^l_{i_1}$, or both.

An increase in the minimum wage mechanically makes minimum wage jobs more attractive for low-skill workers. This effect is captured by the second term in the right-hand-side of equation (A.20). The increased attractiveness attracts new applicants toward minimum-wage sub-markets thus pushing $\theta^l_{i_1}$ downwards until the across sub-market equilibrium is restored. This decreases the employment probability, as captured by the first term in the right-hand-side of equation (A.20). The overall effect is ambiguous, depending on whether the wage or the employment effects dominate.

Changes in $\overline{w}$ also affect low-skill sub-markets for which the minimum wage is not binding. Let i_2 be a sub-market for which the minimum wage is not binding, so $w^l_{i_2} > \overline{w}$. Differentiating yields:

$$\frac{dU^l}{d\overline{w}} \quad = \quad p^l_\theta \frac{d\theta^l_{i_2}}{d\overline{w}}(w^l_{i_2} - T(w^l_{i_2}) - y_0) + p^l(\theta^l_{i_2})(1 - T'(w^l_{i_2}))\frac{dw^l_{i_2}}{d\overline{w}}. \tag{A.21}$$

Equation (A.20) suggests that the left-hand-side of equation (A.21) is unlikely to be zero, implying that $\theta^l_{i_2}$ or $w^l_{i_2}$ or both are possibly affected by changes in the minimum wage. There are two forces that mediate this spillover. First, the change in applicant flows between sub-markets and from in and out of the labor force affects the employment probabilities of all sub-markets until the equilibrium condition of equal expected utilities is restored. This effect is captured by the first term in the right-hand-side of equation (A.21). Second, firms can also respond to changes in applicants. The potential wage response is captured in the second term in the right-hand-side of equation (A.21). Changes in vacancy posting implicitly enter the terms $d\theta^l_m/d\overline{w}$ of equations (A.20) and (A.21). The overall effect is also ambiguous.

Changes in U^l also affect labor market participation. Recall that $L^l_A = \alpha_l F_l(U^l - y_0)$, so $dL^l_A/d\overline{w} = \alpha_l f_l(U^l - y_0)\left(dU^l/d\overline{w}\right)$. Then, if $dU^l/d\overline{w} > 0$, minimum wage hikes increase labor market participation.

The behavioral response, however, is scaled by $f_l(U^l)$, which may be negligible. This may result in positive impacts on expected utilities with modest participation effects at the aggregate level.

Now consider the sub-population of high-skill workers. If $\min_m\{w_m^h\} > \overline{w}$, equilibrium effects for high-skill workers take the form of equation (A.21). In this model, effects in high-skill sub-markets are mediated by the production function, since demand for high-skill workers depends on low-skill workers through ϕ^j. Then, this model may induce within-firm spillovers explained by a technological force: changes in low-skill markets affect high-skill posting, thus affecting high-skill workers' application decisions.

To see the effect of the minimum wage on firms' decisions, note that the five first-order conditions (equations (A.5) and (A.6) for $s = \{l, h\}$, and equation (A.7)) hold for firms for which the minimum wage is not binding, while equation (A.5) no longer holds for firms for which the minimum wage is binding. Then, for firms that operate in sub-markets with $w_m^l > \overline{w}$, it is sufficient to verify the reaction of one of the five endogenous variables to changes in the minimum wage and use the within-firm correlations to predict reactions in the other variables. For firms that operate in sub-markets where $w_m^l = \overline{w}$, it is necessary to first compute the change in low-skill vacancies and then infer the changes in high-skill vacancies and wages using the within-firm between-skill correlations that still hold for the firm. As above, I omit superscripts j to simplify notation.

In both cases, it is easier to work with equation (A.6) for $s = l$. When the minimum wage is not binding, totally differentiating the first-order condition yields:

$$\begin{aligned}\left(\left[\phi_{ll}\left(q_\theta^l d\theta^l v^l + q^l dv^l\right) + \phi_{lh}\left(q_\theta^h d\theta^h v^h + q^h dv^h\right) + \phi_{lk} dk\right] - dw^l\right) q^l & \\ +(\phi_l - w^l) q_\theta^l d\theta^l &= \eta_{vv}^l dv^l,\end{aligned}$$

where I omitted sub-market sub-indices to simplify the notation. Rearranging terms gives:

$$dw^l\left[\frac{dv^l}{dw^l}\left(\eta_{vv}^l - \phi_{ll} q^{l2} - \phi_{lh} q^h q^l \frac{dv^h}{dv^l}\right) - \frac{dk}{dw^l}\phi_{lk} q^l + q^l\right] = d\theta^l q_\theta^l\left[(\phi_l - w^l) + \phi_{ll} v^l q^l\right] + d\theta^h q_\theta^h \phi_{lh} q^l.$$

Note that the sign and magnitude of $dw^l/d\overline{w}$ depend on $d\theta^l/d\overline{w}$. With the variation in wages, it is possible to predict variation in vacancies (and, therefore, firm size) and spillovers to high-skill workers. Capital may amplify or attenuate the effect depending on whether capital and low-skill labor are complements or substitutes.

When the minimum wage is binding, totally differentiating the first-order condition yields:

$$\begin{aligned}\left(\left[\phi_{ll}\left(q_\theta^l d\theta^l v^l + q^l dv^l\right) + \phi_{lh}\left(q_\theta^h d\theta^h v^h + q^h dv^h\right) + \phi_{lk} dk\right] - d\overline{w}\right) q^l & \\ +(\phi_l - \overline{w}) q_\theta^l d\theta^l &= \eta_{vv}^l dv^l,\end{aligned}$$

where I omitted sub-market sub-indices to simplify the notation. Rearranging terms gives:

$$\frac{dv^l}{d\overline{w}}\left(\eta_{vv}^l - \phi_{ll} q^{l2} - \phi_{lh} q^h q^l \frac{dv^h}{dv^l}\right) = \frac{d\theta^l}{d\overline{w}} q_\theta^l\left[(\phi_l - \overline{w}) + \phi_{ll} v^l q^l\right]$$

$$+\frac{d\theta^h}{d\overline{w}}q_\theta^h\phi_{lh}q^l+\frac{dk}{d\overline{w}}\phi_{lk}q^l-q^l.$$

The sign and magnitude depend on the reaction on equilibrium sub-market tightness. However, note that the first-order effect is decreasing in productivity since ϕ_l is decreasing in ψ and $(\phi_l-\overline{w})\to 0$ as $\overline{w}$ increases. That is, among firms that pay the minimum wage, the least productive ones are more likely to decrease their vacancies, and therefore shrink and eventually exit the market (conditional on j, omitted here for simplicity).

The effect of the minimum wage on the utility of inactive capitalists is zero. Using the envelope theorem, the effect of the minimum wage on the utility of active capitalists that are constrained by the minimum wage is given by:

$$\begin{aligned}\frac{\partial U^K}{\partial\overline{w}} &= (1-t)\frac{\partial\Pi(\psi,1-t)}{\partial\overline{w}}\\ &= (1-t)\left(q_\theta^l\left[\frac{\partial\theta^l}{\partial\overline{w}}+\frac{\partial\theta^l}{\partial U^l}\frac{\partial U^l}{\partial\overline{w}}\right]v^l(\phi_l-\overline{w})+q_\theta^h\frac{\partial\theta^l}{\partial U^h}\frac{\partial U^h}{\partial\overline{w}}v^h(\phi_h-w^h)-v^lq^l\right).\end{aligned}\tag{A.22}$$

This effect is possibly negative given that the first-order condition with respect to low-skill wages holds with inequality and is stronger for less productive firms. When $\overline{w}=w^l$, the first order condition holds with equality and therefore:

$$\left.\frac{\partial U^K}{\partial\overline{w}}\right|_{\overline{w}=w^l}=(1-t)\left(q_\theta^l\frac{\partial\theta^l}{\partial U^l}\frac{\partial U^l}{\partial\overline{w}}v^l(\phi_l-w^l)+q_\theta^h\frac{\partial\theta^h}{\partial U^h}\frac{\partial U^h}{\partial\overline{w}}v^h(\phi_h-w^h)\right).\tag{A.23}$$

This latter expression also coincides with the utility effect on active capitalists that are not constrained by the minimum wage, since they face indirect effects mediated by the effect on job-filling probabilities.

More intuition on the SWF. The average social value of the expected utility of active workers of skill s is $\int_0^{U^s-y_0}G(U^s-c)d\tilde{F}_s(c)$, where $\tilde{F}_s(c)=F_s(c)/F_s(U^s-y_0)$. Then, the total value is given by $L_A^s\int_0^{U^s-y_0}G(U^s-c)d\tilde{F}_s(c)$, which yields the expressions of equation (14) noting that $L_A^s=\alpha_sF(U^s-y_0)$. The average social value of the utility of capitalists of type j is $\int_{\psi_j^*}^{\overline{\psi}}G((1-t)\Pi^j(\psi,t)-\xi)d\tilde{O}_j(\psi)$, with $\tilde{O}_j(\psi)=O_j(\psi)/(1-O_j(\psi^*))$. Then, their total value is $K_A^j\int_{\psi_j^*}^{\overline{\psi}}G((1-t)\Pi^j(\psi,t)-\xi)d\tilde{O}_j(\psi)=\mathcal{K}\int_{\psi_j^*}^{\overline{\psi}}G((1-t)\Pi^j(\psi,t)-\xi)dO_j(\psi)$, since $K_A^j=1-O_j(\psi_j^*)$. Aggregating across types yields $\mathcal{K}\sum_{j\in\mathcal{J}}\sigma_j\int_{\psi_j^*}^{\overline{\psi}}G((1-t)\Pi^j(\psi,t)-\xi)dO_j(\psi)$.

B Simulation appendix

The calibration of the model is as follows. Because capital intensity mediates the relative distortions of the policies, the main comparative static of interest concerns a_s. Therefore, I solve the model for all combinations $(a_l,a_h)\in\mathcal{A}\times\mathcal{A}$, with $\mathcal{A}=\{0.15,0.20,...,0.80,0.85\}$. I set $b_l=b_h=0.79$ following Lamadon et al. (2022). The foreign investment return $r_l^*=r_h^*=r^*$ is set to 4.2%, which comes from applying a global profit net-of-tax rate of 70% (Bachas et al., 2024) to an approximate global pre-tax return of capital of 6% (Piketty and Zucman, 2014).[2] To characterize social preferences, I specify $G(.) = \log(.)$. I assume efficient rationing, so $g_1^M = 0$ in Propositions 1 and 2 in the equilibrium with no minimum wage. This assumption is irrelevant to the assessment of Proposition 3. The remaining parameters are chosen to match moments under the optimal tax system. I specify the conditional participation cost distribution for a skill level $s \in \{l, h\}$ as $c|s \sim \exp(\lambda_s)$. Then, there are 6 remaining free parameters: $(\lambda_l, \lambda_h, \psi_l, \psi_h, \overline{k}_l, \overline{k}_h)$. For each (a_l, a_h) combination, I calibrate the productivity shifters (ψ_l, ψ_h) to generate equilibrium wages of $(w^l, w^h) = (15, 50)$ under the optimal tax system. The idea is that \$15,000 approximately matches the annual pre-tax earnings of a full-time worker (40 weekly hours) earning the US federal hourly minimum wage of \$7.5. The choice of w^h is arbitrary and only meant to illustrate a high-skill labor market that pays wages far above the minimum wage in equilibrium. Similarly, I choose (λ_l, λ_h) so the equilibrium labor supply elasticities equals 0.5 (Chetty et al., 2011) at wages $(15, 50)$ under the optimal tax system.[3] Finally, I set the capital stock $\overline{k}_s$ as 1.5 times the optimal domestic capital at the calibration equilibrium. This parameter is not particularly consequential because it does not directly affect the first order conditions of the capitalists.

Figure B.1 presents the results. Panels (a), (b), and (c) plot the LHS of versions of equations (4), (6), and (7) (augmented by equation (8)) where all terms are put in the LHS. That is, a positive value in these panels indicates that the mathematical condition in the propositions holds: the proposed reform is welfare-improving. Panel (d) plots the solutions for the optimal corporate tax rate t^* in each case considered. Each point in the plots represents solutions for a particular (a_l, a_h) combination, where the optimal tax system is jointly determined with the re-calibration of $(\lambda_l, \lambda_h, \psi_l, \psi_h, \overline{k}_l, \overline{k}_h)$. The x-axis presents the grid of a_l, and the different lines represent solutions for different values of a_h, from $a_h = 0.15$ (lighter) to $a_h = 0.85$ (darker). The y-axis in Panels (a), (b), and (c) is a measure of the degree of slack (or lack of slack) of the condition pertaining to each proposition. In Panel (d), the y-axis measures the optimal tax rate in levels (i.e., taking values between 0 and 1).

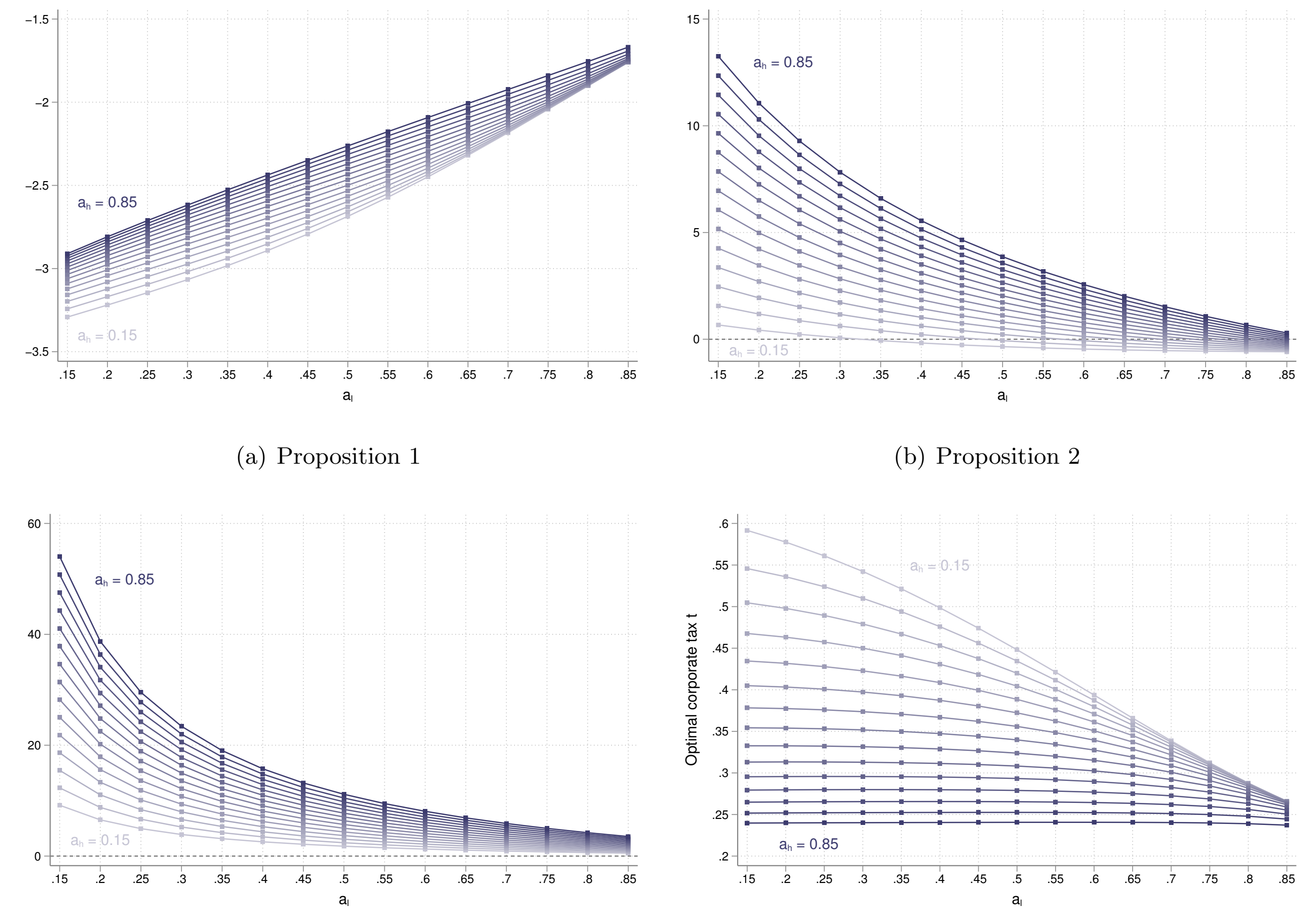
Panel (a) of Figure B.1 shows that, under this parametrization, it is never desirable to introduce a binding minimum wage when taxes are optimal and not reoptimized to accompany the minimum wage reform. That is, the condition for minimum wage desirability stated in Proposition 1 does not hold in this example when taxes are optimal. Because the distributional tradeoffs are already optimized using the tax system, the hypothetical benefit of the minimum wage is restricted to beneficial fiscal externalities. In this restricted model with little worker heterogeneity, the optimal ΔT^l is always positive (i.e., there is no EITC at the optimum), so both the employment and profit fiscal externalities are negative.[4] Then, the planner does not benefit from mechanically introducing a minimum wage under optimal taxes. Of course, if taxes are suboptimal, Proposition 1 still may hold depending on the underlying tax system.

[2] This number comes from combining a global capital to global output of 500% and a global capital share of 30%.

[3] The labor supply elasticity is given by $f_s(w^s - \Delta T^s)(w^s - \Delta T^s)/F_s(w^s - \Delta T^s)$. Then, λ_s solves $\lambda_s \exp(-\lambda_s(w^s - \Delta T^s))(w^s - \Delta T^s)/(1 - \exp(-\lambda_s(w^s - \Delta T^s))) = 0.5$.

[4] A standard condition for the EITC to be optimal in models with extensive margin responses is $g_1^l > 1$ (Saez, 2002; Piketty and Saez, 2013). Since WWs average to one at the optimum in these models, the condition is unlikely to hold with only two skill types unless non-welfarist assumptions on g_1^l are imposed.

Figure B.1: Numerical illustration of propositions 1, 2, and 3



(a) Proposition 1

(b) Proposition 2

(c) Proposition 3

(d) Optimal corporate tax, t^*

Notes: This figure plots simulations of modified versions of equations (4), (6), and (7) properly augmented by the industry-heterogeneity term described in equation (8), under the calibration scheme described in Section 2.3. Panel (a) concerns Proposition 1. Panel (b) concerns Proposition 2. Panel (c) concerns Proposition 3. In each panel, solutions are computed for different combinations of (a_l, a_h), with a_l varying in the horizontal axis and a_h being represented by different curves, with lighter colors representing smaller values. All simulations are done under the optimal tax system, which is numerically computed using results presented in Appendix A.1. Panel (d) plots the optimal corporate tax rate for each simulation.

Importantly, as the analysis above suggests, the costs of the reform decrease as capital intensity increases, as the optimal tax equilibrium is more distortionary when a_l and a_h are large.

Panels (b) and (c) of Figure B.1 give a different conclusion: re-optimization of the tax system after the introduction of the minimum wage enables the planner to exploit interactions between the policies so that they use the minimum wage to tax profits in the low-skill sector and alleviate corporate tax distortions in the high-skill sector. These panels show that carefully considering interactions among policies, in particular between the minimum wage and the corporate tax, can yield gains for the social planner.

Panel (b) of Figure B.1 shows the results for Proposition 2. Introducing a minimum wage is desirable except when the affected industry is very capital-intensive, especially when the unaffected industry is relatively more labor-intensive ($a_l > a_h$). Intuitively, because corporate tax distortions are increasing in capital intensity, t^* is *too high* in the capital-intensive sector and *too low* in the labor-intensive sector. When the high-skill sector is relatively more capital-intensive, the corporate tax cut that leaves the low-skill capitalist's welfare constant positively affects the high-skill sector by generating a behavioral effect that increases in a_h. This behavioral effect attenuates the mechanical loss in corporate tax revenue from introducing a minimum wage, and also generates a positive fiscal externality in high-skill labor income taxes because ΔT^h is positive and large. Therefore, the aggregate effects of the corporate tax cut are positive. Together with the positive fiscal externality driven by the increase in T_1, they make the reform desirable. On the contrary, when the high-skill sector is labor intensive, the corporate tax cut has little effect on its equilibrium, meaning that, if anything, the planner would benefit from increasing the corporate tax on the high-skill sector. Because of the higher equilibrium wages, the minimum wage does not contribute to that objective, so the positive effects of the corporate tax cut do not materialize. Two comments follow. First, the positive fiscal externality in terms of low-skill income taxes also decreases with the capital intensity of the low-skill sector since it is proportional to the low-skill employment level. Second, this result shows that the results in Lee and Saez (2012) are presumably overly restrictive since they only allow fiscal externalities regarding EITC savings. In this case, the multiple-sector economy paired with distortionary profit taxes allows for the possibility of revenue gains even if net taxes on low-skill workers are positive, as is the case in this numerical example.

The same logic holds and is intensified in Proposition 3 (Panel (c) of Figure B.1): in all (a_l, a_h) combinations, the introduction of a minimum wage paired with a corporate tax cut that leaves employment constant is desirable, and the net benefit is again increasing in the relative capital intensity of the high-skill sector. Part of the explanation is found in Panel (d) of Figure B.1: when the unaffected industry is very capital-intensive, the planner is restricted to implementing relatively low values of t^*. Lower taxes affect corporate tax revenue and the desired levels of profits in terms of optimal redistribution: low-skill profits are inefficiently large, while high-skill profits are inefficiently low. Then, allowing the planner to substitute corporate taxes with a minimum wage allows the planner to optimally affect low-skill profits without distorting the high-skill sector. Unsurprisingly, then, the conditions are relatively more favorable than in Proposition 2: the planner not only has potential benefits in terms of fiscal externalities, but it can also implement more preferred allocations that are infeasible in the absence of a minimum wage.

C Empirical appendix

This appendix provides more details on the empirical results presented in the main text.

Events. Following Cengiz et al. (2019, 2022), a state-by-year minimum wage is defined as the maximum between the statutory values of the federal and state minimum wages throughout the calendar year. Nominal values are transformed to 2016 dollars using the R-CPI-U-RS index including all items. An event is defined as a state-level hourly minimum wage increase above the federal minimum wage of at least \$0.25 (in 2016 dollars) in a state with at least 2% of the employed population affected, where the affected population is computed using the NBER Merged Outgoing Rotation Group of the CPS (henceforth, CPS-MORG). This is done by computing employment counts by wage bins and checking whether, on average, the previous year's share of workers with wages below the new minimum wage is above 2%. I also restrict the attention to minimum wage events where treated states do not experience other events in the three years previous to the event and whose timing allows me to observe the outcomes from three years before to four years after. This results in 50 valid state-level events, whose time distribution is plotted in Figure C.1. Table C.1 displays the list of the considered events with their corresponding treated states.

Small state-level or binding federal minimum wage increases are not recorded as events, however, regressions control for small state-level and federal minimum wage increases. Following Cengiz et al. (2019, 2022), controls for small state-level and binding federal minimum wage increases are included as follows. Let $\hat{t}$ be the year in which the small state-level or binding federal minimum wage increase takes place. Then, define $Early_t = 1\{t \in \{\hat{t}-3, \hat{t}-2\}\}$, $Pre_t = 1\{t = \hat{t}-1\}$ and $Post_t = 1\{t \in \{\hat{t}, \hat{t}+1, \hat{t}+2, \hat{t}+3, \hat{t}+4\}\}$, and let $Small_i$ and Fed_i be indicators of states that face small state-level and binding federal minimum wage increases, respectively. Then X_{it} in regressions (19) and (20) includes all the interactions between $\{Early_t, Pre_t, Post_t\} \times \{Small_i, Fed_i\}$ for each event separately. Regressions that control for additional tax reforms follow an equivalent strategy. I use tax reform data from Robinson and Tazhitdinova (2025) and include in X_{it} all the interactions between $\{Early_t,\ Pre_t,\ Post_t\} \times \{TopMTR\_Up_i,$ $TopMTR\_Down_i,\ CorpTax\_Up_i,\ CorpTax\_Down_i,\ EITC\_Up_i,\ EITC\_Down_i,\ SalesTax\_Up_i,\ SalesTax\_Down_i\}$, where $TopMTR$ is the top marginal personal income tax rate, $CorpTax$ is the top marginal corporate income tax rate (usually linear), $EITC$ is the state-level EITC as a share of the federal ETIC (in percent), and $SalesTax$ is the sales tax rate. In these variables, Up means indicators of tax increases and $Down$ means indicators of tax cuts.

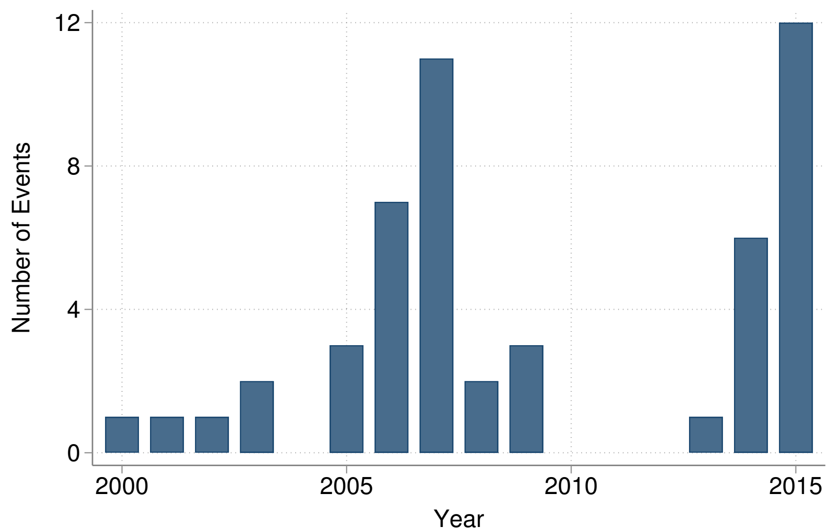
Data. I use the CPS-MORG data to compute average pre-tax hourly wages and the Basic CPS monthly files to compute employment rates, average weekly hours, and participation rates at the state-by-year-by-skill level. Low-skill (high-skill) workers are defined as not having (having) a college degree. Hourly wages are either directly reported or indirectly computed by dividing reported weekly earnings by weekly hours worked. I drop individuals aged 15 or less, self-employed individuals, and veterans. Nominal wages are transformed to 2016 dollars using the R-CPI-U-RS index including all items. Observations whose hourly wage is computed using imputed data (on wages, earnings, and/or hours) are excluded to minimize the scope for measurement error. To avoid distorting low-skill workers' statistics with non-affected individuals at the top of the wage distribution, I restrict the low-skill workers' sample to workers that are either out of the labor force, unemployed, or in the bottom half of the wage distribution when employed. I test how results change when considering different wage percentile thresholds.

Regarding fiscal variables at the state-by-year level, I use data from the Bureau of Economic Analysis (BEA) regional accounts. I consider income maintenance benefits, medical benefits, and gross federal income tax liabilities. The BEA definition of income maintenance benefits is as follows: "Income maintenance benefits consist largely of Supplemental Security Income (SSI) benefits, Earned Income Tax Credit (EITC), Additional Child Tax Credit, Supplemental Nutrition Assistance Program (SNAP) benefits, family assistance, and other income maintenance benefits, including general assistance." Medical benefits consider both Medicaid and Medicare programs.

For computing average profits per establishment at the industry-by-state-by-year level using state-level aggregates, I use the Gross Operating Surplus (GOS) estimates from the BEA regional accounts as a proxy of state-level aggregate profits and divide them by the average number of private establishments reported in the QCEW data files. The BEA definition of gross operating surplus is as follows: "Value derived as a residual for most industries after subtracting total intermediate inputs, compensation of employees, and taxes on production and imports less subsidies from total industry output. Gross operating surplus includes consumption of fixed capital (CFC), proprietors' income, corporate profits, and business current transfer payments (net)." Nominal profits are transformed to 2016 dollars using the R-CPI-U-RS index including all items. I consider 25 industries that have a relatively large coverage across states and years (when an industry has low representation in a given state-year cell, the BEA and QCEW do not report aggregates for privacy reasons). Noting that minimum wage workers are not evenly distributed across industries, I group industries into two large groups: exposed and non-exposed industries. Exposed industries mainly include food and accommodation, retail trade, and low-skill health services. I exclude agriculture and mining. I also exclude construction and finance since they experienced particularly abnormal profit dynamics around the 2009 financial crisis. Manufacturing industries include nonmetallic mineral products, fabricated metal products, machinery, electrical equipment, food and beverages and tobacco, printing and related support activities, chemical manufacturing, and plastics and rubber products. Exposed services include retail trade, ambulatory health services, nursing and residential care facilities, food, accommodation, and social services and other services. Non-exposed services include wholesale trade, transport, information, real estate, professional services, management of businesses, administrative support, educational services, hospitals, arts, and recreation industries. While fiscal effects are proportional to the effect on profits, I also use data on taxes on production and imports net of subsidies reported on the BEA regional accounts at the industry-level, and data on business and dividend income reported in the state-level Statistics of Income (SOI) tables to test for additional fiscal externalities. Within-industry labor shares displayed in the descriptive statistics are computed using state-by-industry BEA data on GOS, taxes on production and imports net of subsidies, and compensation of employees. The standard computation is Labor Share = Compensation of employees / (GOS + taxes on production and imports net of subsidies + compensation of employees).

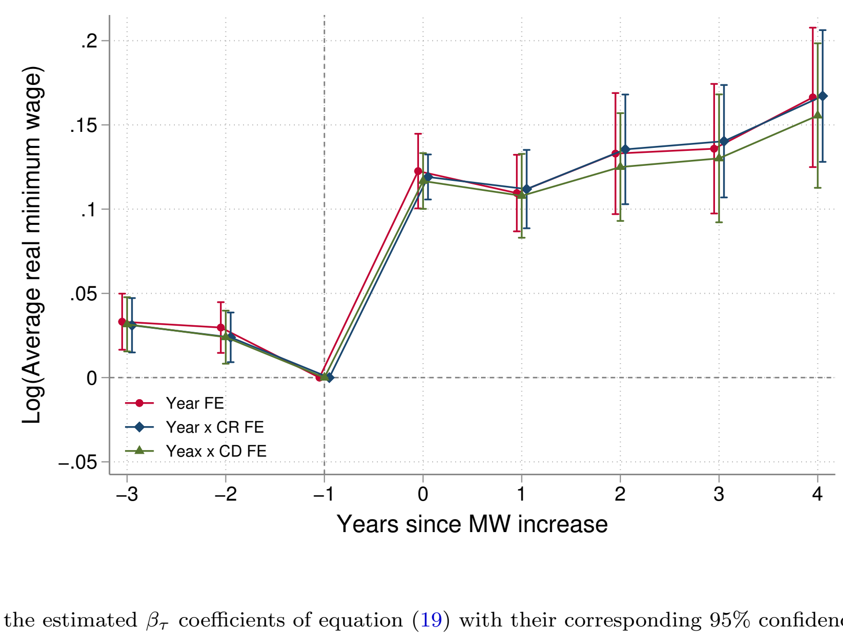
C.1 Additional figures and tables

Figure C.1: State-level events by year



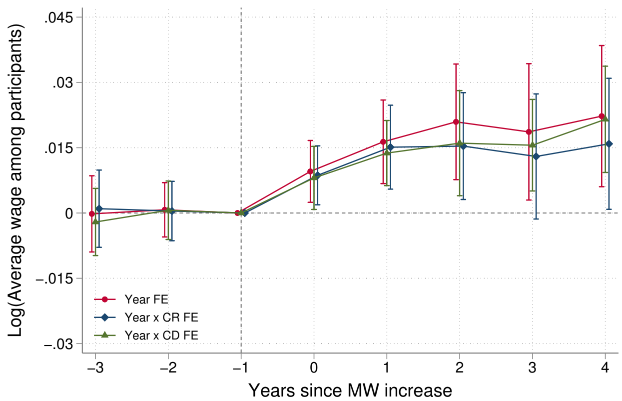
Notes: This figure plots the annual frequency of state-level minimum wage increases classified as events following Cengiz et al. (2019, 2022). Data on minimum wages is taken from Vaghul and Zipperer (2016). A state-level hourly minimum wage increase above the federal level is classified as an event if the increase is of at least \$0.25 (in 2016 dollars) in a state with at least 2% of the working population affected, where the affected population is computed using the NBER Merged Outgoing Rotation Group of the CPS, treated states do not experience other events in the three years previous to the event, and the event-timing allows to observe the outcomes from three years before to four years after.

Figure C.2: First stage: Real minimum wage increase after the event

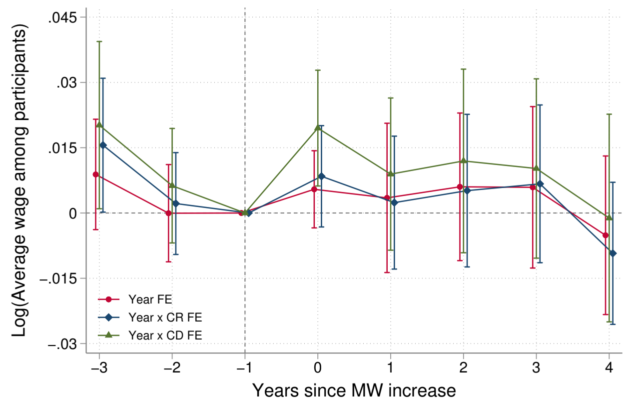


Notes: This figure plots the estimated β_τ coefficients of equation (19) with their corresponding 95% confidence intervals using the log real hourly minimum wage as the dependent variable. The analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population. The different series correspond to different time fixed effects. Red series use year fixed effects. Blue series use census region-by-year fixed effects. Green series use census division-by-year fixed effects.

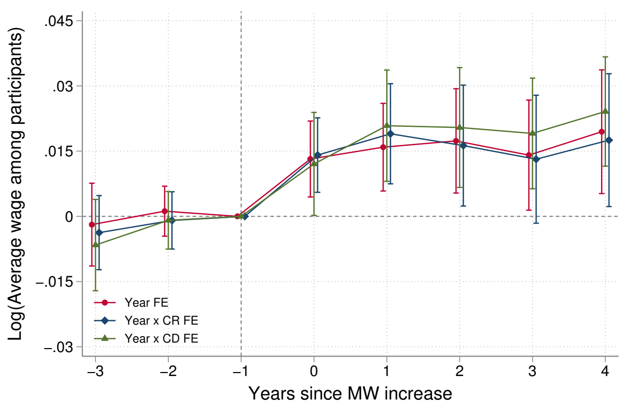
Figure C.3: Effects of state-level minimum wage reforms on average pre-tax wage including the unemployed, for low- and high-skill workers (different fixed effects)



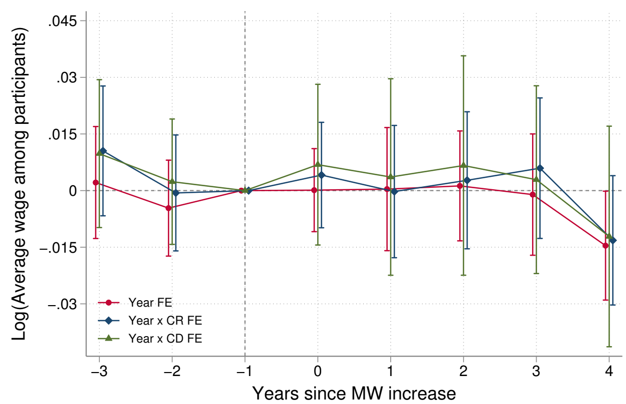
(a) Low-skill workers



(b) High-skill workers



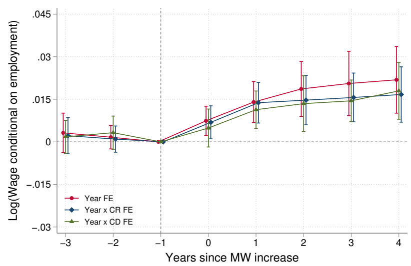
(c) Low-skill workers (including controls for tax reforms)



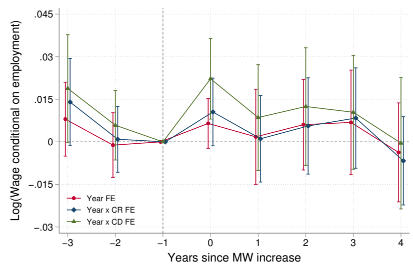
(d) High-skill workers (including controls for tax reforms)

Notes: These figures plot the estimated β_τ coefficients of equation (19) with their corresponding 95% confidence intervals. Panel (a) uses the log of the average pre-tax wage of active low-skill workers including the unemployed as the dependent variable. Panel (b) uses the log of the average pre-tax wage of active high-skill workers including the unemployed as the dependent variable. Panels (c) and (d) replicate the analysis including controls for state-level personal income taxes, corporate taxes, EITC, and sales taxes. The analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population. In each figure, the different series correspond to different time fixed effects. Red series use year fixed effects. Blue series use census region-by-year fixed effects. Green series use census division-by-year fixed effects.

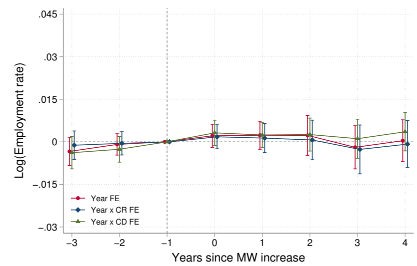
Figure C.4: Effects of state-level minimum wage reforms on low- and high-skill workers, different margins (wages, employment, hours, and participation)



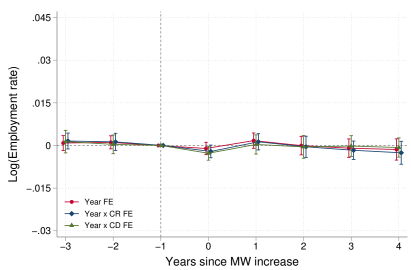
(a) Low-skill workers - Wage conditional on employment



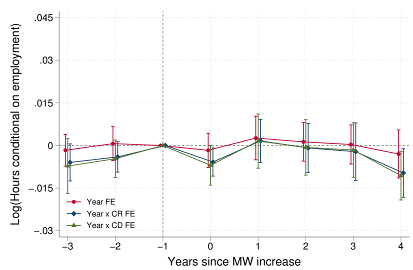
(b) High-skill workers - Wage conditional on employment



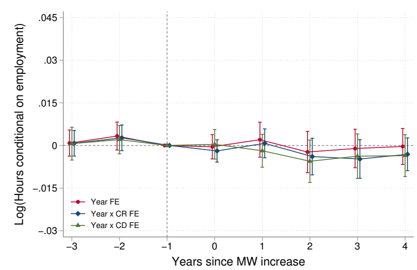
(c) Low-skill workers - Employment rate



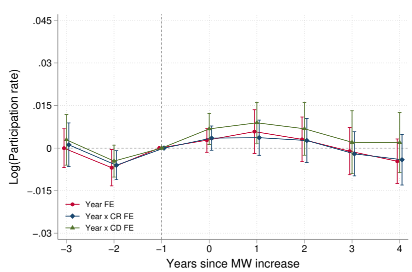
(d) High-skill workers - Employment rate



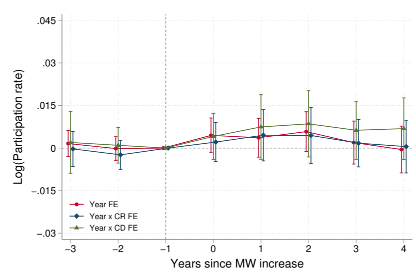
(e) Low-skill workers - Hours worked conditional on employment



(f) High-skill workers - Hours worked conditional on employment



(g) Low-skill workers - Participation rate

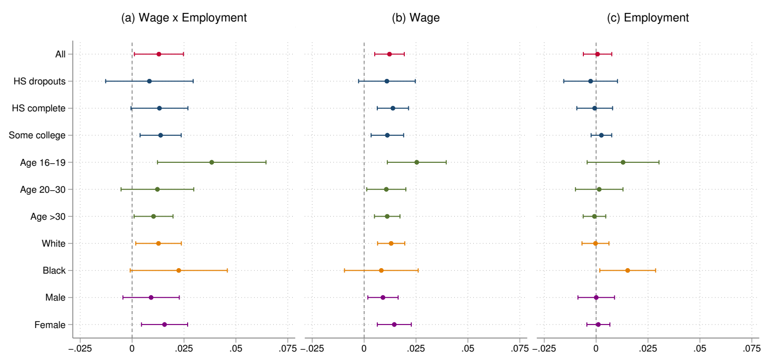


(h) High-skill workers - Participation rate

Notes: These figures plot the estimated β_τ coefficients of equation (19) with their corresponding 95% confidence intervals. Panels (a) and (b) use the log of the average pre-tax wage of workers conditional on employment as the dependent variable. Panels (c) and (d) use the log of the employment rate of workers as the dependent variable. Panels (e) and (f) use the log of the average weekly hours worked as the dependent variable. Panels (g) and (h) use the log of the participation rate of workers as the dependent variable. The analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population. In each figure, the different series correspond to different time fixed effects. Red series use year fixed effects. Blue series use census region-by-year fixed effects. Green series use census division-by-year fixed effects.

Figure C.5: Minimum wage effects on low-skill workers: Heterogeneity

(a) Year fixed effects

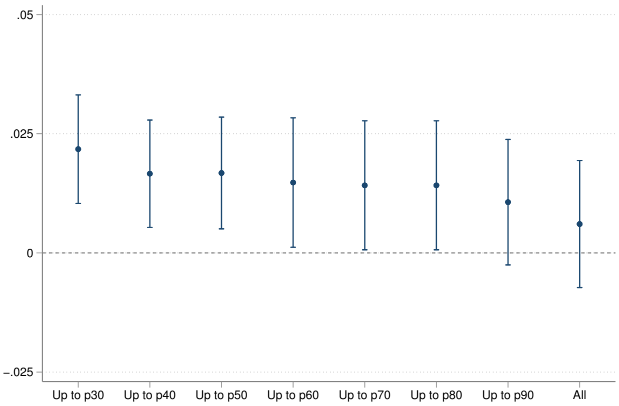


(b) Census region-by-year fixed effects

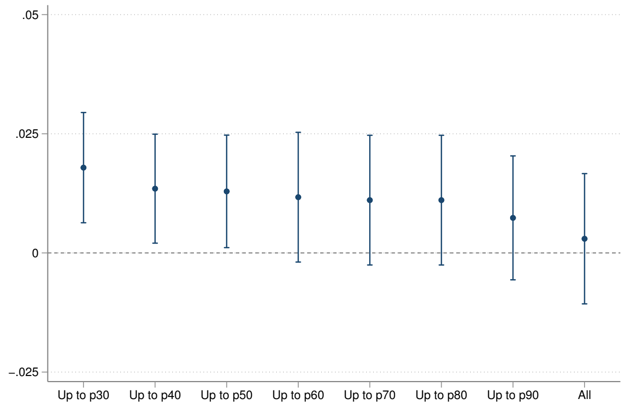
(c) Census division-by-year fixed effects

Notes: These figures plot the estimated β coefficient with its corresponding 95% confidence intervals from equation (20) for different groups of low-skill workers and different dependent variables. Panel (a) uses the average pre-tax wage of active low-skill workers including the unemployed as the dependent variable. Panel (b) uses the average pre-tax hourly wage of low-skill workers conditional on employment as the dependent variable. Panel (c) uses the average employment rate of low-skill workers as the dependent variable. Red coefficients reproduce the analysis with the complete sample. Blue coefficients split low-skill workers by education (high-school dropouts, high-school complete, and college incomplete). Green coefficients split low-skill workers by age (16-19, 20-30, and more than 30). Orange coefficients split low-skill workers by race (white and black). Purple coefficients split low-skill workers by sex (male and female). The analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population. Each panel corresponds to different time fixed effects. Panel (a) year fixed effects. Panel (b) uses census region-by-year fixed effects. Panel (c) uses census division-by-year fixed effects.

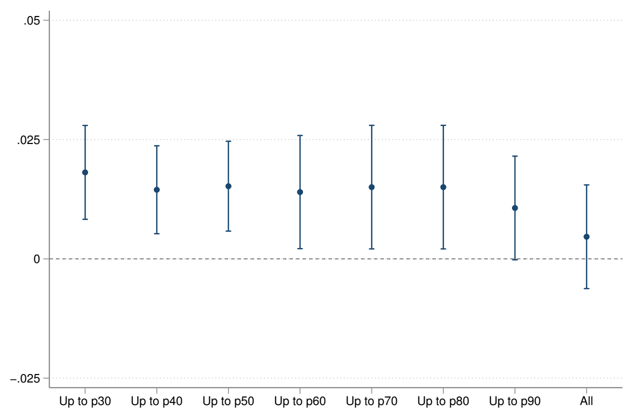
Figure C.6: Minimum wage effects on low-skill workers' average pre-tax wage including the unemployed: change in percentile considered



(a) Year fixed effects



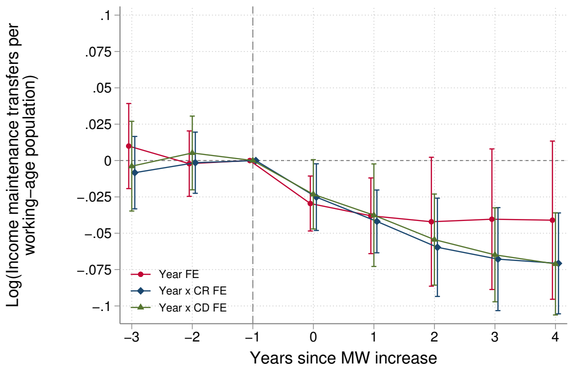
(b) Census region-by-year fixed effects



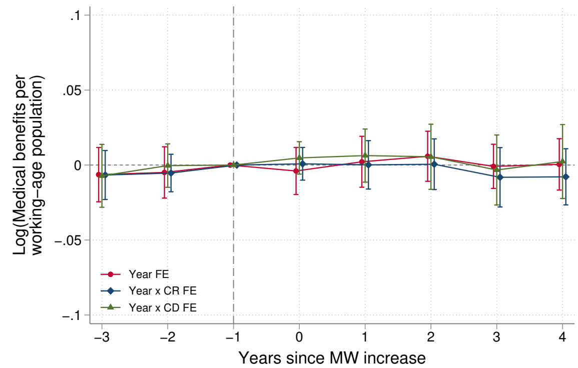
(c) Census division-by-year fixed effects

Notes: These figures plot the estimated β coefficient with its corresponding 95% confidence intervals from equation (20) using the average pre-tax wage of active low-skill workers including the unemployed as the dependent variable. Each coefficient comes from a different regression where the dependent variable is computed using different percentiles to truncate the sample of employed low-skill workers when computing the average wage. The analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population. Each panel corresponds to different time fixed effects. Panel (a) year fixed effects. Panel (b) uses census region-by-year fixed effects. Panel (c) uses census division-by-year fixed effects.

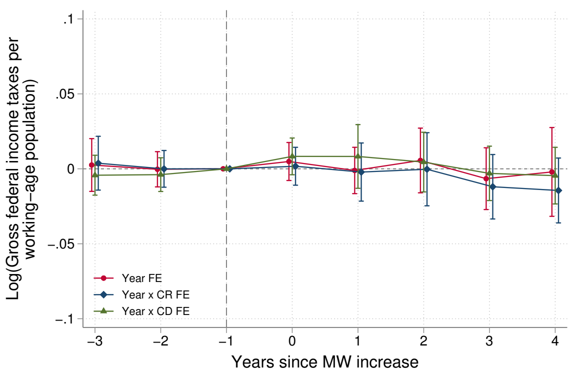
Figure C.7: Worker-level fiscal externalities after minimum wage increases



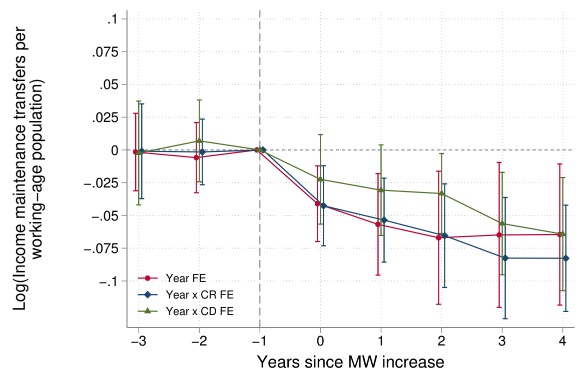
(a) Income maintenance benefits



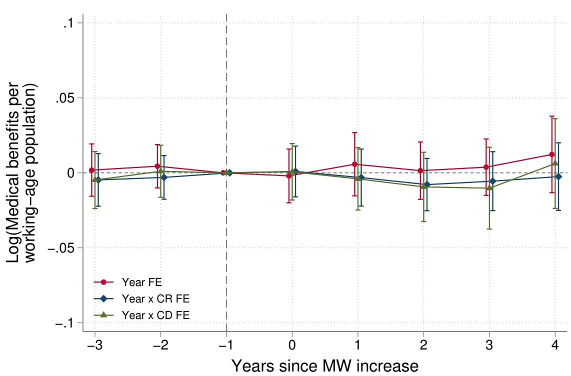
(b) Medical benefits



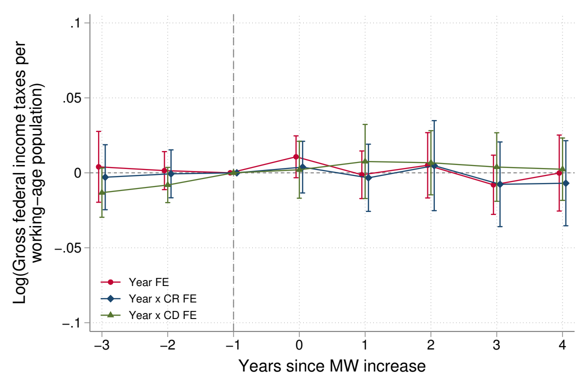
(c) Gross federal income taxes



(d) Income maintenance benefits (including controls for tax reforms)



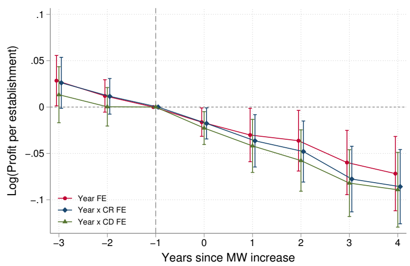
(e) Medical benefits (including controls for tax reforms)



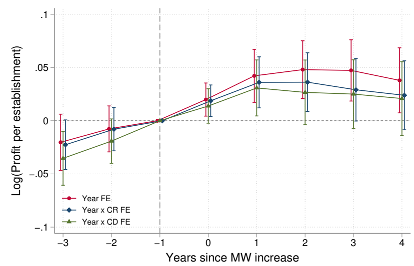
(f) Gross federal income taxes (including controls for tax reforms)

Notes: These figures plot the estimated β_τ coefficients of equation (19) with their corresponding 95% confidence intervals. Panel (a) uses the log income maintenance benefits per working-age population as the dependent variable. Panel (b) uses the log medical benefits per working-age population as the dependent variable. Panel (c) uses the log gross federal income taxes per working-age population as the dependent variable. Panels (d), (e) and (f) replicate the analysis including controls for state-level personal income taxes, corporate taxes, EITC, and sales taxes. The analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population. Exposed industries include food and accommodation, retail trade, and low-skill health services. In each figure, the different series correspond to different time fixed effects. Red series use year fixed effects. Blue series use census region-by-year fixed effects. Green series use census division-by-year fixed effects.

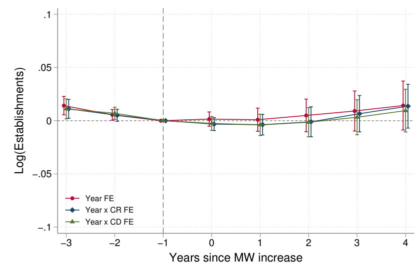
Figure C.8: Effects of state-level minimum wage reforms on profits and establishments



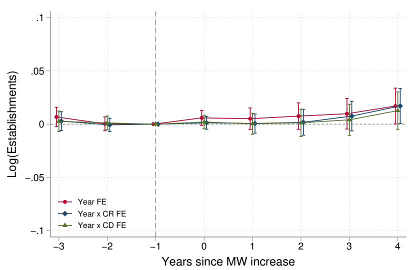
(a) Exposed industries - Profit per establishment



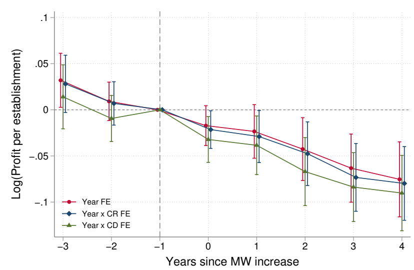
(b) Non-exposed industries - Profit per establishment



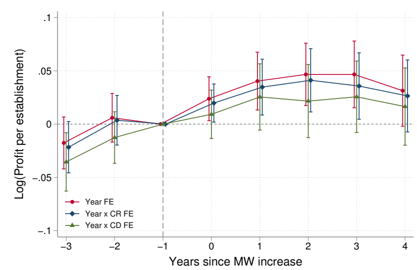
(c) Exposed industries - Establishments



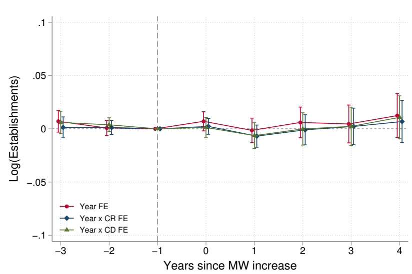
(d) Non-exposed industries - Establishments



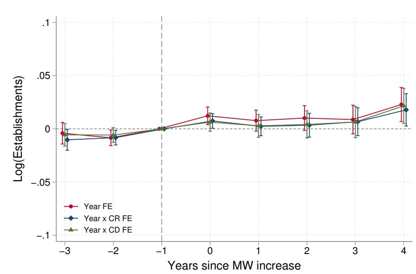
(e) Exposed industries - Profit per establishment (including controls for tax reforms)



(f) Non-exposed industries - Profit per establishment (including controls for tax reforms)



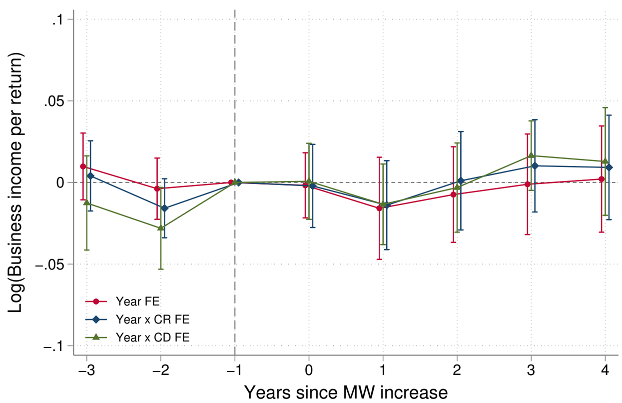
(g) Exposed industries - Establishments (including controls for tax reforms)



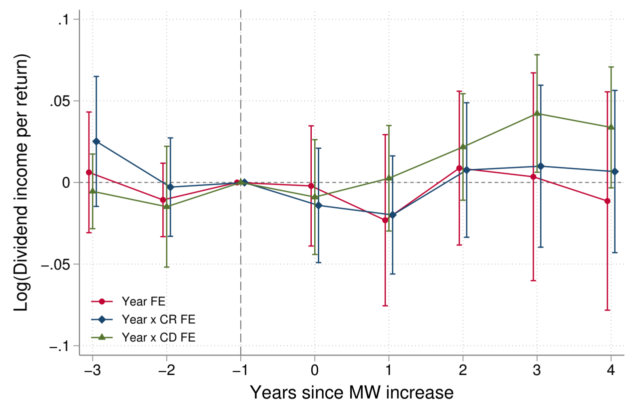
(h) Non-exposed industries - Establishments (including controls for tax reforms)

Notes: These figures plot the estimated β_τ coefficients of equation (19) with their corresponding 95% confidence intervals. Panel (a) uses the log profit per establishment in exposed industries as the dependent variable. Panel (b) uses the log profit per establishment in non-exposed industries as the dependent variable. Panel (c) uses the log of the number of establishments in exposed industries as the dependent variable. Panel (d) uses the log of the number of establishments in non-exposed industries as the dependent variable. Panels (e), (f), (g) and (h) replicate the analysis including controls for state-level personal income taxes, corporate taxes, EITC, and sales taxes. The analysis is at the state-by-industry-by-year level, standard errors are clustered at the state-by-industry level, and regressions are weighted by the average pre-event industry-by-state employment. Exposed industries include food and accommodation, retail trade, and low-skill health services. In each figure, the different series correspond to different time fixed effects. Red series use year fixed effects. Blue series use census region-by-year fixed effects. Green series use census division-by-year fixed effects.

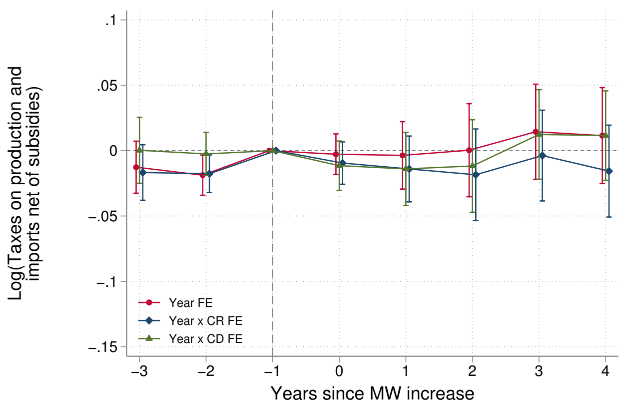
Figure C.9: Additional firm-level fiscal externalities



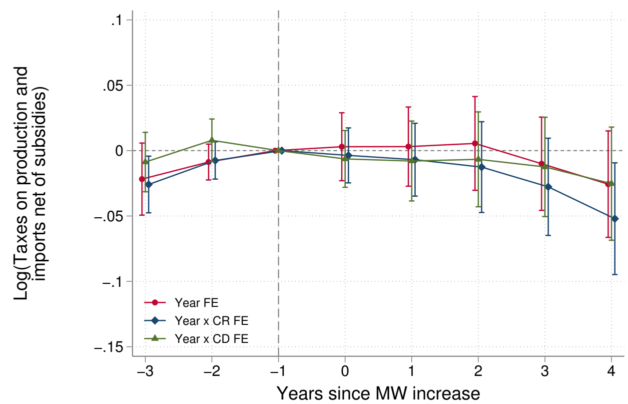
(a) Business income per tax return



(b) Dividend income per tax return



(c) Exposed industries - Taxes on production and imports net of subsidies



(d) Non-exposed industries - Taxes on production and imports net of subsidies

Notes: These figures plot the estimated β_τ coefficients of equation (19) with their corresponding 95% confidence intervals. Panel (a) uses the log business income per tax return as the dependent variable. Panel (b) uses the log dividend income per tax return as the dependent variable. Panel (c) uses the log taxes on production and imports net of subsidies in exposed industries as the dependent variable. Panel (d) uses the log taxes on production and imports net of subsidies in non-exposed industries as the dependent variable. In Panels (a) and (b), the analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population. In Panels (c) and (d), the analysis is at the state-by-industry-by-year level, standard errors are clustered at the state-by-industry level, and regressions are weighted by the average pre-period state-by-industry-by-year employment. Exposed industries include food and accommodation, retail trade, and low-skill health services. In each figure, the different series correspond to different time fixed effects. Red series use year fixed effects. Blue series use census region-by-year fixed effects. Green series use census division-by-year fixed effects.

Table C.1: List of Events

State	Events (year)	Total	State	Events (year)	Total
Alabama	-	0	Montana	2007	1
Alaska	2003, 2015	2	Nebraska	2015	1
Arizona	2007	1	Nevada	2006	1
Arkansas	2006, 2015	2	New Hampshire	-	0
California	2007, 2014	2	New Jersey	2006, 2014	2
Colorado	2007, 2015	2	New Mexico	2008	1
Connecticut	2009, 2015	2	New York	2005, 2013	2
Delaware	2000, 2007, 2014	3	North Carolina	2007	1
District of Columbia	2014	1	North Dakota	-	0
Florida	2005, 2009	2	Ohio	2007	1
Georgia	-	0	Oklahoma	-	0
Hawaii	2002, 2015	2	Oregon	2003	1
Idaho	-	0	Pennsylvania	2007	1
Illinois	2005	1	Rhode Island	2006, 2015	2
Indiana	-	0	South Carolina	-	0
Iowa	2008	1	South Dakota	2015	1
Kansas	-	0	Tennessee	-	0
Kentucky	-	0	Texas	-	0
Louisiana	-	0	Utah	-	0
Maine	-	0	Vermont	2009, 2015	2
Maryland	2015	1	Virginia	-	0
Massachusetts	2001, 2007, 2015	3	Washington	2007	1
Michigan	2006, 2014	2	West Virginia	2006, 2015	2
Minnesota	2014	1	Wisconsin	2006	1
Mississippi	-	0	Wyoming	-	0
Missouri	2007	1			

Notes: This table details the list of events considered in the event-studies. Data on minimum wages is taken from Vaghul and Zipperer (2016). A state-level hourly minimum wage increase above the federal level is classified as an event if the increase is of at least $0.25 (in 2016 dollars) in a state with at least 2% of the working population affected, where the affected population is computed using the NBER Merged Outgoing Rotation Group of the CPS, treated states do not experience other events in the three years previous to the event, and the event-timing allows to observe the outcomes from three years before to four years after.

Table C.2: Difference-in-difference results: Different margins for low- and high-skill workers

(a) Low-skill workers

	Wages			Employment			Hours			Participation		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\hat{\beta}$	0.014	0.012	0.011	0.002	0.001	0.005	0.000	-0.000	-0.000	0.003	0.002	0.006
	(0.003)	(0.004)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.005)
Year FE	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Year x CR FE	N	Y	N	N	Y	N	N	Y	N	N	Y	N
Year x CD FE	N	N	Y	N	N	Y	N	N	Y	N	N	Y
Obs.	10,300	10,300	9,653	10,300	10,300	9,653	10,300	10,300	9,653	10,300	10,300	9,653
Elasticity estimate:												
First stage ($\Delta \log \text{MW}$)	0.114	0.117	0.109	0.114	0.117	0.109	0.114	0.117	0.109	0.114	0.117	0.109
	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)
F-test	80.039	83.904	88.700	80.039	83.904	88.700	80.039	83.904	88.700	80.039	83.904	88.700
Second stage (elasticity)	0.126	0.104	0.096	0.022	0.006	0.043	0.000	-0.004	-0.002	0.029	0.020	0.053
	(0.027)	(0.023)	(0.028)	(0.030)	(0.029)	(0.024)	(0.021)	(0.025)	(0.031)	(0.027)	(0.029)	(0.046)

(b) High-skill workers

	Wages			Employment			Hours			Participation		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
$\hat{\beta}$	0.001	-0.001	0.003	-0.001	-0.002	-0.001	-0.002	-0.004	-0.004	0.003	0.003	0.006
	(0.007)	(0.006)	(0.008)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.004)
Year FE	Y	N	N	Y	N	N	Y	N	N	Y	N	N
Year x CR FE	N	Y	N	N	Y	N	N	Y	N	N	Y	N
Year x CD FE	N	N	Y	N	N	Y	N	N	Y	N	N	Y
Obs.	10,300	10,300	9,653	10,300	10,300	9,653	10,300	10,300	9,653	10,300	10,300	9,653
Elasticity estimate:												
First stage ($\Delta \log \text{MW}$)	0.114	0.117	0.109	0.114	0.117	0.109	0.114	0.117	0.109	0.114	0.117	0.109
	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)	(0.013)	(0.013)	(0.012)
F-test	80.039	83.904	88.700	80.039	83.904	88.700	80.039	83.904	88.700	80.039	83.904	88.700
Second stage (elasticity)	0.012	-0.008	0.028	-0.009	-0.018	-0.013	-0.015	-0.031	-0.032	0.023	0.029	0.051
	(0.059)	(0.049)	(0.074)	(0.012)	(0.011)	(0.012)	(0.019)	(0.017)	(0.023)	(0.028)	(0.030)	(0.042)

Notes: This table shows the estimated β coefficient from equation (20) with corresponding standard errors reported in parentheses. All columns represent different regressions using different dependent variables (all in logarithms) and fixed effects. Panel (a) considers variables computed for low-skill workers, who are defined as workers without a college degree, while Panel (b) considers variables computed for high-skill workers. Within each panel, regressions are as follows. Columns (1) to (3) use the average wage conditional on employment as the dependent variable. Columns (4) to (6) use the employment rate as the dependent variable. Columns (7) to (9) use the average weekly hours worked conditional on employment as the dependent variable. Columns (10) to (12) use the labor force participation rate as a dependent variable. Year FE means that the regression includes year-by-event fixed effects. Year x CR FE means that the regression includes census region-by-year-by-event fixed effects. Year x CD FE means that the regression includes census division-by-year-by-event fixed effects. $\Delta \log \text{MW}$ is the average change in the log of the real state-level minimum wage across events as estimated from an analog of equation (20) that uses $\log \text{MW}_{ite}$ as the dependent variable. The implied elasticity is computed by dividing the point estimate by $\Delta \log \text{MW}$, which corresponds to the second stage of the instrumental variables estimation. The analysis is at the state-by-year level, standard errors are clustered at the state level, and regressions are weighted by state-by-year average population. Outcome variables are computed using data from the CPS (MORG and Basic Monthly files).

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