Minimum Wages and Optimal Redistribution in the Presence of Taxes and Transfers

Online Appendix

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A Additional theoretical results

Firm's problem The first-order conditions of a firm of type ψ are given by

$$w^s : \qquad (\psi \cdot \phi_s - w^s) \cdot \tilde{q}^s_w = \tilde{q}^s, \tag{A.I}$$

$$v^s : \qquad (\psi \cdot \phi_s - w^s) \cdot \tilde{q}^s = \eta^s_v, \tag{A.II}$$

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 $\psi \cdot \phi_s > w^s$. Also, combining both FOCs yields $\tilde{q}^{s2} = \eta^s_v \cdot \tilde{q}^s_w$. Differentiating and rearranging terms yields

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

provided $\tilde{q}^s_{ww} < 0$.[2] Moreover, differentiating (A.II) yields

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

Note that

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

where j is the other skill-type. Replacing (A.I) and (A.V) in (A.IV), yields

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

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

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

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 $\mathcal{M}(L, V) = L^\delta V^{1-\delta}$, $\mathrm{sgn}\,[\tilde{q}_{ww}] = \mathrm{sgn}\left[\frac{-(1-T'(w))^2}{1-\delta} - T''(w)\right]$, so the condition holds as long as the tax system is not too concave. In any case, 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 the concavity and constant returns to scale of the matching function. To see why $\partial^2\theta/\partial w^2 > 0$, recall that $dU = p_\theta \cdot d\theta_m \cdot (w_m - T(w_m) - y_0) + p_m \cdot (1 - T'(w)) \cdot dw_m$. Setting $dU = 0$ and differentiating again yields

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

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

Setting $d\psi = 0$ and rearranging terms gives

$$\frac{dv^s}{dv^j} = \left[\phi_{sj} \cdot \left(\tilde{q}_w^j \cdot \frac{dw^j}{dv^j} \cdot v^j + \tilde{q}^j\right)\right]^{-1} \cdot \left[\frac{\eta_{vv}^s}{\psi \cdot \tilde{q}^s} - \phi_{ss} \cdot \left(\tilde{q}_w^s \cdot \frac{dw^s}{dv^s} \cdot v^s + \tilde{q}^s\right)\right], \tag{A.VII}$$

which, given (A.III), implies that $\operatorname{sgn}(dv^s/dv^j) = \operatorname{sgn}\phi_{sj}$. Also, departing from (A.VI), I can write

$$\begin{aligned}\frac{dw^s}{d\psi} = \phi_s \cdot \Bigg[\frac{\eta_{vv}^s}{\tilde{q}^s} \cdot \frac{dv^s}{dw^s} - \psi \cdot \Bigg(\phi_{ss} \cdot \left(\tilde{q}^s \cdot v^s + \tilde{q}^s \cdot \frac{dv^s}{dw^s}\right) + \\ \phi_{sj} \cdot \frac{dv^j}{dv^s} \cdot \frac{dv^s}{dw^s} \cdot \left(\tilde{q}_w^j \cdot \frac{dw^j}{dv^j} \cdot v^j + \tilde{q}^j\right)\Bigg)\Bigg]^{-1}.\end{aligned} \tag{A.VIII}$$

Note that $dw^s/d\psi$ is positive provided the cross effects do not dominate.

Firms' responses to changes in the minimum wage To see the effect of the minimum wage on firms' decisions, note that the four first order conditions (equations (A.I) and (A.II) for $s = \{l, h\}$) hold for firms that are not constrained by the minimum wage, while (A.I) no longer holds for firms that are constrained by the minimum wage. 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 four 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 that $w_m^l = \overline{w}$, 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.

In both cases, it is easier to work with equation (A.II) for $s = l$. For an unconstrained firm, totally differentiating the first order condition and setting $d\psi = 0$ yields

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

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

$$\begin{aligned}&dw^l \cdot \left[\frac{dv^l}{dw^l} \cdot \left(\eta_{vv}^l - \psi \cdot \phi_{ll} \cdot q^{l2} - \psi \cdot \phi_{lh} \cdot q^h \cdot q^l \cdot \frac{dv^h}{dv^l}\right) + q^l\right] \\ &= d\theta^l \cdot q_\theta^l \cdot \left[(\psi \cdot \phi_l - w^l) + \psi \cdot \phi_{ll} \cdot v^l \cdot q^l\right] + d\theta^h \cdot q_\theta^h \cdot \phi_{lh} \cdot q^l.\end{aligned} \tag{A.IX}$$

Note that the sign and magnitude of $dw^l/d\overline{w}$ is ambiguous but is likely to be non-zero since it depends 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.

On the other hand, for a constrained firm, totally differentiating the first order condition and setting

$d\psi = 0$ yields

$$\left(\psi \cdot \left[\phi_{ll} \cdot \left(q^l_\theta \cdot d\theta^l \cdot v^l + q^l \cdot dv^l\right) + \phi_{lh} \cdot \left(q^h_\theta \cdot d\theta^h \cdot v^h + q^h \cdot dv^h\right)\right] - d\overline{w}\right) \cdot q^l$$
$$+(\psi \cdot \phi_l - \overline{w}) \cdot q^l_\theta \cdot d\theta^l \quad = \quad \eta^l_{vv} \cdot dv^l,$$

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

$$\frac{dv^l}{d\overline{w}} \cdot \left(\eta^l_{vv} - \psi \cdot \phi_{ll} \cdot q^{l2} - \psi \cdot \phi_{lh} \cdot q^h \cdot q^l \cdot \frac{dv^h}{dv^l}\right) \quad = \quad \frac{d\theta^l}{d\overline{w}} \cdot q^l_\theta \cdot \left[(\psi \cdot \phi_l - \overline{w}) + \psi \cdot \phi_{ll} \cdot v^l \cdot q^l\right]$$
$$+\frac{d\theta^h}{d\overline{w}} \cdot q^h_\theta \cdot \phi_{lh} \cdot q^l - q^l. \tag{A.X}$$

Again, the sign is ambiguous but depends on the reaction on equilibrium sub-market tightness. However, note that the first-order effect is decreasing in productivity, since $(\psi \cdot \phi_l - \overline{w}) \to 0$ 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 close.

Finally, to see the effect of the minimum wage on profits, we can use the envelope theorem and conclude that the total effect is equal to the partial effect ignoring general equilibrium changes. For an unconstrained firm, the first-order effects on profits of changes in the minimum wage are negligible. For constrained firms there is an increase in labor costs and a mechanic increase in job-filling probabilities. Formally

$$\frac{d\Pi(\psi)}{d\overline{w}} = \frac{\partial\Pi(\psi)}{\partial\overline{w}} = q^l_\theta \cdot \frac{\partial\theta^l}{\partial w^l} \cdot v^l \cdot (\psi \cdot \phi_l - \overline{w}) - v^l \cdot q^l. \tag{A.XI}$$

This effect is negative given that the first-order condition with respect to low-skill wages holds with inequality and is stronger for less productive firms.

Employment effects and workers' welfare For simplicity, assume away taxes. Recall that, in equilibrium, $U^s = p^s_m \cdot w^s_m$. Multiplying by L^s_m at both sides and integrating over m yields $L^s_A \cdot U^s = \int E^s_m w^s_m dm$, where $E^s_m = L^s_m \cdot p^s_m$ is the mass of employed workers of skill s in sub-market m. Differentiating gives

$$\frac{dU^s}{d\overline{w}} \cdot (L^s_A + U^s \cdot \alpha_s \cdot f_s(U^s)) \quad = \quad \int \left(\frac{dE^s_m}{d\overline{w}} \cdot w^s_m + E_m \cdot \frac{dw^s_m}{d\overline{w}}\right) dm, \tag{A.XII}$$

where I used $L^s_A = \alpha_s \cdot F_s(U^s)$. The left-hand side is the welfare effect on workers times a positive expression. Then, the right-hand side can be used to calculate the wage-weighted disemployment effects, $\int (dE^s_m/d\overline{w}) w^s_m dm$, that can be tolerated for the minimum wage to still increase aggregate welfare for workers given positive wage effects. Note that if both employment and wage effects are positive, the welfare effect on workers has to be positive (possibly attenuated by a participation response).

Average welfare weight of capitalists under optimal taxes Consider (B.IX). The FOC w.r.t. t is given by

$$\begin{aligned}\frac{\partial\mathcal{L}}{\partial t} &= \frac{\partial K_I}{\partial t}\cdot G(y_0) - K\cdot\frac{\partial\psi^*}{\partial t}\cdot G(y_0)\cdot o(\psi^*) - K\cdot\int_{\psi^*}^{\overline{\psi}} G'((1-t)\Pi(\psi)-\xi)\Pi(\psi)dO(\psi) \\ &\quad +\gamma\cdot K\cdot\int_{\psi^*}^{\overline{\psi}}\Pi(\psi)dO(\psi) - t\cdot K\cdot\frac{\partial\psi^*}{\partial t}\cdot\Pi(\psi^*)\cdot o(\psi^*) - y_0\cdot\frac{\partial K_I}{\partial t} = 0. \qquad \text{(A.XIII)}\end{aligned}$$

The first two terms cancel out. Then, the expression can be rewritten as

$$\gamma\cdot K\cdot\int_{\psi^*}^{\overline{\psi}}(1-g_\psi)\,\Pi(\psi)dO(\psi) = \frac{\partial K_I}{\partial t}\left(t\Pi(\psi^*)+y_0\right). \qquad \text{(A.XIV)}$$

The right-hand-side is negative, which implies that

$$\int_{\psi^*}^{\overline{\psi}} g_\psi\omega_\psi dO(\psi) < 1, \qquad \text{(A.XV)}$$

where $\omega_\psi = \Pi(\psi)/\int_{\psi^*}^{\overline{\psi}}\Pi(\psi)dO(\psi)$ is a profit-based weight.

Additional discussion on the limitations of the model I briefly discuss the implications of abstracting from dynamics, intensive margin responses, capital in the production function, and informal labor markets.

Dynamics: The model is static. The implications of this assumption for the optimal policy analysis are, in principle, ambiguous. Dube et al. (2016) and Gittings and Schmutte (2016) show that minimum wage shocks decrease employment flows –separation, hires, and turnover rates– while keeping the employment stock constant, thus increasing job stability. In the presence of labor market frictions, this induces a dynamic efficiency gain from minimum wage increases that is not captured by the model. On the other hand, Sorkin (2015), Aaronson et al. (2018), and Hurst et al. (2022) argue that the long-run employment distortions of minimum wage shocks are larger than the short-run responses, thus reducing the attractiveness of the minimum wage policy. This is driven by long-run capital substitution that is also absent from the model (see below).

Intensive margin responses: The model assumes segmented labor markets. This assumption implies that the model abstracts from intensive margin responses (Saez, 2002). For example, increasing the minimum wage could induce high-skill workers to apply to low-skill vacancies. To the extent that these responses are empirically relevant, this is a caveat of the policy analysis. Note that this is different from changes in demand for skills, as suggested by Butschek (2022) and Clemens et al. (2021). The model can rationalize this by changes in the skill composition of posted vacancies mediated by ϕ. Intensive margin responses could also affect incentives conditional on labor market segmentation. For example, workers may want to work more hours if the after-tax wage increases. This mechanism is muted in the model, mainly motivated by the fact that at the bottom of the wage distribution extensive margin responses tend to play a more important role to understand workers behavior. The empirical analysis finds no effect on hours worked conditional on employment, providing empirical support to the assumption.

Capital in the production function: The production function is only a function of labor. However, firms may also use capital. This is a caveat of the policy analysis since minimum-wages could in principle induce capital-labor substitution in the long-run (Sorkin, 2015; Hurst et al., 2022). However, Harasztosi and Lindner (2019) finds that firms that pay the minimum wage are usually labor intensive, which is consistent with the estimated heterogeneities in the estimated profit elasticities. Therefore, even if capital-labor substitution is substantive, it is unlikely to have a meaningful impact on aggregate outcomes. This point is also related to the discussion on the labor market effects of automation (e.g., Autor, 2015; Acemoglu and Restrepo, 2019) since minimum wage shocks could accelerate labor-saving automation. While evidence in this regard is scarce, Ashenfelter and Jurajda (2022) study of McDonald's restaurants suggests that minimum wage shocks have not accelerated the automation process. They show that the differential adoption of touch screen ordering technology across franchises is not correlated with local minimum wage increases.

Informality: In some contexts, the interaction between the minimum wage and the degree of formality of the labor market may be a first order consideration. In the model, the costs of participating in the labor market, which are not taxed, may rationalize heterogeneity in outside options, including informal labor market opportunities. However, changing the characteristics of the formal sector may affect both the supply and demand for formal jobs. For detailed analyses, see Bosch and Manacorda (2010), Meghir et al. (2015), Pérez (2020), and Haanwinckel and Soares (2021).

Additional discussion on the empirical effects of minimum wages I briefly discuss the price and productivity effects found in the empirical literature and its implications from abstracting from them in the optimal policy analysis.

Price effects: The model assumes that output prices are fixed, ruling out price increases driven by minimum wage shocks. However, the empirical literature finds substantial passthrough to prices (Allegretto and Reich, 2018; Harasztosi and Lindner, 2019; Renkin et al., 2020; Ashenfelter and Jurajda, 2022; Leung, 2021). Modeling price increases after minimum wage shocks in the presence of limited employment effects is challenging: if employment does not fall and demand curves are downward sloping, prices should decrease rather than increase. Bhaskar and To (1999) and Sorkin (2015) try to formally reconcile limited employment effects with price increases. Price effects matter for welfare since they can erode nominal minimum wage increases. Also, the unemployed and non-employed households can be made worse off given the absence of nominal improvements (MaCurdy, 2015). The distributional effect depends on which consumers buy the goods produced by firms that pay the minimum wage, and the relative importance of these goods in consumption bundles. It also depends on the share of minimum wage workers since it affects the mapping from product-level prices to economy-level price indexes.

While more research is needed to assess the distributional impacts of the price effects, the available evidence suggests that they are unlikely to play a big role in the aggregate distributional analysis. Minimum wage workers represent a small share of the aggregate labor market, so it is unlikely that a small share of price increases can have substantial effects on aggregate price indexes. Also, Harasztosi and Lindner (2019) show that the goods produced by firms that pay the minimum wage are evenly consumed across the income distribution, which neutralizes the potential unintended consequences through redistribution from high-income consumers to low-skill workers. Ashenfelter and Jurajda (2022) analyze McDonald's restaurants responses to local minimum wage shocks and show that the elasticity of the number of Big Mac's that can be purchased by minimum wage workers is around 80% of the own-wage elasticity, meaning that even if workers spend all their money in Big Mac's, their real wage increases are still sizable. Renkin et al. (2020) also suggest that the price effects do not neutralize the redistributive potential of the minimum wage, arguing that: "the rise in grocery store prices following a \$1 minimum wage increase reduces real income by about \$19 a year for households earning less than \$10,000 a year. (...). The price increases in grocery stores offset only a relatively small part of the gains of minimum wage hikes. Minimum wage policies thus remain a redistributive tool even after accounting for price effects in grocery stores." Based on these pieces of evidence, I conjecture that ignoring price effects is unlikely to dramatically affect the conclusions of the policy analysis.

Productivity effects: The model assumes that technology and labor productivity are independent from the minimum wage. This abstracts from recent literature that finds that minimum wages can increase both workers' (Ku, 2022; Coviello et al., 2021; Ruffini, 2021) and firms' (Riley and Bondibene, 2017; Mayneris et al., 2018) productivities. Potential mechanisms include efficiency wages (Shapiro and Stiglitz, 1984) and effects on investment in training (Acemoglu and Pischke, 1999). Harasztosi and Lindner (2019) argue that it is unlikely that productivity increases play a major role at the firm level as it would contradict the heterogeneous employment effects found between tradable and non-tradable sectors. If these effects are substantial, abstracting from these worker- and firm-specific increases in productivity after minimum wage hikes is likely to make the case for a positive minimum wage conservative. Note, however, that the model can accommodate aggregate increases in productivity through reallocation effects, as in Dustmann et al. (2022). Importantly, the main policy results depend on reduced-form profit elasticities that are robust to productivity increases.

B Proofs

Proof of Proposition I In the absence of taxes, there is no budget constraint and the social welfare function is given by

$$
\begin{aligned}
SW(\overline{w}) &= \left(L_I^l + L_I^h + K_I\right) \cdot G(0) + \alpha_l \cdot \int_0^{U^l} G(U^l - c) dF_l(c) \\
&\quad + \alpha_h \cdot \int_0^{U^h} G(U^h - c) dF_h(c) + K \cdot \int_{\psi^*}^{\overline{\psi}} G\left(\Pi(\psi) - \xi\right) dO(\psi). \qquad \text{(B.I)}
\end{aligned}
$$

Replacing $L_I^l + L_I^h = 1 - L_A^l - L_A^h$, the total derivative with respect to the minimum wage is given by

$$
\begin{aligned}
\frac{dSW}{d\overline{w}} &= \left(\frac{dK_I}{d\overline{w}} - \frac{dL_A^l}{d\overline{w}} - \frac{dL_A^h}{d\overline{w}}\right) \cdot G(0) \\
&\quad + \alpha_l \cdot G(0) \cdot f_l(U^l) \cdot \frac{dU^l}{d\overline{w}} + \alpha_l \cdot \frac{dU^l}{d\overline{w}} \cdot \int_0^{U^l} G'(U^l - c) dF_l(c) \\
&\quad + \alpha_h \cdot G(0) \cdot f_h(U^h) \cdot \frac{dU^h}{d\overline{w}} + \alpha_h \cdot \frac{dU^h}{d\overline{w}} \cdot \int_0^{U^h} G'(U^h - c) dF_h(c) \\
&\quad + K \cdot \left(\int_{\psi^*}^{\overline{\psi}} G'(\Pi(\psi) - \xi) \frac{d\Pi(\psi)}{d\overline{w}} dO(\psi) - \frac{d\psi^*}{d\overline{w}} \cdot G(0) \cdot o(\psi^*)\right). \qquad \text{(B.II)}
\end{aligned}
$$

Note that $dL_A^s/d\overline{w} = d(\alpha_s \cdot F_s(U^s))/d\overline{w} = \alpha_s \cdot f_s(U^s) \cdot (dU^s/d\overline{w})$, for $s \in \{l, h\}$, and that $dK_I/d\overline{w} = d(K \cdot O(\psi^*))/d\overline{w} = K \cdot o(\psi^*) \cdot (d\psi^*/d\overline{w})$. Then, (B.II) is reduced to

$$
\begin{aligned}
\frac{dSW}{d\overline{w}} &= \alpha_s \cdot \frac{dU^l}{d\overline{w}} \cdot \int_0^{U^l} G'(U^l - c) dF_l(c) + \alpha_h \cdot \frac{dU^h}{d\overline{w}} \cdot \int_0^{U^h} G'(U^h - c) dF_h(c) \\
&\quad + K \cdot \int_{\psi^*}^{\overline{\psi}} G'(\Pi(\psi) - \xi) \frac{d\Pi(\psi)}{d\overline{w}} dO(\psi). \qquad \text{(B.III)}
\end{aligned}
$$

Using the marginal welfare weights definitions, (B.III) is reduced to

$$
\frac{dSW}{d\overline{w}} = \gamma \cdot \left(\frac{dU^l}{d\overline{w}} \cdot L_A^l \cdot g_1^l + \frac{dU^h}{d\overline{w}} \cdot L_A^h \cdot g_1^h + K \cdot \int_{\psi^*}^{\overline{\psi}} g_\psi \frac{d\Pi(\psi)}{d\overline{w}} dO(\psi)\right). \quad \square \qquad \text{(B.IV)}
$$

Proof of Proposition II The Lagrangian is given by

$$\begin{aligned}\mathcal{L}(\overline{w}, y_0) &= \left(L_I^l + L_I^h + K_I\right) \cdot G(y_0) \\ &+\alpha_l \cdot \int_0^{U^l - y_0} G(U^l - c)dF_l(c) + \alpha_h \cdot \int_0^{U^h - y_0} G(U^h - c)dF_h(c) \\ &+K \cdot \int_{\psi^*}^{\overline{\psi}} G((1-t)\Pi(\psi) - \xi)dO(\psi) + \gamma \cdot \left[\int \left(E_m^l T(w_m^l) + E_m^h T(w_m^h)\right) dm\right. \\ &\left.+t \cdot K \cdot \int_{\psi^*}^{\overline{\psi}} \Pi(\psi)dO(\psi) - y_0 \left(L_I^l + L_I^h + K_I + \rho^l \cdot L_A^l + \rho^h \cdot L_A^h\right)\right], \qquad \text{(B.V)}\end{aligned}$$

where γ is the budget constraint multiplier. Since $\rho^s \cdot L_A^s = L_A^s - \int E_m^s dm$, and the fact that $L_I^l + L_I^h + L_A^l + L_A^h = 1$, the expression is simplified to

$$\begin{aligned}\mathcal{L}(\overline{w}, y_0) &= \left(L_I^l + L_I^h + K_I\right) \cdot G(y_0) \\ &+\alpha_l \cdot \int_0^{U^l - y_0} G(U^l - c)dF_l(c) + \alpha_h \cdot \int_0^{U^h - y_0} G(U^h - c)dF_h(c) \\ &+K \cdot \int_{\psi^*}^{\overline{\psi}} G((1-t)\Pi(\psi) - \xi)dO(\psi) + \gamma \cdot \left[\int \left(E_m^l (T(w_m^l) + y_0)\right.\right. \\ &\left.\left.+E_m^h (T(w_m^h) + y_0)\right) dm + t \cdot K \cdot \int_{\psi^*}^{\overline{\psi}} \Pi(\psi)dO(\psi) - y_0 \left(1 + K_I\right)\right]. \qquad \text{(B.VI)}\end{aligned}$$

The derivative with respect to $\overline{w}$, taking y_0, t, and $T(\cdot)$ as given, is given by

$$\begin{aligned}\frac{d\mathcal{L}}{d\overline{w}} &= \left(\frac{dK_I}{d\overline{w}} - \frac{dL_A^s}{d\overline{w}} - \frac{dL_A^h}{\overline{w}}\right) \cdot G(y_0) \\ &+G(y_0) \cdot \alpha_l \cdot f_l(U^l - y_0) \cdot \frac{dU^l}{d\overline{w}} + \alpha_l \cdot \frac{dU^l}{d\overline{w}} \cdot \int_0^{U^l - y_0} G'(U^l - c)dF_l(c) \\ &+G(y_0) \cdot \alpha_h \cdot f_h(U^h - y_0) \cdot \frac{dU^h}{d\overline{w}} + \alpha_h \cdot \frac{dU^h}{d\overline{w}} \cdot \int_0^{U^h - y_0} G'(U^h - c)dF_h(c) \\ &+K \cdot \left[\int_{\psi^*}^{\overline{\psi}} G'((1-t)\Pi(\psi) - \xi)(1-t)\frac{d\Pi(\psi)}{d\overline{w}}dO(\psi) - G(y_0) \cdot o(\psi^*) \cdot \frac{d\psi^*}{d\overline{w}}\right] \\ &\gamma \cdot \left[\int \left(\frac{dE_m^l}{d\overline{w}}\left(T(w_m^l) + y_0\right) + E_m^l T'(w_m^l)\frac{dw_m^l}{d\overline{w}}\right.\right. \\ &\left.+\frac{dE_m^h}{d\overline{w}}\left(T(w_m^h) + y_0\right) + E_m^h T'(w_m^h)\frac{dw_m^h}{d\overline{w}}\right) dm \\ &\left.+t \cdot K \cdot \left(\int_{\psi^*}^{\overline{\psi}} \frac{d\Pi(\psi)}{d\overline{w}}dO(\psi) - \Pi(\psi^*) \cdot o(\psi^*) \cdot \frac{d\psi^*}{d\overline{w}}\right) - y_0 \cdot \frac{dK_I}{d\overline{w}}\right]. \qquad \text{(B.VII)}\end{aligned}$$

Recall that $dK_I/d\overline{w} = K \cdot o(\psi^*) \cdot (d\psi^*/d\overline{w})$ and $dL_A^s/d\overline{w} = \alpha_s \cdot f_s(U^s - y_0) \cdot (dU^s/d\overline{w})$ for $s \in \{l, h\}$.

Using the social marginal weights definitions, and grouping common terms, (B.VII) can be written as

$$\begin{aligned}\frac{d\mathcal{L}}{d\overline{w}}\cdot\frac{1}{\gamma} &= \frac{dU^l}{d\overline{w}}\cdot L_A^l\cdot g_1^l+\frac{dU^h}{d\overline{w}}\cdot L_A^h\cdot g_1^h+K\cdot(1-t)\cdot\int_{\psi^*}^{\overline{\psi}} g_\psi\frac{d\Pi(\psi)}{d\overline{w}}dO(\psi)\\ &+\int\left(\frac{dE_m^l}{d\overline{w}}\left(T(w_m^l)+y_0\right)+E_m^l T'(w_m^l)\frac{dw_m^l}{d\overline{w}}\right)dm\\ &+\int\left(\frac{dE_m^h}{d\overline{w}}\left(T(w_m^h)+y_0\right)+E_m^h T'(w_m^h)\frac{dw_m^h}{d\overline{w}}\right)dm\\ &+t\cdot K\cdot\int_{\psi^*}^{\overline{\psi}}\frac{d\Pi(\psi)}{d\overline{w}}dO(\psi)-\frac{dK_I}{d\overline{w}}\cdot\left(t\cdot\Pi(\psi^*)+y_0\right). \quad \square \qquad \text{(B.VIII)}\end{aligned}$$

Proof of Proposition III I assume that the planner optimizes allocations instead of taxes. That is, the planner chooses $\Delta y_m^s = y_m^s - y_0$, for all m and $s \in \{l,h\}$, and then recover taxes by noting that $T(w_m^s)+y_0 = w_m^s - \Delta y_m^s$. This implies that the Lagrangian is given by

$$\begin{aligned}\mathcal{L}\left(\overline{w},\{\Delta y_m^s\},y_0\right) &= \left(L_I^l+L_I^h+K_I\right)\cdot G(y_0)\\ &+\alpha_l\cdot\int_0^{U^l-y_0}G(U^l-c)dF_l(c)+\alpha_h\cdot\int_0^{U^h-y_0}G(U^h-c)dF_h(c)\\ &+K\cdot\int_{\psi^*}^{\overline{\psi}}G((1-t)\Pi(\psi)-\xi)dO(\psi)\\ &+\gamma\cdot\Bigg[\int\left(E_m^l(w_m^l-\Delta y_m^l)+E_m^h(w_m^h-\Delta y_m^h)\right)dm\\ &+t\cdot K\cdot\int_{\psi^*}^{\overline{\psi}}\Pi(\psi)dO(\psi)-y_0\left(1+K_I\right)\Bigg]. \qquad \text{(B.IX)}\end{aligned}$$

There are two differences w.r.t. to the first-order condition derived for Proposition II. First, now the planner takes partial derivatives rather than total derivatives, leaving Δy_m^s constant, for all m and $s \in \{l,h\}$ when choosing the minimum wage. This implies that the relevant elasticities are micro rather than macro elasticities. Second, this transformation affects the term in the budget constraint that previously contained $T(\cdot)$. This implies that the optimality condition of the minimum wage can be written as

$$\begin{aligned}\frac{\partial\mathcal{L}}{\partial\overline{w}}\cdot\frac{1}{\gamma} &= \frac{\partial U^l}{\partial\overline{w}}\cdot L_A^l\cdot g_1^l+\frac{\partial U^h}{\partial\overline{w}}\cdot L_A^h\cdot g_1^h+K\cdot(1-t)\cdot\int_{\psi^*}^{\overline{\psi}} g_\psi\frac{\partial\Pi(\psi)}{\partial\overline{w}}dO(\psi)\\ &+\int\left(\frac{\partial E_m^l}{\partial\overline{w}}\left(T(w_m^l)+y_0\right)+E_m^l\frac{\partial w_m^l}{\partial\overline{w}}\right)dm\\ &+\int\left(\frac{\partial E_m^h}{\partial\overline{w}}\left(T(w_m^h)+y_0\right)+E_m^h\frac{\partial w_m^h}{\partial\overline{w}}\right)dm\\ &+t\cdot K\cdot\int_{\psi^*}^{\overline{\psi}}\frac{\partial\Pi(\psi)}{\partial\overline{w}}dO(\psi)-\frac{\partial K_I}{\partial\overline{w}}\cdot\left(t\cdot\Pi(\psi^*)+y_0\right). \qquad \text{(B.X)}\end{aligned}$$

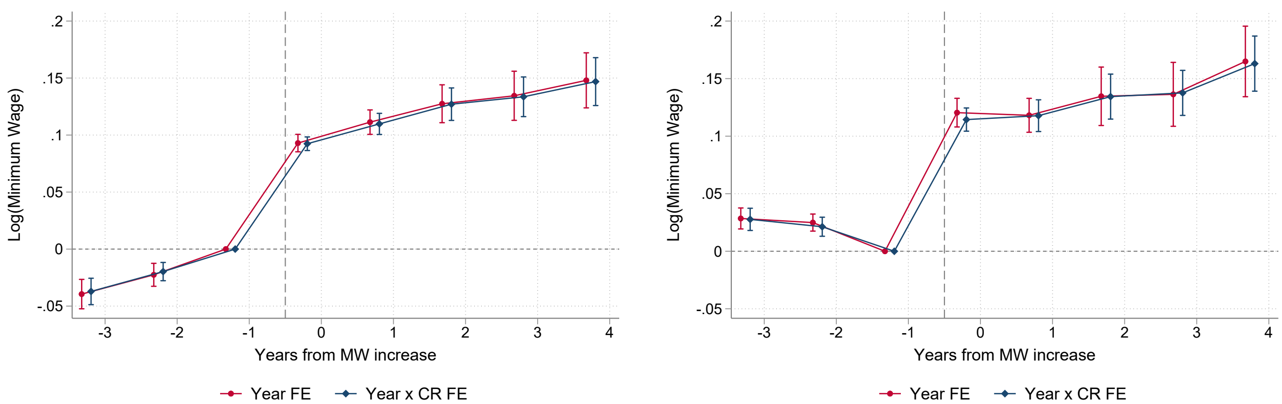
See the main text for a discussion on micro versus macro elasticities. □

C Additional figures and tables

Table C.I: List of Events

State	Events (in bold the selected sample)	Total
Alabama	-	0
Alaska	**2003**, **2015**, 2016	3
Arizona	**2007**, 2009, 2012, 2017, 2018, 2019	6
Arkansas	**2006**, **2015**, 2016, 2017, 2019	5
California	**1988**, **1997**, 1998, 2001, 2002, **2007**, 2008, **2014**, 2016, 2017, 2018, 2019	12
Colorado	**2007**, 2009, **2015**, 2017, 2018, 2019	6
Connecticut	1980, 1981, **1988**, **1999**, **2009**, **2015**, 2016, 2017	8
Delaware	**2000**, **2007**, **2014**, 2015, 2019	5
District of Columbia	1980, **1987**, **1993**, **2014**, 2015, 2016, 2017, 2018	8
Florida	**2005**, **2009**, 2012	3
Georgia	-	0
Hawaii	**1988**, **1993**, **2002**, 2003, 2006, 2007, **2015**, 2016, 2017, 2018	10
Idaho	-	0
Illinois	**2005**, 2007, 2010	3
Indiana	-	0
Iowa	**1990**, 1991, 1992, **2008**	4
Kansas	-	0
Kentucky	-	0
Louisiana	-	0
Maine	2017, 2018, 2019	3
Maryland	**2015**	1
Massachusetts	**1997**, **2001**, **2007**, **2015**, 2016, 2017, 2019	7
Michigan	**2006**, **2014**, 2016, 2017	4
Minnesota	**1988**, 1989, 1991, **2014**, 2015, 2016	6
Mississippi	-	0
Missouri	**2007**, 2009, 2019	3
Montana	**2007**, 2009, 2012	3
Nebraska	**2015**, 2016	2
Nevada	**2006**, 2009, 2010	3
New Hampshire	-	0
New Jersey	**1992**, **2006**, **2014**, 2019	4
New Mexico	**2008**, 2009	2
New York	**2005**, 2006, **2013**, 2014, 2015, 2016, 2017, 2018, 2019	9
North Carolina	**2007**	1
North Dakota	-	0
Ohio	**2007**, 2009, 2012	3
Oklahoma	-	0
Oregon	**1989**, 1990, 1991, **1997**, 1998, 1999, **2003**, 2006, 2007, 2009, 2016, 2017, 2019	13
Pennsylvania	**1989**, **2007**	2
Rhode Island	**1986**, 1989, **1999**, 2000, **2006**, **2015**, 2016, 2019	8
South Carolina	-	0
South Dakota	**2015**	1
Tennessee	-	0
Texas	-	0
Utah	-	0
Vermont	**1999**, 2001, **2009**, **2015**, 2016, 2017, 2018	7
Washington	**1989**, 1990, **1994**, **1999**, 2000, **2007**, 2009, 2012, 2017, 2018, 2019	11
West Virginia	**2006**, 2007, **2015**, 2016	4
Wisconsin	**1989**, **2006**	2
Wyoming	-	0

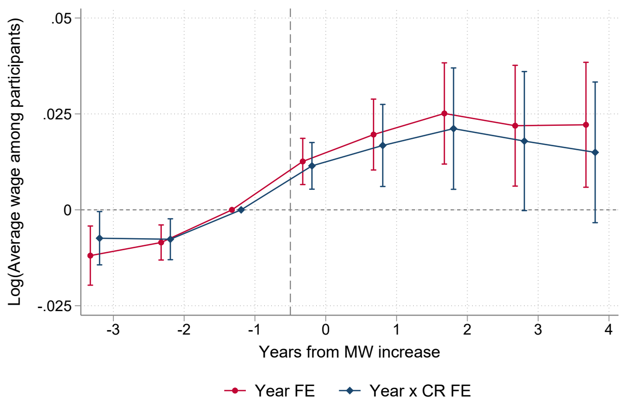
Figure C.I: State-level real minimum wage increase by event



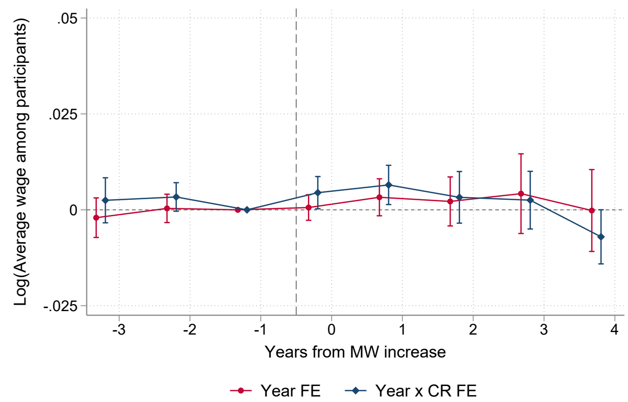
(a) All events (b) Selected events

Notes: These figures plot the estimated β_τ coefficients with their corresponding 90% confidence intervals from equation (17) using the log of the real hourly state-level minimum wage as a dependent variable. Red lines represent specifications that control by year-by-event fixed effects. Blue lines represent specifications that control by census-region-by-year-by-event fixed effects. Panel (a) considers all 172 events. Panel (b) considers a selected sample of 72 events where treated states do not experience other events in the three years previous to the event and whose timing allow to observe the outcomes from three years before to four years after. Minimum wage data is taken from Vaghul and Zipperer (2016). Standard errors are clustered at the state level, and regressions are weighted by state-by-year average population computed using the CPS monthly files.

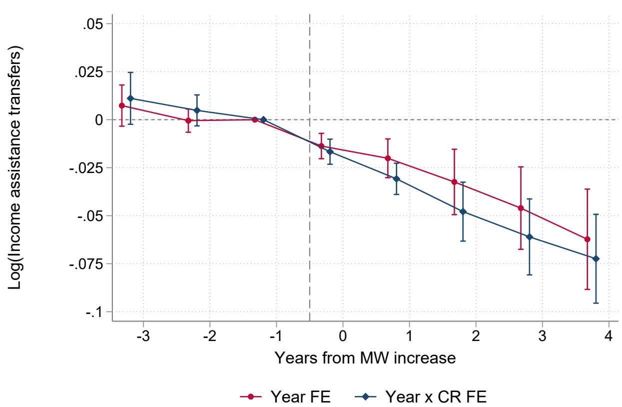
Figure C.II: Changes in workers' welfare after minimum wage increases (all events)



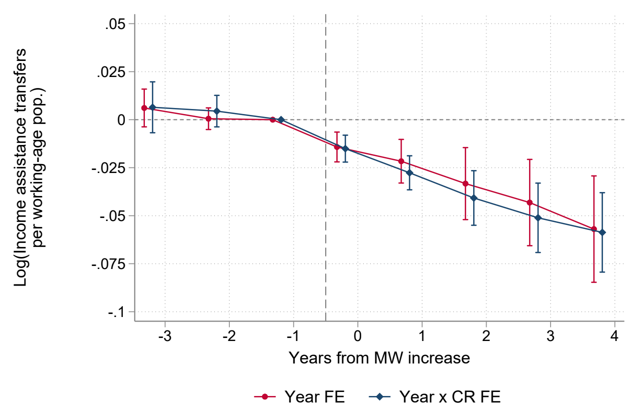
(a) Low-skill workers



(b) High-skill workers



(c) Income maintenance benefits (total)



(d) Income maintenance benefits (per working-age pop.)

Notes: These figures plot the estimated β_τ coefficients with their corresponding 90% confidence intervals from equation (17). Estimations consider all 172 events. Panel (a) uses the average pre-tax wage of low-skill workers including the unemployed as dependent variable. Panel (b) uses the average pre-tax wage of high-skill workers including the unemployed as dependent variable. Panels (c) and (d) use total and per working-age population income maintenance benefits as dependent variable, respectively. Red lines represent specifications that control by year-by-event fixed effects. Blue lines represent specifications that control by census-region-by-year-by-event fixed effects. Standard errors are clustered at the state level, and regressions are weighted by state-by-year average population computed using the CPS monthly files.

Table C.II: Additional results for low-skill workers (all events)

(a) Year-by-event fixed effects

	Margins				**Het.: Age**			**Het.: Educ**		
	Wage	Hours	Emp.	Part.	[16,19]	[20,30]	>30	HS drop.	HS comp.	Coll. inc.
$\hat{\beta}$	0.023	0.000	0.003	-0.005	0.057	0.025	0.022	0.031	0.020	0.028
	(0.004)	(0.003)	(0.005)	(0.007)	(0.017)	(0.007)	(0.007)	(0.011)	(0.008)	(0.007)
Obs.	36613	36613	36613	36613	36613	36613	36613	36613	36613	36613
Events	172	172	172	172	172	172	172	172	172	172
$\Delta \log \text{MW}$	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101
Elast.	0.226	0.001	0.025	-0.046	0.564	0.244	0.215	0.307	0.194	0.281

(b) Census-region-by-year-by-event fixed effects

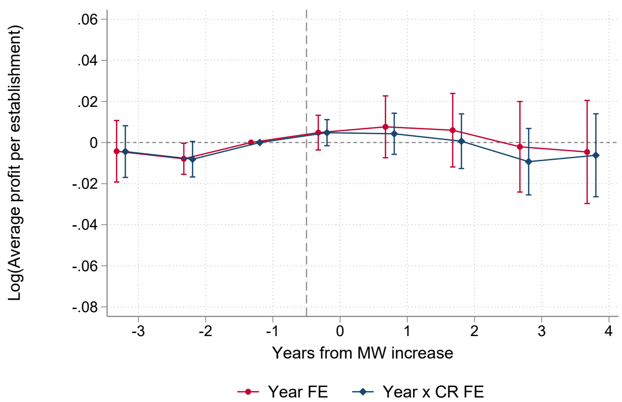
	Margins				**Het.: Age**			**Het.: Educ**		
	Wage	Hours	Emp.	Part.	[16,19]	[20,30]	>30	HS drop.	HS comp.	Coll. inc.
$\hat{\beta}$	0.018	-0.002	0.002	-0.010	0.047	0.018	0.018	0.023	0.014	0.024
	(0.004)	(0.003)	(0.006)	(0.006)	(0.014)	(0.007)	(0.009)	(0.011)	(0.008)	(0.008)
Obs.	36613	36613	36613	36613	36613	36613	36613	36613	36613	36613
Events	172	172	172	172	172	172	172	172	172	172
$\Delta \log \text{MW}$	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101
Elast.	0.183	-0.018	0.020	-0.096	0.465	0.181	0.175	0.228	0.139	0.240

(c) Census-division-by-year-by-event fixed effects

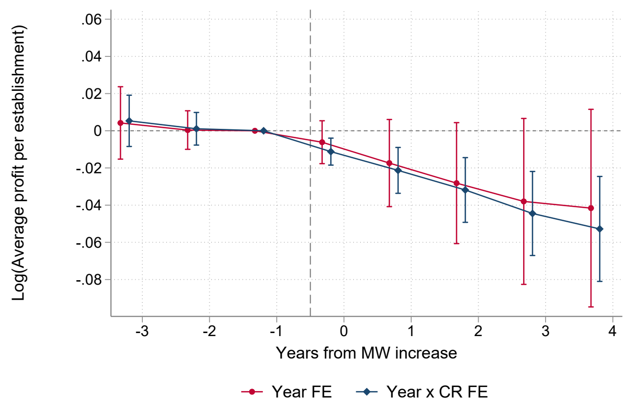
	Margins				**Het.: Age**			**Het.: Educ**		
	Wage	Hours	Emp.	Part.	[16,19]	[20,30]	>30	HS drop.	HS comp.	Coll. inc.
$\hat{\beta}$	0.025	-0.004	0.006	-0.006	0.050	0.021	0.023	0.030	0.020	0.026
	(0.005)	(0.004)	(0.007)	(0.009)	(0.022)	(0.009)	(0.012)	(0.016)	(0.010)	(0.011)
Obs.	34797	34797	34797	34797	34797	34797	34797	34797	34797	34797
Events	172	172	172	172	172	172	172	172	172	172
$\Delta \log \text{MW}$	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101	0.101
Elast.	0.180	-0.041	0.062	-0.055	0.494	0.203	0.223	0.297	0.202	0.252

Notes: This table shows the estimated β coefficient from equation (18) using different dependent variables for low-skill workers (all in logarithms). Regressions consider all events. Panel (a) uses year-by-event fixed effects. Panel (b) uses census-region-by-year-by-event fixed effects. Panel (c) uses census-division-by-year-by-event fixed effects. Within each panel, columns (1)-(4) decompose the overall effect in four margins: wage (conditional on employment), hours (conditional on employment), employment rate, and participation rate. Columns (5)-(7) use the average pre-tax hourly wage of active low-skill workers including the unemployed that are between 16 and 19 years old, between 20 and 30 years old, and older than 30, respectively. Columns (8)-(10) use the average pre-tax hourly wage of active low-skill workers including the unemployed that are high school dropouts, have complete high-school education, and have incomplete college education, respectively. $\Delta \log \text{MW}$ is the average change in the log of the real state-level minimum wage across events in the year of the event. Elast. is the implied elasticity, that comes from dividing the point estimate by $\Delta \log \text{MW}$. Standard errors (in parentheses) are clustered at the state level and regressions are weighted by state-by-year population.

Figure C.III: Changes in capitalists' welfare after minimum wage increases (all events)



(a) Profits per establishment (all industries)



(b) Profits per establishment (non-professional services)

Notes: These figures plot the estimated β_τ coefficients with their corresponding 90% confidence intervals from equation (17). Estimations consider all 172 events. Panel (a) uses the gross operating surplus per private establishment in all industries as dependent variable. Panel (b) only considers the non-professional services industry, that is, educational services, health care, arts, entertainment, recreation, accomodation, and food services. Red lines represent specifications that control by year-by-event fixed effects. Blue lines represent specifications that control by census-region-by-year-by-event fixed effects, respectively. Standard errors are clustered at the state level, and regressions are weighted by state-by-year average population computed using the CPS monthly files.

Table C.III: Capitalists results: Industry heterogeneity

(a) Year-by-event fixed effects

	All	All	NNRR	Constr.	Manuf.	Transp.	Wholesale	Retail	Finance	Prof. serv	Non-prof. serv.
$\hat{\beta}$	0.007	0.007	0.013	-0.013	0.022	0.005	-0.018	0.010	0.005	0.019	-0.024
	(0.008)	(0.008)	(0.025)	(0.031)	(0.018)	(0.020)	(0.015)	(0.010)	(0.013)	(0.010)	(0.022)
Obs.	37749	32943	31494	32170	32098	32171	32259	32259	32259	32259	32167
Events	172	157	157	157	157	157	157	157	157	157	157
$\Delta \log \text{MW}$	0.101	0.099	0.100	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099
Elast.	0.068	0.072	0.132	-0.127	0.225	0.050	-0.178	0.097	0.046	0.190	-0.239

(b) Census-region-by-year-by-event fixed effects

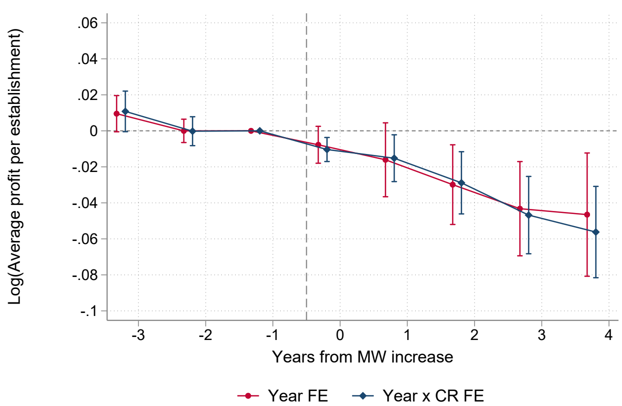
	All	All	NNRR	Constr.	Manuf.	Transp.	Wholesale	Retail	Finance	Prof. serv	Non-prof. serv.
$\hat{\beta}$	0.006	0.004	-0.024	-0.045	0.034	-0.021	-0.021	-0.008	0.006	0.019	-0.030
	(0.008)	(0.008)	(0.025)	(0.032)	(0.026)	(0.027)	(0.017)	(0.013)	(0.012)	(0.012)	(0.010)
Obs.	37749	32943	31409	32170	32098	32171	32259	32259	32259	32259	32167
Events	172	157	157	157	157	157	157	157	157	157	157
$\Delta \log \text{MW}$	0.101	0.099	0.100	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099
Elast.	0.054	0.043	-0.244	-0.450	0.346	-0.214	-0.210	-0.083	0.056	0.189	-0.303

(c) Census-division-by-year-by-event fixed effects

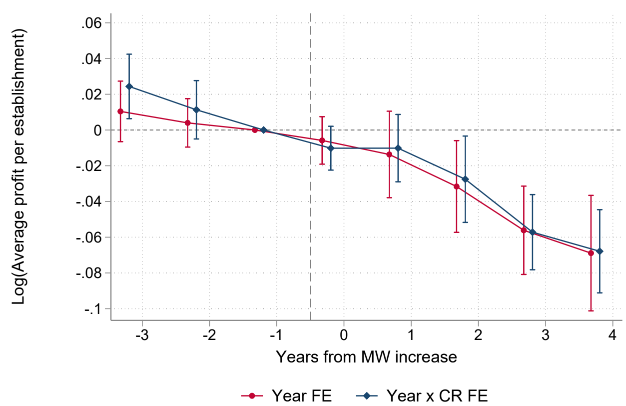
	All	All	NNRR	Constr.	Manuf.	Transp.	Wholesale	Retail	Finance	Prof. serv	Non-prof. serv.
$\hat{\beta}$	0.008	0.006	-0.052	-0.062	0.008	-0.070	0.016	-0.012	0.000	0.008	-0.012
	(0.010)	(0.010)	(0.034)	(0.036)	(0.024)	(0.028)	(0.020)	(0.010)	(0.017)	(0.013)	(0.010)
Obs.	35914	31246	29692	30492	30423	30496	30584	30584	30584	30584	30490
Events	172	157	157	157	157	157	157	157	157	157	157
$\Delta \log \text{MW}$	0.102	0.099	0.100	0.099	0.099	0.099	0.099	0.099	0.099	0.099	0.099
Elast.	0.076	0.065	-0.519	-0.628	0.079	-0.710	0.160	-0.124	0.002	0.081	-0.119

Notes: This table shows the estimated β coefficient from equation (18) using the gross operating surplus per private establishment for different industries (all in logarithms). Panel (a) uses year-by-event fixed effects. Panel (b) uses census-region-by-year-by-event fixed effects. Panel (c) uses census-division-by-year-by-event fixed effects. NNRR includes agriculture, forestry, fishing, hunting, and mining. Constr. includes construction. Manuf. includes durable and nondurable goods manufacturing. Transp. includes transportation. Wholesale includes wholesale trade. Retail includes retail trade. Finance includes finance, insurance, real estate, rental, and leasing. Prof. serv. includes professional and business services. Non-prof. serv. includes educational services, health care, arts, entertainment, recreation, accomodation, and food services. $\Delta \log \text{MW}$ is the average change in the log of the real state-level minimum wage across events in the year of the event. Elast. is the implied elasticity, that comes from dividing the point estimate by $\Delta \log \text{MW}$. Standard errors (in parentheses) are clustered at the state level and regressions are weighted by state-by-year population.

Figure C.IV: Changes in capitalists' welfare after minimum wage increases: non-professional services, construction, wholesale trade, and finance



(a) Profits per establishment (all events)



(b) Profits per establishment (selected events)

Notes: These figures plot the estimated β_τ coefficients with their corresponding 90% confidence intervals from equation (17). The dependent variable is the gross operating surplus per private establishment only considering non-professional services, construction, wholesale trade, and finance. Panel (a) uses all events. Panel (b) only considers the selected sample of events. Red lines represent specifications that control by year-by-event fixed effects. Blue lines represent specifications that control by census-region-by-year-by-event fixed effects. Standard errors are clustered at the state level, and regressions are weighted by state-by-year average population computed using the CPS monthly files.

Table C.IV: Additional fiscal externalities on capitalists

(a) Year-by-event fixed effects

	# Estab. (All) (1979-2019)	# Estab. (All) (1990-2019)	# Estab. (Exp.) (1990-2019)	Bus. inc. (per ret.)	Bus. inc. (per wa pop)	# of Bus. rets. (per tot. ret.)	Div. inc. (per ret.)	Div. inc. (per wa pop)	# of Div. rets. (per tot. ret.)	S-Corp. inc. (per ret.)	S-Corp. inc. (per wa pop)	# of S-Corp. rets. (per tot. ret.)
$\hat{\beta}$	0.013	0.013	0.025	0.002	-0.005	-0.004	0.004	-0.003	-0.005	0.036	0.031	-0.003
	(0.009)	(0.009)	(0.011)	(0.010)	(0.011)	(0.008)	(0.020)	(0.021)	(0.006)	(0.029)	(0.027)	(0.007)
Obs.	17604	17604	13732	11969	11969	11969	11969	11969	11969	5258	5258	5258
Events	72	72	60	60	60	60	60	60	60	42	42	42
ΔMW	0.127	0.127	0.126	0.128	0.128	0.128	0.128	0.128	0.128	0.090	0.090	0.090
Elast.	0.099	0.099	0.198	0.012	-0.038	-0.031	0.033	-0.026	-0.039	0.396	0.351	-0.028

(b) Census-region-by-year-by-event fixed effects

	# Estab. (All) (1979-2019)	# Estab. (All) (1990-2019)	# Estab. (Exp.) (1990-2019)	Bus. inc. (per ret.)	Bus. inc. (per wa pop)	# of Bus. rets. (per tot. ret.)	Div. inc. (per ret.)	Div. inc. (per wa pop)	# of Div. rets. (per tot. ret.)	S-Corp. inc. (per ret.)	S-Corp. inc. (per wa pop)	# of S-Corp. rets. (per tot. ret.)
$\hat{\beta}$	0.007	0.007	0.016	0.006	0.006	0.002	0.002	-0.004	-0.005	0.011	0.003	-0.006
	(0.006)	(0.006)	(0.008)	(0.011)	(0.013)	(0.006)	(0.018)	(0.019)	(0.006)	(0.027)	(0.026)	(0.006)
Obs.	17604	17604	13732	11969	11969	11969	11969	11969	11969	5258	5258	5258
Events	72	72	60	60	60	60	60	60	60	42	42	42
ΔMW	0.127	0.127	0.126	0.128	0.128	0.128	0.128	0.128	0.128	0.090	0.090	0.090
Elast.	0.058	0.058	0.128	0.044	0.050	0.012	0.014	-0.035	-0.043	0.118	0.029	-0.069

(c) Census-division-by-year-by-event fixed effects

	# Estab. (All) (1979-2019)	# Estab. (All) (1990-2019)	# Estab. (Exp.) (1990-2019)	Bus. inc. (per ret.)	Bus. inc. (per wa pop)	# of Bus. rets. (per tot. ret.)	Div. inc. (per ret.)	Div. inc. (per wa pop)	# of Div. rets. (per tot. ret.)	S-Corp. inc. (per ret.)	S-Corp. inc. (per wa pop)	# of S-Corp. rets. (per tot. ret.)
$\hat{\beta}$	0.011	0.011	0.011	0.015	0.015	-0.002	0.030	0.023	-0.008	0.030	0.020	-0.010
	(0.008)	(0.008)	(0.007)	(0.012)	(0.012)	(0.006)	(0.012)	(0.012)	(0.007)	(0.032)	(0.030)	(0.005)
Obs.	16818	16818	13069	11341	11341	11341	11341	11341	11341	4883	4883	4883
Events	72	72	60	60	60	60	60	60	60	42	42	42
ΔMW	0.125	0.125	0.123	0.125	0.125	0.125	0.125	0.125	0.125	0.088	0.088	0.088
Elast.	0.092	0.092	0.088	0.122	0.120	-0.016	0.238	0.185	-0.067	0.344	0.232	-0.111

Notes: This table shows the estimated β coefficient from equation (18) using different dependent variables (all in logarithms) using the selected sample of events. Regressions consider all events. Panel (a) uses year-by-event fixed effects. Panel (b) uses census-region-by-year-by-event fixed effects. Panel (c) uses census-division-by-year-by-event fixed effects. # Estab. (all) measures the number of establishments of all industries. # Estab. (Exp.) measures the number of establishments of non-professional services, construction, wholesale trade, and finance. The rest of the dependent variables are taken from public SOI tables at the state level. Bus. inc. is reported business income in personal tax forms, and available from 1996. Column (4) uses Bus. inc. normalized by the returns that report positive business income. Column (5) uses Bus. inc. normalized by working-age population. Column (6) measures the number of returns that report positive business income. Div. inc. is reported dividend income in personal tax forms, and available from 1996. Column (7) uses Div. inc. normalized by the returns that report positive dividend income. Column (8) uses Div. inc. normalized by working-age population. Column (9) measures the number of returns that report positive dividend income. S-Corp. inc. is reported S-Corp income in personal tax forms, and available from 2009. Column (10) uses S-corp. inc. normalized by the returns that report positive business income. Column (11) uses S-corp. inc. normalized by working-age population. Column (12) measures the number of returns that report positive S-Corp. income. $\Delta \log \mathrm{MW}$ is the average change in the log of the real state-level minimum wage across events in the year of the event. Elast. is the implied elasticity, that comes from dividing the point estimate by $\Delta \log \mathrm{MW}$. Standard errors (in parentheses) are clustered at the state level and regressions are weighted by state-by-year population.

D Details of the calibration of Proposition II

This appendix describes the details of the calibration that gives form to the results in Table 6.

Monetary values Total pre-tax earnings, total pre-tax profits, and total income maintenance transfers are computed using the estimation sample. Total pre-tax earnings are computed using the CPS-MORG data as described in Section 4. Since average pre-tax individual incomes are measured in hourly wages, I multiply the annual sum of hourly wages by the average usual weekly hours worked, and 52 weeks. Average weekly hours worked by employed low-skill workers are 32.6 and 33.7 in the cases considered below. Total pre-tax profits per industry are directly taken from the BEA industry level estimates of the gross operating surplus. Finally, total income maintenance benefits are taken from the BEA regional accounts. To compute the welfare weights I also calculate average post-tax incomes of low-skill workers, which correspond to the annualized version of the sufficient statistic (average hourly wage times average weekly hours worked times the employment rate times 52), and average post-tax incomes of capitalists, which correspond to the annual gross operating surplus per private establishment (taken from the QCEW files) net of the corporate tax rate considered. Table D.I shows the computed values for the two scenarios considered. Values are in 2016 thousand dollars. The first column is the population-weighted average across treated states of all pre-event year observations. The second column is the population-weighted average across states using data on year 2019. Average annual incomes of capitalists are pre-tax so post-tax values correspond to the values of the table times $(1-t)$, for the different assumptions on t. While total values are larger for workers, average incomes are several times larger for capitalists.

Table D.I: Monetary values (in 2016 thousand dollars)

	Pre-event years	2019
Totals:		
TPTW	452,000,000	383,000,000
TIMB	16,500,000	12,000,000
TPTP (Non-prof. serv.)	32,800,000	30,300,000
TPTP (Constr.)	13,500,000	14,100,000
TPTP (Wholesale)	17,000,000	20,700,000
TPTP (Finance)	170,000,000	157,000,000
Averages:		
Low-skill workers	17.180	20.437
Cap. (Non-prof. serv.)	156.383	200.938
Cap. (Constr.)	294.692	366.430
Cap. (Wholesale)	499.010	711.332
Cap. (Finance)	3,168.497	3,478.396

Computing ϵ_{U^l} For each underlying model and assumption on the totals, ϵ_{U^l} is computed as:

$$\epsilon_{U^l} \quad = \quad \frac{\text{TPTW} \cdot \epsilon_{U^l}(\text{pre-tax}) + TIMB \cdot \epsilon_B}{\text{TPTW} + \text{TIMB}}. \tag{D.I}$$

Table D.II shows the estimated values.

Table D.II: Estimated ϵ_{Ul}

	Pre-event years	2019
Using semi-elasticities from models with:		
Year-by-event fixed effects	0.012	0.012
Census-region-by-year-by-event fixed effects	0.010	0.100
Census-division-by-year-by-event fixed effects	0.018	0.180

Computing $\omega(\zeta)$ Recall that average social welfare weights are the social value of the marginal utility of consumption normalized by the marginal cost of raising public funds. Since the normalizing constant is equal for all agents, the ratio of average social welfare weights equates the ratio of the social value of the marginal utility of consumption. I assume that the social welfare function is CRRA, that is, $G(V) = V^{1-\zeta}/(1-\zeta)$. This implies that $G'(V) = V^{-\zeta}$. I approximate V with average post-tax low-skill annual earnings, y^l, and average post-tax annual profits, y^k. Then $\omega(\zeta) = (y^l/y^k)^{-\zeta}$. Then, when $\zeta = 1$, $\omega(1)$ is the inverse of the ratio of average incomes. As ζ increases, the ratio is amplified, implicitly capturing stronger preferences for redistribution, since the relative social value is larger that the relative average incomes.

Table D.III shows the estimated value of $\omega(\zeta)$ for all cases considered in Table 6. Values for the three panels are the same since $\omega(\zeta)$ does not depend on the semi-elasticities.

Table D.III: Calibration of $\omega(\zeta)$

	Pre-event years			**2019**		
			ζ			ζ
	$1/\omega(1)$	$1/\omega(1.5)$	$1/\omega(2)$	$1/\omega(1)$	$1/\omega(1.5)$	$1/\omega(2)$
Statutory t:						
$\omega(\zeta)$ (Non-prof. serv.)	5.92	14.39	35.01	7.77	21.65	60.33
$\omega(\zeta)$ (Constr.)	11.15	37.23	124.31	14.16	53.31	200.62
$\omega(\zeta)$ (Wholesale)	18.88	82.03	356.44	27.50	144.18	756.04
$\omega(\zeta)$ (Finance)	119.88	1,312.51	14,370.50	134.46	1,559.08	18,078.37
Effective t:						
$\omega(\zeta)$ (Non-prof. serv.)	7.01	18.56	49.12	8.55	25.02	73.17
$\omega(\zeta)$ (Constr.)	13.21	48.00	174.44	15.60	61.61	243.31
$\omega(\zeta)$ (Wholesale)	22.37	105.77	500.19	30.28	166.63	916.92
$\omega(\zeta)$ (Finance)	142.01	1,692.27	20,166.32	148.07	1801,80	21,925.20