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March 24, 2026

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The effects of minimum wage in inter-regional duopoly competition*

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March 24, 2026

Abstract

A binding minimum wage can raise the regulated firm's profits when labor-market power interacts with product-market competition. We develop a duopoly model in which firms compete in the same product market but hire workers from distinct, geographically segmented labor markets. Because the minimum wage applies only to one firm's labor market, it does not directly raise its rival's costs. With monopsony power, the minimum wage reduces the regulated firm's marginal cost and induces it to expand output, forcing its rival to contract through strategic interaction. Under Cournot competition, this mechanism also increases total employment and consumer surplus.

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1 Introduction

Introducin a minimum wage into a labor market is generally viewed as reducing firms' profits because it rises labor costs (Rebitzer and Taylor, 1995; Draca et al., 2005, 2011; Babiak et al., 2019; Bossler et al., 2020). Although firms may partially offset this negative effect through higher prices (Aaronson, 2001; Harasztosi and Lindner, 2019; Yamanouchi et al., 2025) or efficiency improvements (Riley and Bondibene, 2017; Mayneris et al., 2018; Ku, 2022), the net effect on profitability is often found to be negative or, at best, negligible (Cuong, 2017). Recent research nevertheless emphasizes that the effects of minimum wages is not uniform, but depend critically on firm heterogeneity and market structure. In particular, the effects differ significantly between high- and low-productivity firms (Bossavie et al., 2019; Luca and Luca, 2019; Dustmann et al., 2022) and between competitive and monopsonistic labor markets (Azar et al., 2024; Popp, 2024).

In contrast to this prevailing view, a distinct strand of research shows that under specific conditions, minimum wage regulation can actually increase firms' profits. One classical mechanism, proposed by Williamson (1968), suggests that some large firms may have an incentive to collude with labor unions to introduce a minimum wage with in order to raise the relative costs of smaller competitors. Although the policy increases a firm's own labor costs, it also raises the costs of its rivals; depending on the relative magnitude of these cost increases, the policy may ultimately benefits some firms. Bachmann et al. (2014) provides empirical support for this raising-rivals'-costs hypothesis.

Alternatively, the effects of minimum wage regulation can be analyzed through the distinctive cost structures of monopsonistic labor markets. Motivated by Card and Krueger (1994)'s empirical findings that a rise in the minimum wage can increase employment, Bhaskar and To (1999) develop a model of monopsonistic competition to explain this phenomenon. They show that in a market with monopsony power, a binding minimum wage can effectively reduce the marginal cost of hiring and thereby encourage firms to expand employment. However, while Bhaskar and To (1999) successfully explain the positive employment effect in individual firms, their model typically implies a decline in firms' profits as a result of competition between employers.

More recently, Pan and Zeng (2024) study general-equilibrium models with monopolistic competition and firm heterogeneity, following Melitz and Ottaviano (2008), and show that minimum wages can improve aggregate welfare by inducing firm selection and reducing markups, without relying on monopsony power. However, in the cases with and without minimum wage regulation, *ex-ante* expected profits are zero.

In this paper, we propose a new theoretical mechanism under which minimum wage regulation can simultaneously increase both employment and a firm's profits. We show that the introduction of a binding minimum wage in the labor market faced by one firm can raise that firm's profits through strategic interaction in the product market, *even when the policy does not directly increase its rivals' costs*.

To isolate the effects of the minimum wage in one firm's own labor market from any effect on its rival's labor costs, we consider a setting with two firms that compete in the same product market but procure labor from distinct, independent labor markets—so labor supply to each firm depends only on its own wage, and there are no cross-market worker flows. One interpretation is that these labor markets correspond to geographically segmented local labor markets, which is plausible when worker mobility across regions is sufficiently costly. Under this interpretation, it is natural to assume that the minimum wage is binding in some markets but not in others. Many countries set minimum wages at subnational levels (e.g., US states and cities, Japanese prefectures, Chinese provinces/municipalities). In our model, the minimum wage is binding in only one labor market, leaving the rival firm's labor market and costs unchanged; nevertheless, the rival adjusts its behavior endogenously through product-market competition.

Our formulation is relevant in industries characterized by (i) monopsonistic labor markets, (ii) limited worker mobility across regions, and (iii) strategic interaction in product markets. These conditions are empirically plausible in settings where large establishments or platforms play a dominant role in local hiring—for example, manufacturing plants and concentrated local labor markets (Azar et al., 2022; Benmelech et al., 2022; Yeh et al., 2022), large-facility logistics and retail entrants (Lehner et al., 2024), and platform-mediated work (Dube et al., 2020). By contrast, in settings with highly competitive labor markets or high worker mobility, the marginal-cost compression channel emphasized in this paper is less likely to hold.

Additionally, competition among Apple's major electronics assemblers in China provides a real-world example of our model. Luxshare Precision, primarily located in coastal Yangtze River Delta provinces such as Jiangsu, and Foxconn, with major operations in inland provinces such as Henan, compete fiercely for Apple's global orders, representing competition within the same product market. Consistent with our assumption of asymmetric minimum wages, minimum wage standards vary across regions due to differing regional regulations in China. As of October 2025, the hourly minimum wage stands at \$3.41 in Jiangsu versus \$2.93 in Henan, and assembly-line base wages are anchored to these levels. Furthermore, the labor pools of the two firms are effectively segmented, as geographic factors and China's household registration system create substantial costs for workers to migrate to other cities. In addition, both firms exhibit monopsony power within their respective regions. These manufacturers operate massive industrial parks employing hundreds of thousands of workers, dominating the local demand for low-skilled labor. Similar dynamics can be observed in other parts of Apple's supply chain in China.

We formalize the mechanism explained above in a duopoly model in which two firms engage in homogeneous-good Cournot competition in the same product market while procuring labor from two distinct labor markets. We show that the introduction of a binding minimum wage in the labor market faced by one of the firms increases that firm's profits. The mechanism behind this counterintuitive result is as follows. Although the minimum wage slightly increases the firm's total cost, it substantially reduces its marginal cost. The resulting decline in marginal cost induces the firm to expand its output, which in turn forces its rival to reduce output through a strategic effect. Because the resulting increase in revenue from this strategic effect dominates the increase in total costs, the minimum wage ultimately raises the firm's profit. Importantly, the minimum wage does not directly affect the rival's cost; rather, it influences the rival's output purely through product-market strategic interaction. To the best of our knowledge, this mechanism is novel within the literature demonstrating that minimum wages can improve a firm's profits.

As an extension, we discuss price competition with differentiated products to clarify how the implications differ under quantity and price competition. We show that the firm facing a binding minimum wage earns a relatively higher profit than its rival whose minimum wage is non-binding.

Our mechanism differs from existing explanations for profit-enhancing minimum wages. Unlike the raising-rivals'-costs argument (Williamson, 1968), the minimum wage in our model does not directly affect the rival firm's labor costs, since firms source labor from distinct, segmented labor markets. Unlike standard monopsony and oligopsony models of minimum wages (e.g., Bhaskar and To, 1999), where employment may increase but firms' profits typically decline due to intensified wage competition or entry responses, the profit gain in our setting arises from strategic interaction in the product market. Bhaskar et al. (2002) provide an early synthesis of monopsony and oligopsony models, including their implications for minimum wage policy, while subsequent work such as Kaas and Madden (2008, 2010) studies minimum wages as constraints on wage competition in oligopsonistic labor markets. Relatedly, Clark et al. (2006) show that a minimum wage can raise firms' profits by softening wage competition in the labor market, though at the cost of reduced employment. By contrast, in our model firms act as monopsonists in segmented labor markets, so the minimum wage does not affect wage competition or rivals' labor costs. The profit effect in our setting arises solely through strategic interaction in the product market.

Recent research has examined the interplay between labor-market power and product-market competition in oligopoly settings. In a general joint oligopoly–oligopsony framework, Tong and Ornaghi (2022) show that minimum wages may be efficiency-enhancing because they curb firms' wage markdown power, reduce marginal hiring costs—as in Bhaskar and To (1999) and Manning (2003b)—and mitigate underemployment arising from imperfect labor-market competition. Relatedly, Voudon (2023) develops a linear oligopoly–oligopsony model to study mergers and no-poaching agreements, highlighting how labor-market competition shapes price, wage, and welfare effects in these enforcement contexts, but without treating minimum wages as an explicit policy instrument. Bisceglia (2025) shows, within an oligopoly–oligopsony framework, that labor-market power can enhance firms' ability to collude in product markets. Ghosh et al. (2026) analyze the interaction between product and labor markets in a framework with firm-sponsored training, but do not consider minimum wage regulation. We contribute to this literature by identifying a novel product-market strategic channel through which a binding minimum wage can increase firm profits.

In sum, this paper makes three contributions. First, it identifies a novel channel through which minimum wage regulation can increase firm profits via product-market strategic interaction, even when rivals' labor costs are unaffected. Second, it shows that this mechanism generates employment spillovers across regions, implying that local null employment effects need not reflect aggregate outcomes. Third, it characterizes how the implications differ under quantity and price competition. Note that our analysis does not aim to estimate the effects of minimum wages, but to provide a theoretical framework that helps interpret recent empirical findings on heterogeneous firm responses and spatial spillovers following minimum wage increases.

The remainder of this paper is as follows. Section 2 provides the model. Section 3 analyzes the model. Section 4 extends the main model by considering price competition. Section 5 discusses the implications of our results. Finally, Section 6 concludes the paper.

2 Model

We consider a duopoly in which firms A and B hire labor from distinct labor markets to produce a homogeneous product and sell it in a common product market. Each firm is a monopsonist in its own labor market and faces an inverse labor supply function $w_i(l_i)$, where $l_i \geq 0$ denotes firm i's labor input. This reduced-form representation follows the classic monopsony framework originating in Robinson (1933), is consistent with monopsony models in which firms face upward-sloping labor supply (Manning, 2006), and has been used more recently by Sato (2024). Production is linear, with one unit of labor yielding one unit of output, so that $q_i = l_i$. The firms compete in quantities and face the inverse demand function $P(Q)$, where $Q = q_A + q_B$.

In the absence of minimum wages, firm i's profit π_i is represented as follows.

$$\begin{aligned}\pi_i &= (P(Q) - w_i(l_i))q_i \\ &= (P(Q) - w_i(q_i))q_i,\end{aligned}$$

where $j \neq i$. To ensure that the second-order conditions are always satisfied, we assume $P'(Q) < 0$, $P''(Q) \leq 0$ for every $Q \geq 0$ and $w_i'(l_i) > 0$, $w_i''(l_i) \geq 0$ for every $l_i \geq 0$.

Suppose that the minimum wage is imposed in the labor market A, so the wage paid by firm A cannot fall below the minimum wage $\underline{w} > 0$. Firm A's is given by:

$$\pi_A = \begin{cases} (P(Q) - \underline{w})q_A & \text{if} \quad w_A(q_A) < \underline{w}, \\ (P(Q) - w_A(q_A))q_A & \text{if} \quad w_A(q_A) \geq \underline{w}. \end{cases}$$

The worker surplus in labor market i is represented as

$$LS_i = w_i^* l_i^* - \int_0^{l_i^*} w_i(l_i)dl_i,$$

where w_i^* and l_i^* denote the equilibrium wage and employment level, respectively. The consumer surplus is represented as

$$CS = \int_0^{Q^*} P(Q)dQ - P(Q^*)Q^*,$$

where Q^* denotes the equilibrium output.

In each scenario, each firm simultaneously determines its quantity q_i, which equals l_i. The solution concept is Nash equilibrium.

3 Analysis

We discuss the cases without and with minimum wage regulation.

3.1 No minimum wage regulation

As a preliminary benchmark, we derive the equilibrium when no minimum wage regulation is imposed in either labor market, or when any existing minimum wage is sufficiently low to be non-binding. The equilibrium output levels (q_A^N, q_B^N) are characterized by the following first-order conditions in (1). Throughout the analysis, superscript "N" indicates equilibrium outcomes when no minimum wage is imposed.

$$MR_i(q_i^N, q_j^N) = MC_i(q_i^N), \tag{1}$$

for $i = A, B$ and $j \neq i$, where $MR_i(q_i, q_j) = P'(Q)q_i + P(Q)$ and $MC_i(q_i) = w_i(q_i) + w_i'(q_i)q_i$. Then, the equilibrium wage is $w_i^N \equiv w_i(q_i^N)$. Notice that $MC_i(q_i)$ is increasing in q_i and $MR_i(q_i, q_j)$ is decreasing in q_i and q_j.

3.2 Minimum wage regulation in labor market A

We now consider the case in which a minimum wage $\underline{w}$ is introduced in labor market A at a binding level, that is, at a level higher than the equilibrium wage in the absence of a minimum wage, w_A^N. To focus on the marginal effects of the minimum wage becoming binding, we restrict attention to cases in which the minimum wage is set sufficiently close to w_A^N, that is, $\underline{w} = w_A^N + \varepsilon$, where $\varepsilon > 0$ is sufficiently small.

In the presence of the minimum wage, firm A's marginal cost is $\underline{w}$ for any $q_A \leq w_A^{-1}(\underline{w})$ and reverts to $MC_A(q_A)$ above that point. The wage floor therefore creates a flat marginal-cost segment followed by a kink at $q_A = w_A^{-1}(\underline{w})$. For $\varepsilon \in (0, w'_A(q_A^N)q_A^N)$, this flat segment lies below firm A's original marginal cost at the no-minimum-wage equilibrium because

$$\underline{w} = w_A^N + \varepsilon < w_A^N + w'_A(q_A^N)q_A^N = MC_A(q_A^N).$$

When the minimum wage is binding, firm A's marginal cost is constant at $\underline{w}$, so it expands its output up to $q_A = w_A^{-1}(\underline{w})$. If output were increased to $q_A > w_A^{-1}(\underline{w})$, the minimum wage would become non-binding and the marginal cost would jump to $MC_A(q_A, q_B)$ discontinuously. Since $MR_A(q_A, q_B)$ is continuous in q_A, this discrete increase in marginal cost makes any output level strictly above $w_A^{-1}(\underline{w})$ suboptimal. Hence, firm A has no incentive to increase its output beyond $q_A = w_A^{-1}(\underline{w})$. Once firm A's output is pinned down in this way, firm B adjusts along its usual first-order condition in (1).

The equilibrium output levels in the presence of the minimum wage are denoted by (q_A^M, q_B^M), where the superscript "M" refers to the case in which the minimum wage is imposed in labor market A. Proposition 1 summarizes the equilibrium characterization.

Proposition 1. *Suppose that a binding minimum wage $\underline{w} = w_A^N + \varepsilon$ is introduced in labor market A, with $\varepsilon > 0$ sufficiently small. Then, the equilibrium output levels (q_A^M, q_B^M) are characterized by the following equations.*

$$q_A^M = w_A^{-1}(\underline{w}),$$
$$MR_B(q_B^M, q_A^M) = MC_B(q_B^M).$$

In words, firm A produces at the largest employment level consistent with the wage floor, while firm B moves along its usual best response.

Proof. To establish $q_A^M = w_A^{-1}(\underline{w})$, we show the following inequalities:

$$\underline{w} < MR_A(q_A^M, q_B^M) < MC_A(q_A^M). \tag{2}$$

We define firm B's best response function $q_B(q_A)$ as the solution to $MR_B(q_B, q_A) = MC_B(q_B)$. To show (2), we show three results: $-1 < dq_B(q_A)/dq_A < 0$, $q_A^M > q_A^N$, and $q_B^M < q_B^N$. We obtain the first result using the implicit function theorem:

$$\frac{dq_B(q_A)}{dq_A} = -\frac{P''(Q)q_B + P'(Q)}{P''(Q)q_B + 2P'(Q) - (w_B''(q_B) + 2w_B'(q_B))}.$$

This is clearly negative by assumption, and its absolute value is strictly less than one since the absolute value of the denominator exceeds that of the numerator, because $P'(Q) - (w_B''(q_B) + 2w_B'(q_B)) < 0$. We have the second result, $q_A^M > q_A^N$, because the following holds:

$$q_A^M = w_A^{-1}(\underline{w}) = w_A^{-1}(w_A^N + \varepsilon) > w_A^{-1}(w_A^N) = q_A^N.$$

This inequality implies the third result $q_B^M < q_B^N$ since $dq_B(q_A)/dq_A < 0$.

We define q_A^* as the solution to

$$MR_A(q_A, q_B^N) = w_A(q_A). \tag{3}$$

Because $MC_A(q_A) > w_A(q_A)$ for every $q_A > 0$, comparing (1) and (3), we have $q_A^* > q_A^N$ and $w_A(q_A^*) > w_A^N$. If $\varepsilon \in (0, w_A(q_A^*) - w_A^N)$, we have $q_A^M < q_A^*$ because

$$q_A^M = w_A^{-1}(\underline{w}) = w_A^{-1}(w_A^N + \varepsilon) < w_A^{-1}(w_A^N + w_A(q_A^*) - w_A^N) = w_A^{-1}(w_A(q_A^*)) = q_A^*.$$

Using $q_A^M < q_A^*$ and $w_A(q_A^*) > w_A^N$, we have $MR_A(q_A^M, q_B^N) > w_A^N$ because

$$MR_A(q_A^M, q_B^N) > MR_A(q_A^*, q_B^N) = w_A(q_A^*) > w_A^N.$$

If $\varepsilon \in (0, MR_A(q_A^M, q_B^N) - w_A^N)$, using $q_B^M < q_B^N$, we obtain the first part of inequality (2) because

$$\underline{w} = w_A^N + \varepsilon < w_A^N + MR_A(q_A^M, q_B^N) - w_A^N = MR_A(q_A^M, q_B^N) < MR_A(q_A^M, q_B^M).$$

Since $dq_B(q_A)/dq_A > -1$ and $q_A^M > q_A^N$, we have $q_B^M > q_B^N - (q_A^M - q_A^N)$. The second part of inequality (2) holds because

$$\begin{aligned} MR_A(q_A^M, q_B^M) &< MR_A(q_A^M, q_B^N - (q_A^M - q_A^N)) \\ &= P'(Q^N) q_A^M + P(Q^N) \\ &= P'(Q^N) q_A^M - P'(Q^N) q_A^N + MC_A(q_A^N) \\ &= \underbrace{P'(Q^N)}_{<0} \underbrace{(q_A^M - q_A^N)}_{>0} + MC_A(q_A^N) < MC_A(q_A^N) < MC_A(q_A^M). \end{aligned}$$

□

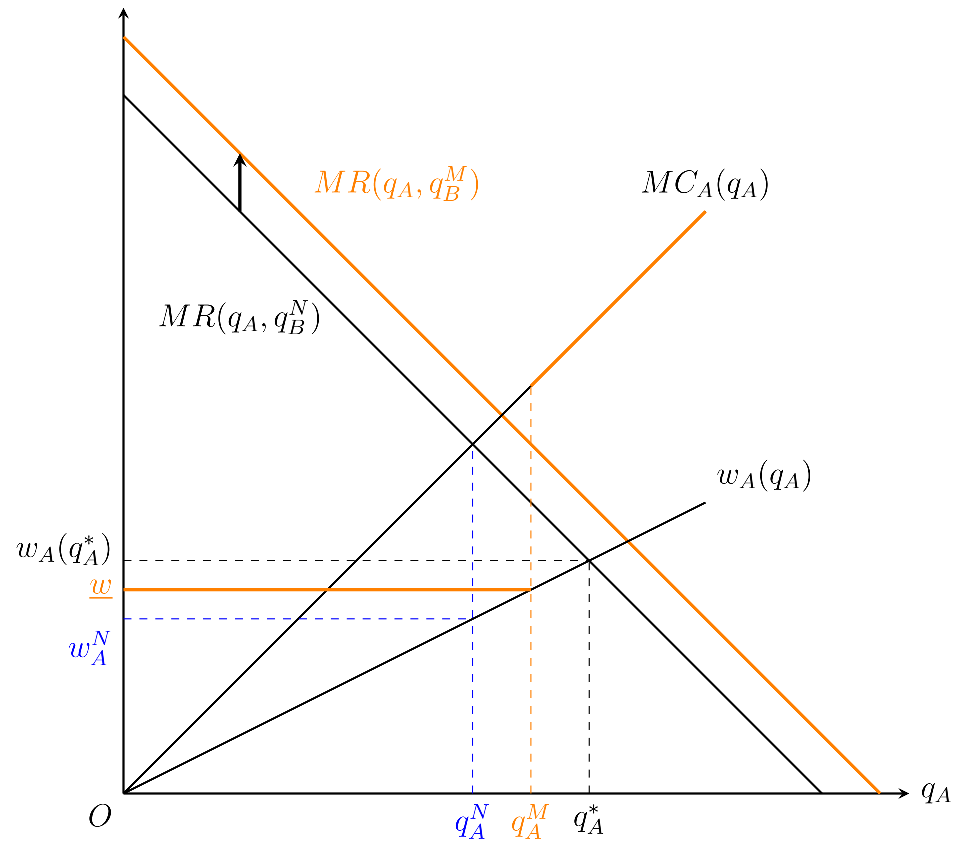

Figure 1: The determination of firm A's output level

Figure 1 illustrates the key mechanism. Around the original equilibrium output q_A^N, the binding minimum wage replaces the upward-sloping marginal cost schedule with a flat segment at the wage floor. This reduces firm A's marginal cost in a neighborhood of the original equilibrium, as in the standard monopsony logic of minimum wage models (Stigler, 1946; Bhaskar and To, 1999; Bhaskar et al., 2002; Manning, 2003a; Aaronson and French, 2007).Firm A therefore expands its output to $q_A = w_A^{-1}(\underline{w})$. Anticipating this expansion, firm B reduces its output due to the strategic substitutability of quantities.

With the equilibrium output levels under a binding minimum wage, we can investigate how the minimum wage influences the firms' profits. It is immediate that firm B's profit decreases in the presence of the minimum wage in labor market A since $q_A^M > q_A^N$ and $q_B^M < q_B^N$. By contrast, it is not *a priori* clear whether firm A's profit increases or decreases as a result of the binding minimum wage.

Three effects are at work. First, the minimum wage raises firm A's average cost and thereby increases its total cost (the *average cost effect*). Second, it lowers marginal cost and increases output, which raises total revenue (the *marginal cost effect*). Third, firm A's output expansion induces a reduction in firm B's output, shifting firm A's marginal revenue curve upward and further increasing total revenue (the *strategic effect*).

The magnitudes of these effects (the first negative effect and the second and third positive effects) depend on the level of the minimum wage. At the margin (i.e., for ε sufficiently close to zero), the first and second effects exactly offset each other, leaving only the third positive effect. As a result, the marginal effect of a binding minimum wage on firm A's profit is positive. The following proposition formalizes this result.

Proposition 2. *Suppose that a binding minimum wage $\underline{w} = w_A^N + \varepsilon$ is introduced in labor market A, where $\varepsilon > 0$ is sufficiently small. Then, at the margin, firm A's profit increases as a result of the binding minimum wage, that is,*

$$\left.\frac{d\pi_A^M}{d\varepsilon}\right|_{\varepsilon=0} > 0.$$

Proof. Taking the partial derivative of π_A^M with respect to ε, we obtain

$$\begin{aligned}\frac{d\pi_A^M}{d\varepsilon} &= \underbrace{\frac{\partial \pi_A^M}{\partial \varepsilon}}_{\text{(i) average cost effect}} + \underbrace{\frac{\partial \pi_A^M}{\partial q_A^M}\frac{\partial q_A^M}{\partial \varepsilon}}_{\text{(ii) marginal cost effect}} + \underbrace{\frac{\partial \pi_A^M}{\partial q_B^M}\frac{\partial q_B^M}{\partial \varepsilon}}_{\text{(iii) strategic effect}} \\ &= -q_A^M + (P'(Q^M)q_A^M + P(Q^M) - \underline{w})\frac{1}{w_A'(q_A^M)} + P'(Q^M)\frac{dq_B}{dq_A}(q_A^M)\frac{1}{w_A'(q_A^M)}.\end{aligned}$$

Evaluating this at $\varepsilon = 0$, we derive

$$\begin{aligned}\left.\frac{d\pi_A^M}{d\varepsilon}\right|_{\varepsilon=0} &= -q_A^N + (P'(Q^N)q_A^N + P(Q^N) - w_A^N)\frac{1}{w_A'(q_A^N)} + P'(Q^N)\frac{dq_B}{dq_A}(q_A^N)\frac{1}{w_A'(q_A^N)} \\ &= -q_A^N + w_A'(q_A^N)q_A^N\frac{1}{w_A'(q_A^N)} + P'(Q^N)\frac{dq_B}{dq_A}(q_A^N)\frac{1}{w_A'(q_A^N)} \\ &= \underbrace{P'(Q^N)}_{<0}\underbrace{\frac{dq_B}{dq_A}(q_A^N)}_{<0}\underbrace{\frac{1}{w_A'(q_A^N)}}_{>0} \\ &> 0.\end{aligned}$$

□

The effects of the minimum wage on worker surplus and consumer surplus are summarized in the following corollary.

Corollary 1. *Suppose that a binding minimum wage $\underline{w} = w_A^N + \varepsilon$ is introduced in labor market A, where $\varepsilon > 0$ is sufficiently small. Then, worker surplus increases in labor market A and decreases in labor market B. In addition, consumer surplus increases.*

Proof. We have

$$\begin{aligned} LS_A^M - LS_A^N &= \underline{w}q_A^M - \int_0^{q_A^M} w_A(l_A)dl_A - w_A^N q_A^N + \int_0^{q_A^N} w_A(l_A)dl_A \\ &= \underline{w}q_A^M - w_A^N q_A^N - \int_{q_A^N}^{q_A^M} w_A(l_A)dl_A \\ &\geq \underline{w}q_A^M - w_A^N q_A^N - \int_{q_A^N}^{q_A^M} \underline{w}\ dl_A \\ &= \underbrace{(\underline{w} - w_A^N)}_{=\varepsilon} q_A^N \\ &> 0, \end{aligned}$$

and

$$\begin{aligned} LS_B^M - LS_B^N &= w_B^M q_B^M - \int_0^{q_B^M} w_B(l_B)dl_B - w_B^N q_B^N + \int_0^{q_B^N} w_B(l_B)dl_B \\ &= w_B^M q_B^M - w_B^N q_B^N + \int_{q_B^M}^{q_B^N} w_B(l_B)dl_B \\ &\leq w_B^M q_B^M - w_B^N q_B^N + \int_{q_B^M}^{q_B^N} w_B^M dl_B \\ &= \underbrace{(w_B^M - w_B^N)}_{<0} q_B^N \\ &< 0. \end{aligned}$$

Since CS is increasing in Q, it suffices to compare Q^M and Q^N. From $0 > dq_B/dq_A > -1$ (proof of Proposition 1), we have

$$\begin{aligned} Q^M - Q^N &= q_A^M + q_B^M - q_A^N - q_B^N \\ &> q_A^M + (q_B^N - (q_A^M - q_A^N)) - q_A^N - q_B^N \\ &= 0. \end{aligned}$$

□

To illustrate our results graphically, we specialize the model to the following functional forms.

$$P(Q) = 1 - Q,$$
$$w_i(l_i) = \alpha_i l_i,$$

where $\alpha_A, \alpha_B > 0$. Given these, we obtain ($i, j = A, B,\ j \neq i$):

$$q_i^N = \frac{2\alpha_j + 1}{4(\alpha_i\alpha_j + \alpha_i + \alpha_j) + 3},\ w_i^N = \frac{\alpha_i(2\alpha_j + 1)}{4(\alpha_i\alpha_j + \alpha_i + \alpha_j) + 3},$$
$$\pi_i^N = \frac{(2\alpha_i + 1)^2(\alpha_j + 1)}{[4(\alpha_i\alpha_j + \alpha_i + \alpha_j) + 3]^2},$$
$$q_A^M = \frac{\underline{w}}{\alpha_A}, \quad q_B^M = \frac{\alpha_A - \underline{w}}{2\alpha_A(\alpha_B + 1)}, \quad w_A^M = \underline{w}, \quad w_B^M = \frac{\alpha_B(\alpha_A - \underline{w})}{2\alpha_A(\alpha_B + 1)},$$
$$\pi_A^M = \frac{\underline{w}(\underline{w}(2\alpha_A\alpha_B + 2\alpha_A + 2\alpha_B + 1) - \alpha_A(\alpha_B + 1))}{2\alpha_A^2(\alpha_B + 1)}, \quad \pi_B^M = \frac{(\underline{w} - \alpha_A)^2}{4\alpha_A^2(\alpha_B + 1)},$$

where $\underline{w} \in \left(w_A^N, 2w_A^N\right)$.

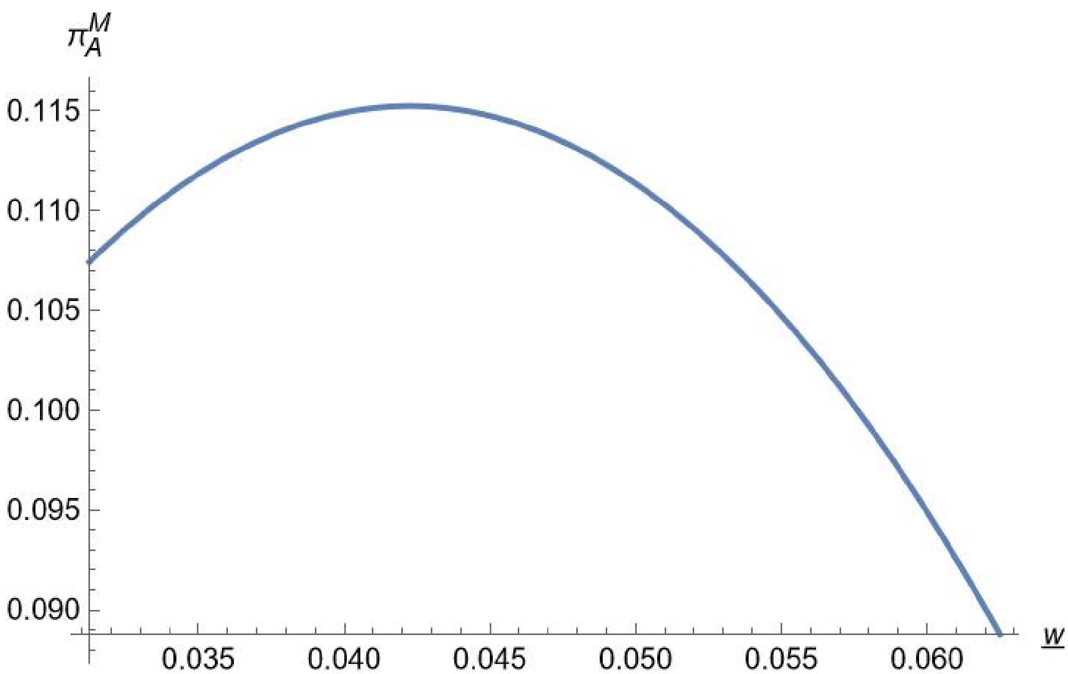

Figure 2: The relationship between the minimum wage in labor market A and firm A's profit ($\alpha_A = \alpha_B = 0.1$)

Figure 2 indicates that π_A^M is increasing in $\underline{w}$ if $\underline{w}$ is sufficiently close to w_A^N, that is, $\underline{w} < \alpha_A(2\alpha_B + 1)/2(2(\alpha_A\alpha_B + \alpha_A + \alpha_B) + 1)$.

4 Extension: Price competition

In this section, we replace quantity competition with price competition to clarify which parts of the main result depend on the strategic variable. The main message is simple: the minimum wage still makes firm A behave more aggressively, but under price competition this intensifies rivalry and reduces both firms' absolute profits. We use the following demand system for differentiated products and symmetric inverse labor supply functions:

$$q_i(p_i, p_j) = \frac{1 - \gamma - p_i + \gamma p_j}{1 - \gamma^2},$$
$$w_i(l_i) = \alpha l_i,$$

where $i \neq j$, $\alpha > 0$, and $\gamma \in [0, 1)$ represents the degree of product homogeneity. The objective of firm i is

$$\pi_i(p_i, p_j) = (p_i - w_i(l_i))q_i(p_i, p_j) = (p_i - \alpha q_i(p_i, p_j))q_i(p_i, p_j).$$

Below, we focus on the exogenous parameters such that an interior solution exists.

As in the analysis of the main model, we obtain the equilibrium outcome without minimum wage regulation by solving the first-order conditions, leading to

$$p_A^N = p_B^N = \frac{1 - \gamma^2 + 2\alpha}{\gamma(1 - \gamma) + 2(1 + \alpha)},$$
$$w_A^N = w_B^N = \frac{\alpha}{\gamma(1 - \gamma) + 2(1 + \alpha)}.$$

Substituting these values into the objectives of the firms, we obtain

$$\pi_A^N = \pi_B^N = \frac{1 - \gamma^2 + \alpha}{(\gamma(1 - \gamma) + 2(1 + \alpha))^2}.$$

Suppose now that a minimum wage $\underline{w} = w_A^N + \varepsilon$ is introduced in labor market A, where $\varepsilon > 0$ is sufficiently small. As in the main model, the regulated firm chooses the largest output level consistent with the wage floor. Under price competition, this is implemented through a corner solution for firm A's price, characterized by

$$w_A(q_A(p_A, p_B)) = \underline{w}.$$

Combining this equation with the standard first-order condition of firm B yields the equilibrium under minimum wage regulation::

$$p_A^M = \frac{(1-\gamma^2+2\alpha)(2(1+\alpha)-\gamma^2)\alpha - 2(1-\gamma^2+\alpha)(2(1+\alpha)+\gamma(1-\gamma))\varepsilon}{(2(1+\alpha)-\gamma^2)(2(1+\alpha)+\gamma(1-\gamma))\alpha},$$
$$p_B^M = \frac{(1-\gamma^2+2\alpha)((2(1+\alpha)-\gamma^2)\alpha - (2(1+\alpha)+\gamma(1-\gamma))\gamma\varepsilon)}{(2(1+\alpha)-\gamma^2)(2(1+\alpha)+\gamma(1-\gamma))\alpha},$$

where $\varepsilon < ((1+2\alpha-\gamma^2)(2(1+\alpha)-\gamma^2)\alpha)/(2(1-\gamma^2+\alpha)(2(1+\alpha)+\gamma(1-\gamma)))$. Given these values, we obtain the equilibrium wages and firms' profits under minimum wage regulation.

$$w_A^M = \underline{w}, \quad w_B^M = \frac{\alpha(2(1+\alpha)-\gamma^2) \ - (2(1+\alpha)+\gamma(1-\gamma))\gamma\varepsilon}{2(1+\alpha)+\gamma(1-\gamma)},$$
$$\pi_A^M = \frac{\Omega_A}{((2(1+\alpha)-\gamma^2)(2(1+\alpha)+\gamma(1-\gamma))\alpha)^2},$$
$$\pi_B^M = \frac{(1-\gamma^2+\alpha)((2(\alpha+1)-\gamma^2)\alpha - (2(1+\alpha)+\gamma(1-\gamma))\gamma\varepsilon)^2}{((2(1+\alpha)-\gamma^2)(2(1+\alpha)+\gamma(1-\gamma))\alpha)^2},$$

where $\Omega_A = (2(1+\alpha)-\gamma^2)(1-\gamma^2+\alpha)\alpha^2 - (1-\gamma^2+2\alpha)(2(1+\alpha)+\gamma(1-\gamma))\alpha\gamma^2\varepsilon + (2(1+\alpha)+\gamma(1-\gamma))^2(2(1+\alpha)^2+(2-\alpha)\gamma)\varepsilon^2$.

Comparing the equilibrium outcomes with and without minimum wage regulation yields the following proposition.

Proposition 3. *Suppose that a binding minimum wage $\underline{w} = w_A^N + \varepsilon$ is introduced in labor market A, where $\varepsilon > 0$ is sufficiently small. Then, for both firms, prices decrease, and profits decline. Firm A's relative profit vis-à-vis firm B (i.e., $\pi_A - \pi_B$) increases.*

The binding minimum wage makes firm A price more aggressively. Firm B partially follows along its best response, so both prices fall and both firms' absolute profits decline. The regulated firm nevertheless loses less than its rival, so its relative profit increases.

Proof. Simple calculation yields the results:

$$p_A^N - p_A^M = \frac{2(1-\gamma^2+\alpha)\varepsilon}{(2(1+\alpha)-\gamma^2)\alpha} > 0,$$
$$p_B^N - p_B^M = \frac{\gamma(1-\gamma^2+2\alpha)\varepsilon}{(2(1+\alpha)-\gamma^2)\alpha} > 0,$$
$$p_B^M - p_A^M = \frac{(1-\gamma)(\gamma(1-\gamma)+2(1+\alpha))\varepsilon}{(2(1+\alpha)-\gamma^2)\alpha} > 0,$$
$$\pi_A^N - \pi_A^M = \frac{(1-\gamma^2+2\alpha)\gamma^2\varepsilon}{(2(1+\alpha)-\gamma^2)(2(1+\alpha)+\gamma(1-\gamma))\alpha} + \frac{\{2\alpha^2+(4-\gamma^2)\alpha+2(1-\gamma^2)\}\varepsilon^2}{\alpha^2(2(1+\alpha)-\gamma^2)} > 0,$$
$$\pi_B^N - \pi_B^M = \frac{2(1-\gamma^2+\alpha)\gamma\varepsilon}{(2(1+\alpha)-\gamma^2)(2(1+\alpha)+\gamma(1-\gamma))\alpha} - \frac{(1-\gamma^2+\alpha)\gamma^2\varepsilon^2}{\alpha^2(2(1+\alpha)-\gamma^2)^2} > 0,$$
$$\pi_A^M - \pi_B^M = \frac{(1-\gamma)\gamma\varepsilon}{\alpha(2(1+\alpha)-\gamma^2)} - \frac{(1+\alpha)(4-5\gamma^2+\gamma^4+4(2-\gamma^2)\alpha+4\alpha^2)\varepsilon^2}{\alpha^2(2(1+\alpha)-\gamma^2)^2}.$$

The last one is positive if

$$\varepsilon < \frac{\alpha\gamma(1-\gamma)(2(1+\alpha)-\gamma^2)}{(1+\alpha)(4-5\gamma^2+\gamma^4+4(2-\gamma^2)\alpha+4\alpha^2)}.$$

□

As in quantity competition, the minimum wage induces firm A to produce up to the level where its marginal cost is lower than its original marginal cost. This quantity level is achieved through firm A's price control, which works as a precommitment to produce this quantity. This situation is similar to the classical price-versus-quantity competition in Singh and Vives (1984). In their model, if one firm (firm 1) sets a price and another (firm 2) sets a quantity, then firm 1 earns a lower profit than firm 2 because firm 2 behaves as a price cutter and firm 1 is forced to treat firm 2's supply as given.

5 Discussions

We briefly discuss the implications for empirical research and management.

5.1 Implications for Empirical Research

Our model shows that when the minimum wage becomes binding in a local labor market, employment in that region may actually increase, while employment in other regions declines through strategic interactions in the product market. This result offers useful implications for empirical research in labor economics.

Much of the empirical literature on minimum wages examines employment effects by comparing treated and untreated regions, often focusing primarily on employment changes within the affected region (e.g. Caliendo et al., 2018, 2025). Influential studies such as Card and Krueger (1994) and Dube et al. (2010), for example, find little or no negative employment effect in low-wage labor markets, a result commonly interpreted as evidence of monopsony power. Consistent with this interpretation, Azar et al. (2024) show that employment effects of minimum wage increases depend on labor market concentration. Related studies from Japan, including Okudaira et al. (2019) and Yamaguchi (2020), also document limited or heterogeneous employment responses to minimum wage increases. Our model is consistent with such findings at the local level, but suggests that they may provide an incomplete picture of the aggregate employment effects.

Even if a minimum wage does not reduce employment in the regulated region, it may still lead to employment reductions or contractions in other regions through strategic interactions in the product market. In this sense, a minimum-wage policy imposed in one region can generate spillovers to other regions that are not directly regulated. This perspective complements recent empirical work emphasizing spatial spillovers and reallocation effects, such as Dustmann et al. (2022) and Jardim et al. (2024), which document that minimum wage increases can induce adjustments across firms and locations beyond the directly treated market.

Our argument is therefore as follows: to assess the overall employment effects of a minimum wage imposed in a given region, it is necessary to account for spillover effects to other regions operating through product-market competition, rather than focusing exclusively on local labor-market outcomes. For instance, one setting in which these considerations may be relevant is the U.S. beer industry. Empirical and industry studies commonly model competition among major brewers as Cournot quantity competition (e.g. Tremblay and Tremblay, 2005; Ashenfelter et al., 2015), while production takes place in large plants that are geographically dispersed across different U.S. states, implying locally segmented labor markets subject to heterogeneous state minimum-wage regulation.

5.2 Managerial Implications

Our model shows that, in this environment, when a minimum wage becomes binding in a local labor market, the profits of firms that source labor from that market increase. In this setting, firms can use the minimum wage as a commitment device for a larger scale of production, thereby inducing firms that source labor from other labor markets to behave more passively in the product market. We do not suggest that firms directly choose statutory minimum wages; rather, minimum wage regulation can operate as an exogenous commitment device, while similar commitment effects may arise when firms credibly adopt wage floors through internal policies or collective arrangements.

This mechanism is consistent with empirical evidence suggesting that firms holding dominant positions in local labor markets are often relatively tolerant of minimum wage policies. For example, Azar et al. (2024) and Popp (2024) show that the effects of minimum wages depend critically on labor market concentration, with firms facing less competitive labor markets experiencing weaker adverse effects. Relatedly, studies such as Draca et al. (2011) and Bossler et al. (2020) document substantial heterogeneity in firms' profitability responses to minimum wage increases.

Although our model focuses on minimum wages imposed by policy authorities, it also relates to the broader literature on strategic commitment in oligopolistic competition, including work on strategic delegation (Vickers, 1985; Fershtman and Judd, 1987; Sklivas, 1987). If firms can credibly commit to wage floors—either through internal policies or collective arrangements—our analysis identifies a theoretical channel through which such commitments can be profit-enhancing by altering rivals' product-market behavior, as discussed in unionized oligopoly settings (e.g., Vannini, 2000; Meland, 2002).

6 Conclusion

We investigate a duopoly model in which two firms engage in homogeneous-good Cournot competition in the same product market while procuring labor from two distinct labor markets. We show that the introduction of a binding minimum wage in the labor market faced by one of the firms increases that firm's profits. Importantly, the minimum wage does not directly affect the rival's cost; rather, it influences the rival's output purely through product-market strategic interaction. Also, this binding minimum wage increases worker surplus in this labor market but reduces it in the other labor market.

In addition, it increases consumer surplus in the product market.

Our results, therefore, point to a potential trade-off in the regional incidence of minimum wage regulation. While the policy benefits workers in the regulated region and consumers in the product market, it may adversely affect workers in other regions through product-market spillovers. From a policy perspective, this highlights the importance of evaluating minimum wage policies in a broader spatial equilibrium, rather than focusing exclusively on outcomes within the treated labor market.

Our analysis assumes segmented labor markets in order to isolate the product-market strategic channel. Relaxing this assumption to allow for limited worker mobility across regions would likely attenuate the mechanism, because wage differences would induce some reallocation of labor across local markets. Even so, the mechanism need not disappear entirely as long as firms retain some degree of local monopsony power. Analyzing this intermediate case of partial labor-market segmentation is an important topic for future research.

Another interesting extension is to endogenize regional minimum-wage setting. Suppose that each local government chooses its own minimum wage to maximize regional surplus, including worker surplus and local firm profit, in the spirit of Fukumura and Yamagishi (2020). In such an environment, both firms could be subject to binding minimum-wage regulation, but at different levels across regions. If the minimum wage is set more stringently in region A than in region B, and both wage floors remain close to the unregulated wage schedules, our analysis suggests that firm A may behave more aggressively in the product market and can earn a higher profit relative to firm B, much as in the price-competition case studied in Section 4. Exploring how endogenous regional policy competition interacts with the product-market strategic channel identified here is left for future research.

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