Routledge
Taylor & Francis Group

Economic Research-Ekonomska Istraživanja

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rero20

Minimum wages, firms’ capital intensity and the evolution of economic efficiency in China

Xin Liu & Dewang Wu

To cite this article: Xin Liu & Dewang Wu (2023) Minimum wages, firms’ capital intensity and the evolution of economic efficiency in China, Economic Research-Ekonomska Istraživanja, 36:2, 2108475, DOI: 10.1080/1331677X.2022.2108475

To link to this article: https://doi.org/10.1080/1331677X.2022.2108475

Published online: 30 Aug 2022.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA
2023, VOL. 36, NO. 2, 2108475
https://doi.org/10.1080/1331677X.2022.2108475

Routledge
Taylor & Francis Group

OPEN ACCESS Check for updates

Minimum wages, firms' capital intensity and the evolution of economic efficiency in China

Xin Liu and Dewang Wu

School of Economics and Business Administration, Chongqing University, Chongqing, China

ABSTRACT

Implementing the minimum wage (M.W.) regime leads to higher barriers to entry and the elimination of inefficient firms. This may be a key factor that affects the efficiency of Chinese firms' evolution and contributes to macroeconomic growth. Based on Chinese industrial enterprise and district M.W. data, we analyse the impact of China's M.W. regime on the evolution and behaviour of micro firms and the resulting macroeconomic effects from two aspects: a theoretical model and panel data regression. The results show that the M.W. regime increases firms' factor productivity significantly but leads to the immobility of incumbents, as it results in lower entry and exit probabilities. Total factor decomposition suggests that a M.W. regime improves regional economic efficiency via the growth effect. In addition, as capital intensity increases, a M.W. regime further boosts the growth in firms' productivity, but its positive effect on macroeconomic efficiency diminishes. The results help understand the underlying drivers of China's economic growth and offer important reference significance for rationalising labour policies.

ARTICLE HISTORY
Received 18 October 2021
Accepted 27 July 2022

KEYWORDS
minimum wage (M.W.); firms' dynamic evolution; internal efficiency improvement; resource reallocation; efficiency of economic evolution

JEL CODES
D2; D24; J3

1. Introduction

China's minimum wage (M.W.) standard has been increasing annually. Since the promulgation of the M.W. regulations in 2004, the regional M.W. standard has recorded an average annual rate of 10%. Statistics show that, from 1994 to 2004, the average annual growth rate of urban unit wages was 8%. In 2014, it reached 18%, exceeding the G.D.P. growth in the same period. As shown in Figure 1, between 1998 and 2007, the growth rate of M.W. far outpaced the growth rate of G.D.P., whereas enterprise T.F.P. increased slowly. As the most direct control segment of the labour market, the rise in the M.W. standard leads to an increase in labour costs, causing enterprises to adjust their production and market behaviour, thereby affecting regional economic efficiency.

CONTACT Xin Liu liuxin@cqu.edu.cn

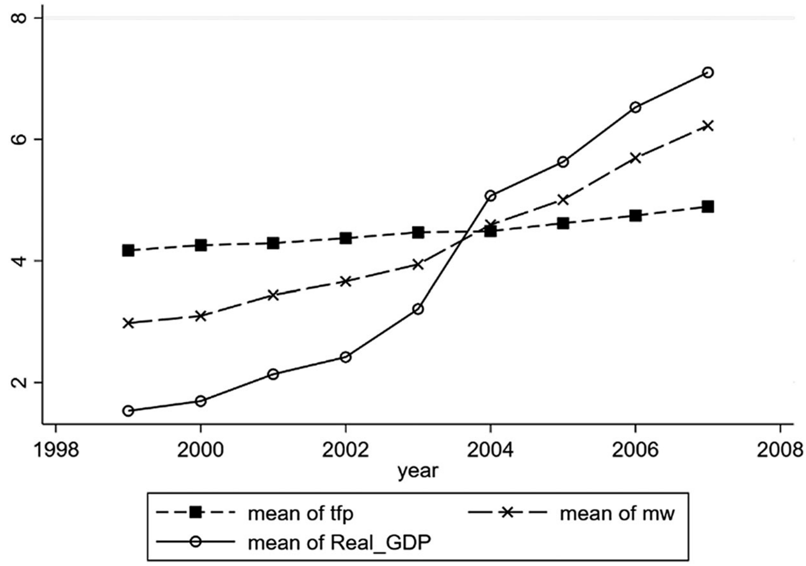

Figure 1. MW, real GDP and TFP.
Source: China's National Bureau of Statistics data from 1998 to 2007. The figure is made by the authors.

In countries with abundant labour supply, such as China, implementing an M.W. regime is a powerful regulatory policy. Besides influencing employment and labour income (Brochu & Green, 2013; Dube et al., 2016), it also affects firms' business decisions (Barros & Managi, 2016), R&D and innovation (Cubitt & Heap, 1999), and the capital/labour ratio (Draca et al., 2011) by incurring labour cost shocks. As a critical component of the labour system established by China, the M.W. regime has stimulated institutional change, which has led to faster but heterogeneous firm-level changes. Some firms have exited, while others have entered; some have grown fast, others have remained unchanged, and some have declined. Institutional change has resulted in the heterogeneous reactions of capital-intensive firms to the effects of M.W. (Mayneris et al., 2014). The effects on the evolution of firms inevitably affect their macroeconomic efficiency.

A higher M.W. means higher average labour costs for firms (Xiao & Xiang, 2009). According to classical growth theory, increases in unit labour costs stimulate firms to increase their capital inputs, leading to higher capital intensity and greater technological advancement (Lucas, 1988; Romer, 1990). Mayneris et al. (2014) argued that holding the output constant, an M.W. regime significantly increases the marginal opportunity cost, forcing low-tech firms to change their production methods. Capital-intensive firms have more advanced technologies and equipment, indicating that they need fewer high-skilled workers or less total labour than do less capital-intensive firms. As companies become more capital-intensive, the cost impact of M.W. will have a greater impact on their production and business decisions. Hence, an M.W. regime has a greater impact on the production and business decisions of labour-intensive firms than on those of capital-intensive firms.

The business decisions and performance of firms often determine regional economic efficiency (Baldwin & Gu, 2006; Foster et al., 2001). In an empirical study, Hsieh and Klenow (2009) concluded that the inefficiency of firms is an important contributor to poor macroeconomic performance. In terms of the dynamic allocation of resources, regional economic efficiency improvement depends on the elimination of inefficient firms from the market (Baldwin & Gu, 2003); accordingly, the evolution of firms will become more efficient, thus gradually leading to regional economic efficiency improvement.

Previous studies have focused on specific firm behaviour, ignoring the possible impact of the M.W. regime on firms' dynamic evolution and, thus, on regional economic efficiency. Economic development is a dynamic evolution process by which the fittest economic entities survive. The endless cycle of firms entering, growing, and exiting forms a dynamic micro-foundation for macroeconomic growth. In addition, several studies on the economic effects of the M.W. regime are empirical (Blažević, 2013; Guo et al., 2021; Zhan et al., 2020), and theoretical research on how M.W. impacts firms' dynamic evolution is scant.

Therefore, to better answer the question of how M.W. affects the evolutionary behaviour of enterprises and, consequently, regional economic efficiency, we first build a theoretical model to analyse the influence of M.W. On the basis of this model, a panel data model is constructed using the data of Chinese industrial enterprises from 1998 to 2007[1] and county-level M.W. data. Then, O.L.S. regression is performed on the four links of enterprise evolution. Finally, D.O.P. (Olley & Pakes, 1996) decomposition is performed to decompose the total TFP into growth and net entry effects. Considering the possible endogeneity of the model, this study also examines its robustness using the instrumental variable for results.

This study makes the following contributions: (1) we consider the responses of heterogeneous firms (low capital intensity and high marginal labour demand, high capital intensity and low marginal labour demand) to cost shocks in the market under the M.W. shock. On this basis, we further consider the hypothesis that M.W. can improve the distribution of production potential and combine it with variable capital intensity to study the impact of M.W. on micro-enterprise characteristics and regional economic efficiency. It provides a new perspective and theoretical support for research on the influence of M.W. on enterprises; (2) we focus on how the M.W. regime impacts firms' dynamic evolution and thus regional economic efficiency under the influence of capital intensity, adding to the debate on M.W.

The rest of the article is organised as follows. The second section presents the literature review. The third part introduces our extended model. The fourth part describes the data and production function estimation methods used in this study. The fifth part introduces the empirical model and the results of this study. The sixth section provides further analysis results at the macro level. The seventh part provides a summary of this thesis.

2. Literature review

2.1. The development of literature on M.W. influencing enterprise labour costs

Many influential studies have demonstrated that M.W. changes firms' labour costs. Stigler (1946) first pointed out that a M.W. regime reduces labour demand and increases labour supply, resulting in lower employment. However, Welch (1974) believed that the negative effect of M.W. increase on employment may not be so serious because the uncovered sectors will absorb more employment. In terms of empirical research, Brown et al. (1982) concluded that a 10% M.W. growth results in a 1% to 3% decrease in employment. Flinn (2006) reviewed empirical studies published before the 1980s and found that early empirical studies on M.W. provide firm support for Stigler's theoretical view.

With more precise methods introduced to examine the effects of an M.W. regime, the academic community has observed changes in its understanding of the economic effects of M.W. Katz and Krueger (1992), Card (1992) and Card and Krueger (1993) conducted quasi-experiments using M.W. adjustment policies in the fast food industry in California and Texas and found that M.W. increases lead to a 5%–10% rise in the wages of low-wage workers. This means that instead of reducing employment, raising M.W. results in higher employment. These findings have changed people's perceptions of M.W., and some researchers have attempted to examine the economic effects of an M.W. regime from the perspective of the cost shocks of M.W. instead of using the framework of a homogeneous and competitive labour market. For example, Brown (1999), Draca et al. (2011) and Dube et al. (2016) argued that instead of being fully competitive, the labour market is monopolistic and that the economic effects of M.W. depend on how the cost shocks of M.W. are compensated for: job cuts by firms would lead to unemployment, whereas lower marginal income or higher cost markups would not. By contrast, Xiao and Xiang (2009) argued that cost shocks could be compensated for through operational adjustments; therefore, M.W. does not affect employment in the short run while employment decreases by only 0.03% in the long run.

Although the findings regarding the effects of M.W. on employment and labour income are far from unanimous, there is a consensus that as an effective regulatory policy, M.W. will increase firms' labour expenses. Our article can be viewed as an attempt to contribute to this stream of literature.

2.2. Study on the impact of M.W. on enterprise behaviour

With the deepening of research, scholars have gradually paid attention to M.W. as a cost impact to investigate its influence on enterprise behaviour. Brecher (1974) found that M.W. growth in capital-intensive countries leads to more exports of capital-intensive goods. Further research revealed that M.W. growth reverses the export and import behaviour of capital-intensive and labour-intensive industries (Magee, 1975). Egger and Kreickemeier (2009) found that when M.W. increases in one of two countries, the productivity of the producers of final goods in both countries decreases overall, thus leading to reductions in the exports of all firms.

Several subsequent studies have shown that M.W. growth leads to increases in firms' variable and fixed costs and that firms adjust their production and factor inputs to varying degrees accordingly. Acemoglu and Pischke (1999) examined the relationship between M.W. cost shocks and firms' willingness to train employees. They found that M.W. enforcement and growth lead to higher total labour costs, making firms more willing to train low-skilled workers and thereby leading to productivity growth. Acemoglu and Pischke (2003) further argued that the effects of M.W. on employee training are significantly heterogeneous: some firms tend to provide more training for high-skilled workers, whereas others tend to offer less training for low-skilled workers. These findings further prove that M.W. cost shocks significantly affect firms' resource inputs. David et al. (2016) also found that firms tend to compensate for the cost shocks of higher M.W. by cutting back on wage increases for highly paid employees or lowering dividends. In terms of productivity, Galindo-Rueda and Pereira (2004) and Mayneris et al. (2014) concluded that firms compensate for the cost shocks of M.W. by adjusting their operations; this adjustment indirectly leads to productivity growth.

2.3. Literature summary

The findings show that M.W. cost shocks have a significant impact on firm production and management. However, further research is necessary because of the following reasons: (1) Previous works only focused on the effects of the cost shocks of M.W. on firms' production and management and thus ignored the tendency of such effects to change with increases in firms' capital intensity; (2) Previous studies failed to examine how an M.W. regime affects macroeconomic efficiency (e.g., regional economic efficiency) by affecting the evolution of firms. Therefore, we try to explain the influence of M.W. as a cost impact on enterprises and the regional economy from theoretical and empirical perspectives.

3. Theoretical model

In this section, a theoretical model of how the M.W. regime affects macroeconomic efficiency by influencing the evolution of firms is constructed based on Melitz's framework. According to Melitz's (2003) heterogeneous productivity model, the threshold determines incumbents' minimum productivity when the market is equilibrium.[2]

3.1. Effects of cost shocks on the evolution of firms

Mayneris et al. (2014) point out two paths of firm production: (1) a high-technology path with high capital intensity and low marginal labour demand; and (2) a low-technology path with low capital intensity and high marginal labour demand. M.W. cost shocks widen the marginal cost gap between the two paths. Holding the output constant, the M.W. regime significantly increases the marginal opportunity cost of firms following the second path, compelling them to invest more in R&D, increase their capital inputs, and change their production methods. Thus, we assume that under the impact of M.W., there are enterprises affected by M.W. in the market (*Low-technology production path, with both low capital intensity and high marginal labour demand*) and enterprises that are not affected by M.W. (*High technology production path, with high capital intensity and low labour marginal demand*).

Some firms' marginal costs increase due to the M.W. regime. Suppose that they increase by $\tau(\tau > 1)$ and that the shape of firms' potential productivity distribution is unaffected; that is, $g(\varphi)$ remains unchanged. The prices of the goods produced by these firms are $p_x(\varphi) = \tau\omega/\rho\varphi$. If ω equals 1, then $p_x(\varphi) = \tau p(\varphi)$,[3] and the firm's profit $\pi_x = \frac{r_x}{\sigma} - f_x$, where f_x is the firm's fixed cost after being subject to the cost shocks of M.W. and $f_x > f$. For these firms, there is a zero cutoff productivity φ_x^*, such that $\pi_x(\varphi_x^*) = 0, \overline{\pi}_x\left(\widetilde{\varphi}_x\right) = f_k k(\varphi_x^*)$, where $k(\varphi_x^*) = \left[\widetilde{\varphi}(\varphi_x^*)/\varphi_x^*\right]^{\sigma-1} - 1$. According to Equation (5), the relationship between firm revenue in the two scenarios is expressed as follows:

$$\frac{r_x(\varphi_x^*)}{r(\varphi^*)} = \tau^{1-\sigma}\left(\frac{\varphi_x^*}{\varphi^*}\right)^{\sigma-1} = \frac{f_x}{f} \underset{r=pq}{\Longleftrightarrow} \varphi_x^* = \varphi^*\tau\left(\frac{f_x}{f}\right)^{\frac{1}{\sigma-1}}$$

Because $\tau\left(\frac{f_x}{f}\right)^{\frac{1}{\sigma-1}} > 1$, zero-cutoff productivity φ^*, when there are no-cost shocks is lower than the zero-cutoff productivity φ_x^*. We set $1 - G(\varphi_x^*)$ as the probability of firm entry following the cost shocks of M.W.; then, $P_x = \left[1 - G(\varphi_x^*)\right]/[1 - G(\varphi^*)]$ represents the probability of firms being affected by the M.W. regime. When the market is subject to cost shocks, the average expected profitability is the weighted average of the profits of the affected and unaffected firms:

$$\overline{\pi}\left(\varphi_t^*\right) = [1 - P_x]fk(\varphi^*) + P_x f_x k\left(\varphi_x^*\right) = f_t k(\varphi_t^*)$$

where $\overline{\pi}(\varphi_t^*)$ is the weighted average of the average market profit and firms' profits following cost shocks, and the weight is P_x. φ_t^* is the average expected equilibrium profit following the cost shocks and f_t is the firm's fixed costs following the cost shocks. Because $k(\varphi)$ is a monotonically decreasing function, $\varphi^* < \varphi_t^* < \varphi_x^*$. At the same time, the equilibrium condition (F.E. curve) for new entrants is $\overline{\pi} = \frac{\partial f_e}{1-G(\varphi_t^*)}$[4]. As a result of the cost shocks, a new entrant needs a higher productivity threshold to enter successfully ($\varphi^* < \varphi_t^*$), and the equilibrium zero-cutoff productivity φ_t^* following the cost shocks and expected market profit $\overline{\pi}$ are jointly determined by the new Z.C.P. and F.E. curves (Figure 2).

Figure 2 shows that under the M.W. regime, the new equilibrium zero-cutoff productivity increases from φ^* to φ_t^*, the equilibrium profit increases from $\overline{\pi}(\varphi^*)$ to $\overline{\pi}(\varphi_t^*)$, and the aggregate productivity of incumbents increases from $\widetilde{\varphi}(\varphi^*)$ to $\widetilde{\varphi}(\varphi_t^*)$.

Equilibrium zero-cutoff productivity increases from to φ_t^*, implying that the productivity threshold for new entrants also increases from φ^* to φ_t^*. Figure 3 shows that the distribution of incumbents' productivity $\mu(\varphi)$ changes with an increase in φ^* and that the productivity threshold of new entrants also increases. According to Equation (10), the weighted average productivity of new entrants is higher than that of incumbents (i.e., $(\widetilde{\varphi}(\varphi_t^*) > \widetilde{\varphi}(\varphi^*))$.

Increasing zero-cutoff productivity directly impacts the productivity threshold of new entrants, and the average equilibrium profit is determined by the number of incumbents or market size. A larger market indicates a lower average profit. Subsequently, $\overline{\pi}(\varphi^*)$ increases to $\overline{\pi}(\varphi_t^*)$ which increases the average partial

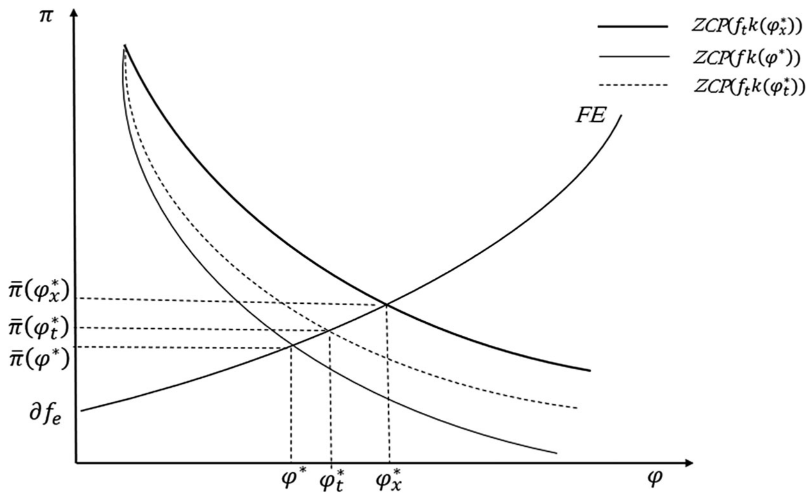

Figure 2. Determination of zero-cutoff productivity φ^* and average profit $\bar{\pi}$ following the cost shocks.
Source: made by the authors.

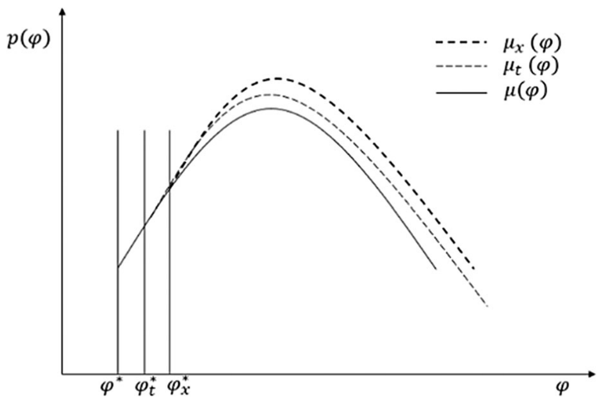

Figure 3. Productivity distribution and changes in φ^*
Source: made by the authors.

equilibrium profit. Therefore, some inefficient firms must exit, contributing to significant growth in incumbents' average productivity.

In summary, the M.W. regime leads to higher equilibrium cutoff productivity and helps eliminate inefficient firms so that new entrants have higher productivity. That is, it affects firm entry and exit.

3.2. Potential productivity change

The previous section shows that M.W. cost shocks may change zero-cutoff productivity and thus the aggregate productivity of firms, consistent with the findings of previous studies. In other words, increases in firms' capital inputs decrease the average cost of capital, which stimulates R&D investment, innovation, and technological advancement and enhances firm-level productivity. This section shows that, under the M.W. regime, firms' potential productivity $g(\varphi)$ may change. In this part, a new potential productivity function, $\acute{g}(\varphi) = [g(\varphi) + \alpha\varphi k + \beta]/k$ is defined, where α、β are endogenous parameters, which provide practical implications. First, when firms' capital intensity k remains unchanged, they need higher potential productivity to mitigate the cost shocks of M.W.; that is, the M.W. regime drives every firm's potential productivity to increase as its productivity rises. Second, when firms' productivity φ remains unchanged, firms with high capital intensity need lower potential productivity to mitigate the cost shocks of the M.W.; that is, the M.W. regime drives every firm's potential productivity to decrease as its capital intensity rises.

Then, weighted average productivity is

$$\acute{\tilde{\varphi}}\left(\acute{\varphi}_t^*\right) = \left[\frac{1}{1 - \acute{G}(\acute{\varphi}_t^*)}\int_{\acute{\varphi}_t^*}^{+\infty} \varphi^{\sigma-1}\acute{g}(\varphi)d\varphi\right]^{1/(\sigma-1)}$$

The probability P_x of firms affected by the cost shocks of M.W. changes to $\acute{p_x} = [1 - \acute{G}(\varphi_x^*)\}/[1 - G(\varphi^*)]$ and the average profit of these firms is $\acute{\bar{\pi}} = f\acute{k}(\acute{\varphi}_x^*)$, and $\acute{k}(\acute{\varphi}_x^*) = \left[\tilde{\varphi}(\acute{\varphi}_x^*)/\acute{\varphi}_x^*\right]^{\partial-1} - 1$, $\acute{\bar{\pi}} = \frac{\partial f_e}{1-\acute{G}(\varphi^*)}$ is the lowest expected equilibrium profit. Under the M.W. regime, zero-cutoff productivity for firms increases from φ_x^* to $\acute{\varphi}_x^*$. The actual profit following the cost shocks is

$$\acute{\bar{\pi}}\left(\acute{\varphi}_t^*\right) = [1 - \acute{p_x}]fk(\varphi^*) + \acute{p_x}f_x\acute{k}\left(\acute{\varphi}_x^*\right)$$

Therefore, when considering the cost shocks of M.W., the potential productivity distribution $g(\varphi)$ becomes $\acute{g}(\varphi)$ and the M.W. regime also increases equilibrium zero-cutoff productivity and eliminates inefficient firms; thus, new entrants have higher productivity, and incumbents have higher weighted average productivity. Figure 4 shows the original and new productivity distributions following M.W. cost shocks.

The changes in weighted average productivity before and after the M.W. cost shocks are expressed as follows:

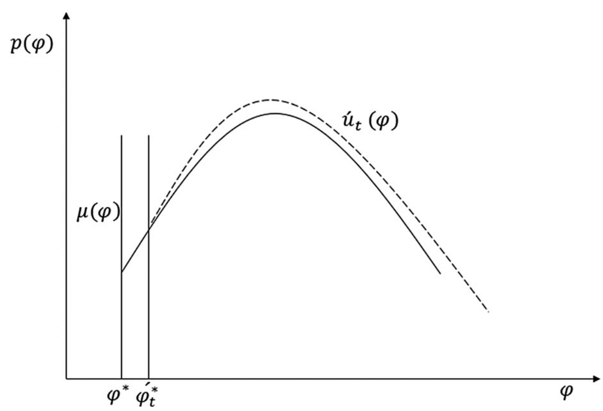

Figure 4. Cost shocks of MW and the productivity distribution.
Source: made by the authors.

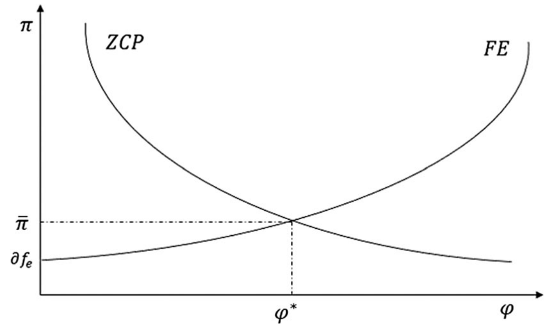

Figure 5. Determination of equilibrium zero-cutoff productivity and average productivity.
Source: made by the authors.

$$\tilde{\acute{\varphi}}\left(\acute{\varphi}_t^*\right)^{\sigma-1} - \tilde{\varphi}(\varphi^*)^{\sigma-1} = \int_{\acute{\varphi}_t^*}^{+\infty} \varphi^{\sigma-1}\acute{\mu}_t(\varphi)d\varphi - \int_{\varphi^*}^{+\infty} \varphi^{\sigma-1}\mu(\varphi)d\varphi$$

$$= \underbrace{\int_{\acute{\varphi}_t^*}^{+\infty} \varphi^{\sigma-1}\frac{\alpha\varphi k+\beta}{k\left[1-\acute{G}(\varphi_t^*)\right]}d\varphi}_{growth\ \ effect} + \underbrace{\int_{\acute{\varphi}_t^*}^{+\infty} \varphi^{\sigma-1}\left(\left(\frac{\theta}{k}-1\right)\mu(\varphi)\right)d\varphi - \int_{\varphi^*}^{\acute{\varphi}_t^*} \varphi^{\sigma-1}\mu(\varphi)d\varphi}_{net\ \ entry\ \ effect}$$

where $\theta = \frac{1-G(\varphi^*)}{1-\acute{G}(\varphi_t^*)}$. The above equation indicates that the changes in the weighted average productivity of incumbents before and after the cost shocks of M.W. come from the growth and net entry effects. First, for the growth effect, facing the cost shocks of M.W., firms choose to improve their management capacity and introduce advanced technologies and equipment, thus growing T.F.P.; the growth effect brought about by the M.W. regime weakens as capital intensity k increases. Second, for the net entry effect, the weighted average productivity of new entrants is higher than the weighted average productivity of incumbents, and exiting firms' weighted average productivity is lower than the weighted average productivity of incumbents, thus improving economic efficiency; the net entry effect brought about by the M.W. regime weakens or even becomes negative as capital intensity k increases (Figure 5).

4. Data and modeling

4.1. Data source

We took the year of a firm's last appearance as the exit year before 2007; however, if a firm last appeared in 2007, we labelled it as 'exit unidentifiable', irrespective of the year of its first appearance. Assume that the year of a firm's first appearance is t and the year of its last appearance is $\tau(\tau \geq t)$; then:

$$exit = \begin{cases} \tau & if \quad t \neq 2007, \tau \neq 2007 \\ unknown & if \quad \tau = 2007 \end{cases}$$

Using the value-added variable, we construct the following market share indicator:

$$share\_d_i = |(value\_added_i - l.value\_added_i)/value\_added_i|$$

where $share\_d_i$ is the change in the firm's market share in the current year, $value\_added_i$ is the value-added of the firm in the current year, and $l.value\_added_i$ is the value-added in the previous year.

Finally, we used the Solow residual method to measure firms' T.F.P. We assume that the firm's production function is a C-D function with returns to scale remaining unchanged; then, the T.F.P. of firm i in period t is:

$$lnTFP_{it} = lnY_{it} - \alpha_k lnk_{it} - \alpha_l lnl_{it}$$

where Y is the firm's total output; α_k and α_l represent the shares of capital and labour inputs, respectively; and k 、 l represent the firm's fixed capital stock and headcount, respectively.

Previous studies (Mayneris et al., 2014) have concluded that firms with different capital intensities may react differently to M.W. cost shocks. Therefore, we construct the following econometric model to examine the impact of the M.W. regime on firms' dynamic evolution while introducing the interaction term between firms' capital intensity and M.W. into the model:

$$Evo^k_{ijt} = \alpha_k + \beta_{k1} Min_{ijt} + \beta_{k2} Capin_{ijt} + \beta_{k3} DUCapin_{ijt} + \beta_{k4i} \sum_i \gamma + \beta_{k5j} \sum_j \delta + \varphi_{\ kijt} \ (k = 1, 2, 3, 4)$$

where Evo^k_{ijt} represents the link k of the evolution of firm i in county j in year t; the superscript k is 1,2,3,4 representing firm entry, firm exit, market share change, and T.F.P. growth, respectively; Min_{ijt} is the M.W. recorded by firm i in region j in year t; $Capin_{ijt}$ is the capital intensity of firm i in region j in year t; $DUCapin_{ijt}$ is the interaction term of M.W. and the firm's capital intensity; $\sum_i \gamma$ and $\sum_j \delta$ represent the firm-level and region-level control variables, including firms' liabilities-to-assets ratio, profitability, firm size, the population of the county in which the firm is based, and per capita G.D.P.; and φ is the residual term. The M.W. and capital intensity indicators are averaged before the regression, given the economic implications of the coefficients of the interaction term and covariance.

4.2. Decomposition of macroeconomic efficiency

In this study, we used the D.O.P. method to decompose the T.F.P. of China's manufacturing industry from 1997 to 2008. The specific steps are:

The aggregate productivity of all firms in a region in period t is defined as

$$\Phi_t = \sum \varpi_{it} \varphi_{it}$$

where ϖ_{it} is the weight, typically referring to the share of a firm in the total output, value-added, and employment. In this study, the value added $value\_added_{it}$ was used. φ_{it} represents the T.F.P. of firm i in period t.

Decompose aggregate productivity in period $t-k$ into the sum of the weighted average productivity of the surviving and exiting firms

$$\Phi_{t-k} = \Phi_{S(t-k)} \sum_{i \ni S} w_{i(t-k)} + \Phi_{X(t-k)} \sum_{i \ni X} w_{i(t-k)} = \Phi_{S(t-k)} + \sum_{i \ni X} w_{i(t-k)} [\Phi_{X(t-k)} - \Phi_{S(t-k)}]$$

We consider aggregate productivity in period t as the sum of the weighted average productivity of surviving firms and new entrants:

$$\Phi_t = \Phi_{St} \sum_{i \ni S} w_{it} + \Phi_{Nt} \sum_{i \ni N} w_{it} = \Phi_{St} + \sum_{i \ni N} w_{it} [\Phi_{Nt} - \Phi_{St}]$$

satisfying:

$$\sum_{i \ni S} w_{i(t-k)} + \sum_{i \ni X} w_{i(t-k)} \equiv \sum_{i \ni \Omega} w_{i(t-k)} \equiv 1$$

$$\sum_{i \ni S} w_{it} + \sum_{i \ni X} w_{it} \equiv \sum_{i \ni \Omega} w_{it} \equiv 1$$

where Ω represents all firms in a region in period t, S represents surviving firms, X represents exiting firms, N represents new entrants, and Φ_{St} and $\Phi_{S(t-k)}$ represent the aggregate productivity of the firms that survived in periods t and $t-k$, respectively. Φ_{Nt} and $\Phi_{X(t-k)}$ represent the aggregate productivity of new entrants in period t and that of exiting firms in periods $t-k.w_i$ represents the share of firm i in the total output of all firms in the region in period t.

The D.O.P. result from the above equations is as follows:

$$\Delta\Phi_t = \underbrace{\Delta\overline{\varphi_t} + \Delta cov_S(s_{it}, \varphi_{it})}_{growth\ \ effect} \underbrace{+ S_{Nt}(\Phi_{Nt} - \Phi_{St}) + \left\{-S_{X(t-k)}\left[\Phi_{X(t-k)} - \Phi_{S(t-k)}\right]\right\}}_{net\ \ entry\ \ effect} \stackrel{\text{def}}{=} \sum_{\mathrm{k}=1}^{2} Effect_{\mathrm{k}}$$

where $\Delta\Phi_t$ represents the overall change in regional economic efficiency, and $Effect_k$ represents the effect k. Using the D.O.P. method, we decompose regional economic efficiency into the growth effect and net entry effect. The growth effect represents the T.F.P. growth of incumbents attributed to a firm's self-enhancement actions, the introduction of advanced technologies and equipment, and regional economic efficiency improvement attributed to changes in incumbents' market share and the flow of factors of production. The net entry effect states that regional economic efficiency improves because new entrants achieve a higher weighted average productivity than incumbents, and the weighted average productivity of exiting firms is lower than that of incumbents.

Similarly, after considering the interaction effect of average capital intensity and M.W. at the regional level, we construct the following model to further examine the paths by which the M.W. regime affects regional economic efficiency based on firms' dynamic evolution:

$$Effect_{jt}^{k} = \alpha_k + \beta_{k1} Min_{jt} + \beta_{k2} avCapin_{jt} + \beta_{k3} DUavCapin_{jt} + \beta_{k4j} \sum\nolimits_j \delta + \varphi_{kjt} \quad (k = 1, 2, 3)$$

where $Effect_{jt}^{k}$ represents the effect k in region j in period t and $k = 1, 2, 3$ represent the growth, net entry, and total effects, respectively. The change in the macroeconomic efficiency of region j in period t is the sum of two efficiencies, that is, $\Delta\Phi_{jt} \equiv \sum_{k=1}^{2} Effect_{jt}^{k}$; Min_{jt} is the M.W. of region j in year t, $avCapin_{jt}$ is the average capital intensity in region j in year t, $DUavCapin_{jt}$ is the interaction term of M.W. and capital intensity; and $\sum_j \delta$ represents the region-level control variables, including regional population, per capita output, average firm size, and the number of firms. Similarly, we averaged the indicators as before.

5. M.W. and the dynamic evolution of firms

In the previous sections, we constructed four indicators for firms' dynamic evolution, and conclude that firms' dynamic evolution plays a decisive role in macroeconomic efficiency. In this section, we examine the effects of the M.W. regime on these four indicators. To ensure the robustness of the measurements, extreme values for each variable were removed. For the key variables, observations below the 1st percentile and above the 99th percentile were replaced with the sample means. Table 1 shows the ordinary least squares (O.L.S.) regression results.

Columns (1) and (2) show that the M.W. regime significantly negatively affects firm entry and exit. Every 100-yuan increase in M.W. leads to a 2.8% drop in entry probability and a significant drop of 32.9% in exit probability. The results of the interaction term between capital intensity and M.W. show that as capital intensity increases (higher than the average of incumbents), M.W. has a stronger negative effect on firm entry, as reflected by a higher barrier to entry into capital-intensive industries under the M.W. regime, and a weaker negative effect on firm exit, as reflected by the elimination of inefficient firms with high capital intensity due to the cost shocks of M.W. Columns (3) and (4) show that the M.W. regime also exerts a negative effect on the flow of resources between incumbents. As capital intensity increases, the M.W. regime further promotes the growth in firms' T.F.P.

Considering that endogeneity may affect the model outcomes, we use instrumental variables for M.W. to examine the effects of the M.W. regime on firms' dynamic evolution.

China does not implement a unified M.W. system and allows each region to determine its M.W. according to its economic development. Hence, the distribution of

Table 1. Basic estimation results.

Variables	Firm entry (1)	Firm exit (2)	Resource reallocation (3)	Total factor productivity (4)
MW	−0.028***	−0.329***	−0.019***	0.027***
	(0.003)	(0.006)	(0.001)	(0.000)
MW * capital intensity	−0.007***	0.007***	0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Capital intensity	0.026***	−0.029***	0.000***	−0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Liabilities-to-assets ratio	−0.004***	0.016***	0.009***	0.039***
	(0.000)	(0.001)	(0.000)	(0.000)
Profitability	−0.385***	−2.455***	−1.481***	2.578***
	(0.031)	(0.051)	(0.021)	(0.009)
Population	0.002***	−0.003***	0.000***	−0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Per capita GDP	−0.017***	−0.023***	0.006***	0.078***
	(0.008)	(0.001)	(0.000)	(0.000)
Firm size	−0.003***	−0.002***	−0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant term	−0.681***	−2.251***	0.546***	3.704***
	(0.008)	(0.015)	(0.005)	(0.003)
Time_fixed	Yes	Yes	Yes	Yes
Individual_fixed	Yes	Yes	Yes	Yes
Adj_R^2	0.588	0.496	0.384	0.501
Number of observations	1,273,226	1,037,953	949,379	1,199,863
Number of firms	386,108	339,412	294,194	362,813

Note: standard errors are in brackets; *, ** and * * * mean that the coefficients are significant at 10%, 5%, and 1% level of significance, respectively. For columns (1) and (2), the binary choice panel data model is used, and for columns (3) and (4), the linear regression panel model is used.
Source: estimated and made by the authors.

M.W. from the provincial capital to remote cities is characterised by a decrease in the gradient. This provides the basis for using geographic distance as an instrumental variable in this study. In addition, we obtained the second I.V. by referring to Bai et al. (2021), that is, ranking cities with similar per capita G.D.P. from large to small in relevant years and grouping them together. Twenty groups were created as a result, and the average M.W. of other cities in the same group was taken as the instrumental variable of the sample city.

Table 2 shows the regression results of the first stage, and Columns (1)–(4) show the results of the two instrumental variables under different conditions. It can be found that the instrumental variables we used have a good interpretation of the endogenous variable (M.W.), which is consistent with the regression results of Bai et al. (2021) in the first stage. Table 3 shows the tests we conducted on the instrumental variables, including the weak instrumental variable test, over identification test, and endogeneity test. All tests show that our instrumental variables are of good applicability. Table 4 shows the regression results for the instrumental variables, which are consistent with our basic regression results.

Based on the regression results, we conclude that the M.W. regime has a significant impact on the dynamic evolution of firms. It contributes significantly to incumbents' immobility, which does not promote firm entry or exit. In terms of productivity, the M.W. regime significantly boosts firms' T.F.P., and this effect strengthens as the capital intensity increases. Hence, the M.W. regime exerts a greater positive effect on T.F.P. growth for firms with higher capital intensity and a weaker positive effect on firms with lower capital intensity.

Table 2. IV regression: results of the first stage regression.

Variables	(1)	(2)	(3)	(4)
Geographical distance (IV)	−0.207***	−0.213***	−0.246***	−0.245***
	(0.001)	(0.001)	(0.000)	(0.000)
Average MW of other cities in the same group (IV)	−0.156***	−0.147***	−0.007***	−0.008***
	(0.001)	(0.001)	(0.000)	(0.000)
Liabilities-to-assets ratio		0.02***		0.01***
		(0.000)		(0.000)
Profitability		0.000		−0.000
		(0.000)		(0.000)
Population		−0.001***		−0.004***
		(0.000)		(0.000)
Per capita GDP		0.011***		−0.005***
		(0.000)		(0.000)
Firm size		0.000***		−0.000***
		(0.000)		(0.000)
Constant term	8.585***	8.248***	3.093***	3.064***
	(0.000)	(0.000)	(0.000)	(0.000)
Time_fixed	No	No	Yes	Yes
Individual_fixed	No	No	Yes	Yes
Adj_R^2	0.48	0.469	0.504	0.507
Number of observations	1,241,609	1,241,433	1,241,690	1,241,433
Number of firms	373,448	373,385	373,448	373,385

Source: estimated and made by the authors.

Table 3. Validation of instrumental variables.

	Firm entry (1)	Firm exit (2)	Resource reallocation (3)	Total factor productivity (4)
Kleibergen-Paap rk LM statistic	39000***	38000***	31000***	320000***
p-value	0.000	0.000	0.000	0.000
Cragg-Donald Wald F statistic	18,000	17,000	14,000	15,000
Hansen J statistic	0.559	0.65	0.794	0.984
p-value	0.455	0.42	0.373	0.321
Endogeneity test	1.686*	30.698***	326.951***	713.749***
p-value	0.088	0.000	0.000	0.000

Source: estimated and made by the authors.

6. M.W., the dynamic evolution of firms and regional economic efficiency

Tables 5 and 6 report the basic decomposition results and the results for the instrumental variable. The latter is consistent with the basic estimation results. The results in Column (1) of Table 5 show that the M.W. regime promotes regional economic efficiency via the growth effect. The results for the interaction term show that the positive effect of the M.W. regime weakens as the firms' average capital intensity increases. Conclusively, M.W. regime impacts macro-level T.F.P. in two main ways: (1) it compels firms with lower capital intensity to increase their capital inputs and change their production methods, which helps boost T.F.P.; and (2) it compels firms to introduce new technologies and invest more in innovation, which improves regional macroeconomic efficiency. When the capital intensity of firms in a region is low, M.W. accelerates firms' technological and management innovation and accelerates firms' capital input, improving regional economic efficiency. When the capital intensity of firms in a region is high, the M.W. regime exerts its effect. When the average capital intensity of firms in a region increases, the positive effect of the M.W.

Table 4. Estimation results for the instrumental variable.

Variables	Firm entry (1)	Firm exit (2)	Resource reallocation (3)	Total factor productivity (4)
MW(IV)	0.002***	−0.023***	−0.002***	−0.051***
	(0.002)	(0.000)	(0.002)	(0.000)
MW(IV) * capital intensity	−0.001***	0.000***	−0.000	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Capital intensity	0.000***	−0.001***	0.000***	−0.000
	(0.000)	(0.000)	(0.000)	(0.000)
Liabilities-to-assets ratio	0.002***	−0.002***	0.011***	0.035***
	(0.000)	(0.000)	(0.000)	(0.000)
Profitability	−0.000**	−0.000(0.001)	−0.077***	0.000***
	(0.000)		(0.004)	(0.000)
Population	−0.001***	0.004***	−0.001***	−0.008***
	(0.000)	(0.000)	(0.000)	(0.000)
Per capita GDP	0.001***	−0.004***	0.003***	0.036***
	(0.000)	(0.000)	(0.000)	(0.000)
Firm size	−0.000***	−0.000***	−0.000***	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)
Constant term	0.137***	0.382***	0.556***	4.106***
	(0.007)	(0.000)	(0.003)	(0.000)
Time_fixed	*YES*	*YES*	*YES*	*YES*
Individual_fixed	*YES*	*YES*	*YES*	*YES*
Adj_R^2	0.401	0.278	0.714	0.274
Number of observations	1,017,022	1,241,433	929,634	1,169,343
Number of firms	328,697	373,385	285,923	350,943

Note: standard errors are in brackets; *, ** and *** mean that the coefficients are significant at 10%, 5%, and 1% level of significance, respectively. For columns (1) and (2), the binary choice panel data model is used, and for columns (3) and (4), the linear regression panel model is used.
Source: estimated and made by the authors.

Table 5. Economic efficiency decomposition: basic estimation results.

Variables	Growth effect (1)	Net entry effect (2)	Total effect (3)
MW	0.104***	−0.001	0.094***
	(0.012)	(0.007)	(0.013)
Average capital intensity	0.001	−0.000	0.002***
	(0.000)	(0.000)	(0.000)
MW * average capital intensity	−0.000***	0.000	−0.000***
	(0.000)	(0.000)	(0.000)
Number of firms	0.024	0.024	0.021
	(0.022)	(0.021)	(0.023)
Population	−0.011***	0.000	−0.009***
	(0.003)	(0.001)	(0.000)
Per capita GDP	−0.039***	−0.006**	−0.043***
	(0.004)	(0.003)	(0.003)
Average firm size	−0.107***	−0.024	−0.121***
	(0.029)	(0.021)	(0.039)
Constant term	0.909***	−0.202	1.001***
	(0.206)	(0.152)	(0.281)
Time_fixed	Yes	Yes	Yes
Individual_fixed	Yes	Yes	Yes
Adj_R^2	0.511	0.47	0.782
Number of regions	12,699	12,999	12,999

Note: standard errors are in brackets; *, ** and *** mean that the coefficients are significant at 10%, 5% and 1% level of significance, respectively. For columns (1)–(3), linear regression panel model is used.
Source: estimated and made by the authors.

regime on regional economic efficiency weakens. Therefore, the M.W. regime has a more positive effect on firms in regions with low capital intensity.

The results in Column (2) show that it is likely that the M.W. regime does not boost macroeconomic efficiency via the net entry effect. The theoretical analysis

Table 6. Economic efficiency decomposition: estimation results for the instrumental variable.

Variables	Growth effect (1)	Net entry effect (2)	Total effect (3)
MW(IV)	0.223***	−0.055	−0.002***
	(0.059)	(0.001)	(0.008)
Average capital intensity	−0.000	−0.000	0.000
	(0.000)	(0.000)	(0.001)
MW(IV) * average capital intensity	−0.002*	0.000	−0.000*
	(0.001)	(0.000)	(0.000)
Number of firms	−0.000	−0.001	−0.0000
	(0.001)	(0.021)	(0.023)
Population	0.097	0.037	−0.001
	(0.103)	(0.092)	(0.000)
per capita GDP	−0.025*	−0.004***	−0.013***
	(0.013)	(0.001)	(0.002)
Average firm size	−0.001***	0.000	−0.000
	(0.000)	(0.000)	(0.000)
Constant term	0.373**	0.208***	0.598***
	(0.168)	(0.048)	(0.125)
Time_fixed	Yes	Yes	Yes
Individual_fixed	Yes	Yes	Yes
Adj_R^2	0.233	0.171	0.447
Number of regions	11459	8734	8407

Note: standard errors are in brackets; *, ** and * * * mean that the coefficients are significant at 10%, 5% and 1% level of significance, respectively. For columns (1)–(3), linear regression panel model is used.
Source: estimated and made by the authors.

shows that the productivity changes of new entrants and exiting firms may impact the net entry effect. By contrast, the M.W. regime significantly contributes to the immobility of incumbents, exerting a negative effect on both firm entry and exit. Therefore, at the macro level, that entrants' aggregate productivity is higher than that of incumbents and that exiting firms' aggregate productivity is lower does not significantly increase regional economic efficiency, weakening the net entry effect. The results in Column (3) show that the M.W. regime significantly boosts regional economic efficiency by impacting firms' dynamic evolution. However, as firms' average capital intensity increases, the positive effect of the M.W. regime weakens. In addition, the growth effect is the key path through which the M.W. regime helps boost macroeconomic efficiency.

7. Conclusion

7.1. Findings

Our findings are threefold. First, regarding the evolution of firms, the M.W. regime significantly contributes to the growth of firms' T.F.P. and the immobility of incumbents. Thus, it has a negative effect on both firm entry and exit. The M.W. regime significantly affects resource reallocation. Second, regarding macroeconomic efficiency, the M.W. regime significantly boosts the average productivity of incumbents by impacting firm entry, firm exit and T.F.P., thus improving regional economic efficiency. This is attributed to the growth effect. Finally, the interaction effect of M.W. and capital intensity shows that the latter is an important mediating factor through which the former affects macroeconomic efficiency by influencing the evolution of firms. Our findings are not only revealing the impact of M.W. on regional economic efficiency in China from 1998 to 2007 but also reflects the current development trajectory of China's micro economy. Most importantly, it also provides a good reference for developing countries and regions that have not yet strictly implemented M.W. policies.

7.2. Limitations and future projections

This study examines the impact of M.W. on the evolution of micro firms and regional economic efficiency in Chinese cities. In the theoretical analysis, the model divides the enterprises in the market into two parts: those affected by M.W. and those not affected by M.W., to simplify the analysis. However, this assumption may be unrealistic. In addition, there are significant differences in economic development between North and South China; therefore, regional heterogeneity analysis of empirical results can provide more information to study the impact of M.W. Given these shortcomings, our study had some limitations. Notably, the conclusion of this study can be regarded as the theoretical basis for the influence of M.W. on micro-enterprises. Further studies in this aspect can be conducted by considering the affected enterprises are represented in a probability distribution. Further, the heterogeneous influence of M.W. on the regions with different economic development should be considered.

Notes

1. Considering the integrity of variables and reliability of the calculation indexes, we ultimately chose to use Chinese industrial enterprise data of 1998–2007.
2. Limited by the length of the article, for the basic conclusions please refer to Melitz's (2003).
3. Throughout, the superscript x refers to firms affected by the M.W. regime.
4. The distribution pattern of potential productivity is unaffected, that is, is unchanged, and its cumulative distribution function is unchanged. Therefore, the new firm entry equilibrium condition (F.E. curve) remains unchanged, too.

Disclosure statement

No potential conflict of interest was reported by the authors.

Funding

This work was supported by [the National Social Science Fund of China] under Grant [number 17BGL144]; [the Fundamental Research Funds for the Central Universities] under Grant [number 2020CDJSK02XK10]; [the Chongqing Social Science Planning Office Social Science Planning Major Project] under Grant [number 2021ZDSC12]; and [Open Fund of Chongqing Key Laboratory of Vehicle Emission and Energy Conservation in 2022] under Grant [number PFJN-07].

References

Acemoglu, D., & Pischke, J.-S. (1999). The structure of wages and investment in general training. *Journal of Political Economy*, *107*(3), 539–572. https://doi.org/10.1086/250071

Acemoglu, D., & Pischke, J.-S. (2003). *Minimum wages and on-the-job training*. Emerald Group Publishing Limited.

Bai, X., Chatterjee, A., Krishna, K., & Ma, H. (2021). Trade and minimum wages in general equilibrium: Theory and evidence. *Journal of International Economics*, *133*, 103535. https://doi.org/10.1016/j.jinteco.2021.103535

Baldwin, J. R., & Gu, W. (2003). Export-market participation and productivity performance in Canadian manufacturing. *Canadian Journal of Economics/Revue Canadienne d'Economique*, *36*(3), 634–657. https://doi.org/10.1111/1540-5982.t01-2-00006

Baldwin, J. R., & Gu, W. (2006). Plant turnover and productivity growth in Canadian manufacturing. *Industrial and Corporate Change*, *15*(3), 417–465. https://doi.org/10.1093/icc/dtj017

Barros, C. P., & Managi, S. (2016). French nuclear electricity plants: Productivity and air pollution. *Energy Sources, Part B: Economics, Planning, and Policy*, *11*(8), 718–724. https://doi.org/10.1080/15567249.2012.723796

Blažević, S. (2013). Is employment decreasing due to minimum wage increase? *Economic Research-Ekonomska Istraživanja*, *26*(1), 69–100. https://doi.org/10.1080/1331677X.2013.11517591

Brecher, R. A. (1974). Minimum wage rates and the pure theory of international trade. *The Quarterly Journal of Economics*, *88*(1), 98–116. https://doi.org/10.2307/1881796

Brown, C. (1999). Minimum wages, employment, and the distribution of income. *Handbook of Labor Economics*, *3*, 2101–2163.

Brown, C., Gilroy, C., & Kohen, A. (1982). The effect of the minimum wage on employment and unemployment. *Journal of Economic Literature*, *20*(2), 487–582.

Brochu, P., & Green, D. A. (2013). The impact of minimum wages on labour market transitions. *The Economic Journal*, *123*(573), 1203–1235. https://doi.org/10.1111/ecoj.12032

Card, D. (1992). Do minimum wages reduce employment? A case study of California, 1987–89. *ILR Review*, *46*(1), 38–54.

Card, D., & Krueger, A. B. (1993). *Minimum wages and employment: A case study of the fast food industry in New Jersey and Pennsylvania*. National Bureau of Economic Research.

Cubitt, R. P., & Heap, S. P. H. (1999). Minimum wage legislation, investment and human capital. *Scottish Journal of Political Economy*, *46*(2), 135–157. https://doi.org/10.1111/1467-9485.00125

David, H., Manning, A., & Smith, C. L. (2016). The contribution of the minimum wage to US wage inequality over three decades: A reassessment. *American Economic Journal: Applied Economics*, *8*(1), 58–99.

Draca, M., Machin, S., & Van Reenen, J. (2011). Minimum wages and firm profitability. *American Economic Journal: Applied Economics*, *3*(1), 129–151.

Dube, A., Lester, T. W., & Reich, M. (2016). Minimum wage shocks, employment flows, and labor market frictions. *Journal of Labor Economics*, *34*(3), 663–704. https://doi.org/10.1086/685449

Egger, H., & Kreickemeier, U. (2009). Firm heterogeneity and the labor market effects of trade liberalization. *International Economic Review*, *50*(1), 187–216. https://doi.org/10.1111/j.1468-2354.2008.00527.x

Flinn, C. J. (2006). Minimum wage effects on labor market outcomes under search, matching, and endogenous contact rates. *Econometrica*, *74*(4), 1013–1062. https://doi.org/10.1111/j.1468-0262.2006.00693.x

Foster, L., Haltiwanger, J. C., & Krizan, C. J. (2001). *Aggregate productivity growth: Lessons from microeconomic evidence (New developments in productivity analysis.* (pp. 303–372). University of Chicago Press.

Galindo-Rueda, F., & Pereira, S. (2004). *The impact of the National Minimum Wage on British firms: Report for the Low Pay Commission*. London School of Economics and University College London.

Guo, L., Duan, X., Li, H., Yang, W., Ren, Y., & Guo, Y. (2021). Does a higher minimum wage accelerate labour division in agricultural production? Evidence from the main rice-planting area in China. *Economic Research-Ekonomska Istraživanja*, *35*(1), 2984–3010. https://doi.org/10.1080/1331677X.2021.1985573

Hsieh, C.-T., & Klenow, P. J. (2009). Misallocation and manufacturing TFP in China and India. *Quarterly Journal of Economics*, *124*(4), 1403–1448. https://doi.org/10.1162/qjec.2009.124.4.1403

Katz, L. F., & Krueger, A. B. (1992). The effect of the minimum wage on the fast-food industry. *ILR Review*, *46*(1), 6–21. https://doi.org/10.1177/001979399204600102

Lucas, R. E., Jr. (1988). On the mechanics of economic development. *Journal of Monetary Economics*, *22*(1), 3–42. https://doi.org/10.1016/0304-3932(88)90168-7

Magee, S. P. (1975). International trade and finance: Frontiers for research. *Journal of Money and Credit and Banking*, *9*(2), 383.

Mayneris, F., Poncet, S., & Zhang, T. (2014). *The cleansing effect of minimum wage: Minimum wage rules, firm dynamics and aggregate productivity in China* (Vol. 16). CEPII Paris.

Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *Econometrica*, *71*(6), 1695–1725. https://doi.org/10.1111/1468-0262.00467

Olley, G. S., & Pakes, A. (1996). The dynamics of productivity in the telecommunications equipment industry. *Econometrica*, *64*(6), 1263–1297. https://doi.org/10.2307/2171831

Romer, P. M. (1990). Endogenous technological change. *Journal of Political Economy*, *98*(5, Part 2), S71–S102. https://doi.org/10.1086/261725

Stigler, G. J. (1946). The economics of minimum wage legislation. *The American Economic Review*, *36*(3), 358–365.

Welch, F. (1974). Minimum wage legislation in the United States. *Economic Inquiry*, *12*(3), 285–318. https://doi.org/10.1111/j.1465-7295.1974.tb00401.x

Xiao, X.-Y., & Xiang, B.-L. (2009). *The impact of minimum wage policy on wages and employment in China*. 2009 International Conference on Information Management, Innovation Management and Industrial Engineering. https://doi.org/10.1109/ICIII.2009.183

Zhan, Q., Zeng, X., Wang, Z.-A., & Mu, X. (2020). The influence of minimum wage regulation on labor income share and overwork: Evidence from China. *Economic Research-Ekonomska Istraživanja*, *33*(1), 1729–1749. https://doi.org/10.1080/1331677X.2020.1762104