

Minimum Wages, Cost-Price Pass-Through and Real Welfare Effect of Households

Hong Zou, Han Xiao, Ze Song, Qianqian Xiong*

The minimum wage policy should take into account production costs of enterprises and welfare benefits of families. This paper describes the pass-through process of the minimum wage costs in the enterprise sector and the household sector by building a theoretical model, investigates the impact of the minimum wage adjustment on urban household consumption utility and its price pass-through mechanism from the perspective of living costs based on several sets of databases, such as household survey, supermarket prices and industrial enterprises for the first time, and further estimates the net welfare changes including income compensation and consumption utility loss. The findings of the study are as below: (1) The price transfer behavior of enterprises is the main cause of the loss of household consumption utility. The average wage level and labor costs of enterprises rise with the increase of minimum wages. Both the cost-price pass-through elasticity estimated based on the theoretical model and the minimum wage price elasticity coefficient obtained by empirical estimation show that the price transfer behavior of enterprises leads to the rise of final consumer prices; (2) With a 10% increase in minimum wages, the overall household living costs increase by 2.47%–6.76%, and the economic living costs increase by about 122–334 yuan per quarter, among which the living costs are most affected in terms of food, shoes and clothing; (3) Under the combined effect of income compensation and consumption utility loss, the bottom 20% of households and middle 60% of households will get 658 yuan and 469–556 yuan per quarter, respectively. The findings of this paper are conducive to improving the supporting minimum wage policy by taking a number of measures simultaneously, so as to provide a path reference for promoting the realization of Chinese modernization and expanding domestic demand for common prosperity for all.

Keywords: minimum wages, cost-price pass-through, household living costs, net welfare

1. Introduction

Bringing benefits to the people is the fundamental principle of governance.

* Hong Zou, Professor, School of Economic, Southwestern University of Finance and Economics; Ze Song (Corresponding author; e-mail: benz1985@nankai.edu.cn), Associate professor, School of economics, Nankai university. Han Xiao and Qianqian Xiong, PhD candidate, School of Economic, Southwestern University of Finance and Economics, We thank the anonymous reviewers for their valuable suggestions, and the paper is under the authors' own responsibility.

Achieving common prosperity for everyone is an essential requirement of the Chinese modernization. The key and difficulty to achieve common prosperity lies in enhancing the ability of low-income people to raise their income and their welfare level. Data show that in 2019, China's urban and rural low-income people (with an annual household income of 100,000 yuan or less) accounted for nearly 65% of the country's total, of which urban residents' wage income accounted for about two-thirds of residents' income. In pursuing economic development, China is under the triple pressures of shrinking demand, disrupted supply and weakening expectations. The impact of the Covid-19 epidemic, combined with economic downturn, puts low-income households at higher risk of reduced income, unemployment impact and welfare losses. The income growth of low-income households is much lower than that of middle- and high-income households. It is an urgent problem for the current government to solve to raise the income of the low-income group and expand the middle-income group by institutional means, so as to achieve common prosperity for everyone.

The minimum wage standard is an important system in China to regulate the order of income distribution and ensure the basic needs of workers. The income increase mechanism of minimum wages for low-income groups is conducive to boosting domestic demand. Since its full implementation in 2004, the system has been adjusted every two years or so, strengthening the protection for Chinese workers (Liu and Zhao, 2019). From 2002 to 2019, the average minimum wage at the regional and county level rose from 303 yuan to 1,043 yuan. During this period, the average social wage increased by nearly 7 times, and the minimum wage cut-off mechanism and spillover mechanism played an important role (Xu and Li, 2020), releasing the consumption demand of low-income households (Dautovic *et al.*, 2019). It is an important measure towards common prosperity to give full play to the role of the minimum wage system in income protection and welfare promotion for low-income families.

It can not be ignored that the minimum wage standard will also lead to the increase of labor costs in enterprises, which are often distributed between enterprises and families through the flow of economic activities. Due to rising labor costs, companies may be hit by lower profit margins and reduced production scale (Harasztosi and Lindner, 2019). Enterprises with market power may transfer costs by raising product prices or other means, so that the prices of consumer goods, especially those of necessities, rise, and are passed on to consumers through commodity circulation (Xu *et al.*, 2017), resulting in an increase in household living costs and affecting households of all income levels. If the welfare effect of minimum wages is analyzed only from the perspective of income, it will ignore the cost-price pass-through of the circulation, and further overestimate the real welfare effect brought by the increase of the minimum wage standard. Therefore, the government should participate in the process of sharing institutional costs to support policy coordination, which is essential for enhancing the reliability of the domestic circulation and improving the quality of Chinese modernization.

The literature concerning the study of the price effect of minimum wages can be divided into two types according to the empirical data and research objects. The first type analyzes the impact of minimum wages on the prices of tradable goods, and concludes that the increase in minimum wages causes the price effect and increases the prices of exports and domestic products based on the enterprise-product data (Gan *et al.*, 2016). The second type mainly examines the impact of minimum wages on the prices of specific industries. Some scholars found that minimum wages significantly increased the prices of food, beverages and goods in convenience stores (Aaronson *et al.*, 2008; Leung, 2021; Renkin *et al.*, 2022). In the research on the consumption effect of minimum wages, existing literature generally hold that minimum wages will increase household consumption, but the reasons for the consumption increase and specific areas are different. Cooper *et al.* (2020) believed that the increase of minimum wages would increase nominal consumption expenditure in the United States, due to the increase in income and employment rate on the one hand, and the increase in living costs resulting from the rise in relative prices on the other hand. Alonso (2020) found that minimum wages would increase the consumption expenditure of non-durable goods of American households, while Aaronson *et al.* (2012) found the evidence of the increase in durable goods consumption. Dautovic *et al.* (2019) found that the minimum wage standard increased the income of low-income families in China, 30% of which was used for medical and education expenses. As for the study on the welfare effect of minimum wages, MaCurdy (2015) found that the impact of minimum wages on family welfare was more reflected in cost sharing by analyzing the input-output model. Enterprises coped with the rise of minimum wages by raising product prices, thereby transferring part of labor costs to consumers.

This paper builds a cost-price pass-through theoretical model of minimum wages, extends Lenug (2021)'s theoretical model at the household consumption utility level, measures the consumption utility loss caused by the cost-price pass-through of minimum wages, and describes the pass-through process of minimum wages→enterprise costs→consumer goods prices→household net welfare. This paper mainly uses the data of urban household survey, national supermarket retail prices of consumer goods, Chinese Industrial Enterprise Database (CIED) and minimum wages at the regional and county level and so on to study the spatio-temporal adjustment difference of minimum wages. According to the empirical study, first, the increase in minimum wages significantly increased the total household living costs and the living costs of various consumer goods, and reduced the real consumption utility of households. The minimum wages rose by 10%, the total living costs rose by 2.47% to 6.76%, and the economic living costs rose by about 122–334 yuan per quarter. Second, the increase of minimum wages significantly increased the labor costs of enterprises. The price transfer of enterprises was the main reason for the loss of household consumption utility, and food and shoes, clothing & textiles were the main transfer objects of minimum wage costs. Furthermore,

the increase in minimum wages mainly boosted the net welfare gains of low-income households. With a 10% increase in minimum wages, the bottom 20% of households will get an average of 658 yuan per quarter, and the middle 60% of households will get an average of 469–556 yuan per quarter, thus reducing the social inequality by about 3.73%. However, the increase in minimum wages needs to be kept within a reasonable range. An excessive adjustment may lead to higher living costs for low-income households. When the adjustment is in the range of 5%–10%, the marginal improvement of social inequality will be the best. Lastly, in order to cope with the loss of household welfare caused by the adjustment of minimum wages, the government may enhance the urban minimum subsistence allowances and provide consumption subsidies in a targeted manner to hedge the impact of living costs faced by low-income households.

The main contributions of this paper are as follows. First, different from studies at the production and sales levels (Gan *et al.*, 2016; Leung, 2021; Renkin *et al.*, 2022), this paper focuses on the impact of the minimum wage cost-price pass-through from the perspective of households, builds a theoretical model of cost-price pass-through and extends it to the level of household net welfare, and describes the consumption utility loss caused by the minimum wage cost-price pass-through through market clearing, hence complementing the studies on the effect of the minimum wage system on household consumption. Second, different from the study of Dautovic *et al.* (2019) on the impact of minimum wages on absolute household consumption expenditure, this paper establishes the index of living costs based on consumption structure and price factors to measure the change of household living costs under the given consumption utility, so as to avoid overestimating the consumption welfare utility of minimum wages. This paper also finds that through the cost-price pass-through mechanism, minimum wages not only affect low-income households and low-skilled workers concerned by previous literature, but also affect families of all income levels through the external transfer of enterprise costs, and enrich the existing research on the minimum wage price effect. Third, different from the study of MaCurdy (2015) on the sharing of minimum wage costs by households, this paper analyzes the impact of minimum wages on the net welfare of urban households from two aspects of income compensation and additional consumption expenditure, measures the changes of net welfare in absolute and relative terms, and accurately identifies the groups that bear the minimum wage costs, thus offering empirical evidence for further improving the minimum wage guarantee system and scientifically designing the labor cost sharing mechanism, and providing precise policy guidance for promoting the Chinese modernization of common prosperity for all and expanding domestic demand.

The rest of this paper is arranged as follows: the second part focuses on the empirical strategy and data indicators; the third part introduces the empirical estimation results of minimum wages and household consumption utility; the fourth part focuses on the estimation of the minimum wage cost-price pass-through mechanism; the

fifth part includes the welfare analysis and policy design; and the last part covers the conclusions and policy implications.

2. Empirical Strategy and Data Indicators

2.1. Empirical Strategy

In order to examine the overall impact of the increase in minimum wages on household consumption utility, this paper introduces the real living costs of households¹ which is easier to measure. At a given utility level, the effect of the increase in minimum wages on changes in the real living costs is compatible with the overall effect of the increase in minimum wages on household consumption utility. This paper first uses a simple regression method to estimate the impact coefficient of the increase in minimum wages on real living costs, then estimates the impact coefficient of the increase in minimum wages on household consumption utility based on a theoretical model, and compares the coefficients obtained by the above two methods.

Based on the difference of the spatial-temporal adjustment of minimum wages, the empirical regression first estimates the elasticity of the impact of minimum wages on the real living costs through the two-way fixed effects (TWFE) model. The benchmark regression equation is set as follows:

$$\ln(LC_{mct}^J) = \beta_0 + \beta^J \ln(mw_{mct}) + \theta X_{mct} + \alpha_c + \delta_g + \lambda_t + \alpha_c \delta_g + \delta_g \lambda_t + \varepsilon_{mct} \quad (1)$$

Wherein, the explained variable $\ln(LC_{mct}^J)$ represents the logarithm of the living costs of various consumer goods J in period t of household i in district/county c of city m . The explaining variable $\ln(mw_{mct})$ represents the quarterly minimum wage standard of district/county c in city m in period t , taking the maximum value of the monthly minimum wage in the quarter. X_{mct} includes a series of control variables at the household and city levels. Household characteristic variables include the household head/spouse's gender, age, marital status, education background, family size, and children/elderly dependency ratio, and city characteristic variables include the per capita GDP, housing price, average wage, average population, and population density. Besides, α_c refers to the city fixed effects, δ_g refers to the fixed effects of the income group, λ_t refers to the quarterly and annual fixed effects, $\alpha_c \delta_g$ represents the group-city interactive fixed effects, $\delta_g \lambda_t$ represents the group-annual, and group-quarterly interactive fixed effects, ε_{mct} is the error term, and the standard errors of regression results are clustered to the city level. This paper focuses on the coefficient β^J . As both

¹ The household living costs here refer to the ratio of the minimum total expenditure required in period t to the actual total expenditure in the base period to maintain a given level of utility.

sides of the equation are logarithmic, B^j measures the percentage change in the living costs of urban households for every 1% increase in minimum wages.

2.2. Data and Descriptive Statistics

This paper mainly uses the data at the household, enterprise, store and city levels.

2.2.1. Urban Household Survey (UHS) Data

Data at the household level are urban household survey data collected by the National Bureau of Statistics, including the monthly consumption data of Liaoning, Shanghai, Sichuan and Guangdong from 2013 to 2016, and unbalanced panel data from 2013 to 2014 and from 2015 to 2016, which are collated into quarterly frequency data in this paper, totally 136,191 pieces of data for 23,168 households. The sample information for four or more consecutive quarters of more than 90% of households are collected. Based on the UHS data, mainly four consumption areas of food, clothing, daily necessities and durable goods are selected in this paper. The real living costs can be approximated using Törnqvist Price Index (TPI), Sato-Vartia Price Index (SPI), Laspeyres Price Index (LPI) and Paasche Price Index (PPI) (Redding and Weinstein, 2020). Compared with LPI and PPI, which are calculated based on the consumption in the fixed base period and the reporting period respectively, TPI and SPI are closer to the real living costs when the optimal consumption and consumption structure change simultaneously. This paper mainly calculates the living costs of Chinese urban households during the sample period based on the TPI index under a fixed basket of goods, and uses other index results for robustness tests. The functional form of the TPI index is as below:

$$TPI_t^J = \prod_{j \in \Omega} \left(\frac{p_t^j}{p_0^j} \right)^{\frac{s_t^j + s_0^j}{2}} \quad (2)$$

Wherein, $s_0^j = p_0^j q_0^j / \sum_j p_0^j q_0^j$ ¹, $s_t^j = p_t^j q_t^j / \sum_j p_t^j q_t^j$, represent the proportion of product j in consumption area J . p_t^j , q_t^j and p_0^j , q_0^j refer to the consumption price and quantity of product in the reporting period and the base period, respectively. Changes in the living costs of households at the same income level mainly depend on

¹ It is a fixed base price for all households. In this paper, the corresponding price is calculated at the district/county, income group, and quarter levels, as a proxy variable of consumer prices. The consumption quantity in the base period is the consumption quantity of the sample households when they were first observed.

the consumption structure of households and price changes of various products in the consumption basket. Therefore, if the minimum wage affects the product price in the product market and the proportion of each product consumed by households, it may change the living costs of households at all income levels.

2.2.2. Chinese Industrial Enterprise Database (CIED)

The business-level data are mainly from the Chinese Industrial Enterprise Database(CIED) from 2002 to 2013¹. This paper focuses on a total of 11 industry codes in three categories of manufactured goods, namely food, shoes, clothing & textiles and durable goods, with the samples including a total of 574,435 pieces of annual data of 197,281 manufacturing enterprises.

Part A of Table 1 calculates several key indicators involved in the theoretical model estimation based on CIED the Industry Business Data: the average monthly wage of employees $\overline{w_h}$, proportion of labor factor inputs in total outputs δ and proportion of industrial labor costs in total labor costs τ . The average wage and labor input ratio of enterprises are 1319 yuan per month and 11.9% respectively. The average wage level of enterprises in the food industry is the lowest among the three industries, and the proportion of labor factor inputs in outputs is also the lowest, followed by those of the shoes, clothing & textile industry. From a horizontal dimension, the shoes, clothing & textile industry accounts for the highest proportion of the total labor costs of the three industries, reaching 45.7%, and the other two industries account for a similar share of total labor costs.

Table 1. Descriptive Statistics of Main Variables

A: Key indicator description of CIED	(1)	(2)	(3)	(4)
Manufactured goods	Food	Shoes, clothing & textile	Household durable goods	(1)-(3) All manufactured goods
Average monthly wage of employees($\overline{w_h}$) (yuan per month)	1184	1273	1585	1319
Proportion of labor factor inputs in total outputs (δ)	0.085	0.129	0.145	0.119
Proportion of industrial labor costs in total labor costs (τ)	0.255	0.457	0.288	1
B: Descriptive statistics of main variables	Average	Standard deviation	Minimum	Maximum
Logarithm of the minimum wage	7.209	0.265	6.661	7.692
Logarithm of TPI	4.333	0.622	2.325	5.981
Female head of household	0.320	0.467	0	1

¹ Due to the low quality of CIED in 2009 and 2010, this paper excludes the samples of the two years.

B: Descriptive statistics of main variables	(1)	(2)	(3)	(4)
Age logarithm	3.912	0.215	3.045	4.263
Married	0.912	0.283	0	1
Years of schooling	11.810	3.099	0	19
Family size	2.946	0.993	1	11
Children dependency ratio (A sample under the age of 16 years is defined as a child)	0.100	0.150	0	0.750
Elderly dependency ratio (A sample aged 60 and over is defined as an elderly person)	0.092	0.229	0	1
Quarterly household consumption	4944	3239	869.800	19787
Logarithm of GDP per capita	11.230	0.926	9.211	13.200
Logarithm of housing price	11.020	0.358	10.380	11.700
Logarithm of average wage	8.977	0.687	8.036	10.720
Logarithm of average population	6.247	0.763	4.524	7.280
Logarithm of population density	6.433	0.989	2.152	7.842

2.2.3. Data of National Supermarket Retail Prices of Consumer Goods

The store-level data come from the *Price Monitoring Data of Major Cities in China*, published by the Price Monitoring Center of the National Development and Reform Commission from 2002 to 2019, which collects the price data of various products at various price monitoring points in major cities across China. This paper estimates the average price of consumer goods at the month, store, and product category dimensions. Different from the retail goods data used by Renkin *et al.* (2022) and Leung (2021), the price data in this paper do not involve the actual sales amount and quantity of goods, therefore this paper mainly uses the arithmetic average method to calculate the average price of consumer goods at the supermarket level. Corresponding to the categories of goods in the UHS and manufacturing industry classification of CIED, this paper also selects corresponding categories of goods in three categories to calculate the average goods price in the consumption basket. The sample includes 151,484 pieces of monthly data of 461 supermarkets.

2.2.4. City-Level Data

This paper collects the minimum wage standards of districts and counties throughout the country from 2002 to 2019, and obtains macro-statistical variables such as urban per capita GDP, housing price, average wage, average population and population density with the aid of the *China City Statistical Yearbook* and CEIC database from 2003 to 2020. Part B of Table 1 provides descriptive statistics of main

variables for the benchmark regression. From the standard deviation of household living cost indicators, it can be seen that the living costs of residents changed greatly between 2013 and 2016. Among the control variables, the average years of schooling of the household head is 11.81 years, basically equivalent to high school education. The children dependency ratio and elderly dependency ratio are basically the same, and the sum of the two is close to 20%, indicating that the middle-aged group of urban families are facing greater pressure to raise children and support the elderly.

3. Minimum Wages and Household Consumption Utility

3.1. Benchmark Regression

This paper first studies the impact of minimum wages on the overall consumption utility of households by estimating the elasticity coefficient of minimum wages and household living costs. Part A of Table 2 shows the estimated results of Equation (1). After controlling a series of household characteristic variables, regional macro variables and a variety of fixed effects, if the minimum wage standard increases by 10%, the TPI, LPI, PPI and SPI will rise by 6.76%, 2.72%, 2.47% and 3.33% respectively. Combined with the average quarterly household consumption in the descriptive statistics in Table 1, the household economic living costs will increase by about 122–334 yuan per quarter. These results suggest that the increase in minimum wages significantly raises the living costs of urban households and may reduce the potential welfare level of the household sector. Dautovic *et al.* (2019) found that the coefficient of impact of minimum wages on the total household consumption level was [1.224, 1.914], but it was mainly analyzed from the perspective of induced demand due to the income.

The difference in household characteristics affects consumption preferences, which in turn lead to different structures of household consumption. As a result, it is necessary to consider the difference in the impact of minimum wages on the household living costs in different areas. This paper classifies TPI into four categories: food, clothing, daily necessities and durable goods to estimate the impact of minimum wages respectively. Part B of Table 2 shows that the living costs of urban households in food, clothing and daily necessities increase significantly by 1.61%, 4.49% and 1.63%, respectively for every 10% increase in the minimum wage standard. Alonso (2020) conducted a study based on the retail sales data at the store level in the United States and found that the impact of minimum wages on household consumption was mainly reflected in food and daily necessities, and the impact coefficients of nominal consumption and actual consumption were 1.1% and 0.7% respectively. Renkin *et al.* (2022) estimated that the effect of minimum wages on retail price inflation was about 0.36%, slightly lower than the estimation in this paper. However, on the one hand, the above studies were conducted based on the relatively higher consumption level and

more standardized production process in the United States. The standardization of food production in China is obviously lower than that of clothing and daily necessities. On the other hand, the sales data at the store level may also include some collective purchasing demand that is less sensitive to price, hence the coefficient is slightly lower than observation at the micro household level in this paper.

Table 2. Impact of Minimum Wages on Household Living Costs

A: Impact of minimum wages on the overall household living costs				
	(1)	(2)	(3)	(4)
	Ln(TPI)	Ln(LPI)	Ln(PPI)	Ln(SPI)
Ln(minimum wage)	0.676*** (0.124)	0.272*** (0.078)	0.247*** (0.072)	0.333*** (0.075)
N	136191	136191	136191	136191
R ²	0.214	0.179	0.136	0.211
B: Impact of minimum wages on household living costs in different areas				
	Food	Clothing	Daily necessities	Durable goods
Ln(minimum wage)	0.161** (0.063)	0.449*** (0.078)	0.163*** (0.033)	0.068* (0.038)
N	136191	136191	136191	136191
R ²	0.476	0.203	0.238	0.046

Note: (1) Values in brackets are clustered robust standard errors at the city level, where *, ** and *** represent significance levels of 10%, 5% and 1% respectively, the same below. (2) Household-level control variables include the household head/spouse's gender, age, marital status, education background, family size, and children/elderly dependency ratio; city-level control variables include the per capita GDP, housing price, average wage, CPI, average population, and population density of the prefecture-level city. The fixed effects include the group, prefecture-level city, year and quarter fixed effects, and the group-year, group-quarter and group-prefecture-level city fixed effects. Due to space restrictions, coefficients of control variables will not be given, the same below. (3) Explained variables in Part B of the table are the TPI logarithm of the corresponding area.

3.2. Estimation of Changes in Consumption Utility Resulting from Cost-Price Pass-Through of Minimum Wages

According to the estimation based on the theoretical model¹, the coefficient of

¹ Based on the model of general equilibrium between the enterprise sector and the household sector, the changes $\hat{\phi}$ in the consumption utility caused by the minimum wage cost-price pass-through can be expressed as below: $\hat{\phi} = \sum_j \tau^j \rho^j \varepsilon_{w_h, w_l}^j$, wherein, τ^j is the proportion of the labor costs of the industry in

which product j is located, ρ^j is the pass-through rate of unit consumption tax for product j , and ε_{w_h, w_l}^j is the impact coefficient of minimum wages on the average wage of the industry in which product j is located. Due to space constraints, the details of theoretical model derivation and parameter estimation are not fully given, which can be requested when necessary.

changes in the consumption utility resulting from the cost-price pass-through of minimum wages is about 0.106, slightly less than the elasticity coefficient of the impact of minimum wages on the living costs obtained through a simple empirical estimation. Since the theoretical model only describes the changes in the consumption utility caused by the cost-price pass-through, 0.106 is roughly the lower bound of the impact of minimum wages on the household consumption utility, which indicates that merely focusing on the impact of minimum wages on absolute consumption will ignore consumers' sharing of minimum wage costs, thus overestimating the role of minimum wages in improving household consumption welfare. The cost-price pass-through plays a key role in this process. The fifth part will further analyze the price pass-through mechanism. Overall, both the estimate of consumption utility loss and the estimate of household costs increase caused by the adjustment of minimum wages indicate that minimum wages may damage the benefits of consumers through the price pass-through.

4. Cost-price Pass-Through Mechanism of Minimum Wages

This part first estimates the elasticity of the overall impact of minimum wages on consumer prices based on empirical data, then obtains the cost-price pass-through elasticity of minimum wages by theoretical model estimation, and examines the long-term development trend of the cost-price pass-through elasticity of minimum wages from 2002 to 2013 at the end.

4.1. Estimation of Impact Elasticity of Minimum Wages on Consumer Prices

This paper first estimates the overall impact of minimum wages on the purchase price of consumer goods from the retail sales perspective directly, using the data of national supermarket retail prices of consumer goods and the two-way fixed effect model. As shown in Table 3, the increase in minimum wages significantly increases the overall retail prices of consumer goods. By category, the minimum wage has a more significant impact on the retail sale of food, shoes, clothing & textiles, while the elasticity coefficient of its impact on the price of durable goods is relatively small and not significant at the level of 10%, which also demonstrates that the increase in minimum wages has a limited effect on the living costs for durable goods.

Table 3. Impact of Minimum Wages on Retail Prices (ε_{p,w_1})

	(1)	(2)	(3)	(4)
	Ln(retail price)			
	All goods	Food	Shoes, clothing & textiles	Durable goods
Ln(minimum wage)	0.138** (0.055)	0.137* (0.075)	0.205*** (0.025)	0.027 (0.067)
N	151484	78237	36285	36962

	(1)	(2)	(3)	(4)
	Ln(retail price)			
	All goods	Food	Shoes, clothing & textiles	Durable goods
R ²	0.955	0.76	0.881	0.579

Note: All goods in column (1) refer to food, shoes, clothing & textiles and durable goods. Regression control variables include per capita GDP, average wage, housing price, average population and working population, population density and proportion of secondary industry in the prefecture-level city where the supermarkets are located. Fixed effects include supermarkets, prefecture-level cities, years, and months.

4.2. Estimation of Cost-Price Pass-Through Elasticity of Minimum Wages

Table 4 shows the cost-price pass-through elasticity coefficient of minimum wages estimated based on the estimation in Table 3 and the theoretical model¹. Column (1) shows the overall price pass-through elasticity of minimum wages ε_{p,w_1} which is directly estimated with the data of supermarket retail sales in Table 3. Column (2) shows the minimum wage price pass-through elasticity $\widehat{\varepsilon_{p,w_1}}$ due to cost changes estimated based on the theoretical model. By comparing the first row of columns (1) and (2), it can be seen that $\widehat{\varepsilon_{p,w_1}}$ estimated based on the theoretical model in this paper is about 0.018. If ρ is set to 1, the upper bound of the parameter estimation $\widehat{\varepsilon_{p,w_1}}^{sup}$ is about 0.043. According to column (5) in Table 4, the cost-price pass-through channel described by the theoretical model in this paper can roughly explain 12.9% of the overall impact that minimum wages have on consumer prices, and if $\rho=1$, the proportion increases to 31.2%. The influence not discussed in the theoretical model may involve the following two aspects. First, the theoretical model in this paper only describes the cost-price pass-through in the production process of enterprises, while it may also occur in the actual circulation link, so the effects of the two will be reflected in the estimated coefficient ε_{p,w_1} . In order to further explore the impact of the circulation link, this paper further estimates the impact of minimum wages on the labor costs of enterprises in the circulation link based on the post salary information in the retail industry in 2019 obtained by a crawler on 51job platform, adds the estimated coefficient 0.232 with

¹ Based on the cost minimization of enterprises, the minimum wage cost-price pass-through elasticity $\widehat{\varepsilon_{p,w_1}}$ can be expressed as below: $\widehat{\varepsilon_{p,w_1}} = \rho \times \delta \times \varepsilon_{w_h, w_1}^-$. Wherein, the three parts are respectively the pass-through rate of unit consumption tax ρ , proportion of total labor factor inputs in total outputs δ and impact elasticity of minimum wages on the average wage of enterprises ε_{w_h, w_1}^- . Due to space constraints, the details of theoretical model derivation and parameter estimation are not fully given, which can be requested when necessary.

the elasticity coefficient ε_{w_0, w_1}^- of the impact of minimum wages on the labor costs of enterprises in the production link directly, and figures out that $\widehat{\varepsilon_{p, w_1}^{add}}$ is 0.029 after recalculation. It contributes 21.2% of the overall impact that minimum wages have on consumer prices, and if $\rho=1$, the proportion may increase to 51.2%. Second, minimum wages may also affect consumer prices by affecting the income of workers and changing the elasticity of market demand for consumer goods (Leung, 2021). Due to space constraints, it is not discussed in this paper. However, on the whole, the cost-price pass-through channel of minimum wages has a considerable impact on consumer prices, which in turn has a potential impact on the living costs of consumers.

The remaining rows of Table 4 show the estimates of $\widehat{\varepsilon_{p, w_1}}$ by category accordingly, wherein food contributes 37.4% of the overall impact, and shoes, clothing & textiles contribute 26.7% of the overall impact. As the elasticity coefficient of the impact of minimum wages on the price of durable goods in Table 3 is only 0.027, some of the elasticity coefficients estimated by the theoretical model exceed the estimated results. This indicates that labor costs pass-through may not be applicable to explain the impact of minimum wages on the price of durable goods, and efficiency improvement and technical progress resulting from productivity effects may offset the impact of costs (Mayneris *et al.*, 2018).

Table 4. Estimation of Impact Elasticity of Minimum Wages on Consumer Prices ($\widehat{\varepsilon_{p, w_1}}$)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Categories	ε_{p, w_1}	$\widehat{\varepsilon_{p, w_1}}$	$\widehat{\varepsilon_{p, w_1}}^{sup}$	$\widehat{\varepsilon_{p, w_1}}^{add}$	$\frac{\widehat{\varepsilon_{p, w_1}}}{\varepsilon_{p, w_1}}$	$\frac{\widehat{\varepsilon_{p, w_1}}^{sup}}{\varepsilon_{p, w_1}}$	$\frac{\widehat{\varepsilon_{p, w_1}}^{add}}{\varepsilon_{p, w_1}}$	$\frac{\widehat{\varepsilon_{p, w_1}}^{add+sup}}{\varepsilon_{p, w_1}}$
All goods	0.138	0.018	0.043	0.029	12.9%	31.2%	21.2%	51.2%
Food	0.137	0.014	0.032	0.022	9.9%	23%	16.1%	37.4%
Shoes, clothing & textiles	0.205	0.009	0.025	0.019	4.2%	12.1%	9.3%	26.7%
Durable goods	0.027	0.017	0.041	0.031	64%	153.6%	116%	278.2%

In order to further explore the long-term development trend of the cost-price pass-through elasticity of minimum wages, this paper estimates the average wage elasticity of minimum wages and the proportion of labor factors in total outputs from 2002 to 2013 based on CIED. Figure 1(a) shows that the cost-price pass-through elasticity of minimum wages first declined and then remained stable with 2005 as the turning point. During this period, after the introduction of the *Provisions on Minimum Wages* in 2003, the impact of minimum wages on the average wage decreased year by year. The introduction of the new *Labor Contract Law* in 2008 strengthened the implementation of the minimum wage standard, and the average wage elasticity of minimum wages began to rise year by year (Figure 1 (b)). However, the cost-price pass-through elasticity

of minimum wages did not recover significantly as the annual decline in the proportion of labor factor inputs offset the second-round impact of labor costs increase after 2008.

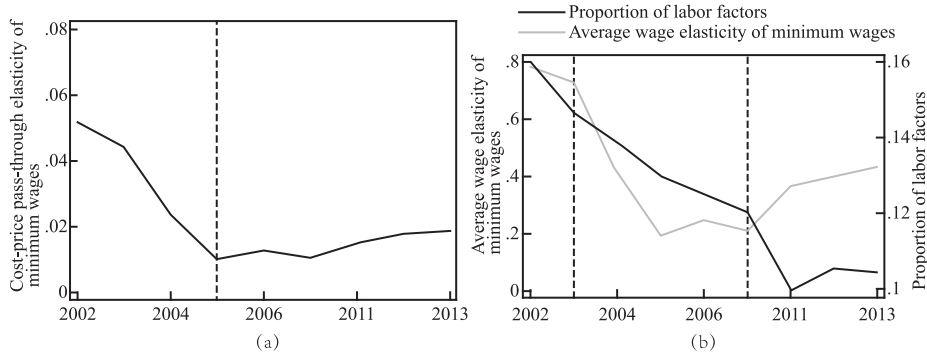


Figure 1. Estimation of Cost-Price Pass-Through Elasticity of Minimum Wages (2002-2013)

5. Welfare Analysis and Policy Design

It is explained through theoretical and empirical analysis above that the increase in the minimum wage standard will increase the living costs of households through the cost-price pass-through mechanism, which in turn may weaken the household consumption utility, but there is still no unified analysis on the income effect of minimum wages. This paper further distinguishes the income compensation effect of minimum wages from the additional consumption expenditure arising from the cost-price pass-through, and quantifies the net welfare impact of minimum wages on urban households¹.

5.1. Results of Welfare Analysis

First, the income compensation effect of minimum wages is analyzed, without

¹ The net welfare breakdown of the minimum wage increase can be expressed as below:

$$\sum_h \omega \Delta U^h = \sum_h \frac{\Delta w_1}{w_1} \varepsilon_{y, w_1}^h y^h - \sum_h \sum_j \frac{\Delta w_1}{w_1} e^{jh} \varepsilon_{p, w_1}^h, \text{ wherein } (\Delta w_1 / w_1) \varepsilon_{y, w_1}^h y^h \text{ refers to the increase in household}$$

labor income due to an increase in minimum wages $\Delta w_1 / w_1$; $\sum_j (\Delta w_1 / w_1) e^{jh} \varepsilon_{p, w_1}^h$ refers to the sum of various additional consumption expenditures of the household due to an increase in minimum wages $\Delta w_1 / w_1$, corresponding to. The net welfare of the household is the income compensation after deducting additional additional consumption expenditures.

In the actual calculation, for h , this paper takes the 10th, 30th, 50th, 70th and 90th percentiles of households to reflect the difference in income compensation and consumption expenditure of low-, middle- and high-income households respectively (In the later section, the 10th percentile of households represent the bottom 20% of households, 30-70 percentile of households represent the middle 60% of households, and the 90 percentile of households represent the top 20% of households), assuming a single adjustment of 10% for minimum wages. Due to space constraints, the details of model derivation and parameter estimation are not fully given, which can be requested when necessary.

considering the increase of household living costs arising from the price pass-through of minimum wages. Due to the spillover effect of minimum wages, the groups affected by minimum wages will not be limited to those whose income is below the minimum wage. Although this spillover effect will diminish as income levels rise, the impact direction will always be positive (Dube, 2019). Figure 2(a) shows changes in income compensation for households at different income levels. The income compensation of the bottom 20% of households is 689 yuan per quarter, equivalent to about 135 yuan per person per month, approximately 7.3% of the average urban minimum subsistence allowance (362 yuan per person per month) in 2013, and the income compensation is the highest among all the percentiles. The income compensation of the middle 60% of households exceeds 570 yuan per quarter, while the absolute compensation of the top 20% of households is only 187 yuan per quarter. Figure 2(b) shows the proportion of income compensation in household wage income. According to the results, the proportion of income compensation of the bottom 20% households in the wage income is also the highest, up to 15%, while for middle- and high-income households, the income compensation accounts for less than 5% of their wage income. The proportion of income compensation in total income shows a trend of decreasing with the increased income. This indicates that the minimum wage system has been well implemented in China, and due to the spillover effect, the wage income of households at all income levels has increased.

Considering that minimum wages will also increase the living costs of households through cost-price pass-through, it is necessary to further investigate the impact of minimum wages on additional consumption expenditures of households. Figure 2(c) shows the additional consumption expenditure of households at all income levels as a result of the increased minimum wages. Minimum wages increase the living costs for households of all income levels, and the impact of minimum wages on the absolute living costs of households is positively correlated with income distribution. With a 10% increase in minimum wages, the living costs of the bottom 20% of households increase by 31 yuan per quarter, while the top 20% of households see an increase of 185 yuan per quarter in their living costs. However, as shown in Figure 2(d), at a relative level, the bottom 20% of households have the highest proportion of added living costs in the household income. The cost-price pass-through arising from minimum wages increases the living burden of low-income households, and the negative impact on their consumption welfare may be greater than that of middle- and high-income households. This result indicates that the increase of minimum wages should be kept within a reasonable range, and excessive adjustment may lead to higher living costs for low-income households.

Figure 2(e) shows the net welfare of households at all income levels. With a 10% increase in minimum wages, the net welfare of households at all income levels remain positive after taking into account the welfare loss resulting from additional consumption expenditures. After a summary of the net welfare of households at all income levels, the overall social welfare level increase by 443 yuan per quarter on

average, and the net welfare of the bottom 20% of households is the highest, up to 658 yuan per quarter. Figure 2(f) shows the proportion of additional consumption expenditure in income compensation for low- and middle-income households with a 10% increase in minimum wages, to reflect the share of nominal income loss arising from the cost-price pass-through. The price effect of a 10% increase in minimum wages leads to a nominal income loss of about 5% for the bottom 20% of households, and a nominal income loss of 8–18% for the middle 60% of households, while the net welfare of the top 20% of households is almost unaffected.

Finally, the paper calculates the impact of a 10% (counterfactual) increase in minimum wages on the income distribution. After the increase of minimum wages, the Lorenz curve realized an inward contraction, indicating that the increase of minimum wages reduced social inequality. The Gini coefficient decreased from 0.429 to 0.413 after a 10% increase, and social inequality decreased by 3.73%.

Three conclusions can be drawn according to the above welfare analysis results. First, the increase of minimum wages mainly improves the welfare of urban low-income households, and the bottom 20% of households receive the highest income compensation of minimum wages; Second, the bottom 20% of households suffer relatively higher consumption welfare loss, and the real consumption loss caused by the rising living costs offsets about 5% of the nominal income compensation. The high proportion of food consumption is the potential factor that leads to the lower welfare improvement of low-income households than expected; Third, due to the wage spillover effect, in addition to the bottom 20% of households, the middle 60% of households can also benefit from the increase of minimum wage which will improve the overall social welfare and reduce social inequality to some extent.

5.2. Design of Supporting Policies

Based on the above welfare analysis results, this paper further proposes the design of three sets of supporting policies:

The first is reasonable adjustment of minimum wages. By simulating the changes of inequality in the context of different counterfactual minimum wage increases, this paper finds that the average marginal effect of the increase in minimum wages is enhanced when the minimum wage adjustment is within the range of 5%–10%. When the minimum wage adjustment exceeds 10%, its marginal effect on social inequality gradually decreases.

The second is adjustment of urban minimum subsistence allowances. For the bottom 10% of households, their income level is right within the range of minimum subsistence allowances. The adjustment of minimum wages will lead to an increase in their living costs, and thus directly affect their normal living standards. According to the calculation in this paper, the adjustment of minimum wages will increase the household living costs by about 10.3 yuan per month. On the basis of the average

urban minimum subsistence allowances in 2013, an additional increase of at least 3% will be needed to offset the impact of the minimum wage adjustment on living costs.

The third is targeted distribution of consumption vouchers or consumption subsidies. For the middle 60% of households, although minimum wages improve their net welfare, the price transfer damage their consumption welfare to a considerable extent. The government should issue consumption vouchers or subsidies in a targeted manner to share the rising living costs in daily necessities such as food. According to the calculation, the increase of minimum wages leads to an increase in the living costs of households at all income levels, from 1%–2.5% for food and 0.5%–1.2% for daily necessities. The government should issue 1%–2% of consumption vouchers or subsidies for specific goods according to the total amount of consumption to offset the rise in the living costs of daily necessities.

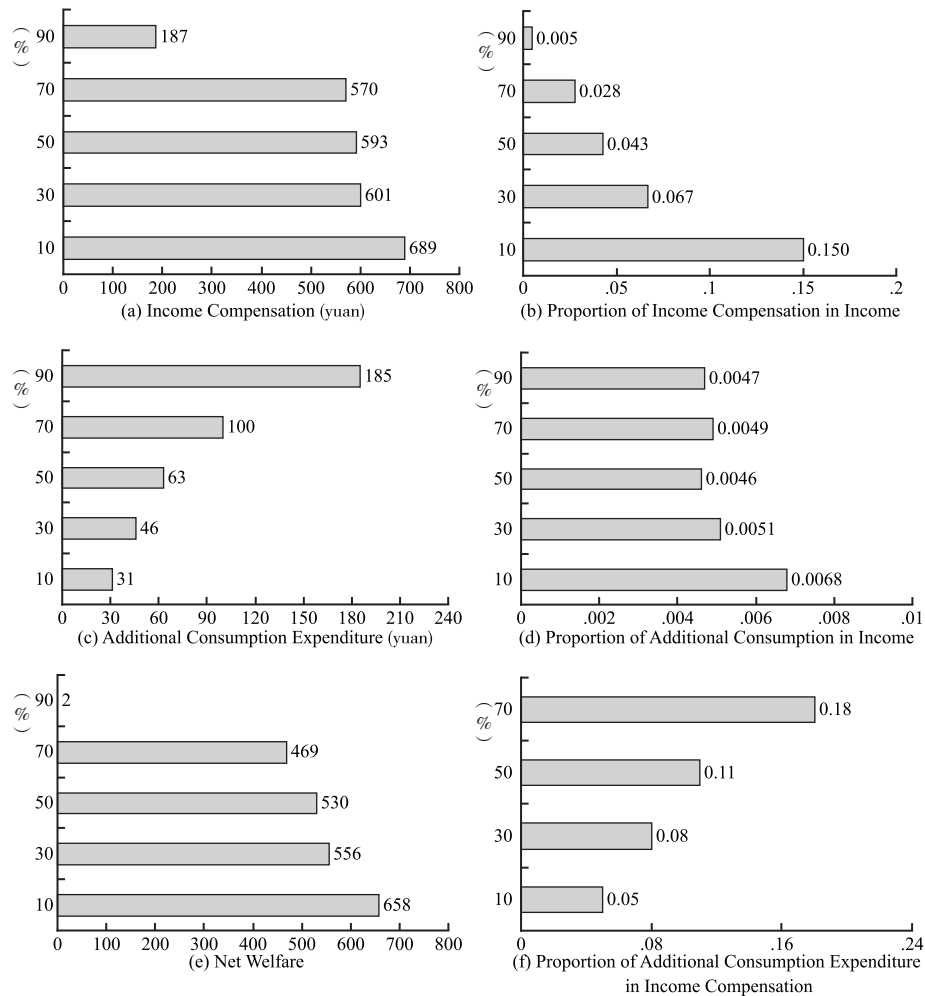


Figure 2. Net Welfare Measurement of Households at All Income Levels (2013-2016)

6. Conclusions and Policy Implications

It is the ultimate goal of economic development to achieve people's happiness and improve people's well-being. As a policy means to ensure the wage income of low-income workers, the minimum wage system can improve the wage income of workers, and further stimulate consumption and expand domestic demand. However, the cost transfer behavior of enterprises will increase the price of products, resulting in a rise in the living costs of households, and thus reduce the real welfare of minimum wages. The improvement of the minimum wage guarantee system and the cost-sharing mechanism by the government will help enhance the reliability of the domestic circulation and promote the realization of the Chinese modernization of common prosperity for all.

This paper examines the impact of minimum wages on the consumption utility and its price pass-through mechanism from the perspective of household living costs, and further calculates the changes in net welfare including income compensation and utility loss. According to the results, first, the increase of minimum wages led to a significant increased in the total living costs and the costs of all kinds of consumer goods of the household, and reduced the real consumption utility of the household. With an increase of 10% in minimum wages, the total living costs will rise by 2.47%–6.76%, the economic living costs will reach about 122–334 yuan per quarter, and the living costs of food, clothing, daily necessities and durable goods will increase by 1.61%, 4.49%, 1.63% and 0.68%, respectively. Both the theoretical model estimate of consumption utility loss and the empirical estimate of household costs increase caused by the increase of minimum wages indicate that minimum wages may damage household consumption welfare through price pass-through. Second, the increase of minimum wages significantly increased the labor costs of enterprises, and the price transfer of enterprises turned out to be the main reason for the loss of household consumption utility. Food and shoes, clothing & textiles were the main price pass-through objects of minimum wage costs. Based on theoretical model estimates, cost-price pass-through contributed 37.4% and 26.7% of the price changes of food and shoes, clothing & textiles, respectively, while the durable goods industry hedged the impact of minimum wage costs through productivity effects. The cost-price pass-through elasticity of minimum wages first weakened and then remained stable over time. The decline in the share of labor factors offset the second-round impact of labor costs increase after 2008, resulting in that the cost-price pass-through elasticity failed to recover significantly. Third, the measurement of net welfare changes, including income compensation and utility loss, show that the rise of minimum wages mainly increases the net welfare gains of the bottom 20% of households. If minimum wages increase by 10%, the bottom 20% and middle 60% of households will get an average of 658 yuan per quarter and 469–556 yuan per quarter, respectively, and the overall social welfare will

increase by an average of 443 yuan per quarter. Although low- and middle-income households lost about 5%–18% of the nominal welfare of the minimum wage increase due to the cost-price pass-through, minimum wages still reduced social inequality, reflected in that a 10% increase in minimum wages can reduce social inequality by about 3.73%. An adjustment of 5%–10% can maximize the role of promoting common prosperity in terms of the marginal effect. Fourth, the findings of this paper provide a reference for the establishment of a cost sharing mechanism of minimum wages that features the multi-subject participation of the government, enterprises and families. Based on the estimation, the government may increase the urban minimum subsistence allowances by 3% to hedge the impact of living costs faced by low-income families, and issue 1%–2% consumption subsidies in a targeted manner according to the total consumption amount to offset the rise in the living costs of social necessities.

The policy implications of this paper are as follows: First, China still needs to further improve the minimum wage standard adjustment mechanism, give full play to the role of minimum wages in raising the income of the low-income group during the primary distribution, and build an income distribution order that is conducive to realizing common prosperity and expanding domestic demand. The absolute income compensation of minimum wages is positively correlated with income distribution. In order to further improve the social security for low-income groups, it is necessary to focus on the scientific design of supporting policies, establish a linkage mechanism where the minimum wage system and the minimum subsistence allowance standard complement each other, link subsistence allowances to the local CPI, implement a reasonable entry and exit mechanism, strengthen the supervision and regulation, and ensure basic living allowances.

Second, it is necessary to establish a minimum wage cost-sharing mechanism where the government, enterprises and families take part in, focus on the improvement of the real welfare of families and the sustainable development of enterprises, enhance the internal driving force and reliability of the domestic circulation, and promote the Chinese modernization with high-quality development. This paper finds that the proportion of the added value of living costs in household income increases with the decrease of income. The rising price further increases the living burden of low-income groups and weakens the real improvement of family welfare with the income effect. The government should actively participate in the sharing of institutional costs. On the one hand, it should pay attention to the household welfare loss effect of cost-price pass-through. An excessive adjustment of minimum wages may cause low-income households to bear higher living costs, so it is necessary to stabilize the price of daily necessities and provide moderate consumption subsidies to low-income households. On the other hand, the government should pay attention to the impact of rising labor costs on enterprises, especially on private enterprises, micro, small and medium-sized enterprises and manufacturing enterprises, formulate industry-specific plans for

minimum wages, scientifically link social security contributions to minimum wages, provide financial and monetary subsidies to some livelihood industries to reduce the additional burden on enterprises, and actively encourage enterprises to reduce enterprise costs and improve product quality by improving innovation capacity and production efficiency.

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