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# MINIMUM WAGE IMPACT ON INCOME AND POVERTY: EVIDENCE FROM TAIWAN

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This paper investigates the impact of minimum wage policies on income and poverty across Taiwan and its six metropolises. Utilizing data from 1993 to 2019, the study employs various regression models to analyze how adjustments to the minimum wage influence average household income and poverty rates. The findings reveal that increasing the minimum wage does not significantly raise average per capita income. However, elevating the minimum wage relative to the minimum living cost significantly mitigates poverty, particularly among lower-income groups in urban areas. These results indicate that while minimum wage increases alone may not substantially enhance average income levels, aligning the minimum wage with the cost of living can effectively reduce poverty. This study offers valuable insights for policymakers, highlighting the importance of considering the real purchasing power of the minimum wage in efforts to improve the living standards of low-income workers and reduce economic inequality.

*Keywords*: Minimum Wage, Poverty, Wage Inequality, Taiwan
*JEL Classification*: J31; O15; I38

## 1. INTRODUCTION

In 1928, the International Labor Organization (ILO) held its 11th session in Geneva, where it resolved to adopt an international convention to establish regulations on minimum wage procedures. The minimum wage refers to the lowest amount that must be paid to workers for their labor or services over a certain period. Observing the policy objectives of minimum wage across various countries, we find that Germany, France, South Korea, and Hong Kong view the minimum wage as a tool to guarantee workers' basic living standards. In contrast, the United States, Australia, and Japan use it to prevent exploitation of vulnerable workers. Since the majority of those affected by the minimum wage are low-skilled workers, the United Kingdom sees the minimum wage as

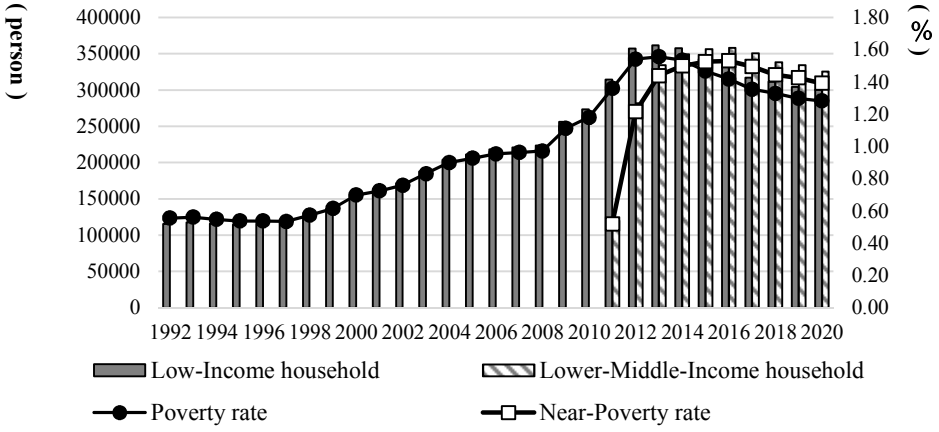
a key tool to secure employment for young workers. Table 1 presents the adjustment process of Taiwan's minimum wage over the years, showing that the government has slightly increased the minimum wage nearly every year since 2011.

**Table 1.** The Changes of Minimum Wage in Taiwan

| Implement date | Monthly wage (NT$) | Changes | Daily wage | Changes | Hourly wage (NT$) | Changes |
|---|---|---|---|---|---|---|
| - | 300 | - | - | - | - | - |
| - | 450 | 50.00% | - | - | - | - |
| - | 600 | 33.33% | 20 | - | - | - |
| 12/1/1978 | 2,400 | 300.00% | 80 | 300.00% | - | - |
| 5/1/1980 | 3,300 | 37.50% | 110 | 37.50% | - | - |
| 5/1/1983 | 5,700 | 72.73% | 190 | 72.73% | - | - |
| 7/1/1984 | 6,150 | 7.89% | 205 | 7.89% | - | - |
| 11/1/1986 | 6,900 | 12.20% | 230 | 12.20% | - | - |
| 7/1/1988 | 8,130 | 17.83% | 271 | 17.83% | - | - |
| 7/1/1989 | 8,820 | 8.49% | 294 | 8.49% | - | - |
| 8/1/1990 | 9,750 | 10.54% | 325 | 10.54% | - | - |
| 8/1/1991 | 11,040 | 13.23% | 368 | 13.23% | - | - |
| 8/1/1992 | 12,365 | 12.00% | 412 | 11.96% | 51.5 | - |
| 8/16/1993 | 13,350 | 7.97% | 445 | 8.01% | 55.5 | 7.77% |
| 8/20/1994 | 14,010 | 4.94% | 467 | 4.94% | 58.5 | 5.41% |
| 8/1/1995 | 14,880 | 6.21% | 496 | 6.21% | 62 | 5.98% |
| 9/1/1996 | 15,360 | 3.23% | 512 | 3.23% | 64 | 3.23% |
| 10/16/1997 | 15,840 | 3.13% | 528 | 3.13% | 66 | 3.13% |
| 7/1/2007 | 17,280 | 9.09% | - | - | 95 | 43.94% |
| 1/1/2011 | 17,880 | 3.47% | - | - | 98 | 3.16% |
| 1/1/2012 | 18,780 | 5.03% | - | - | 103 | 5.10% |
| 1/1/2013 | 18,780 | 0.00% | - | - | 109 | 5.83% |
| 4/1/2013 | 19,047 | 1.42% | - | - | 109 | 0.00% |
| 1/1/2014 | 19,047 | 0.00% | - | - | 115 | 5.50% |
| 7/1/2014 | 19,273 | 1.19% | - | - | 115 | 0.00% |
| 7/1/2015 | 20,008 | 3.81% | - | - | 120 | 4.35% |
| 10/1/2016 | 20,008 | 0.00% | - | - | 126 | 5.00% |
| 1/1/2017 | 21,009 | 5.00% | - | - | 133 | 5.56% |
| 1/1/2018 | 22,000 | 4.72% | - | - | 140 | 5.26% |
| 1/1/2019 | 23,100 | 5.00% | - | - | 150 | 7.14% |
| 1/1/2020 | 23,800 | 3.03% | - | - | 158 | 5.33% |
| 1/1/2021 | 24,000 | 0.84% | - | - | 160 | 1.27% |

*Source:* Taiwan Ministry of Labor.

Increasing income is a primary way to address poverty. It is worth exploring whether raising the minimum wage can enhance workers' living standards and reduce poverty. Although Taiwan does not have an official poverty line, it has established a Minimum Living Cost Standard.[1] Practically, those with income below this threshold are considered impoverished, and this standard serves as the basis for defining low-income and lower-middle-income households in various social welfare laws. A household or individual is considered low-income if their monthly per capita income is below the minimum living cost, while those with income less than 1.5 times the minimum living cost are considered lower-middle-income. Consequently, the poverty rate is defined as the proportion of the total population whose income falls below the minimum living cost, while the near-poverty rate refers to those whose income is below 1.5 times the minimum living cost. Figure 1 shows the trends of poverty and near-poverty rates in Taiwan over the years. It is evident that the poverty rate has been rising since the early 1990s, reaching its peak in 2012 before declining. The near-poverty rate also increased after the inclusion of lower-middle-income households in 2011, followed by a decline.[2]




*Source:* Taiwan Ministry of Labor and Ministry of Health and Welfare.

**Figure 1.** Number and Proportion of Low-Income and Lower-Middle-Income Households in Taiwan Over the Years

[1] This standard is established in accordance with Article 4 of the Social Assistance Act. The term "minimum living cost" is defined by the central and municipal competent authorities, referencing 60% of the median per capita disposable income for the most recent year published by the Central Budget Office. It is adjusted in the new fiscal year if the calculated amount changes by more than 5% compared to the current minimum living cost.

[2] The amended Social Assistance Act, which introduced the category of lower-middle-income households, was promulgated on December 29, 2010, and came into effect on July 1, 2011.

Figure 2 illustrates the trends in minimum wage and poverty rates from 1992 to 2020. The minimum wage shows an upward trend, while the poverty rate increased significantly between 1992 and 2013, reaching its peak at 1.56% in 2013, before declining over the past nine years. According to documents from the Central Bank of the Republic of China (2018), evaluations of the impact of minimum wage adjustments suggest that both low wages and income distribution have improved due to the increases in the minimum wage and economic recovery.


*Source:* Taiwan Ministry of Labor and Ministry of Health and Welfare.

**Figure 2.** Changes in Minimum Wage and Poverty Rates, 1992-2020

Most of the literature on minimum wage focuses on its impact on employment. Neoclassical theory assumes a homogeneous and fully competitive labor market, where a binding minimum wage acts as a price floor. If the minimum wage is set above the market equilibrium wage, the demand for labor determines the number of employed, resulting in excess labor supply and increased unemployment. However, empirical studies have shown that minimum wage increases can have positive, negative, or no impact on employment, indicating that there is no definitive causal relationship between minimum wage and unemployment rates.[3]

There is relatively less research on the impact of minimum wage policy on household income. Neumark, Schweitzer, and Wascher (2005) used non-parametric

[3] For a comprehensive empirical review of the employment effects of minimum wage, refer to Neumark and William (2008) and Neumark (2018), which provide an extensive discussion of the related literature.

estimation to compare states that have raised minimum wages with those that have not, finding that raising the minimum wage increases the proportion of families that are poor or near-poor. Wong (2012) evaluated the effectiveness of Hong Kong's Minimum Wage Ordinance after one and a half years, analyzing its impact on low-income households and income inequality. The study showed that prior to implementation, 233,000 families (10% of Hong Kong households) had at least one member benefiting from the minimum wage, which halved to 121,000 households (5.1%) a year later, indicating a significant positive impact on low-income households.

Recent research by Dube (2019) provides more detailed findings. Using individual data from the Current Population Survey (1984-2013), Dube assessed how minimum wage policies altered household income distribution. The study used a linear probability model to estimate how minimum wage increases affected the proportion of various income groups relative to the federal poverty line. The results showed that higher minimum wages could increase lower-income household distributions and alleviate poverty. Specifically, within two years of a minimum wage policy change, the population proportion below 0.5 to 1.25 times the federal poverty line significantly decreased. The short-term effects (2 years) were more pronounced than the long-term effects (3 years or more) for low-income individuals. Additionally, minimum wage increases had a smaller impact on less-educated workers, significantly improved income for African American and Hispanic workers, but had no significant effect on single mothers.

Studies examining U.S. data from 1979 to 1988, such as DiNardo, Fortin, and Lemieux (1996) and Lee (1999), found that minimum wage reductions contributed to wage inequality. Autor, Manning, and Smith (2016) extended this research using U.S. long-term data from 1979 to 2012, showing that minimum wage increases significantly reduced wage inequality at the lower end and had spillover effects across distribution groups. Bosch and Manacorda (2010) similarly found that the sharp decrease in minimum wage during the late 1980s to early 2000s in Mexico significantly increased income inequality at the bottom of the distribution. Therefore, increasing the minimum wage appears to improve the income of low-income individuals and reduce wage inequality.

Given Taiwan's long-standing implementation of minimum wage, this paper empirically examines whether the minimum wage helps improve income levels and alleviate poverty using Taiwanese data. The study's contribution is twofold: it supplements existing literature and provides valuable insights for policymakers in formulating related policies in the future.

## 2. EMPIRICAL MODEL AND ESTIMATION METHOD

This study empirically investigates the impact of minimum wage on income and

poverty in Taiwan and the six major municipalities (Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, and Kaohsiung City, hereafter referred to as "the Six-Metropolis"). We use household income time series data for both regions and analyze them with different regression models. The dependent variable for income level is measured by average per capita household income, while poverty is measured by the ratio of average per capita household income to the minimum living cost per capita, where an increase in this ratio indicates an improvement in poverty levels and a decrease indicates a worsening. Policy variables include the statutory minimum wage and the ratio of the minimum wage to the minimum living cost per region to assess the real purchasing power of the minimum wage.

For Taiwan, we use annual time series data from 1993 to 2019 to explore the impact of minimum wage on average household income and poverty levels, estimated using the ordinary least squares (OLS) method. The empirical model for Taiwan is specified as follows:

$$Income = \alpha + \beta MW_t + \gamma X_t + \theta Z_t + \varepsilon_t, \quad (1)$$

$$Poverty = \alpha' + \beta' MW_t + \gamma' X_t + \theta' Z_t + \mu_t, \quad (2)$$

where $t$ represents the sample year (1993, 1994, ..., 2019); $Income$ is the natural logarithm of average per capita household income; $Poverty$ is the ratio of average per capita household income to the minimum living cost per capita, indicating poverty levels; $MW$ represents the natural logarithm of the statutory minimum wage, with two indicators: the first being the natural logarithm of the statutory minimum wage and the second being the ratio of the statutory minimum wage to the minimum living cost; $X$ includes personal characteristics such as gender, age cohort, and education level; and $Z$ includes macroeconomic control variables such as economic growth rate, fertility rate, aging, and proportion of foreign migrant workers. $\varepsilon$ and $\mu$ are error terms.

For the Six-Metropolis, we use panel data from 1999 to 2019, considering whether regional-specific effects exist across different time periods. Depending on their characteristics, we estimate with either a fixed effect model or a random effect model and compare the results to select the appropriate model.

Using Hausman's (1978) test to determine the correlation between intercepts and explanatory variables, the selection criteria are: if $H_0$ is rejected, we choose the fixed effect model; if $H_0$ is not rejected, we choose the random effect model.[4] Given the lack of economic growth rate data for the Six-Metropolis, we substitute unemployment rate as the macroeconomic variable for the Six-Metropolis.

Considering both cross-sectional and time series data allows for the consideration of

[4] For details on the specification and estimation of fixed effects and random effects models in panel data, refer to Baltagi (2005, Chapter 2, pp. 11-20).

sample differences, eliminating multicollinearity among explanatory variables and yielding more accurate results. The fixed effect model, also known as the covariance model or least squares dummy variable (LSDV) model, includes "individual fixed effects" and "time fixed effects" dummy variables to explain regional differences and reduce multicollinearity. Unlike the fixed effect model, the random effect model assumes that sample heterogeneity is random and includes the variability among regions and over time in the error term. Hence, the random effect model is also known as the error component model.

Unlike traditional regression analysis, which only provides the average marginal effects influencing the central tendency of the dependent variable, quantile regression (QR) allows for the estimation of marginal effects at different quantiles of the conditional probability distribution of the dependent variable. This provides richer insights into the behavior of the dependent variable across its entire distribution, particularly in the tails.

By using data from the Six-Metropolis as pooled cross-section and time series data, and incorporating dummy variables for each Metropolis, we can apply quantile regression to analyze the different income or poverty levels at the 10th, 25th, 50th, 75th, and 90th percentiles. This approach helps us observe the entire distribution pattern of the dependent variable at different levels of income or poverty and determine whether the marginal effects of the minimum wage vary across these quantiles.

By examining these variations, we can gain a deeper understanding of how the minimum wage impacts individuals differently depending on their income or poverty levels, providing a more nuanced view than traditional regression analysis offers.[5]

## 3. DATA SOURCES AND VARIABLE DEFINITION

Table 2 provides the main variable settings and explanations. The data for this study primarily come from government sources in Taiwan, detailed as follows:

The primary data sources for this study include reports published by various government agencies, such as the Directorate General of Budget, Accounting and Statistics (DGBAS)' Family Income and Expenditure Survey, the Ministry of Labor's Labor Statistics Report, the Ministry of Health and Welfare's Social Welfare Statistics Report, and the Consumer Price Index linkage tables from the DGBAS and local government accounting offices.

To measure the average living standards per capita, we calculate the average household disposable income by dividing it by the average household size in Taiwan and the Six-Metropolis. To remove the effects of price fluctuations, we then deflate the per

[5] For details on the estimation of quantile regression models, refer to Koenker and Bassett, (1978), Buchinsky (1994, 1998), Garcia et al. (2001), and Machado and Mata (2005), among others.

capita disposable income by the Consumer Price Index (CPI) of Taiwan and the Six-Metropolis to measure real income. For assessing poverty levels, we do not use the proportion of low-income and lower-middle-income households in the total population due to the lack of a unified poverty rate definition and differing standards for low-income and lower-middle-income households across regions. Therefore, we adjust the per capita disposable income by dividing it by the statutory minimum living cost per capita in Taiwan and the Six-Metropolis to measure poverty in terms of equalized purchasing power.

Since Taiwan implements a unified minimum wage policy, the minimum wage is the same across all regions and includes monthly, daily, and hourly rates. The hourly rate system was first implemented on August 1, 1992, and the daily wage is calculated based on the number of working hours from July 1, 2007. Given the study period from 1993 to 2019 and that nearly 90% of employees are full-time, according to the DGBAS, this study uses the monthly minimum wage for full-time workers as the minimum wage variable.

Although the minimum wage is standardized nationwide, the cost of living varies across regions. To measure the real purchasing power, we set a second minimum wage indicator by dividing the minimum wage by the statutory minimum living cost per capita in Taiwan and the Six-Metropolis. The higher the value of this variable, the higher the real purchasing power of the minimum wage.

The individual data used in this study include dummy variables for gender, age, and education level. Gender is categorized as male (1) and female (0); age is divided into three groups: 15-24 years, 25-44 years, and 45-65 years; and education level is categorized into three groups: junior high school and below, senior high school and vocational school, and college and above.

Besides personal characteristics, national economic development also affects living standards. Economic growth increases productivity through labor input, capital accumulation, and technological innovation, thereby meeting more demand and promoting economic expansion.

Taiwan is facing low fertility and an aging population. According to the Central Intelligence Agency (CIA), Taiwan ranked last in fertility rate among 227 countries in 2021. Taiwan became an aging society in 1993, transitioned to an aged society in 2018, and is projected to become a super-aged society by 2025. Low fertility and population aging reduce labor supply, increase financial pressure on the working population, and demand for basic public services, thereby increasing the government's fiscal burden. This phenomenon has significant economic and social implications.

In the 1980s, factors such as the appreciation of the New Taiwan Dollar (NTD), industrial restructuring, and the implementation of the Labor Standards Act increased labor costs, prompting businesses to request the introduction of cheaper foreign labor. The Taiwanese government officially allowed foreign labor in 1991 and passed the Employment Services Act in 1992. According to Article 42 of the Act, employers may hire cheaper foreign labor to save on personnel costs, potentially crowding out local

employment opportunities. Thus, the proportion of foreign migrant workers in the employed population is also considered.

The unemployment rate measures idle labor capacity, which can have significant impacts on individuals, families, society, and the economy. Unemployment reduces personal income and living standards, lowers economic status within the family, and leads to social isolation and psychological or mental health issues. Family economic problems may result in discord, potentially causing domestic violence. Unemployment signifies the underutilization of labor, resulting in economic loss due to decreased total output. Research shows that higher unemployment rates are associated with increased crime and suicide rates. Excessive unemployment leads to economic and social instability, causing severe social issues. Higher unemployment implies fewer job opportunities, making it harder for workers to find employment, reducing income levels, and increasing the likelihood of poverty.

**Table 2.** Variable Definition

| Variable | Explanation |
|---|---|
| Explained Variable | |
| Income | Average Household Disposable Income Divided by Average Household Size, Adjusted by Consumer Price Index. (NT$) |
| Poverty | Average Per Capita Disposable Income Divided by Minimum Living Cost, (%) |
| Policy Variable | |
| Minimum Wage | Natural Logarithm of Statutory Minimum Wage, (NT$) |
| Real Minimum Wage | Ratio of Statutory Minimum Wage to Minimum Living Cost, (%) |
| Personal Characteristics | |
| Gender | Dummy variable, Male = 1, Female = 0 |
| Age | Dummy variable, 15-24 years as the reference group |
| 15-24 Years | Age of the employed is 15-24 years = 1, otherwise = 0 |
| 25-44 years | Age of the employed is 25-44 years = 1, otherwise = 0 |
| 45-65 years | Age of the employed is 45-65 years = 1, otherwise = 0 |
| Education | Dummy variable, Junior high school and below as the reference group |
| Junior high school and below | Education is below junior high school = 1, otherwise = 0 |
| High school and vocational school | Education is high school or vocational school = 1, otherwise = 0 |
| College and above | Education is college and above = 1, otherwise = 0 |
| Macro Indicator | |
| Migrant workers | Migrant workers as a share of the total employment, (%) |
| Fertility rate | The average number of children born to a woman (age 15-49 years) per year, (person) |
| Aging population | The proportion of the population aged 65 and above relative to the total population, (%). |
| Economic growth rate | Average annual growth rate of GDP, (%). |
| Unemployment rate | The proportion of the unemployed relative to the labor force, (%). |

**Table 3.** Sample Summery Statistics of Taiwan and the Six-Metropolis

| | Taiwan（N=27） | | | | Six-Metropolis （N=126） | | | |
|---|---|---|---|---|---|---|---|---|
| Variable | Mean | SD | Min | Max | Mean | SD | Min | Max |
| Explained Variable | | | | | | | | |
| Income | 248715 | 43011 | 167327 | 329076 | 292386 | 57827 | 208647 | 458839 |
| Poverty | 2.7366 | 0.6874 | 2.0716 | 4.4746 | 2.4074 | 0.3390 | 1.9326 | 3.5307 |
| Policy variable | | | | | | | | |
| Minimum wage | 17133 | 2486 | 12734 | 23100 | 17880 | 2202 | 15840 | 23100 |
| Real minimum wage | 2.0255 | 0.4334 | 1.6958 | 3.0171 | 1.6659 | 0.2430 | 1.1018 | 2.2278 |
| Personal characteristics | | | | | | | | |
| Gender | | | | | | | | |
| Male | 0.5790 | 0.0222 | 0 | 1 | 0.5599 | 0.0169 | 0 | 1 |
| Female | 0.4210 | 0.0222 | 0 | 1 | 0.4401 | 0.0169 | 0 | 1 |
| Age | | | | | | | | |
| 15-24 years | 0.1001 | 0.0276 | 0 | 1 | 0.0867 | 0.0235 | 0 | 1 |
| 25-44 years | 0.5869 | 0.0303 | 0 | 1 | 0.5835 | 0.0312 | 0 | 1 |
| 45-65 years | 0.3130 | 0.0560 | 0 | 1 | 0.3298 | 0.0509 | 0 | 1 |
| Education | | | | | | | | |
| Junior High and below | 0.2952 | 0.1050 | 0 | 1 | 0.2144 | 0.0941 | 0 | 1 |
| High school and vocational school | 0.3430 | 0.0145 | 0 | 1 | 0.3451 | 0.0573 | 0 | 1 |
| College and above | 0.3617 | 0.1085 | 0 | 1 | 0.4404 | 0.1367 | 0 | 1 |
| Macro Indicator | | | | | | | | |
| Foreign workers | 0.0377 | 0.0133 | 0.0113 | 0.0639 | 0.0454 | 0.0246 | 0.0188 | 0.1143 |
| Fertility rate | 1.3009 | 0.2818 | 0.8950 | 1.7750 | 1.1455 | 0.1948 | 0.7750 | 1.8350 |
| Aging population | 0.1024 | 0.0222 | 0.0710 | 0.1528 | 0.1026 | 0.0260 | 0.0631 | 0.1807 |
| Economic growth rate | 0.0440 | 0.0275 | -0.0161 | 0.1025 | | | | |
| Unemployment rate | | | | | 0.0421 | 0.0071 | 0.0200 | 0.0600 |

Table 3 provides the summary statistics for the variables used in this study, sourced from the Family Income and Expenditure Survey, Labor Statistics Report, and Social Welfare Statistics Report. These statistics examine the impact of minimum wage on income and poverty levels in Taiwan and the Six-Metropolis.

The sample descriptive statistics indicate that the average per capita disposable income is approximately NT$248,715 in Taiwan and NT$292,386 in the Six-Metropolis, reflecting higher economic development in the Six-Metropolis, which are the primary administrative divisions. The per capita disposable income in Taiwan and the Six-Metropolis is approximately 2.74 times and 2.41 times higher than the statutory minimum living cost, respectively, indicating higher real disposable income in Taiwan compared to the Six-Metropolis. The average minimum wage relative to the minimum living cost is 2.03 times in Taiwan and 1.67 times in the Six-Metropolis, showing that the minimum wage has greater real purchasing power in Taiwan, whereas the Six-Metropolis' real income is insufficient to support general living standards due to higher living costs.

The employment structure in Taiwan and the Six-Metropolis shows minimal differences, with males comprising over half of the employed population and females exceeding 40%. Individuals aged 25-44 represent the majority, accounting for nearly 60%, followed by those aged 45 and above, while the 15-24 age group constitutes a smaller proportion, as many are still in school or have just entered the workforce and may not yet have stable employment. Individuals with junior high school education or below are in the minority, while those with senior high school, vocational school, or higher education make up approximately 35% in Taiwan and 44% in the Six-Metropolis due to higher demand for skilled labor in urban areas.

The fertility rate is 1.3 children per woman of childbearing age (15-49 years) in Taiwan and 1.15 in the Six-Metropolis, indicating low fertility rates and a significant challenge of population decline, especially in urban areas. The elderly population accounts for about 10% of the total population in both Taiwan and the Six-Metropolis, reflecting the aging society. The average economic growth rate in Taiwan from 1993 to 2019 was 4.4%, while the average unemployment rate in the Six-Metropolis was 4.21%. Additionally, the proportion of foreign migrant workers in the total employed population was 3.77% in Taiwan and 4.54% in the Six-Metropolis, indicating a higher demand for foreign labor in urban areas.

## 4. ESTIMATION RESULTS

First, we estimate the impact of the minimum wage on income and poverty levels in Taiwan. Table 4 shows the impact on income, while Table 5 shows the impact on poverty. The basic model includes individual characteristics as explanatory variables, while the extended model incorporates additional macroeconomic and social factors.

**Table 4.** The Effect of Minimum Wage on Income: Taiwan

| | Average income per person per household | | | |
|---|---|---|---|---|
| | Basic Model | Extended | Basic Model | Extended |
| Minimum wage | 0.0908 | -0.0658 | | |
| | (0.1308) | (0.2012) | | |
| Real minimum wage | | | 0.0213 | -0.1420 |
| | | | (0.0576) | (0.0855) |
| Personal characteristics | | | | |
| Gender | 9.0510** | 7.3803* | 9.5156** | 5.1812 |
| | (3.7762) | (3.7877) | (3.7373) | (3.7604) |
| Age | | | | |
| 25-44 years | -2.3770* | -0.5449 | -2.8987** | 2.4761 |
| | (1.3534) | (1.7832) | (1.2504) | (2.4896) |
| 45-65 years | -2.5218 | -0.9950 | -3.7031* | 3.6347 |
| | (2.4565) | (2.8214) | (1.8858) | (3.6945) |
| Education | | | | |
| High school and vocational school | 3.9413*** | 3.4431*** | 4.4636*** | 0.6456 |
| | (0.7107) | (0.8843) | (1.2539) | (1.9051) |
| College and above | 3.2793** | 2.4655 | 4.0424*** | -0.5706 |
| | (1.4043) | (1.6606) | (1.0411) | (2.3200) |
| Macro indicator | | | | |
| Economic growth rate | | 0.2766* | | 0.3557** |
| | | (0.1471) | | (0.1358) |
| Fertility rate | | 0.0345 | | 0.0909 |
| | | (0.0526) | | (0.0599) |
| Aging population | | 0.9659 | | 3.8812 |
| | | (1.5175) | | (2.2758) |
| Foreign workers | | 2.4690 | | 1.8388 |
| | | (2.4125) | | (1.5927) |
| Constant | 15.0894*** | 14.5744*** | 16.3473*** | 11.7797*** |
| | (2.0985) | (2.3435) | (0.6923) | (2.0971) |
| Adj. $R^2$ | 0.9577 | 0.9633 | 0.9570 | 0.9685 |
| Observations | 27 | 27 | 27 | 27 |

*Note:* ***, **, * stands for 1%, 5%, and 10% statistical significant level, respectively.

**Table 5.** The Effect of Minimum Wage on Poverty: Taiwan

| | Average income /Minimum living expenses (per person) | | | |
|---|---|---|---|---|
| | Basic Model | Extended | Basic Model | Extended |
| Minimum wage | -1.9702*** | -1.8352** | | |
| | (0.5274) | (0.7443) | | |
| Real minimum wage | | | 0.9135*** | 0.7003** |
| | | | (0.3262) | (0.2597) |
| Personal characteristics | | | | |
| Male | 20.2310 | 3.0536 | -7.2127 | 32.0409* |
| | (14.5242) | (16.5210) | (12.2550) | (16.6075) |
| Education | | | | |
| High school and vocational school | -17.1034*** | -14.5639*** | -6.1698 | 1.7200 |
| | (3.5519) | (3.9170) | (7.1904) | (6.1521) |
| College and above | 0.0654 | -3.6242 | -4.3915 | 5.3855 |
| | (3.5164) | (3.9996) | (3.1920) | (4.4722) |
| Macro indicator | | | | |
| Economic growth rate | | 1.6178** | | 1.7325** |
| | | (0.6547) | | (0.6254) |
| Fertility rate | | 0.5198** | | 0.2687 |
| | | (0.2295) | | (0.2374) |
| Aging population | | 18.7144*** | | 8.5311 |
| | | (5.6385) | | (6.0474) |
| Foreign workers | | -18.9635* | | -27.9576*** |
| | | (9.4052) | | (7.3424) |
| Constant | 36.2854*** | 26.2525*** | 1.5549 | 12.0230** |
| | (8.1422) | (7.3775) | (3.8249) | (4.6980) |
| Adj. $R^2$ | 0.9796 | 0.9875 | 0.9755 | 0.9881 |
| Observations | 27 | 27 | 27 | 27 |

*Note:* ***, **, * stands for 1%, 5%, and 10% statistical significant level, respectively.

It is expected that government-imposed minimum wages would increase people's income. However, as shown in Table 4, the minimum wage does not significantly impact income levels in either the basic or extended model. This indicates that raising the minimum wage does not effectively increase average per capita income. If we measure the real purchasing power of the minimum wage by its ratio to the minimum living cost, the results are similar to those using the first minimum wage indicator. In

both models, the real purchasing power of the minimum wage does not significantly impact income, indicating that raising the minimum wage relative to the minimum living cost does not enhance average per capita income. Hence, minimum wage policies do not elevate average income levels.

Regarding individual characteristics, male employees have higher average per capita income than females, indicating persistent gender differences in labor conditions, with males earning more than females. In terms of age, individuals aged 25-44 and 45-65 have lower average per capita income compared to those aged 15-24, suggesting that younger generations have higher job rewards due to skills improvement and industrial structure advancements. Education level aligns with the human capital theory, where higher education levels are associated with better job prospects and higher average incomes. However, this is less significant in the extended model with macroeconomic variables. Among macroeconomic indicators, only the economic growth rate significantly boosts income levels, while fertility rates, aging, and migrant worker ratios are not significant. Higher economic growth rates promote national development and increase average per capita income.

As for the impact on poverty levels, it is expected that minimum wage policies would reduce poverty by protecting marginal workers. However, Table 5 shows that minimum wages significantly increase rather than decrease poverty levels in both the basic and extended models. The ratio of average per capita income to the minimum living cost declines, indicating that minimum wage increases exacerbate poverty. Conversely, if we measure the real purchasing power of the minimum wage by its ratio to the minimum living cost, we find that it improves poverty levels in both models. Increasing the ratio of the minimum wage to the minimum living cost by 10% can raise the ratio of average per capita income to the minimum living cost by 7% to 9%. Hence, raising the minimum wage relative to the minimum living cost helps improve living standards and reduce poverty.

Regarding individual characteristics, gender does not significantly affect poverty levels. Educational attainment above the college level is not significant in either model, while having a high school or vocational education increases poverty compared to those with junior high school or lower education. This may be due to the difficulties of finding suitable jobs for such workers in an M-shaped society.

Among macroeconomic indicators, the economic growth rate significantly impacts poverty levels in both models. Higher economic development helps reduce poverty, indicating that economic growth is an effective means to alleviate poverty. Higher fertility rates also significantly improve poverty levels, showing that population growth creates a demographic dividend that reduces poverty. A higher elderly population percentage lowers poverty, indicating that wealth accumulation or social security systems for the elderly in an aging society can reduce poverty. However, this effect is insignificant when using the real purchasing power of the minimum wage. A higher migrant worker ratio significantly increases poverty, indicating that foreign workers may displace local low-skilled workers, reducing their wages and increasing poverty.

**Table 6.** The Effect of Minimum Wage on Income: Panel Data of the Six-Metropolis

| | Average income per person per household | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Basic Model | | Extended | | Basic Model | | Extended | |
| | FE | RE | FE | RE | FE | RE | FE | RE |
| Minimum wage | 0.2496** | -0.1113 | -0.1952 | -0.6410*** | | | | |
| | (0.1151) | (0.1189) | (0.1273) | (0.1785) | | | | |
| Real minimum wage | | | | | 0.0303 | -0.2276*** | -0.0408 | -0.3145*** |
| | | | | | (0.0468) | (0.0491) | (0.0406) | (0.0426) |
| Personal characteristics | | | | | | | | |
| Male | 1.3629 | 0.2039 | 1.0146 | 1.3678 | 1.8560 | -1.0151 | 0.7039 | -0.4320 |
| | (1.2187) | (1.2749) | (1.1105) | (1.4931) | (1.2242) | (1.1976) | (1.1437) | (1.2768) |
| Age | | | | | | | | |
| 25-44 years | -1.9780** | -0.8399 | -1.2435 | -1.4314 | -3.3899*** | -2.1080** | -0.9172 | -1.2760 |
| | (0.9408) | (1.1258) | (0.8433) | (1.0106) | (0.6625) | (0.8320) | (0.8253) | (0.7831) |
| 45-65 years | -2.3386** | -2.2181*** | -1.8820** | -2.4675*** | -3.5113*** | -3.2638*** | -1.6822* | -3.1323*** |
| | (1.0104) | (0.7092) | (0.9509) | (0.6874) | (0.8536) | (0.6300) | (0.9535) | (0.6031) |
| Education | | | | | | | | |
| High school and vocational school | 2.2755*** | 0.6997** | 1.2030*** | 0.8111** | 2.9791*** | 0.3777* | 0.8808* | -0.2133 |
| | (0.5141) | (0.2802) | (0.4456) | (0.2761) | (0.4722) | (0.2058) | (0.4966) | (0.2067) |
| College and above | 1.5287*** | 1.8707*** | 1.0841** | 2.1777*** | 2.2749*** | 1.3443*** | 0.7869 | 1.0748*** |
| | (0.5145) | (0.2013) | (0.4795) | (0.2320) | (0.4171) | (0.1970) | (0.5048) | (0.1832) |
| Macro indicator | | | | | | | | |
| Fertility rate | | | -0.1180*** | -0.1001** | | | -0.1312*** | -0.1482*** |
| | | | (0.0331) | (0.0508) | | | (0.0321) | (0.0434) |
| Aging population | | | 1.3076* | 1.2249** | | | 0.9106 | 0.3170 |
| | | | (0.6777) | (0.4794) | | | (0.6024) | (0.2863) |
| Foreign workers | | | 3.0986*** | 1.2837*** | | | 2.6766*** | 0.9290*** |
| | | | (0.5815) | (0.4408) | | | (0.5447) | (0.3212) |
| Unemployment rate | | | -1.7214*** | -4.0501*** | | | -2.0713*** | -5.0229*** |
| | | | (0.6077) | (0.9140) | | | (0.6430) | (0.7847) |
| Constant | 11.2642*** | 13.9745*** | 15.3821*** | 20.0241*** | 14.5116*** | 14.1557*** | 13.4791*** | 14.6580*** |
| | (1.6467) | (1.6895) | (1.4723) | (2.2110) | (0.5508) | (0.6766) | (0.7143) | (0.7439) |
| Adj. $R^2$ | 0.9335 | | 0.9575 | | 0.9310 | | 0.9570 | |
| F test | 32.53*** | | 40.60*** | | 22.71*** | | 24.66*** | |
| LM test | 0 | | 0 | | 0 | | 0 | |
| Model fitness | Fixed-effect | | Random-effect | | Fixed-effect | | Random-effect | |
| Observations | 126 | | 126 | | 126 | | 126 | |

*Note:* ***, **, * stands for 1%, 5%, and 10% statistical significant level, respectively.

**Table 7.** The Effect of Minimum Wage on Income: Panel Data of the Six-Metropolis

| | Average income per person per household | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Basic Model | | Extended | | Basic Model | | Extended | |
| | FE | RE | FE | RE | FE | RE | FE | RE |
| Minimum wage | 0.2496** | -0.1113 | -0.1952 | -0.6410*** | | | | |
| | (0.1151) | (0.1189) | (0.1273) | (0.1785) | | | | |
| Real minimum wage | | | | | 0.0303 | -0.2276*** | -0.0408 | -0.3145*** |
| | | | | | (0.0468) | (0.0491) | (0.0406) | (0.0426) |
| Personal characteristics | | | | | | | | |
| Male | 1.3629 | 0.2039 | 1.0146 | 1.3678 | 1.8560 | -1.0151 | 0.7039 | -0.4320 |
| | (1.2187) | (1.2749) | (1.1105) | (1.4931) | (1.2242) | (1.1976) | (1.1437) | (1.2768) |
| Age | | | | | | | | |
| 25-44 years | -1.9780** | -0.8399 | -1.2435 | -1.4314 | -3.3899*** | -2.1080** | -0.9172 | -1.2760 |
| | (0.9408) | (1.1258) | (0.8433) | (1.0106) | (0.6625) | (0.8320) | (0.8253) | (0.7831) |
| 45-65 years | -2.3386** | -2.2181*** | -1.8820** | -2.4675*** | -3.5113*** | -3.2638*** | -1.6822* | -3.1323*** |
| | (1.0104) | (0.7092) | (0.9509) | (0.6874) | (0.8536) | (0.6300) | (0.9535) | (0.6031) |
| Education | | | | | | | | |
| High school and vocational school | 2.2755*** | 0.6997** | 1.2030*** | 0.8111** | 2.9791*** | 0.3777* | 0.8808* | -0.2133 |
| | (0.5141) | (0.2802) | (0.4456) | (0.2761) | (0.4722) | (0.2058) | (0.4966) | (0.2067) |
| College and above | 1.5287*** | 1.8707*** | 1.0841** | 2.1777*** | 2.2749*** | 1.3443*** | 0.7869 | 1.0748*** |
| | (0.5145) | (0.2013) | (0.4795) | (0.2320) | (0.4171) | (0.1970) | (0.5048) | (0.1832) |
| Macro indicator | | | | | | | | |
| Fertility rate | | | -0.1180*** | -0.1001** | | | -0.1312*** | -0.1482*** |
| | | | (0.0331) | (0.0508) | | | (0.0321) | (0.0434) |
| Aging population | | | 1.3076* | 1.2249** | | | 0.9106 | 0.3170 |
| | | | (0.6777) | (0.4794) | | | (0.6024) | (0.2863) |
| Foreign workers | | | 3.0986*** | 1.2837*** | | | 2.6766*** | 0.9290*** |
| | | | (0.5815) | (0.4408) | | | (0.5447) | (0.3212) |
| Unemployment rate | | | -1.7214*** | -4.0501*** | | | -2.0713*** | -5.0229*** |
| | | | (0.6077) | (0.9140) | | | (0.6430) | (0.7847) |
| Constant | 11.2642*** | 13.9745*** | 15.3821*** | 20.0241*** | 14.5116*** | 14.1557*** | 13.4791*** | 14.6580*** |
| | (1.6467) | (1.6895) | (1.4723) | (2.2110) | (0.5508) | (0.6766) | (0.7143) | (0.7439) |
| Adj. $R^2$ | 0.9335 | | 0.9575 | | 0.9310 | | 0.9570 | |
| F test | 32.53*** | | 40.60*** | | 22.71*** | | 24.66*** | |
| LM test | 0 | | 0 | | 0 | | 0 | |
| Model fitness | Fixed-effect | | Random-effect | | Fixed-effect | | Random-effect | |
| Observations | 126 | | 126 | | 126 | | 126 | |

*Note:* ***, **, * stands for 1%, 5%, and 10% statistical significant level, respectively.

**Table 8.** The Effect of Minimum Wage on Income: Quantile Regression for the Six-Metropolis

| | OLS | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 | OLS | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average income per person per household Basic Model | | | | | | Average income per person per household Extended Model | | | | | |
| Minimum Wage | 0.2496** | 0.2760* | 0.2612 | 0.1942 | 0.2956* | 0.5001*** | -0.1952 | -0.2285 | -0.0876 | -0.1040 | -0.2630 | -0.2343* |
| | (0.1151) | (0.1594) | (0.1595) | (0.1734) | (0.1677) | (0.1388) | (0.1273) | (0.1380) | (0.1945) | (0.1900) | (0.1623) | (0.1399) |
| *Personal characteristics* | | | | | | | | | | | | |
| Male | 1.3629 | 0.9551 | 1.7925 | 1.9186 | 1.0827 | 3.3855** | 1.0146 | -1.4190 | 1.5510 | 0.4123 | 1.5245 | -0.4083 |
| | (1.2187) | (1.6885) | (1.6894) | (1.8366) | (1.7757) | (1.4704) | (1.1105) | (1.2037) | (1.6962) | (1.6576) | (1.4160) | (1.2199) |
| *Age* | | | | | | | | | | | | |
| 25-44years | -1.9780** | -3.1057** | -2.2679* | -2.8790** | -0.9850 | 1.0355 | -1.2435 | 0.2389 | -0.2422 | -0.9064 | -2.4653** | -2.3234** |
| | (0.9408) | (1.3035) | (1.3042) | (1.4179) | (1.3708) | (1.1352) | (0.8433) | (0.9141) | (1.2881) | (1.2588) | (1.0753) | (0.9264) |
| 45-65years | -2.3386** | -4.2964*** | -2.9895** | -3.0614** | -1.7671 | 0.2814 | -1.8820** | -0.5279 | -1.2889 | -1.7622 | -2.7744** | -3.1343*** |
| | (1.0104) | (1.4000) | (1.4007) | (1.5228) | (1.4722) | (1.2191) | (0.9509) | (1.0307) | (1.4524) | (1.4194) | (1.2125) | (1.0446) |
| *Education* | | | | | | | | | | | | |
| High school and vocational school | 2.2755*** | 3.2074*** | 2.6988*** | 2.6961*** | 2.3622*** | 1.4691** | 1.2030*** | 0.4710 | 1.2232* | 1.0242 | 1.7770*** | 1.9292*** |
| | (0.5141) | (0.7123) | (0.7127) | (0.7748) | (0.7491) | (0.6203) | (0.4456) | (0.4830) | (0.6806) | (0.6652) | (0.5682) | (0.4895) |
| College and above | 1.6287*** | 2.5104*** | 1.9751*** | 1.7988** | 1.4446* | 0.8267 | 1.0841** | 0.3442 | 1.1629 | 0.9624 | 1.5058** | 1.4353*** |
| | (0.5145) | (0.7129) | (0.7132) | (0.7754) | (0.7497) | (0.6208) | (0.4795) | (0.5197) | (0.7324) | (0.7157) | (0.6114) | (0.5267) |
| *Macro Indicator* | | | | | | | | | | | | |
| Fertility rate | | | | | | | -0.1180*** | -0.0727** | -0.0868* | -0.1077** | -0.1144*** | -0.1115*** |
| | | | | | | | (0.0331) | (0.0358) | (0.0505) | (0.0494) | (0.0422) | (0.0363) |
| Aging population | | | | | | | 1.3076* | 1.7593** | 0.9871 | 0.8721 | 1.2718 | 1.5708** |
| | | | | | | | (0.6777) | (0.7346) | (1.0352) | (1.0116) | (0.8642) | (0.7445) |
| Foreign workers | | | | | | | 3.0986*** | 3.2453*** | 3.8190*** | 3.3409*** | 2.1331*** | 2.2657*** |
| | | | | | | | (0.5816) | (0.6303) | (0.8882) | (0.8680) | (0.7415) | (0.6388) |
| Unemployment rate | | | | | | | -1.7214*** | -1.8978*** | -1.2379 | -1.2848 | -1.4589* | -2.1271*** |
| | | | | | | | (0.6077) | (0.6587) | (0.9282) | (0.9071) | (0.7748) | (0.6676) |
| Constant | 11.5515*** | 11.5340*** | 11.6220*** | 12.8475*** | 10.3527*** | 8.0701*** | 15.7047*** | 14.1051*** | 13.9894*** | 14.4228*** | 17.2504*** | 16.1332*** |
| | (1.6199) | (2.2444) | (2.2456) | (2.4413) | (2.3602) | (1.9545) | (1.4584) | (1.5808) | (2.2275) | (2.1769) | (1.8596) | (1.6021) |
| County effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-sq. | 0.9394 | | | | | | 0.9626 | | | | | |
| Adj. R-sq. | 0.9335 | | | | | | 0.9575 | | | | | |
| Pseudo R-sq. | | 0.7051 | 0.7073 | 0.7315 | 0.7990 | 0.8169 | | 0.7840 | 0.7801 | 0.7900 | 0.8429 | 0.8563 |
| Observations | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 |

*Note*: ***, **, * stands for 1%, 5%, and 10% statistical significant level, respectively.

**Table 9.** The Effect of Real Minimum Wage on Income: Quantile Regression for the Six-Metropolis

| | OLS | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 | OLS | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average income per person per household Basic Model | | | | | | Average income per person per household Extended Model | | | | | |
| Real Minimum Wage | 0.0303 | 0.0923 | 0.0887 | -0.0010 | -0.1064 | -0.1865*** | -0.0408 | 0.0675* | 0.0130 | -0.0728 | -0.0750 | -0.1257*** |
| | (0.0468) | (0.0634) | (0.0662) | (0.0671) | (0.0683) | (0.0572) | (0.0406) | (0.0381) | (0.0556) | (0.0603) | (0.0508) | (0.0399) |
| *Personal characteristics* | | | | | | | | | | | | |
| Male | 1.8560 | 1.8277 | 1.8973 | 2.8126 | 1.1310 | 2.4919* | 0.7039 | -1.6611 | 1.6740 | 0.8967 | 1.0569 | -0.5680 |
| | (1.2242) | (1.6585) | (1.7321) | (1.7558) | (1.7855) | (1.4958) | (1.1437) | (1.0729) | (1.5649) | (1.6975) | (1.4310) | (1.1247) |
| *Age* | | | | | | | | | | | | |
| 25-44years | -3.3899*** | -2.1517** | -3.6964*** | -3.9723*** | -4.9059*** | -5.1087*** | -0.9172 | 0.6655 | -0.1824 | -1.5871 | -1.7011 | -1.5000* |
| | (0.6625) | (0.8974) | (0.9373) | (0.9501) | (0.9662) | (0.8094) | (0.8253) | (0.7742) | (1.1293) | (1.2250) | (1.0327) | (0.8116) |
| 45-65years | -3.5113*** | -3.2205*** | -3.7970*** | -3.5571*** | -4.4446*** | -4.9476*** | -1.6822* | -0.9119 | -1.4900 | -2.5421* | -2.4277** | -2.5421*** |
| | (0.8536) | (1.1564) | (1.2077) | (1.2242) | (1.2450) | (1.0429) | (0.9535) | (0.8945) | (1.3047) | (1.2153) | (1.1930) | (0.9377) |
| *Education* | | | | | | | | | | | | |
| High school and vocational school | 2.9791*** | 2.9629*** | 3.3613*** | 2.8795*** | 2.5980*** | 2.7495*** | 0.8808* | 0.5246 | 1.3587** | 1.0787 | 1.2131* | 0.8001 |
| | (0.4722) | (0.6397) | (0.6680) | (0.6772) | (0.6887) | (0.5769) | (0.4966) | (0.4658) | (0.6794) | (0.7370) | (0.6213) | (0.4883) |
| College and above | 2.2749*** | 2.6362*** | 2.4990*** | 2.1309*** | 1.8856*** | 2.1567*** | 0.7869 | 0.5776 | 1.3068* | 1.1868 | 1.1320* | 0.7329 |
| | (0.4171) | (0.5651) | (0.5901) | (0.59982) | (0.6084) | (0.5096) | (0.5048) | (0.4735) | (0.6906) | (0.7492) | (0.6316) | (0.4964) |
| *Macro Indicator* | | | | | | | | | | | | |
| Fertility rate | | | | | | | -0.1312*** | -0.0794*** | -0.0883** | -0.1197** | -0.1461*** | -0.1505*** |
| | | | | | | | (0.0321) | (0.0301) | (0.0439) | (0.0477) | (0.0402) | (0.0316) |
| Aging population | | | | | | | 0.9106 | 0.9779* | 0.5806 | 0.2151 | 0.3456 | 1.1645* |
| | | | | | | | (0.6024) | (0.5651) | (0.8243) | (0.8941) | (0.7537) | (0.5924) |
| Foreign workers | | | | | | | 2.6766*** | 3.6194*** | 3.7450*** | 3.0663*** | 2.0544*** | 1.4041*** |
| | | | | | | | (0.5447) | (0.5110) | (0.7453) | (0.8085) | (0.6816) | (0.5357) |
| Unemployment rate | | | | | | | -2.0713*** | -1.2018** | -1.2664 | -2.0873** | -2.2251*** | -3.0400*** |
| | | | | | | | (0.6430) | (0.6032) | (0.8798) | (0.9544) | (0.8045) | (0.6323) |
| Constant | 14.7465*** | 13.5581*** | 14.7126*** | 15.7008*** | 16.1597*** | 16.9897*** | 13.7996*** | 11.4351*** | 13.1260*** | 14.3451*** | 14.5331*** | 14.1353*** |
| | (0.5461) | (0.7398) | (0.7726) | (0.7832) | (0.7965) | (0.6672) | (0.6901) | (0.6473) | (0.9442) | (1.0242) | (0.8634) | (0.6786) |
| County effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-sq. | 0.9371 | | | | | | 0.9621 | | | | | |
| Adj. R-sq. | 0.9310 | | | | | | 0.9570 | | | | | |
| Pseudo R-sq. | | 0.7019 | 0.7033 | 0.7284 | 0.7955 | 0.8146 | | 0.7792 | 0.7790 | 0.7923 | 0.8457 | 0.8631 |
| Observations | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 |

*Note:* ***, **, * stands for 1%, 5%, and 10% statistical significant level, respectively.

**Table 10.** The Effect of Minimum Wage on Poverty: Quantile regression for the Six-Metropolis

| | OLS | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 | OLS | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average income / Average minimum living expenses (per person) Basic Model | | | | | | Average income / Average minimum living expenses (per person) Extended Model | | | | | |
| Real Minimum Wage | -0.2870 | -1.6333*** | -0.2400 | -0.6449 | -0.4467 | -0.6203 | -1.0389** | -1.6024*** | -1.8258*** | -1.4310* | -1.0583* | -1.3712*** |
| | (0.4370) | (0.4672) | (0.6357) | (0.5756) | (0.4101) | (0.3848) | (0.5099) | (0.3191) | (0.6994) | (0.7571) | (0.5564) | (0.5017) |
| *Personal characteristics* | | | | | | | | | | | | |
| Male | -1.9628 | 1.7327 | -3.7821 | -2.5349 | 1.9868 | 10.4057** | -9.3755** | -14.9553*** | -11.4729* | -2.0965 | -4.1401 | -2.8223 |
| | (4.6284) | (4.9477) | (6.7324) | (6.0962) | (4.3437) | (4.0751) | (4.4480) | (2.7830) | (6.1011) | (6.6036) | (4.8530) | (4.3764) |
| *Age* | | | | | | | | | | | | |
| 25-44years | -1.5832 | -4.7202 | 0.2208 | -7.9283* | -8.4695** | -7.1734** | 1.4476 | 4.0229* | 8.0255* | -1.0928 | -6.6177* | -8.1666** |
| | (3.5731) | (3.8197) | (5.1975) | (4.7063) | (3.3534) | (3.1460) | (3.3778) | (2.1134) | (4.6332) | (5.0149) | (3.6854) | (3.3235) |
| 45-65years | -4.4042 | -11.0626*** | -4.0386 | -7.4698 | -7.5492** | -6.1037* | -1.8269 | -1.0685 | 4.1872 | -2.0510 | -6.9638* | -11.1419*** |
| | (3.8375) | (4.1023) | (5.5820) | (5.0545) | (3.6015) | (3.3787) | (3.8088) | (2.3831) | (5.2243) | (5.6546) | (4.1556) | (3.7475) |
| *Education* | | | | | | | | | | | | |
| High school and vocational school | -2.2826 | 2.5391 | -1.5044 | -1.1203 | -2.2667 | -1.4852 | -5.9345*** | -5.0430*** | -6.4343*** | -4.2513 | -3.3647* | -1.7113 |
| | (1.9525) | (2.0872) | (2.8401) | (2.5717) | (1.8324) | (1.7191) | (1.7849) | (1.1167) | (2.4482) | (2.6499) | (1.9474) | (1.7561) |
| College and above | -1.8514 | 4.7894** | -1.2701 | -1.5965 | -1.0160 | -1.0287 | -4.6157** | -4.6107*** | -6.3211** | -3.3319 | -2.0761 | 0.05990 |
| | (1.9540) | (2.0889) | (2.8423) | (2.5737) | (1.8339) | (1.7204) | (1.9205) | (1.2016) | (2.6342) | (2.8512) | (2.0954) | (1.8896) |
| *Macro Indicator* | | | | | | | | | | | | |
| Fertility rate | | | | | | | -0.3550*** | -0.2607*** | -0.1142 | -0.2108 | -0.2166 | -0.2666** |
| | | | | | | | (0.1325) | (0.0829) | (0.1817) | (0.1967) | (0.1445) | (0.1303) |
| Aging population | | | | | | | 3.7645 | 8.6062*** | 10.7880*** | 3.9314 | -0.6842 | 0.8146 |
| | | | | | | | (2.7145) | (1.6984) | (3.7234) | (4.0301) | (2.9617) | (2.6709) |
| Foreign workers | | | | | | | 1.9448 | 2.1815 | 4.3296 | 4.2496 | 1.5794 | -0.1681 |
| | | | | | | | (2.3292) | (1.4573) | (3.1948) | (3.4580) | (2.5412) | (2.2917) |
| Unemployment rate | | | | | | | -13.9375*** | -11.4543*** | -9.8197*** | -8.5617** | -12.5422*** | -10.8072*** |
| | | | | | | | (2.4340) | (1.5229) | (3.3386) | (3.6136) | (2.6556) | 2.3948) |
| Constant | 8.7136 | 22.0592*** | 5.6062 | 16.2507** | 17.2885*** | 20.8970*** | 13.2895** | 13.4616*** | 14.0935* | 20.3093** | 20.3012*** | 24.5049*** |
| | (6.1521) | (6.5766) | (8.9489) | (8.1032) | (5.7737) | (5.4166) | (5.8414) | (3.6548) | (8.0123) | (8.6724) | (6.3733) | (5.7474) |
| County effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-sq. | 0.7740 | | | | | | 0.8392 | | | | | |
| Adj. R-sq. | | 0.4444 | 0.4875 | 0.5793 | 0.6658 | 0.7179 | | 0.5689 | 0.5802 | 0.6343 | 0.7030 | 0.7505 |
| Pseudo R-sq. | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 |
| Observations | 0.7740 | | | | | | 0.8392 | | | | | |

*Note:* ***, **, * stands for 1%, 5%, and 10% statistical significant level, respectively.

**Table 11.** The Effect of Minimum Wage on Poverty: Quantile Regression for the Six-Metropolis

| | OLS | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 | OLS | 0.1 | 0.25 | 0.5 | 0.75 | 0.9 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Average income / Average minimum living expenses (per person) Basic Model | | | | | | Average income / Average minimum living expenses (per person) Extended Model | | | | | |
| Real Minimum Wage | 1.2674*** | 1.3327*** | 1.0670*** | 1.1843*** | 1.1632*** | 1.2263*** | 1.1064*** | 1.5129*** | 1.1756*** | 0.9431*** | 0.9235*** | 0.9820*** |
| | (0.1284) | (0.1113) | (0.1595) | (0.1967) | (0.1544) | (0.1365) | (0.1265) | (0.0923) | (0.1866) | (0.1789) | (0.1339) | (0.1435) |
| *Personal characteristics* | | | | | | | | | | | | |
| Male | -0.8692 | -4.1438 | -7.0325* | -1.0683 | 5.3763 | 3.2095 | -2.9391 | -3.5559 | -8.5227 | -2.2078 | 4.2010 | 5.5010 |
| | (3.3579) | (2.9109) | (4.1716) | (5.1449) | (4.0395) | (2.5708) | (3.5622) | (2.6005) | (5.2568) | (5.0382) | (3.7725) | (4.0419) |
| *Age* | | | | | | | | | | | | |
| 25-44years | 4.1329** | 4.1562*** | 3.3568 | 2.2692 | 4.8907** | 7.1711*** | 2.3883 | 6.5651*** | 6.1449 | 3.3011 | 1.4624 | 2.5582 |
| | (1.8170) | (1.5752) | (2.2573) | (2.7840) | (2.1859) | (1.9322) | (2.5706) | (1.8766) | (3.7935) | (3.6357) | (2.7223) | (2.9168) |
| 45-65years | 0.2866 | 1.0966 | 0.4045 | -1.0984 | 0.9021 | 2.8637 | --2.5630 | 1.5186 | -0.2321 | -2.9533 | -2.7082 | -3.1851 |
| | (2.3413) | (2.0297) | (2.9087) | (3.5873) | (2.8166) | (2.4898) | (2.9699) | (2.1681) | (4.3827) | (4.2005) | (3.1452) | (3.3698) |
| *Education* | | | | | | | | | | | | |
| High school and vocational school | 1.5026 | 1.5925 | 0.5157 | 1.9986 | 1.6020 | 0.02568 | -0.3791 | -0.5901 | -1.7871 | -1.4572 | -1.2138 | -0.4512 |
| | (1.2951) | (1.1228) | (1.6090) | (1.9844) | (1.5580) | (1.3772) | (1.5466) | (1.1290) | (2.2823) | (2.1874) | (1.6379) | (1.7549) |
| College and above | -0.5384 | -0.9739 | -1.8680 | -0.3260 | -0.1817 | -1.0205 | -0.6495 | -0.8642 | -1.7318 | -0.7616 | -0.6809 | 0.3085 |
| | (1.1441) | (0.9918) | (1.4213) | (1.7529) | (1.3763) | (1.2166) | (1.5721) | (1.1477) | (2.3200) | (2.2236) | (1.6649) | (1.7838) |
| *Macro Indicator* | | | | | | | | | | | | |
| Fertility rate | | | | | | | -0.4303*** | -0.2526*** | -0.3331** | -0.3570** | -0.4839*** | -0.4608*** |
| | | | | | | | (0.1000) | (0.0730) | (0.1476) | (0.1414) | (0.1059) | (0.1135) |
| Aging population | | | | | | | -2.4165 | -3.8121*** | -2.0116 | -2.0132 | -1.8377 | -1.5723 |
| | | | | | | | (1.8763) | (1.3697) | (2.7689) | (2.6537) | (1.9871) | (2.1290) |
| Foreign workers | | | | | | | 2.1877 | 6.1731*** | 3.2215 | 5.6707** | 2.8291 | 1.9540 |
| | | | | | | | (1.6966) | (1.2386) | (2.5038) | (2.3997) | (1.7968) | (1.9251) |
| Unemployment rate | | | | | | | -8.7189*** | -3.7019** | -8.6064*** | -7.3508** | -7.4223*** | -5.2918** |
| | | | | | | | (2.0027) | (1.4602) | (2.9554) | (2.8325) | (2.1209) | (2.2724) |
| Constant | -1.9646 | -3.7103*** | -3.1071* | -0.6268 | 0.2180 | -1.9154 | 0.8482 | -4.1622*** | -4.0482 | 1.0676 | 5.2204** | 4.3899* |
| | (1.4979) | (1.2985) | (1.8609) | (2.2950) | (1.8019) | (1.5928) | (2.1493) | (1.5690) | (3.1717) | (3.0398) | (2.2761) | (2.4387) |
| County effect | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| R-sq. | 0.8777 | | | | | | 0.9016 | | | | | |
| Adj. R-sq. | | 0.5947 | 0.6196 | 0.6554 | 0.7165 | 0.7686 | | 0.6437 | 0.6566 | 0.7007 | 0.7596 | 0.7939 |
| Pseudo R-sq. | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 | 126 |
| Observations | 0.8777 | | | | | | 0.9016 | | | | | |

*Note:* ***, **, * stands for 1%, 5%, and 10% statistical significant level, respectively.

Using panel data from 1999 to 2019 for the Six-Metropolis, we estimate the fixed effect model and random effect model, selecting the appropriate one. Table 6 shows the impact of the minimum wage on income in the Six-Metropolis. The Hausman test results reject the null hypothesis in both the basic and extended models, so we use the fixed effect model. The results show that raising the minimum wage increases average per capita income in the basic model but has no significant impact in the extended model, indicating that the effectiveness of minimum wage policies in raising income is not robust.

When measuring the real purchasing power of the minimum wage by its ratio to the minimum living cost, the Hausman test results again reject the null hypothesis in both models, so we use the fixed effect model. The results are similar to those using the first minimum wage indicator, showing no significant impact on income in either model.

Regarding individual characteristics, gender does not significantly affect income. Only the 25-44 age group is insignificant in the extended model, indicating that those aged 25 and above have lower average per capita income compared to the 15-24 age group. Higher education levels, especially in urban areas, improve employment prospects and increase income.

All macroeconomic indicators significantly affect income. In the Six-Metropolis, lower fertility rates increase average per capita income, contrary to the results for Taiwan, suggesting higher opportunity and childcare costs in urban areas. Encouraging higher fertility in urban areas may require substantial financial incentives. A higher elderly population increases income, consistent with Taiwan's overall results, indicating that the elderly are generally wealthier. A higher migrant worker ratio increases income, contrary to the results for Taiwan, indicating that foreign workers complement local skilled workers in urban areas, promoting industrial development and increasing income. Higher unemployment rates reduce income, indicating fewer job opportunities and lower income levels.

Table 7 shows the impact of the minimum wage on poverty in the Six-Metropolis. To reflect actual poverty levels, we measure poverty by dividing average per capita disposable income by the minimum living cost per region or by dividing the minimum wage by the minimum living cost to assess its real purchasing power. The Hausman test results do not reject the null hypothesis in either model, so we use the random effect model. The results show that raising the minimum wage significantly increases poverty in both models, indicating that minimum wage increases do not reduce poverty.

When measuring the real purchasing power of the minimum wage, the Hausman test results reject the null hypothesis in the basic model, so we use the fixed effect model; in the extended model, we do not reject the null hypothesis, so we use the random effect model. The results show that increasing the real purchasing power of the minimum wage reduces poverty in both models, indicating that raising the minimum wage relative to the minimum living cost helps reduce poverty. This result aligns with international studies, such as those by DiNardo, Fortin, and Lemieux (1996), Lee (1999), and Autor, Manning, and Smith (2016), which found that raising the minimum wage improves wage

distribution.

Regarding individual characteristics, gender significantly affects poverty only in the basic model, but the extended model results are insignificant, indicating no significant gender differences in poverty. Only the 45+ age group significantly increases poverty compared to the 15-24 age group, indicating that middle-aged and older workers are more likely to experience poverty, possibly due to structural unemployment. High school and vocational education increases poverty compared to junior high school or lower education, indicating that middle-skilled workers may face difficulties in finding suitable jobs.

Among macroeconomic indicators, fertility rates, migrant worker ratios, and unemployment rates significantly affect poverty, while aging does not. In urban areas, lower fertility rates improve poverty levels, indicating that lower childcare burdens increase employment and income. A higher elderly population reduces poverty among middle-income groups, indicating that wealth accumulation among the elderly helps reduce poverty. However, in the extended model, a higher elderly population increases poverty among low-income groups, indicating that poor elderly individuals exacerbate poverty. Higher unemployment rates increase poverty across all income groups, indicating fewer job opportunities and higher poverty. The migrant worker ratio has no significant impact.

Since the impact of the minimum wage may vary across different income or poverty levels, we use quantile regression to estimate the effects on average per capita income and poverty at different quantiles (10th, 25th, 50th, 75th, 90th) for the Six-Metropolis, controlling for regional effects. Tables 8 and 9 show the impact of two minimum wage indicators on income.

In the basic model, raising the minimum wage increases income for low and high-income groups. In the extended model, it only negatively impacts high-income groups, indicating the limited effectiveness of minimum wage policies. Increasing the real purchasing power of the minimum wage benefits high-income groups in the basic model but improves low-income groups in the extended model, reducing income inequality.

Regarding personal characteristics, gender impacts high-income groups in the basic model, with males earning more than females. Age impacts middle-income groups in both models, indicating that younger generations earn more. Higher education levels benefit high-income groups in urban areas.

Lower fertility rates increase income across all groups, particularly high-income groups. Aging increases income for low and high-income groups due to accumulated wealth and skills. Higher proportions of migrant workers benefit all income groups, especially middle-income groups. Higher unemployment rates reduce income for low and middle-income groups.

Tables 10 and 11 show the impact of minimum wage indicators on poverty. Raising the minimum wage increases poverty for low-income groups in the basic model and all groups in the extended model. Increasing the real purchasing power of the minimum

wage reduces poverty, particularly for low-income groups, aligning with Dube (2019). A 10% increase in the ratio improves the poverty level by 9.82%-15.1%.

Personal characteristics have inconsistent effects on poverty. Gender, age, and education levels do not significantly impact poverty. Among macroeconomic indicators, lower fertility rates reduce poverty across all groups. Aging reduces poverty in middle-income groups but increases it in low-income groups. Higher unemployment rates increase poverty across all groups.

## 5. CONCLUSION AND RECOMMENDATIONS

Taiwan has had a minimum wage policy for 65 years. Despite periods of stagnation, recent years have seen annual increases, reflecting growing concern for low-income workers. The policy aims to ensure basic living standards and prevent widening income inequality. However, whether it truly improves income levels and alleviates poverty requires empirical analysis. This study uses Taiwan data to examine the effectiveness of the minimum wage in achieving these goals.

The analysis includes both Taiwan as a whole and the six major municipalities, using two minimum wage indicators. The results show that raising the minimum wage does not increase average per capita income but does reduce poverty when considering real purchasing power. Quantile regression reveals that increasing the real purchasing power of the minimum wage benefits low-income groups the most.

Policy implications include considering the minimum living cost when adjusting the minimum wage. Only by increasing the real purchasing power of the minimum wage can the policy effectively improve income levels and reduce poverty. Estimates suggest that a 10% increase in the ratio improves the poverty level by 7%-9% in Taiwan and 9.82%-15.1% in the Six-Metropolis.

Other findings indicate that gender does not significantly impact income, suggesting increasing equality in the workplace. Age and education impact income and poverty differently across groups, reflecting broader social and economic trends. Increasing the proportion of migrant workers has mixed effects, exacerbating poverty in Taiwan but alleviating it in the Six-Metropolis. Lower fertility rates reduce poverty, while aging has varied impacts. Economic growth and lower unemployment consistently improve income and reduce poverty.

Government policies should address these issues holistically, promoting both economic growth and worker welfare to effectively combat poverty.

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