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An Empirical Analysis of the Impact of Housing Prices on Fertility Rates in Taiwan

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Abstract— The low fertility rate has been a global concern, especially in developed economies. High housing prices are proposed to be the most important factor causing the low fertility rate. This study aims to investigate the impact of housing prices on fertility in Taiwan. The empirical sample includes 19 local governments in Taiwan from 2012 to 2021, and the model was estimated using the fixed-effect model. The results show that the ratio of house price to income and the residence education level are significantly negatively correlated with the fertility rate. On the other hand, the area of land for public facilities and the population growth rate are significantly positively correlated. Based on the results, this study suggests that the government should provide more social housing to restrain the housing price, alleviate young people's financial burden, and to increase their willingness to fertilize. Besides, the government should enhance the quantity and quality of public daycare centers to allow parents to work with peace of mind. Finally, the government should provide more public facilities, such as public transportation and park, to enhance the quality of living environment to encourage childbirth.

Index Terms—fertility rate, housing price, panel data estimation

I. INTRODUCTION

The low fertility rate has been a global concern, especially in developed economies. High housing prices are proposed to be the most important factor causing the low fertility rate. The relatively low tax burden of holding real estate in Taiwan has led investors to redirect their funds towards the real estate market. In recent years, soaring prices, persistently high housing costs, rising unemployment rates, and an increasing misery index have contributed to a worsening economic situation. As the economy struggles, income inequality worsens, significantly burdening the younger generation. The real estate market experienced increased transaction activity, stimulating housing prices in 2021. The price-to-income ratio has risen to 9.46 times in Taiwan, far exceeding the reasonable range of 3 to 6 times suggested by the World Bank. According to the statistics, housing prices have risen by 20.1% over the past three years, 2019-2021, while wages have only grown by 4.3% during the same period. The salary increases fall far short of inflation, making childbirth an additional burden for most families. If housing prices remain high and inflation continues, planning for parenthood will become an unattainable dream for young couples.

This study investigates the impact of housing prices on fertility in Taiwan. The empirical sample includes 19 local governments in Taiwan from 2012 to 2021, and the model was estimated using the fixed-effect model suggested by the Hausman test. The empirical results show that the ratio of house price to income and the residence education level are significantly negatively correlated with the fertility rate. On the other hand, the area of land for public facilities and the population growth rate are significantly positively correlated. Based on the results, this study suggests that the government should provide more social housing to restrain the housing price, alleviate young people's financial burden, and to increase their willingness to fertilize. Besides, the government should enhance the quantity and quality of public daycare centers to allow parents to work with peace of mind. Finally, the government should provide more public facilities, such as public transportation and park, to enhance the quality of living environment to encourage childbirth.

The structure of this study is as follows. The first section introduces this research's background, motivation, and purpose. The second section reviews the literature related to Taiwan's real state and fertility rates. The third section describes the methodology. The fourth section illustrates the empirical findings. The last section concludes and proposes policy suggestions.

II. LITERATURE REVIEW

The fertility rate refers to the average number of children born to each woman in a specific population group within a certain period. This study uses the number of children born per thousand women within a specific age range as an indicator, with the age range being women aged 15 to 49. Figure 1 illustrates the fertility rate of Taiwan between 2012 and 2021. As shown in Figure 1, Taiwan's fertility rate has declined recently, from 38‰ in 2012 to 28‰ in 2021, making it one of the

lowest fertility rates globally. This trend of low fertility rates has persisted in Taiwan for some time, with factors including population aging, high housing prices, and high unemployment rates. Population policies and socio-economic development significantly influence the fertility rate. Although the government has implemented various policies to encourage childbirth, such as increasing subsidies for parental leave and expanding childcare resources, the impact remains relatively limited.

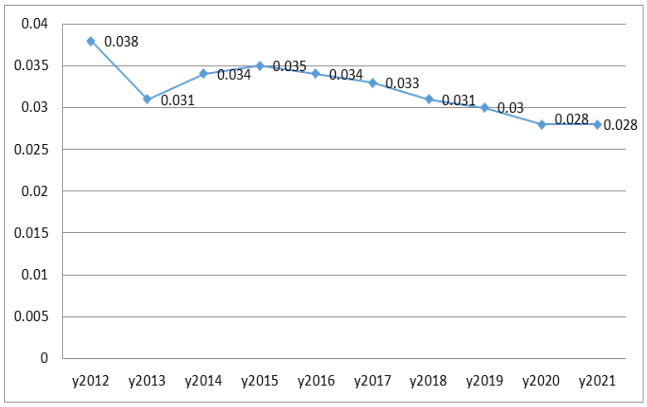

Figure 1 The Taiwan's fertility rate, 2012-2021

The fertility rates in the world vary by region, but overall, there is a downward trend in fertility rates worldwide. United Nations (2021) statistics show that the global average fertility rate peaked in the 1960s. At that time, each woman, on average, could give birth to 5 children. However, since then, global fertility rates have continued to decline, which is expected to persist in the coming decades. By the end of this century, the global fertility rate is projected to decrease to 2.1 children per woman, which is the replacement level fertility rate required for population stability. Notably, the extent and speed of decline vary across regions. In some developed countries such as Japan, South Korea, and Spain, fertility rates have already declined to the point where populations are shrinking. Although fertility rates are high in some undeveloped countries, especially in sub-Saharan Africa, they are also gradually declining.

Novelli et al. (2021) argue that the changes in fertility behavior are one of the most intensely studied issues in demographic science. The willingness to fertilize is correlated to societal, economic, and psychological factors. It depends on individual characteristics such as age, marital status, parity, educational level, economic situation, and a country's political policies and welfare system.

Kahn et al. (2014) point out that having children exacts a high cost on women's careers. The impact of having children on the reduction in female labor force participation is most pronounced when women are young. Lee and Yu (2005) propose that a family's educational resources and parental socioeconomic status directly impact children's educational achievements. Moreover, the more siblings there are, the fewer educational resources are available within the family. Therefore, family educational resources have a significant influence on educational achievements. An increase in educational attainment raises the opportunity cost of fertility for women and enhances expectations for their children's future achievements. In addition to affluent families providing ample resources and environment for their children's education, government expenditure on education and culture is also crucial for providing relative subsidies to low socioeconomic status families to increase their willingness to fertilize.

Yang (2022) notes that government-provided childcare subsidies increase the willingness to fertilize. However, whether the increase in income alone within families leads to increased fertility, known as the income effect, is not easy to estimate. Experiments were conducted using lottery winnings as an opportunity with two groups: one receiving winnings between 1 million new Taiwan dollars (NTD) to 10 million NTD and the other receiving more than 10 million NTD. The results indicate that the fertility-promoting effect is concentrated in households receiving over 10 million NTD. From this, it can be inferred that the effect of income on fertility is quite limited when income increases do not reach a certain threshold.

Kao (2012) finds that relative deprivation significantly negatively influences the willingness to fertilize. In other words, when income inequality widens, the group experiencing relative deprivation tends to be families with relatively disadvantaged incomes, decreasing their willingness to fertilize. Therefore, both increases and decreases in income can impact the willingness to fertilize. Enduring long-term economic instability during economic recessions not only entails the loss of current income but may also affect subsequent decisions regarding fertilization.

Parsons and Gilmour's (2018) research indicates that even with the implementation of aggressive policies in a short timeframe, both fertility and immigration policies are unable to significantly reduce Japan's elderly dependency ratio in the coming decades. To reduce the elderly dependency ratio, the total fertility rate needs to increase significantly and rapidly to a certain extent. However, aggressive fertility policies impose heavy burdens on women, necessitating a choice between fertility and labor force participation. Regardless of the outcome, it is crucial to address population aging. In recent decades, Japan has offered childbirth incentives, increased parental leave, and subsidized childhood education. Despite a slight increase in the total fertility rate, the impact on the number of newborns remains limited. On the other hand, the effect of immigration policies on reducing the elderly dependency ratio is greater than the impact of fertility rates. In other words, immigration has a greater benefit in improving population structure.

Chen (2021) points out that France has maintained a high fertility rate for the past 40 years, and socializing the burden of childcare has been a consistent effort of the French government. In addition to providing childcare subsidies, public daycare centers have been established to ensure all children aged 3-5 can attend. The German government strives to establish childcare as a "right" for its citizens, primarily facilitating women's smooth re-entry into the labor market and increasing labor participation rates. Moreover, the German government has expanded the construction of daycare centers for children aged 0-3. In 2013, legislation was enacted to explicitly guarantee families with children over 1-year-old the "legal right to childcare," meaning that the government must ensure that every family with a 1-year-old child has access to childcare.

According to the statistics, there were 659 childcare centers in Taiwan in 2014, which increased to 1,376 by the end of 2021, representing a growth of 208% over the 7 years. As of the end of 2021, the ratio of public to private childcare institutions is approximately one to three, indicating that resources for public childcare are still insufficient. If childcare costs for one child do not exceed 15% of the household income, it can increase the possibility of parents having a second child and ensure that all children have equal access to educational opportunities. Therefore, publicly provided childcare facilities not only reduce the financial burden on families for childcare expenses but also potentially increase the willingness to have children, thus alleviating the issue of declining birth rates.

Belsie (2012) pointed out that rising housing prices negatively impact birth rates because housing represents the largest component of child-rearing expenses, exceeding those of food, childcare, or education. This means that when housing prices rise, the cost of having children increases, leading to delayed, reduced, or even abstained childbirth. Clark (2012) noted that purchasing and paying monthly mortgage payments for a home in expensive housing markets may require dual incomes. Therefore, decisions regarding whether to remain in the labor force, leading to delayed family formation and postponed childbirth, need to be made.

One of the factors contributing to declining birth rates in Taiwan may be rising housing prices. The long-term trends of housing affordability and birth rates were negatively correlated, meaning that lower affordability of housing loans is associated with lower birth rates, based on the sample of the six municipalities in Taiwan. In conclusion, this study hypothesizes that the increase in housing prices affects the willingness to have children, and women must choose between labor participation and childbirth.

III. RESEARCH METHODOLOGY

This study aims to investigate the impact of housing prices on birth rates and provide insights for the government to formulate policies to increase birth rates. The main explanatory variable in the empirical model is the housing price-to-income ratio. According to the existing research, urban planning for public facilities, population growth rate, per capita disposable income, and level of residence education are included. This study employs panel data estimation to address the non-stationary nature of individual time series and improve parameter bias due to the heterogeneity arising from different characteristics among observation samples.

The basic panel data regression model is shown in Eq. (1):

$$Y_{it} = \alpha_i + \sum_{k=1}^{K} \beta_k X_{kit} + \varepsilon_{it} \quad (1)$$

where Y_{it} denotes the observation value of the *i*-th cross-sectional observation sample in the time series of period *t*, and $i = 1,2,\dots,N, t = 1,2,\dots,T$. α_i denotes the individual intercept term of the *i*-th observation, which can present the variability of each observation; β_k denotes the *k*-th regression coefficient to be estimated for the explanatory variable; X_{kit} denotes the *k*-th explanatory variable of the *i*-th observation in the *t*-th period; ε_{it} denotes the error term of the *i*-th observation value in the *t*-th period.

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The coefficients of the panel data can be estimated using the fixed effect model and random effects model based on the assumption of the characteristics of the intercept term. The intercept term is used to represent the individual effect between the cross-sectional observations. The fixed effect model, also known as the least square dummy variable model (LSDV), is characterized by the individual effects being independent and time-consistent. Moreover, the individual effects of the cross-observations differ. The intercept term represents the different structures among the cross-sectional observation samples. This model assumes variability among the observed samples, but the intercept term does not change over time. The regression model can be rewritten as Eq. (2):

$$Y_{it} = \sum_{i=1}^{N} \alpha_i D_m + \sum_{k=1}^{K} \beta_k X_{kit} + \varepsilon_{it} \quad (2)$$

where α_i is the individual intercept term of each observation, which is time-consistent and independent from different observation samples. D_m is the dummy variable matrix for each observation sample, indicating the different structure of each observation sample.

The random effects model is also known as the error component model (ECM), which focuses on the relationship of the whole population. ECM assumes that each observation has a specific intercept, assumed to be a random variable and time-consistent. Therefore, the α_i is the random variable, and μ_i is the randomly generated intercept term. The regression model can be rewritten as Eq. (3):

$$Y_{it} = \alpha_i + \sum_{k=1}^{K} \beta_k X_{kit} + \mu_i + \varepsilon_{it} \quad (3)$$

The F-test can be used to check whether the intercept terms in the Eq. (1) model are equal (Baltagi, 2001). The null hypothesis H_0 and the alternative hypothesis H_1 are as Eq. (4):

$$\begin{cases} H_0: \alpha_1 = \alpha_2 = \alpha_3 \cdots = \alpha_n \\ H_1: \alpha_i \text{ not exactly equal} \end{cases} \quad (4)$$

If H_0 is not rejected, it means that the intercept terms are equal among the observed samples, so the pooled OLS can be used to estimate Eq. (1) unbiasedly and efficiently. If H_0 is rejected, the intercept terms are not exactly equal among the observed samples, the fixed effect model, i.e., using Eq. (2), must be used for estimation. The F-test statistic is shown in Eq. (5):

$$F_0 = \frac{(R_{FE}^2 - R_{OLS}^2)/(N-1)}{(1-R_{FE}^2)/(NT-N-K)} \quad (5)$$

where R_{FE}^2 denotes the coefficient of determination of the fixed effect model; R_{OLS}^2 denotes the coefficient of determination of the ordinary least square method; N denotes the number of cross-sectional observation samples; T denotes the number of time series; K denotes the number of explanatory variables; $(NT - N - K)$ is the freedom degrees of the F-test.

Breusch and Pagan (1980) proposed the Lagrange multiplier (LM) test to check whether the number of variances among individuals in the Eq. (3) model is heterogeneous and further check whether it is appropriate to use a random effects model. The null hypothesis H_0 and the alternative hypothesis H_1 are as Eq. (6):

$$\begin{cases} H_0: \sigma_\mu^2 = \sigma_i^2 = 0 \\ H_1: \sigma_\mu^2 \neq 0 \end{cases} \quad (6)$$

If H_0 is not rejected, it means that the variants among individuals is not heterogeneous, so pooled OLS is more appropriate. If H_0 is rejected, the variance among individuals is heterogeneous, so the random effects model should be used. LM test statistic is shown in Eq. (7):

$$\lambda_{LM} = \frac{NT}{2(T-1)} \left[\frac{\sum_{i=1}^{N} (\sum_{t=1}^{T} v_{it})^2}{\sum_{i=1}^{N} \sum_{t=1}^{T} v_{it}^2} \right]^2 \sim \chi^2(1) \quad (7)$$

where N is the number of cross-sectional observation samples; T denotes the number of time series; v is the residual matrix of the least square method model; λ_{LM} obeys the cardinality distribution with degree of freedom 1. If H_0 is rejected, the coefficients must be estimated by the random effects model; conversely, if H_0 cannot be rejected, then pooled OLS is used for estimation.

If F-test and LM test reject the null hypothesis of equal intercept terms and no heterogeneity among observation samples, respectively, the Hausman test can be used to determine the choice of fixed effect model or random effects model (Hausman, 1978). The null hypothesis H_0 and the alternative hypotheses H_1 are as Eq. (8):

$$\begin{cases} H_0: E(\mu_i, X_{kit}) = 0 \\ H_1: E(\mu_i, X_{kit}) \neq 0 \end{cases} \quad (8)$$

The Hausman test statistic is shown in Eq. (9):

$$H = (\hat{\beta}_F - \hat{\beta}_R)(\sum_F - \sum_R)^{-1}(\hat{\beta}_F - \hat{\beta}_R) \sim \chi^2(K) \quad (9)$$

where $\hat{\beta}_F$ is the estimated coefficient of the fixed effect model; $\hat{\beta}_R$ is the estimated coefficient of the random effects model; $\sum_F$ is the covariance matrix of the fixed effect model; $\sum_R$ is the covariance matrix of the random effects model. In Eq. (9), H-statistic obeys a degree of freedom of K of the chi-square distribution. If H_0 is rejected, it means μ_i is correlated with X_{kit}. The estimates of the random effects model are not consistent and biased, so the fixed effect model must be used to estimate. Conversely, if the null hypothesis cannot be rejected, it means that μ_i and X_{kit} are not correlated, so the random effects model is the appropriate estimation.

IV. Findings and Discussion

This study uses 19 counties and cities in Taiwan, including the northern region (Keelung City, Yilan County, Taipei City, New Taipei City, Taoyuan City, Hsinchu City, and Hsinchu County), the central region (Miaoli County, Taichung City, Nantou County, Changhua County, and Yunlin County), the southern region (Chiayi City, Chiayi County, Tainan City, Kaohsiung City, Pingtung County), and the eastern region (Hualien County and Taitung County). The data sources were from the Ministry of the Interior Real Estate Information Platform and the statistical indicators of counties and cities of the Directorate General of Budget, Accounting, and Statistics, Executive Yuan. The sample period was selected from 2012 to 2021, with a total of 190 samples.

The definition of the dependent variable and explanatory variables in the regression model and the expected relation among which are described below:

1. *Fertility rate*: The fertility rate refers to the number of children born per thousand women within aged 15-49 as the indicator. During the sample period, the counties (cities) with the highest average birth rates were Hsinchu City and Changhua County, respectively. The fertility rates of both localities are 39.5‰. The high number of newborns in Changhua may also be attributed to the subsidy of 30,000 NTD per birth and the familial support system where grandparents help care for the newborns, thus alleviating the pressure on young parents. On the other hand, due to the influx of population driven by the Hsinchu Science Park, the birth rate in Hsinchu City is relatively high. However, the overall birth rate of the sample still shows a declining trend.
2. *The house price-to-income ratio*: The house price-to-income ratio refers to the multiple of the median residential property price relative to the median household disposable income. It measures how many years of disposable income a homebuyer needs to spend in order to purchase a residential property. In 2021, the house price-to-income ratio in the six municipalities (Taipei City, New Taipei City, Taichung City, Tainan City, Kaohsiung City) exceeded 6, above the affordable range of 3-6. According to data from the Ministry of the Interior (2023) Real Estate Information Platform, the nationwide house price-to-income ratio in the fourth quarter of 2022 was 9.61. Taipei City had the highest house price-to-income ratio at 15.77. If one-third of income is used to pay the mortgage, it would take nearly 47 years to fully repay it. The study expects a negative correlation between the house price-to-income ratio and the birth rate.
3. *The area of land for public facilities*: Local governments implement urban planning policies to promote development. The establishment of redevelopment zones combines nearby living functions. Compared to newly built houses in other areas, the prices of newly built houses in redevelopment zones are relatively lower. This not only attracts first-time homebuyers and those looking to relocate but also entices many large-scale developers to rush in and promote projects in adjacent areas. This allows people to attain the same quality of life at a lower cost, reducing economic burden and thereby increasing the willingness to have children. Therefore, the expected relationship between the urban planning land are of public facilities and the birth rate is positive.
4. *The growth rate of population*: People tend to migrate to areas with better living environments, public facilities, quality of life, employment opportunities, social welfare, and future development potential. For example, the populations of Hsinchu County and Taoyuan City have seen the most significant increases recently. The population growth in Hsinchu County is primarily attributed to the development of the Hsinchu Science Park, which has led to the construction of numerous high-rise buildings, prompting population immigration. In Taoyuan City, population growth is due to the government's active promotion of measures such as childcare subsidies and public daycare services. Additionally, the public infrastructure, coupled with convenient transportation links to Taipei City and New Taipei City, has made Taoyuan City the area with the highest population growth among the six municipalities. The expected relationship between population growth rate and birth rate is positive.
5. *Disposable income*: Disposable income refers to the income available to households after deducting non-consumption expenditures, such as interest, social security contributions, taxes, and fines, from their total income. It is the actual

income that households can use at their discretion. Raising and educating children entail heavy financial burdens and time. Thus, people with high income tend to have more children. On the other hand, the opportunity cost of the time of people with high income is high, discouraging having children. In summary, the impact of disposable income on the fertility rate remains uncertain.

6. *Education*: Generally speaking, individuals with higher levels of education often prioritize their careers and professional development. This may influence their willingness and time allocation for childbearing. Moreover, highly educated women often tend to delay childbirth because they prioritize their career development, value economic independence, and seek high-quality childcare and education. As a result, education attainment level can significantly negatively influence fertility. The study utilizes the proportion of the population aged 15 and above with a college degree or higher as a measure of the educational attainment level of residents in the county or city.

Table 1 shows the descriptive statistics of each variable with the expected direction of effect.

Table 1 Descriptive Statistics

Variable	Mean	Std. dev.	Min.	Max.	Exp. Impact
Fertility rate (children born/1,000 women)	3.11	0.60	2.10	5.40	
House price-to-income ratio	7.83	2.39	4.47	16.29	-
Area of land for public facilities (hectare)	44.69	42.31	168.64	7.42	+
Population growth rate (%)	-0.14	0.71	-3.0	2.3	+
Disposable income (NTD)	310,869	56,685	231,124	520,208	+/-
Education	40.11	11.98	20.34	80.22	-

The sample size is 190.

The study estimates the coefficients using the random effects model and fixed effects model respectively, with the results shown in Table 2. Firstly, the *F*-test results reject the null hypothesis at the 1% significance level, indicating that the intercept terms of each cross-sectional observation sample are not exactly equal, so the fixed effect model is more appropriate than pooled OLS. Second, the LM test results reject the null hypothesis at the 1% significance level, indicating that the cross-sectional samples are heterogeneous, and the random effects model is more appropriate than pooled OLS. Finally, the Hausman test results reject the null hypothesis at the 1% level of significance, indicating that the individual effects are correlated with the explanatory variables. Therefore, the fixed effect model is the most appropriate empirical model for this study.

The empirical estimation results for each explanatory variable are explained as follows:

1. *The house price-to-income ratio*: At the 10% significance level, the house price-to-income ratio negatively correlates with the fertility rates. The higher the house price-to-income ratio, the longer individuals need to bear the pressure of mortgage payments, leading to a decline in their quality of life and consequently affecting their willingness to have children. Furthermore, prolonged mortgage burdens may delay childbearing despite the desire to have children, resulting in a later age for childbirth and potentially reducing the number of children individuals can have.
2. *The area of land for public facilities*: At the 5% significance level, there is a positive and significant correlation between the area of land for public facilities and the fertility rate. Due to urbanization, most people migrate from rural to urban areas, and the urbanization have a significant impact on people's lifestyles. Public facilities contribute to people's quality of life, such as infrastructure and mass transit systems, which can reduce caregiving burdens, make it easier to balance work and family life, and encourage childbirth.
3. *The growth rate of population*: At the 1% significance level, there is a positive correlation between population growth rate and fertility rate. People tend to migrate to areas with superior living environments, well-established social welfare

systems, and greater potential for future development. Most immigrants to newly developed area are young people and have greater incentive to fertilize.

4. *Disposable income*: The empirical results indicate that the correlation between per capita disposable income and the fertility rate is not statistically significant. The incentive to fertilize dependents on not only disposable income but also the living cost of the locality. Without controlling for the local price level, it is difficult to estimate the impact of disposable income on fertility. Moreover, people with high income tend to have more children since raising children is costly. On the other hand, raising children is time consuming and the opportunity cost of the time of high-income people is high. Since the impact and opposite impact of disposable income on fertility cancel each other out, the net impact remains uncertain.
5. *Education*: At the 1% significance level, there is a significant negative correlation between the proportion of the population aged 15 and above with a college degree or higher in the locality and its fertility rate. People with higher levels of education often prioritize their careers, which may negatively influence their decision of childbearing. Besides, highly educated women often tend to delay childbirth because of career. As a result, the education attainment level significantly negatively influence fertility. This finding satisfies our expectations.

Table 2 Estimation Results

Independent Variable: *Fertility rate*	Fixed Effect Model		Random Effects Model	
Dependent Variable	Coefficient	*t*-value	Coefficient	*t*-value
Intercept	0.039	6.148	0.041	17.298
House price-to-income ratio	-0.001*	-1.925	-0.001***	3.478
Area of land for public facilities	3.07E-06**	2.543	-9.71E-08	-0.500
Population growth rate	0.001***	5.602	0.001***	9.062
Disposable income	-1.40E-09	-1.622	-2.37E-08***	-2.959
Education level	-0.001***	-5.777	-0.001***	-3.276
R-squared	0.803		0.439	
Adjusted *R*-squared	0.778		0.424	

*, ** and *** represents 10%, 5% and 1% significance level, respectively.

V. Conclusion and Further Research

The low fertility rate is not only a concern in Taiwan but also a problem faced by developed countries globally. Various factors are proposed to cause the problem of low fertility rate, among which the high housing price is the most important one. This study aims to investigate the impact of housing prices on fertility in Taiwan, using the panel data of 19 local governments in Taiwan from 2012 to 2021. The empirical results estimated by the fixed effect model show that the ratio of house price to income and the educational level of the residence aged 15 and above with a college degree or higher are significantly negatively correlated with the fertility rate. On the other hand, the population growth rate and the area of land for public facilities are significantly positively correlated.

Based on the results, this study suggests the following policies to increase childbearing intentions. Firstly, due to more and more people immigrate to the urban area, the government should provide more social housing to restrain the housing price. The applicants for social housing should limited to young people to alleviate their financial burden and to increase their willingness to have children. Secondly, since dual-income households are becoming a trend, the government should enhance the quantity and quality of public daycare centers to allow parents to work with peace of mind. Thirdly, public facilities, such as public transportation and park, can enhance the quality of living environment for residents and alleviate inconvenience in daily life. The government should provide more public facilities to encourage childbirth.

The estimated coefficient of disposable income on the fertility rate is insignificant in this study. Regarding to the further

research, this study suggests to include the price level in the empirical model to investigate the impact of income on childbirth. Besides, this study employs the county level data. Subsequent research could utilize micro-data to re-examine the impact of each variable in this study on the fertility rate.

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