European Economic Letters
ISSN 2323-5233
Vol 13, Issue 1 (2023)
http://eelet.org.uk

An Analysis of the Effect of the 2016 Income Tax Reform on Taiwan's Housing Prices

[1] Ming-Hung Yao, [2] Tz-Rung Lai
[1] Dept. of Public Finance and Taxation, National Kaohsiung University of Science and Technology
[2] Dept. of Public Finance and Taxation, National Kaohsiung University of Science and Technology
[1] mhyao@nkust.edu.tw,[2] tzrung0725@gmail.com

Abstract: This study applies the panel data estimation to analyze the effect of the 2016 income tax reform, which taxes the transaction income based on the integrated housing and land prices, on Taiwan's housing prices. The sample period is from 2011 to 2020, and the average transaction price per Taiwanese ping of the house is used for the analysis. The results show that the housing price per ping negatively correlates to the house size; on the other hand, the housing price positively correlates to the district's housing stock. The effect of the total population, labor force participation rate, and the time dummy variable of the 2016 income tax reform are insignificant. The 2016 income tax reform did not have a significant effect on the housing price is due to that the reformed tax system only applies to the sale of real estate acquired after 2016, while the sale of real estate acquired before 2016 is still taxed under the old system, i.e., land value increment tax and property transaction income tax are levied separately on land and houses. This study suggests that the local government should assess the tax base of real estates based on the market level, which induces those who own multiple real estates to sell their real estates.

Keywords: housing price; integrated housing and land transaction income tax; panel data estimation

1. INTRODUCTION

For a long time, the taxable value of the real estate in Taiwan has been underestimated, and those who hold multiple sets of real estate do not have to bear the high cost of holding real estate. This phenomenon leads to the gradual widening of the gap between the rich and the poor, affects the sound development of the real estate market, and prevents the implementation of residential justice. Before the implementation of the real estate transaction income tax reform in 2016, speculators who bought and sold real estate for a short period continued to speculate and drove people to blindly rush to buy, leading to the increasing price of real estate in Taiwan due to the imperfect tax system. Because of the COVID-19 pandemic in 2019, quantitative easing monetary policy was implemented globally to eliminate the recession quagmire. The consequence is that excessive lending capital keeps pouring into emerging markets such as Asia, triggering a boom in speculation in people's assets, affecting the sound development of the real estate market, and leading to an irrational escalation of real estate prices in Taiwan.

The booming real estate market attracts large amounts of capital to real estate-related industries, resulting in misplaced resources, which in turn affects the stability of the overall economic and financial system. Figure 1 shows Taiwan's residential price index from the first quarter of 2016 to the third quarter of 2021, using 2016 as the base period. Unlike the general information on individual housing transactions, the residential price index presents the relative changes in the prices of fixed-quality homes. The differences in the indices provide insight into the price changes in each period relative to the base period and help to observe the long-term trend of real estate prices. Since the third quarter of 2021, the residential price index has continued to rise due to the continued growth of Taiwan's economy, the maintenance of low-interest rates and accommodative monetary policy at the financial level, the push-up in pre-sale housing market prices, and the psychological impact of market expectations of inflation. As seen by the residential price index, since the COVID-19 pandemic hit the global economy in 2019, countries have implemented quantitative easing monetary policies, leading to a continuous rise in housing prices. In addition, due to the relative easing of the pandemic in Taiwan during 2020 and 2021, Taiwan's economy continues to grow, and the financial level still maintains low-interest rates and accommodative monetary policies. Coupled with the pre-sale housing market price push and market expectations of inflationary psychological impact, the residential price index continues to soar.

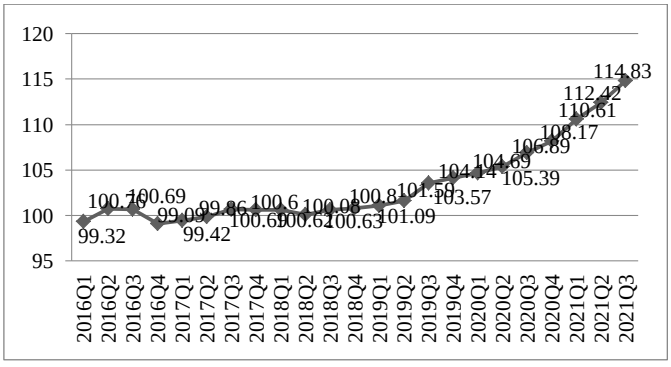

Figure 1 The residential price index in Taiwan: 2016-2021

Under the taxation system related to real estate transactions in Taiwan, in the past, the land was subject to land value increment tax based on the "announced current value of land." On the other hand, housing was primarily subject to income tax based on the "assessed current value of housing," which was included in the comprehensive income of individuals. However, the announced current value of land and the assessed current value of housing are significantly lower than the market level, which encourages speculation in real estate and the inflow of lobbying capital into the real estate market. In addition, the underassessment of the tax base also leads to the problem of low costs of ownership of the real estate, so real estate is not only a consumer product to provide housing but also has become the preferred investment tool for most Taiwanese.

Because of this, the Taiwanese government officially implemented taxation on real estate transactions based on actual selling prices in the integrated housing and land tax system in 2016. For real estate acquired before 2016, land value increment tax and income tax on property transactions are levied separately on land and house when they are sold, following the old system, while the new taxation on real estate transactions is based on actual selling prices in the integrated housing and land tax system will be used for the sale of real estate acquired after 2016, which is a dual-track approach. The integrated housing and land tax system addresses the shortcomings of the past taxation system for housing and land transactions. It is conducive to the sound development of the taxation system for real estate transactions. The government plans to allocate part of the integrated housing and land tax to housing policies and long-term care services to avoid over-concentration of social resources in the real estate industry and implement residential justice. In 2021, the government again reformed the taxation on real estate transactions income which was implemented in 2016. The main direction of the amendment is to prevent short-term speculation in real estate by individuals and profit-making businesses.

The main objective of this study is to examine the effect of the implementation of the integrated housing and land transaction income tax system in 2016 on housing prices in Taiwan and to propose policy recommendations based on the results of the empirical analysis. The structure of this paper is as follows. This section describes the background and motivation of this study. Section II is the literature review, which explains the new integrated housing and land transaction income tax system in 2016, and reviews the relevant literature on the effect of real estate prices as a theoretical basis for selecting the explanatory variables for the empirical analysis. Section III is the research methodology, which explains this study's empirical model and relevant tests. Section IV presents the results of the empirical analysis. Finally, Section V presents the conclusions and policy recommendations of this study.

2. LITERATURE REVIEW

A. Introduction to the integrated housing and land transaction income tax system

The Taiwanese government has been actively implementing real estate regulation policies to improve the real estate market in recent years. One critical policy is the real estate transaction income taxation system. The government has been studying and formulating the taxation on real estate transactions based on actual selling prices in the integrated housing and land tax system since 2014 and started implementing taxation on real estate transactions in the integrated housing and land tax system in 2016. The new system is a reform of the taxation system for housing and land transactions, which focuses on imposing heavy taxes on short-term transactions to promote the development of a sound taxation system for the real estate market and to avoid excessive concentration of social resources, thereby implementing residential justice.

The integrated housing and land tax system abolishes the separate taxation of land and house for the sale of real estate acquired after 2016. The calculation is based on the total combined selling prices of housing and land after deducting the total amount of land value increment, actual acquisition cost, and related expenses. The transaction income tax is levied according to the actual profit, and different tax rates are subjected according to the holding period. The tax rate for the sale of real estate is 45% if the holding period is less than 1 year, 35% if it is more than 1 year and less than 2 years, 20% if it is more than 2 years and less than 10 years, and 15% if it is more than 10 years. In addition, the distinction between domestic and foreign individuals and profit-making businesses is designated for tax obligors to prevent foreign speculators from coming to Taiwan for real estate speculation.

B. Relevant literature affecting real estate prices

Three methods for real estate valuation were developed: the cost method, the comparative method, and the income method (Liao and Chang, 1997). The comparative method, also known as the "comparative market method," is the most common valuation method used by the general public and professional appraisers. It determines the price of real estate by adjusting the transaction prices of other real estate transaction cases. Its advantage is that the information is easy to obtain, and the estimated value is more reflective of actual market conditions. However, this method is susceptible to overly strong subjective judgment when making adjustments, and the choice of individual cases has a wide range of effects. As a result, the hedonic regression method was developed using statistical methods (Rosen, 1974). The hedonic regression theory states that housing combines various attributes and characteristics. The main factor in measuring the price of real estate is the combination of characteristics that cannot be divided and sold, such as the size of the premises, property age, floor, number of rooms, parking space, and accessibility, which are all individual factors of the house to exclude the lack of human subjective judgment.

Many factors affect the price of real estate, and in general, they can be divided into general factors, regional factors, and individual factors, which are described below (Lin et al., 2010):

1. General factors include social, economic, and administrative factors.

   (1) Social factors include population growth, mobility, family structure, and living environment.

   (2) Economic factors include interest rates and exchange rates, money supply, national production, economic growth, national income, price levels, and other factors.

   (3) Administrative factors include policy factors such as land policy and use plan, public housing policy, agricultural land policy, fiscal policy, and economic development plan.

In recent years, real estate prices in Taiwan have been increasing, and high housing prices have led to the socioeconomic status of Taiwanese people tending to be unequal, which is an issue of concern. Li (2016) analyzed the effect of high housing prices on the income structure of Taiwanese households using panel data from counties and cities. The empirical results show that real estate prices have a significant positive effect on individual wealth, indicating that rising housing prices favor those with higher wealth capacity to gain more socio-economic advantages and opportunities, causing economic opportunities in Taiwan to become more unequal. Lin and Cheng (2014) analyzed the factors affecting the housing price-to-income ratio in Taiwan, considering different overall economic variables such as loan affordability, average interest rate, and housing stock. Chang et al. (2004) suggested that for the factors affecting the changes in the real estate market in Taiwan, in addition to focusing on real estate prices, the formulation, and implementation of real estate policies should be paid attention to promote the sound development of the real estate market. In this way, the problems arising from the current changes in the real estate market can be solved by targeting various real estate policies.

2. Regional factors: Many regional factors affect the price of real estates, such as the accessibility to public transportation, the adequacy of road systems, the proximity to markets, schools, and parks, and the current state of land use. In Taiwan's urban development experience, with the development of a modern economy and the increase of national income, residents no longer only attach importance to the construction of roads and commercial facilities but also gradually increase their demand for parks, green areas, and urban open spaces. Therefore, in addition to the construction and maintenance of the buildings and facilities, the price of real estate must be determined by a good neighborhood environment (Hsieh et al., 2000). Lin et al. (2010) empirically analyzed the factors related to floor utility and accessibility to transportation and public facilities. They found that the closer the residential building is to schools and parks, the higher the floor price.

3. Individual factors: The individual factors that affect the price of real estate can be divided into two categories: land and buildings. The land category includes factors such as local markets, physical conditions, and legal restrictions, and factors that affect the value of lands, such as location and topography, building coverage and plot ratio, and T-junction. Factors in the building category include the building itself, the maintenance and occupancy of the facility, the land use of the surrounding environment, and the dangers and problems caused by the traffic system and natural factors.

In addition to the above factors affecting real estate prices, real estate prices in Taiwan have remained high in recent years, and the housing price-to-income ratio has become increasingly high. It is widely believed that the tax burden on real estate transaction income and the cost of holding real estate are both low, making real estate an investment target for people with higher wealth capacity, leading to repeatedly rising housing prices and widening the gap between the rich and the poor in Taiwan. The public has expressed the demand for income taxation on real estate transactions in the actually integrated housing and land price. Therefore, in 2014, the Taiwan government began to consider levying income taxation for housing and land based on actual gains as a tax reform measure to prevent speculators from hoarding and short-term real estate speculation with the expectation of implementing the policy of residential justice. Empirical research by Peng et al. (2007) found that an increase in the effective tax rate on real estate lowers housing prices, and the difference in the effective tax rate on real estate is clearly reflected in housing prices.

The development of the real estate market is closely related to the right to residence. The speculation or unreasonable real estate price may generate problems such as misallocation of social resources and inequality between rich and poor, which is not conducive to maintaining the stability of the financial system and may harm the long-term social and economic development of the country. In the aftermath of the global financial crisis, long periods of low interest rates combined with non-traditional monetary policies such as quantitative easing may produce significant asset redistribution and worsen wealth inequality (Bernanke, 2015). When financial shocks affect the chances of a financial crisis, the most appropriate policy is monetary policy which system responds to the growth of credit (François and Emmanuel, 2018). Therefore, the Taiwanese government is promoting a sound real estate market program to curb undue speculation and ensure the sound development of the real estate market and the rational allocation of resources.

The empirical model of this study incorporates the time dummy variables of the 2016 income tax reform in addition to considering the above-mentioned factors affecting real estate prices. The purpose is to test the effectiveness of the 2016 income tax reform and propose corresponding research recommendations.

3. METHODOLOGY

This study examines the effect of the taxation on real estate transactions in the integrated housing and land tax system on the real estate market in Taiwan. The study subject is the average unit price of housing transactions in each county and city in Taiwan between 2011 and 2020 after the reorganization of counties. The empirical model of this study uses the panel data estimation methodology because the data has both time series and cross-sectional characteristics. The basic 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.

The estimation of the panel data coefficients can be divided into a fixed effect model and random effects model according to the assumption of the characteristics of the intercept term. The intercept term is used to represent the different structures between the cross-sectional observations. The fixed effect model, also known as least square dummy variable model (LSDV), is characterized by the fact that the data are independent of each other and do not change with time, but there are different individual effects among different observed individuals, and the intercept term is used to represent the different structures among the cross-sectional observation samples. This model assumes that there is 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 does not change over time and has different individual effects for 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 between the whole population. ECM assumes that the difference between the observation samples is small and the similarity is high. Each observation sample has different intercepts, and the intercept term is assumed to be a random variable that does not change with time. 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, so 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.

4. RESULTS

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 taken from the Ministry of the Interior Real Estate Information Platform and the Directorate General of Budget, Accounting, and Statistics, Executive Yuan's statistical indicators of counties and cities. The sample period was selected from 2011 to 2020 after the restructuring of counties and cities, with a total of 190 samples. The empirical model uses the housing price per Taiwanese ping, which is about 3.305 square meters, in each county and city as the dependent variable, the average area of real estate transfer, housing stock, annual disposable income per capita, total population, labor force participation rate, and integrated housing and land tax system as the explanatory variables. Since the implementation of the taxation on property transactions based on actual selling prices in the integrated housing and land tax system started in 2016, this study uses the time dummy variable to explore the effect of the tax reform on the real estate market.

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

1. Housing prices: The housing prices in this study are based on the average transaction prices by county and city as provided by the Ministry of the Interior Real Estate Information Platform, which refers to the unit price per ping (in NTD 10,000) of residential houses at the time of transaction.

2. The average transfer area of real estate: This area includes the area of the main building, the area of accessory buildings (e.g., balconies and awnings), and the area of public facilities (e.g., swimming pools and gymnasiums). As real estate prices in Taiwan continue to rise, real estate agents continue to reduce the size of their homes to control the price of housing that is acceptable by the market. As prices in the pre-owned housing market have also risen, the liquidity of small and medium-sized homes is much higher than that of large sized homes, so this study expects a negative relationship between the average size of transacted real estate and the housing price per ping.

3. Housing stock: Based on the Ministry of the Interior's housing statistics, the number of the housing stock is defined as the number of dwellings in the housing tax register. The number of dwellings with a useable area of more than 5 pings and less than 500 pings and with a useable area of more than 50% of the total taxable area is counted. The housing stock is calculated by multiplying the number of dwellings in the housing tax register by the adjustment rate of the number of dwellings in the census (in ten thousand dwellings). The stock of dwellings gives an idea of the current supply of real estate, but the effect of the stock of dwellings on the price of real estate also takes into account the number of households, i.e. the demand for real estate. According to the Ministry of the Interior's Housing Information Statistics Report, all six municipalities in Taiwan, except for Taipei City, show an oversupply of real estate. Nationwide, there is also an oversupply of real estate. According to the theory of supply and demand, the more housing stock there is, the more obvious the oversupply of real estate and the lower the housing price will be, so the relationship between housing stock and unit price per square meter is expected to be negative.

4. Annual disposable income per capita: Disposable income per capita per year is calculated by dividing the average disposable income per household by the average number of persons per household (in New Taiwan dollars). Per capita annual disposable income represents the balance of all income minus non-consumption expenses such as taxes, fines, and interest, which can cover daily consumption expenses. The higher the per capita annual disposable income is, the higher the price of real estate can be purchased, and the higher the price of housing will be, so it is expected that the per capita annual disposable income has a positive relationship with the price of housing.

5. Total population: Population is a direct factor affecting the demand for housing, and the higher the population, the higher the demand for housing.

6. Labor force participation rate: The higher the labor force participation rate, the higher the demand for housing, and the higher the price of housing, so the labor force participation rate is expected to have a positive relationship with the price of housing.

7. Integrated housing and land tax system: The integrated housing and land tax system levies heavy taxes on short-term speculators, and the effect of the integrated housing and land tax system on the real estate market is mainly to discourage short-term speculators and sound housing transactions. This study expects that the taxation system will have a dampening effect on real estate prices in Taiwan after it is implemented in 2016, so it is expected that integrated housing and land tax system will have a negative relationship with housing prices.

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

Table 1 Descriptive Statistics

Variable	Mean	Std. dev.	Median	Max.	Min.	Exp. Impact
Housing price (NTD10,000/ping)	16.92	10.76	14.12	65.86	8.30	-
Average transfer area of real estate (ping)	38.22	5.86	37.92	60.73	27.42	-
Housing stock (10,000 units)	44.69	42.31	18.83	168.64	7.42	-
Disposable income per capita (NTD10,000)	30.2	5.2	29.6	47.3	21.4	+
Total population (10,000 units)	122.2	109.5	56.3	403.0	21.5	+
Labor force participation rate (%)	58.63	1.58	58.65	63.10	55.00	+

The sample size is 190.

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 5% 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. Table 2 collates the estimation results of pooled OLS, random effects model, and fixed effect model.

After the above empirical results using the fixed effect model, the estimated coefficient of explanatory variables of this study are described as follows:

1. Average residential transfer area: At the 5% significance level, the average residential transfer area negatively correlates with the housing price per ping. This means that the smaller the average size of a home transfer, the higher the price per ping of real estate transactions. As home prices continue to rise, the size of a home purchase is forced to shrink, and real estate developers shift to smaller area homes to capture market demand and maintain acceptable home prices in the market. Estimates of the coefficient show that for every 1 ping reduction in the average size of a home transfer, the price per ping in the county will increase by NTD 900. The results of this study are in line with expectations.
2. Housing stock: The housing stock is positively correlated with the housing price per ping in each county and city at the 10% significance level. For every 10,000 houses increase in housing stock, the housing price per ping in the county or city increases by NTD 1,240. The results of this study are not in line with expectations, probably due to the fact that in recent years, real estate developers have been pushing a lot of development projects in areas with high property prices, and under the psychological expectation of the continuous increase in property prices, the phenomenon of “reluctance to sell” occurred, resulting in a positive correlation between the residential stock and the housing price in each county and city, leading to a result which is not in line with the expected one.
3. Annual disposable income per capita: The relationship between disposable income per capita per year and housing prices in each county and city shows a positive correlation at the 1% significance level. For every 1% increase in annual disposable income per capita, the housing price per ping increases by NTD 1,233. The higher the income, the higher the affordability of housing prices, and the higher the price of real estate. On the other hand, higher-income jurisdictions tend to have more developed economic activities and higher price levels. As real estate developers are under pressure from high construction costs, this leaves limited bargaining power for home buyers, resulting in a higher price per ping. The results are consistent with the expected effect.
4. Total population: The empirical results show that the correlation between total population and housing price per ping in each county and city does not reach a statistically significant level, which is not consistent with the expectation that total population and housing price are positively correlated in this study. The possible reason for this is that the total population

is not a direct factor affecting the demand for housing, but rather the age structure of the population. For example, in Japan, the aging trend of the population over the past few decades is obvious, and the demand for housing among the older population is lower than that of the younger working group, thus keeping housing prices low. Since demographics are not something that can be changed in a short period of time, and the age structure of residents in different counties and cities in Taiwan varies greatly, the total population does not have a significant effect on housing prices without being able to control for this factor.

5. Labor force participation rate: The empirical results show that the correlation between the labor force participation rate and housing prices in each county and city does not reach a statistically significant level. The labor force participation rate represents the labor force supply in the jurisdictions. Due to different factors such as industrial structure, social values and welfare system in each county and city, and people's attitudes toward work and willingness to participate in the labor force also vary. Therefore, this study finds that the labor force participation rate does not have a significant effect on housing prices in each county and city.

6. Integrated housing and land tax system: The empirical results show that after the implementation of the integrated housing and land tax system, the housing price per ping in each county and city declined, but did not reach a statistically significant level. Before the implementation of the integrated housing and land tax system in 2016, i.e., before the end of 2015, there was a surge of transactions under the old system, with Taoyuan, Taichung, Tainan, and Kaohsiung all achieving record highs in the number of sales and transfers in a single month in December 2015, and a total of 118,000 houses in the six cities in the first half of the year. Since 2016, the income tax system for property transactions adopted both the old and new systems. The data on housing prices used in this study were obtained from the Ministry of the Interior Real Estate Information Platform. It is difficult to clarify the effect of the tax reform because it is not possible to distinguish between cases in which the transaction tax is levied under the old system or the new system of the integrated housing and land tax.

Table 2 Estimation Results

Independent Variable: Housing price per ping	Pooled OLS		Fixed Effect Model		Random Effects Model	
Dependent Variable	Coefficient	t-value	Coefficient	t-value	Coefficient	t-value
Intercept	-533.08	-9.07	-79.35	-0.80	-165.69	-3.08
Average residential transfer area	-0.17	-1.43	-0.09**	-3.11	-0.09**	-3.02
Housing stock	-0.014	-0.42	0.124*	1.70	0.107*	1.75
Annual disposable income per capita (natural log)	42.54***	10.78	12.33***	6.46	13.19***	7.05
Total population (natural log)	5.26**	3.34	-5.12	-0.78	0.34	0.11
Labor force participation rate	-0.77**	-2.36	0.16	1.26	0.19	1.64
Dummy for integrated housing and land tax system	-3.90**	-3.24	-0.24	-0.72	-0.29	-0.86
R-squared	0.6704		0.9884		0.5209	
Adjusted R-squared	0.6596		0.9867		0.5174	
F test: $F(18,165) = 251.10$ · p-value<0.05 。						
LM test: $\lambda_{LM} = 649.36$ · p-value<0.05 。						
Hausman test: $H = 16.13$ · p-value<0.05 。						

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

5. Conclusion and Suggestions

In recent years, countries worldwide have adopted low-interest rates and quantitative easing monetary policies to stimulate their economies in response to economic shocks, which have also affected changes in real estate trends. The Taiwanese government has also proposed real estate regulation policies, including bank credit control, real estate price registration, and the integrated housing and land tax system, to improve the real estate market, implement residential justice, and maintain taxation fairness. This study uses a panel data estimation to analyze the effect of implementing the real estate transaction income tax integrated housing and land on the real estate market in Taiwan in 2016. And it explores whether the transacted housing prices are affected by the taxation reform. The results of the empirical analysis show that the average area of transferred real estate is significantly and negatively related to housing price per ping; the housing stock and annual disposable income per capita are significantly and positively related to housing price; the effects of total population, labor force participation rate and integrated housing and land tax system on housing price do not reach statistical significance.

The reason why the implementation of the taxation on property transactions based on actual selling prices in the integrated housing and land tax system in 2016 did not have a significant effect on the housing prices is that the integrated housing and land tax system only applies to the sale of real estate acquired after 2016, while the sale of real estate acquired before 2016 is still taxed under the old system, i.e., land value added tax and income tax on property transactions are levied separately on land and houses. Before the implementation of the integrated housing and land tax system in 2016, there was a wave of transactions that were subject to the old system. Therefore, the real estate tax system reform did change the transaction behaviors of real

estate. In addition, as the proportion of property transactions subject to the integrated housing and land tax system increases, the taxation system for property transactions tends to be fairer and better, and the real estate market develops more soundly.

Another possible reason that the integrated housing and land tax system has not been as effective as expected in curbing housing prices is that the real estate holding tax burden in Taiwan is low. The real estate holding tax burden in Taiwan is based on the land value tax and the house tax for land and house respectively, and the two tax bases are the declared land value and the current value of the house tax respectively. It is well-known that there is a considerable discrepancy between the assessed value of the real estate and the market value. Under the real estate taxation system of "transaction-oriented but not possession-oriented", people with multiple properties are less likely to sell their houses. In a low-interest financial market, where people are hesitant to sell and have easy access to capital, the real estate market is in short supply and the transaction price remains high. Some counties and cities in Taiwan impose differential tax rates on multiple property owners who own non-owner-occupied homes, depending on the number of households they own. This study suggests that further analysis can be conducted to determine whether the hoarding tax will suppress housing prices.

Reference

1. Baltagi, B. H. (2001). Econometric Analysis of Panel Data, 2nd editions, New York, John Wiley.
2. Bernanke, S. B. (2015). Federal Reserve Policy in an International Context. Paper presented at 16th Jacques Polak Annual Research Conference.
3. Breusch, T. S., and Pagan, A. R. (1980). The Lagrange multiplier test & its applications to model specification in econometrics. Review of Economic Studies, 47, 239-253.
4. François, G. and Emmanuel, F. (2018). Accounting for Macro-Finance Trends: Market Power, Intangibles, and Risk Premia. Paper presented at BPEA Conference Drafts.
5. Chang, Mei-ying, Lee, Pei-fang, and Lai, Chin-fu. (2004). An Analysis of Real Estate Policies on Real Estate Market, Land Issues Research Quartely, 3(1), 12-28.
6. Hausman, J. A. (1978). Specification Tests in Econometrics. Econometrica, 46(6), 1251-1271.
7. Hsieh, Hung-nien, Hu, Tai-shan, and Shao, Ze-en. (2000). A Study of the Effect of Neighborhood Park on the Adjacent Real Estates—Case of Hsinchu, Journal of Architecture & Planning, 1(3), 258-271.
8. Li, Ming-hsuan. (2016). Impact of Housing Prices on Economic Opportunities in Taiwan, Taiwan Economic Forecast and Policy, 47(1), 37-65.
9. Liao, Hsien-hsing, and Chang, Fung-ling. (1997). On the Comparison between Hedonic Regression and Grid-Adjustment Techniques in Real Estate Appraisal, Journal of Housing Studies, 5, 17-35.
10. Lin, Tso-yu, Chen, Hui-chieh, and Tsai, Yung-li. (2010). The Determinants of Housing Prices on Residential Buildings, Journal of Valuation, 3: 13-23.
11. Lin, Tso-yu, and Cheng, Yu-fang. (2014). Factors of the Herding Behavior and Macro Economy on the Residential Real Estate Markets, Taiwan Journal of Applied Economics, 95: 61-99.
12. Peng, Chien-wen, Wu, Sun-tien, and Wu, Shyang-hua. (2007). The Influences of Effective Property Tax Rates on Housing Values: Evidence from Ta-tung and Nei-hu Districts in Taipei City, Journal of Taiwan Land Research, 10(2), 49-66.
13. Rosen, S. (1974). Hedonic prices and implicit markets: Product differentiation in pure competition. Journal of Political Economy, 82: 34-55.