The Effect of Capital Gains Taxation on Housing Sales: Evidence from Taiwan

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Abstract

This paper examines the impact of the 2016 tax reform in Taiwan on the housing market, specifically focusing on the transition from transaction-based taxes to capital gains taxes. Before the reform, real estate transaction taxes were determined by the transaction price, whereas post-reform, they were based on capital gains. This study uses a regression discontinuity design to quantify the effects of the tax reform. The results show that this reform led to a reduction in capital gains, indicating a "lock-in" effect for homeowners. For transactions with a holding period of less than two years, the capital gains compared to the original purchase price dropped from 30% to 10%. This change is mainly because the initial purchase price went up, which implies that some homeowners who bought their properties at a lower price chose not to sell them.

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1 Introduction

Governments usually implement tax policies in housing markets for specific reasons. For instance, during the Great Recession, the government may use tax cuts to stimulate the housing market (Best and Kleven, 2018). Additionally, when confronting high housing prices, the government can employ taxes as instruments to cool down the market (Agarwal et al., 2020). Among these policy tools, two important taxes for housing transactions are the property transfer tax and the capital gains tax. They serve distinct purposes and apply in different circumstances. In this paper, we examine a tax reform implemented in 2016 in Taiwan to study the effect of capital gains taxation on housing markets.

In 2016, due to high housing prices and other factors, the government in Taiwan initiated a series of tax reforms.[1] The key change introduced on that year was a new version of the House and Land Transaction Income Tax. This reform shifted the primary tax from the property transfer tax to the capital gains tax. Originally, a housing transaction was subject only to the property transfer tax, calculated based on the market value of properties. After the reform, a housing transaction became liable for capital gains tax, so sellers were responsible for paying tax on the gains realized from the sale. Moreover, the government included a complex sunset clause in this reform, enabling us to employ the regression discontinuity design to identify the effect of the capital gains tax.

Based on the literature in the stock market, capital gains taxes could lead to two possible effects: (1) the capitalization effect; (2) the lock-in effect. The capitalization effect is due to a decrease in demand. Because investors know that they need to pay capital gains taxes when they sell their houses in the future, they are less likely to buy houses in the market. The capitalization effect usually happens right after the announcement of capital gains taxes (Dai et al., 2008). On the contrary, the lock-in

[1]The government implemented the House and Land Transactions Income tax 1.0 and 2.0 on January 1, 2016, and July 1, 2021, respectively.

effect is based on a decrease in supply. Since householders need to pay capital gains taxes, some of them are reluctant to sell their houses in the market. These two effects work in opposite directions, so it is plausible to know the effect of the capital gains tax in the housing market.

Figure 1 shows the average capital gains relative to the previous purchase prices in Taiwan over time. Before 2015, the capital gains were around 30% of the previous purchase prices; however, it drops dramatically to 15% after the tax reform. In this paper, we rely on the regression discontinuity design to identify this effect. Focusing on the housing transactions with holding periods of less than two years, we show that the tax reform reduces capital gains by around 18.5 percentage points. To further decompose the effect on capital gains, we find that the housing transaction prices only fall by around 2%, but the previous purchase prices increase by around 11.3%, which demonstrates a lock-in effect for some homeowners with lower previous purchase prices.

This paper contributes to the literature in several ways. First, the tax reform in Taiwan provides a different perspective on capital gains taxes. Most studies rely on the Taxpayer Relief Act of 1997 (TRA97) in the United States, which aims to alleviate tax burdens for homeowners. However, our case can better illustrate the lock-in effect and help further understand any potential selection in this effect. Additionally, we contribute to the literature examining the effects of government interventions in the housing market. We demonstrate that housing market prices may not be directly affected, but the objects of housing transactions in the market may undergo significant changes due to the capital gains tax

The remainder of this paper is organized as follows. Section 2 shows the findings in the existing literature. Section 3 presents the background of the tax reform in Taiwan. Section 4 describes the data we use in this paper. Section 5 displays the identification strategy and the main results. Section 6 concludes the paper.

2 Related Literature

This section provides a brief overview of the literature related to this study. Since the government provides a tax on capital gains after 2016, we first survey the literature related to capital gains taxes and present the findings from the existing literature. In addition, we offer some literature related to transfer taxes in the housing market.

2.1 Capital Gains Taxes

To investigate the effect of capital gains tax, many studies rely on the Taxpayer Relief Act of 1997 (TRA97). Before 1997, capital gains were taxed differently for those above and under the age of 55 (referred to as the age-55 rule), and the TRA97 eliminated this difference. In addition, it replaced the one-time lifetime exclusion of $125,000 with a larger amount of $500,000 in capital gains (or $250,000 for single individuals). Lastly, the TRA97 also lowered the long-term capital gains tax rates. Therefore, this tax reform provides a good opportunity to study the (reverse) lock-in effect of capital gains taxation in the market, such as stock and housing markets.

In the stock market, the effect of capital gains tax had been discussed for a long time, but the results from the literature are mixed. Some studies find that the capital gains tax can reduce stock price and current stock returns (Guenther and Willenborg, 1999; Lang and Shackelford, 2000; Ayers, Lefanowicz and Robinson, 2003), which refers to the capitalization effect. However, other studies find the opposite effect (Reese JR., 1998; Poterba and Weisbenner, 2001; Klein, 2001; Jin, 2006; George and Hwang, 2007) because the lock-in effect may prevent sellers from selling their houses. According to the event of the TRA97, Dai et al. (2008) find that a dominant capitalization effect showed up in the week following the news and a dominant lock-in effect happened in the week after the rate reduction.

Compared to the literature on the stock market, the studies on housing markets are few. Cunningham and Engelhardt (2008) find that the TRA97 increased the

mobility rate of under-55 homeowners, which supports the lock-in effect before 1997. Biehl and Hoyt (2014) further demonstrate that those home sellers slightly under the age of 55 were 6.2% more likely to move for a less expensive house, compared to those slightly over 55. For the $500,000 exclusion, Shan (2011) finds that it increases the sales rate of houses with positive gains up to $500,000. In contrast, for those houses with gains above $500,000, the TRA97 does not have a significant effect on them. In addition, Shan (2011) demonstrates that the short-term effect is much larger than the long-term effect, which suggests that many locked-in homeowners sell their houses immediately after the tax reform.

In contrast to the TRA97, which aimed to alleviate the tax burden for homeowners, the case in Taiwan takes the opposite approach regarding capital gains taxes, directly displaying the lock-in effect. We also further show the selection for the lock-in effect in the housing market.

2.2 Transfer Taxes

Besides the changes in the capital gains tax, changes in transfer taxes (also called transaction taxes) may have a similar impact on the prices or sales in the housing market. For instance, Slemrod, Weber and Shan (2017) examine changes in housing transfer taxes in Washington D.C. which introduced a notch in the rate schedule. More specifically, the government raised the transfer tax rate (based on a house's selling price) from 2.2% to 3% only for those houses with a transaction price greater than or equal to $250,000. First, they find the manipulation of house sales which attempts to avoid higher taxes above the price or time notches. However, they show that there is no lock-in effect after this tax reform, which suggests that increasing a housing transaction tax will have a little long-term effect on the volume or timing of house sales.

In addition, Best and Kleven (2018) use administrative data on property trans-

actions in the U.K. from 2004 to 2012 to study the housing market responses to the change in property transaction tax (Stamp Duty Land Tax, SDLT). To stimulate the housing market during the Great Recession, the U.K. government imposed the stamp duty holiday which provides some tax cuts for certain price brackets temporarily during a period or permanently. The results indicate that it caused large distortions to the price, volume, and timing of property transactions. Also, a temporary elimination of a 1% transaction tax increased housing market transactions by 20% in the short run.

The transfer tax usually has different rates in different price ranges, so the discontinuity in tax rates provides a good opportunity to study how buyers and sellers react to the notch. For instance, the mansion tax in New York and New Jersey applies to residential transactions of $1 million or more (the tax rate is 1%), so Kopczuk and Munroe (2015) find that this distorts the price distribution and results in significant bunching just below $1 million.

3 Background

The tax reform in our case is called the House and Land Transaction Income Tax 1.0[2]. On June 5, 2015, the government passed an amendment to the Income Tax Act, and the new version of the House and Land Transaction Income Tax (new tax regime) was implemented on January 1, 2016. However, the government also included a complicated sunset clause in this tax reform, which makes the old tax regime still apply to some transactions after 2016. In other words, based on the complicated rules, some people can still use the old tax regime for their housing transactions nowadays.

For the old tax regime, a housing transaction involves three parts of taxes: the land value increment tax, luxury tax, and housing transaction income tax. The taxable base for the luxury tax is the transaction price. For those transactions with a holding

[2]In July 2021, the government also implemented another tax reform, which is called House and Land Transaction Income Tax 2.0.

period of less than one year, the luxury tax is 15% of the transaction price, and the luxury tax rate is 10% when the holding period is between one and two years. If the holding period is larger than two years, there is no luxury tax for the transaction. About the housing transaction income tax, there are two important features. First, the transaction income tax is combined with the annual individual income tax, which means the tax rates could vary based on the overall income tax rates for individuals. Second, instead of using the difference between the previous and current transaction prices, the housing transaction income is mainly calculated based on the current value of houses, which is announced by the government and usually underestimated.

To overcome the disadvantage of the old tax regime, the new tax regime consists of two parts: the land value increment tax, and the house and land transaction income tax. The house and land transaction income is calculated mainly based on the difference between previous and current transaction prices,[3] which is a major change from the old tax regime. According to the terminology in the literature, the new tax regime is similar to the capital gains tax, and the old tax regime is close to the transfer tax (or the transaction tax). In addition, the tax rate for capital gains is based on the holding period for sellers. More specifically, if the holding period is less than one year, the tax rate is 45%. If the holding period is between one and two years (between two and ten years), the tax rate is 35% (20%). When the holding period is larger than ten years, the tax rate is only 15%. This spirit of the various tax rates follows the luxury tax in the old tax regime.

However, not all of the transactions that happened after 2016 apply to the new tax regime. First, if the house was owned before January 1, 2014, then the old tax regime can be used for the following transaction at any time, even if it happened after 2016. Second, if the house was owned during the period between January 1, 2014, and December 31, 2015, then people can still use the old tax regime if the holding

[3]The increment of the land value and some transaction fees from the previous transaction could also be calculated as the cost, which could be counted as the part of previous prices.

period is larger than two years. Besides these two exemptions, the new tax regime should be used for all of the transactions that happened after 2016.

To better illustrate the complicated sunset clause, Figure 2 presents all the possible tax regimes based on the holding period, current and previous transaction dates.[4] The x-axis indicates the previous transaction dates, and the y-axis shows the holding period. All the transactions can be plotted on this plane, and the transactions on the same downward-sloping line, such as the orange dashed line, are happened at the same time. For instance, the orange dashed line indicates those transactions on January 1, 2016. The shaded areas indicate the transactions under the new tax regime. More specifically, the six tax regimes are classified as follows:

- Tax Regime I (old): the current transaction date is before January 1, 2016; the holding period is larger than two years.
- Tax Regime II (old): the current transaction date is after January 1, 2016; the previous transaction date is before January 1, 2016; the holding period is larger than two years. (exemptions)
- Tax Regime III (new): the previous transaction date is after January 1, 2016; the holding period is larger than two years.
- Tax Regime IV (old): the current transaction date is before January 1, 2016; the holding period is less than two years.
- Tax Regime V (new): the current transaction date is after January 1, 2016; the previous transaction date is before January 1, 2016; the holding period is less than two years.
- Tax Regime VI (new): the previous transaction date is after January 1, 2016; the holding period is less than two years.

[4] We follow Chia-Hung Chen's thesis (https://ndltd.ncl.edu.tw/cgi-bin/gs32/gsweb.cgi/ccd=SnKhTf/record?r1=1&h1=0) to categorize them

For each tax regime, the tax rates for the luxury tax and new income (capital gains) tax are summarized in Table 1. Although Tax Regimes I and II have the same tax rule, the main reason to split it into two parts is that Tax Regime II coexists with the new tax regime, which is different from Tax Regime I. In addition, Tax Regimes V and VI also have the same tax rule. The only difference is that the sellers in Tax Regime V could wait until the holding period greater than two years and switch to Tax Regime II (the old one); however, the sellers in Tax Regime VI do not have this option to switch back to the old tax regime.

There are three boundaries in Figure 2. The first one is the two-year holding period (the horizontal green line); the second one is the current transaction time on January 1, 2016 (the downward-sloping orange dashed line); the third one indicates the previous transaction time on January 1, 2016 (the vertical blue dotted line). People could advance or delay their transactions across those boundaries, which distorts quantity near the boundaries. For instance, a seller would like to delay his transaction to avoid the high tax rate when the holding period is one or two days less than two years.

Since the two-year holding period creates a significant bunching evidence, it is not suitable to study the difference between old and new tax regimes. We only focus on the boundary between tax regimes IV and V, and the boundary between tax regime II and III to identify the effect of tax reform.[5]

4 Data

This research uses the data from the Real Estate Transaction Registration Database, which is provided by the Ministry of Interior in Taiwan. The data include all the housing transaction record in Taiwan from August 2012 to June 2021. We use the address for each transaction to identify the repeated sales and construct a sample,

[5]In the current draft, we only show the results for the boundary between tax regimes IV and V.

called a "repeated sample". In this repeated sample, we can trace their previous purchase prices, so the capital gains can be calculated by the difference between the current sale prices and the previous purchase prices. Although this is not a random sample[6], it allows us to study how the capital gains tax affects the capital gains in the market. During the sample period in Taiwan, the total number of transactions is 1,765,859, and the number of observations for the repeated sample is only 191,210 (around 11% of total transactions).

Table 2 provides the summary statistics for the repeated sample. The average housing price is around 8.38 million TWD. Compared with the average previous purchase price of 7.51 million TWD, the average capital gains relative to their previous purchase prices is around 21.1%. As for the types of buildings, the majority of the transacted objects are elevator apartments (52.7%), while 25.4% of the transactions involve townhouses. Additionally, Table Table 3 displays the summary statistics by different tax regimes. Given that the capital gains tax is implemented under Tax Regimes III, V, and VI, the capital gains relative to previous purchase prices are much lower compared to those under the old tax regimes (Tax Regimes I, II, and III).

5 Empirical Results

In this section, we concentrate on tax regimes IV and V, which contain transactions with a holding period of less than two years. We begin by presenting our identification strategy and showing the graphical results for the regression discontinuity design. Subsequently, we utilize regression analysis to present the results while controlling for housing characteristics and township fixed effects. Finally, we exhibit the validity test for the cutoff and engage in a discussion about the potential for manipulation.

[6]Since we can not observe the transaction before August 2012, the repeated sales identified from the dataset might not represent all of the repeated sales in the early part of the sample.

5.1 Identification Strategy

Our identification strategy is based on the regression discontinuity design. We focus on the sample in tax regimes IV and V and estimate the following model:

$$Y_{ijt} = \beta_0 + \rho D_t + f(t) + X_{ijt}\gamma + \theta_j + \epsilon_{ijt}, \tag{1}$$

where Y_{ijt} is the variable of interest for house i in township j at month t, D_t is the dummy after January 1, 2016, which is the starting date for the capital gains tax. The running variable is the transaction time, and $f(t)$ is a flexible function for the running variable. We also control the observed housing characteristics (X_{ijt}) and the township fixed effects (θ_j). ϵ_{ijt} is the error term, and the robust standard errors are clustered at the township level. Here, we use three variables of interest: (1) capital gains relative to previous purchase prices; (2) logarithm of housing transaction prices; (3) logarithm of previous purchase prices.

5.2 Main Results

Figure 3 shows that the tax reform led to a reduction in capital gains, from around 30% to 10%. However, Figure 4(a) indicates that housing transaction prices did not change too much after the reform. Additionally, Figure 4(b) suggests that housing transactions that occurred after the tax reform tended to involve properties with higher previous purchase prices. This implies that some homeowners who initially purchased their properties at a lower price chose not to sell them after the tax reform. This phenomenon is commonly referred to as the lock-in effect in the literature.

To further account for housing characteristics and township fixed effects, the last column in Table 4 demonstrates that the tax reform reduces capital gains by approximately 18.5 percentage points, a finding consistent with the results shown in the figure. To decompose the effect on capital gains, we observe that housing transaction prices only experience a slightly decrease of around 2%, while previous purchase

prices exhibit an increase of about 11.3%. Consequently, the majority of the impact on capital gains stems from the rise in previous purchase prices, indicating a lock-in effect for homeowners with lower initial purchase prices. Given that they would incur higher capital gains taxes upon selling, they appear to be hesitant to sell their properties after the tax reform.

5.3 Validity Test

To examine whether transactions could be manipulated around the cutoff, we provide a validity test in this subsection. Figure 5(a) displays the histogram of transaction times, with each bin representing ten days. We observe a clear bunching evidence on the right side of the cutoff. This suggests that individuals tend to delay their transactions because, on average, the amount of luxury tax outweighs the capital gains tax for transactions with a holding period of less than two years. Consequently, it is advantageous for sellers to postpone the transaction. Conversely, for buyers, it is more advantageous to purchase houses before January 1, 2016, as they would not be subject to capital gains tax when selling in the future. Additionally, we note another peak around the beginning of December in 2015, indicating that many people rushed to complete their transactions before the tax reform. In summary, it is not obvious evident which side of the cutoff transactions should cluster on, as buyers and sellers may have differing interests regarding transaction timing, and transactions are ultimately determined through negotiation between them.

Figure 5(b) presents a formal test for the cutoff. Unfortunately, the figure indicates a discontinuity in density around the cutoff. In the future, we intend to employ the regression discontinuity donut to address this manipulation issue. Additionally, we may also aim to quantify the bounds for this treatment effect.

6 Conclusion

This paper relies on the 2016 tax reform in Taiwan to investigate the impact of capital gains taxation on the housing market. We employ a regression discontinuity design to quantify the treatment effect. The results reveal that this reform led to a reduction in capital gains, from 30% relative to the previous purchase price to 10%. In addition, upon further examination, we observe that housing transaction prices only experienced a modest decrease of around 2%, whereas previous purchase prices increased by approximately 11.3%. This demonstrates a lock-in effect for some homeowners with lower previous purchase prices. As of now, we are still working on finding a solution to address the issue of potential manipulation around the cutoff in the regression discontinuity design.

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Figures and Tables

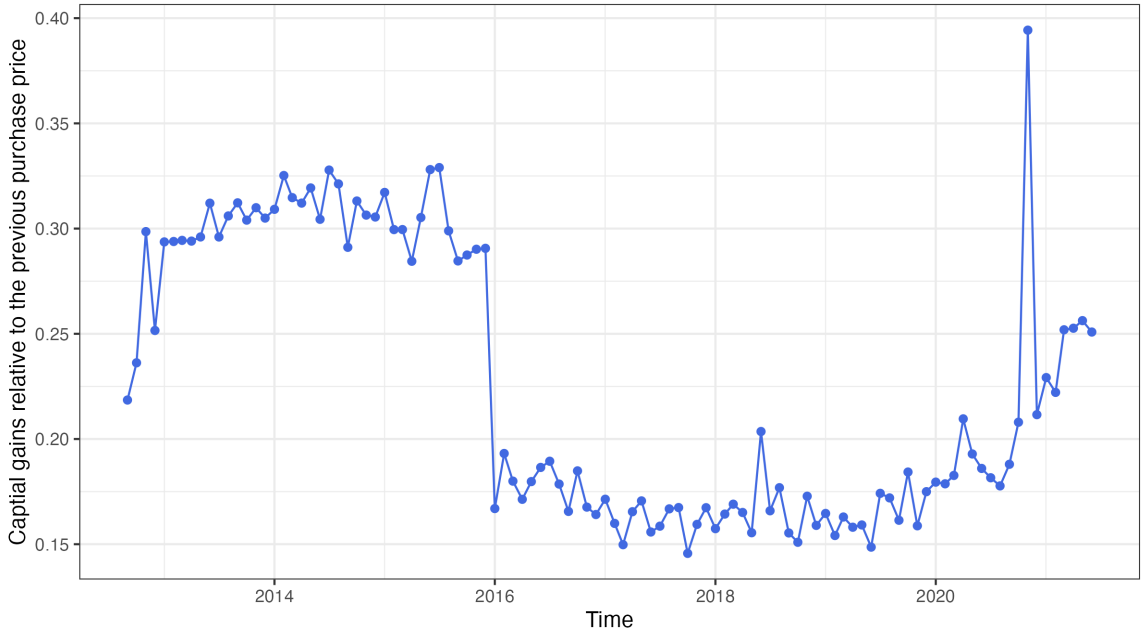


Figure 1: Capital Gains Over Time in Taiwan

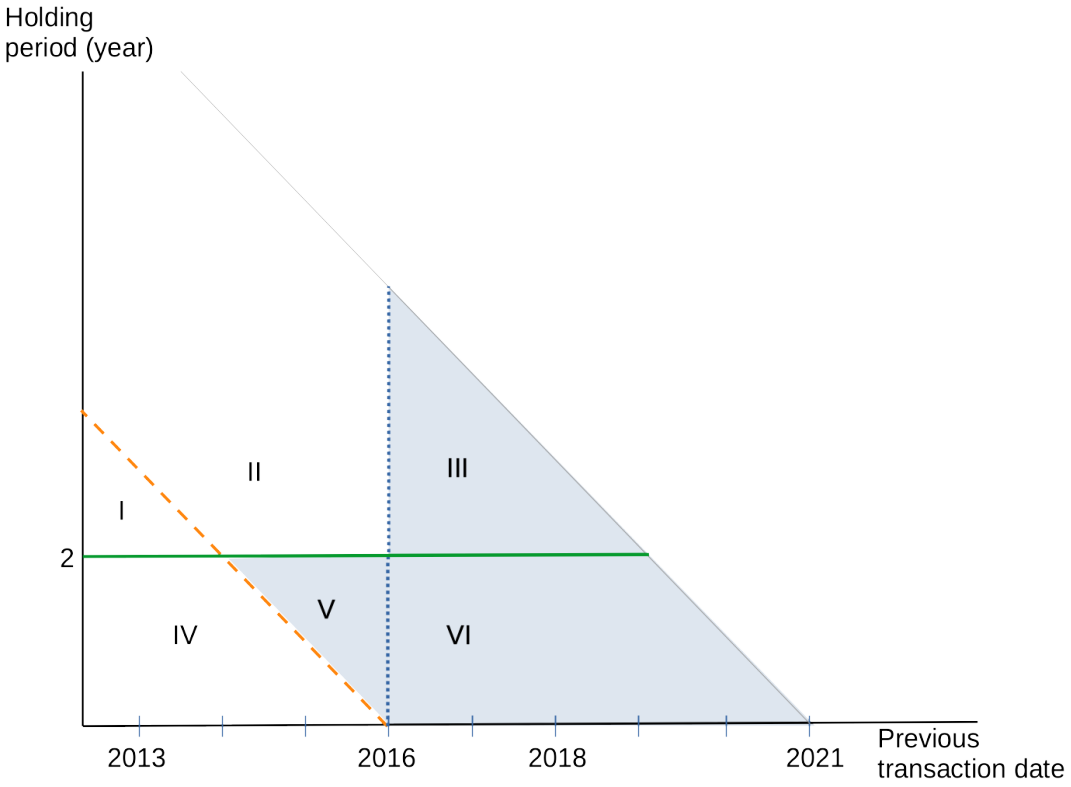


Figure 2: Tax Regimes

Note: We follow Chia-Hung Chen's thesis (https://ndltd.ncl.edu.tw/cgi-bin/gs32/gsweb.cgi/ccd=SnKhTf/record?r1=1&h1=0) to categorize all the transactions into six tax regimes based on the holding period, current and previous transaction dates.

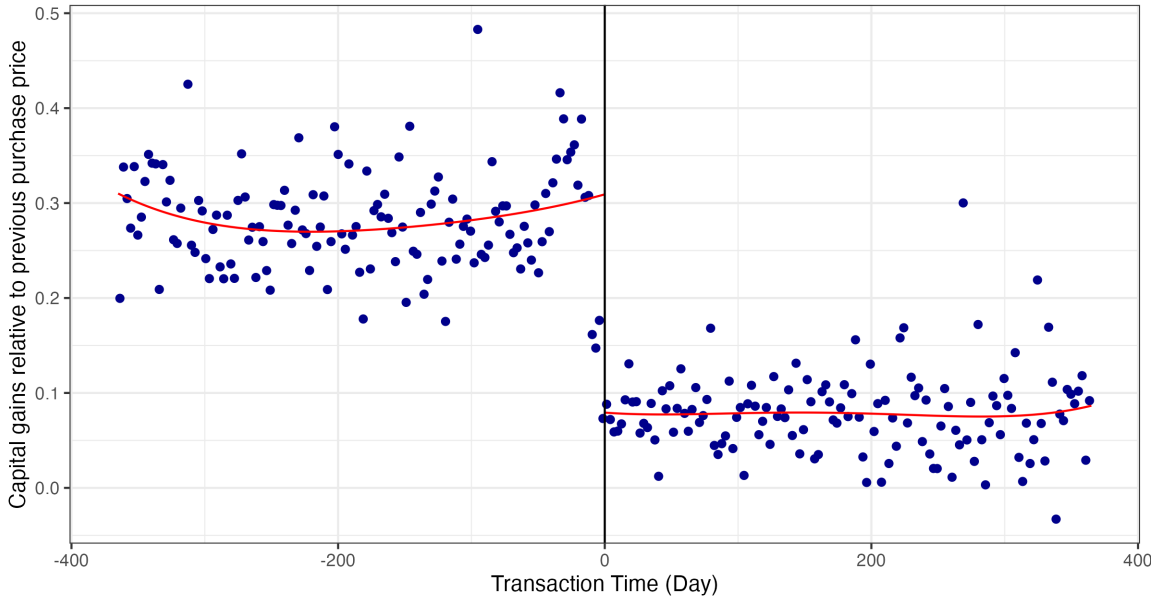
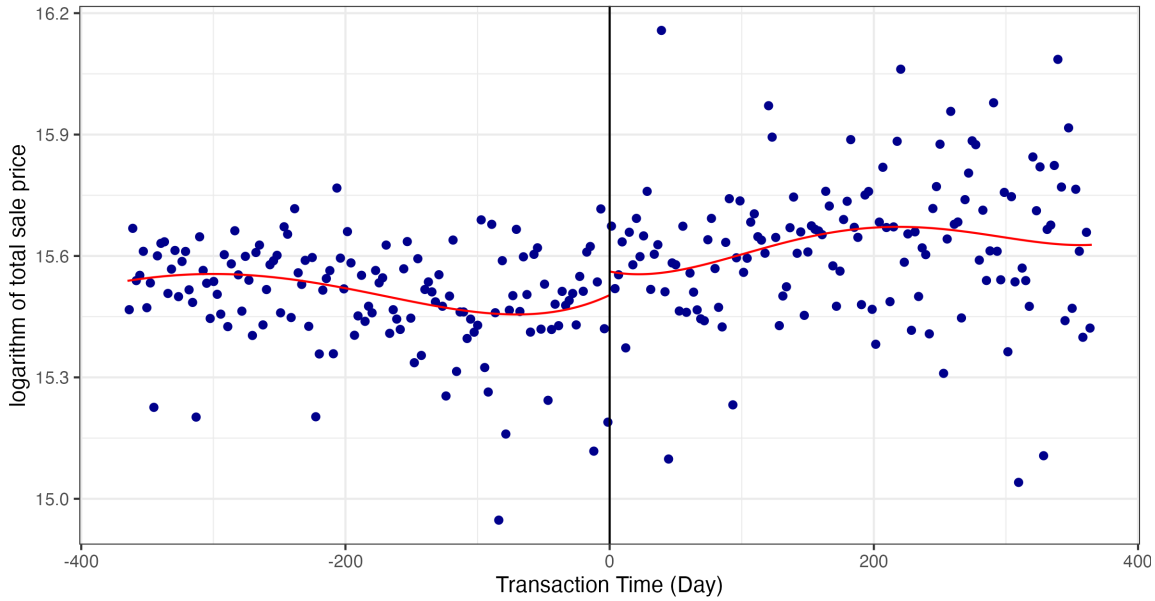
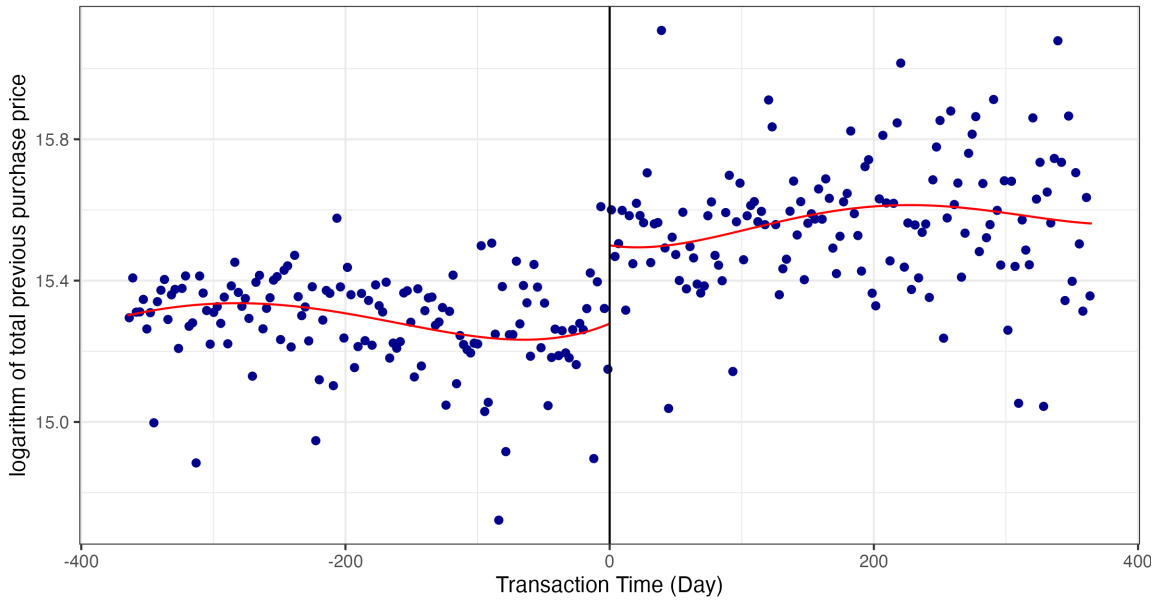


Figure 3: The Effect on Capital Gains: Tax Regimes IV and V

Note: This figure shows the regression discontinuity plot. The x-axis represents the transaction time, and all the observations with the holding period less than two years. The cutoff is at January 1, 2016.



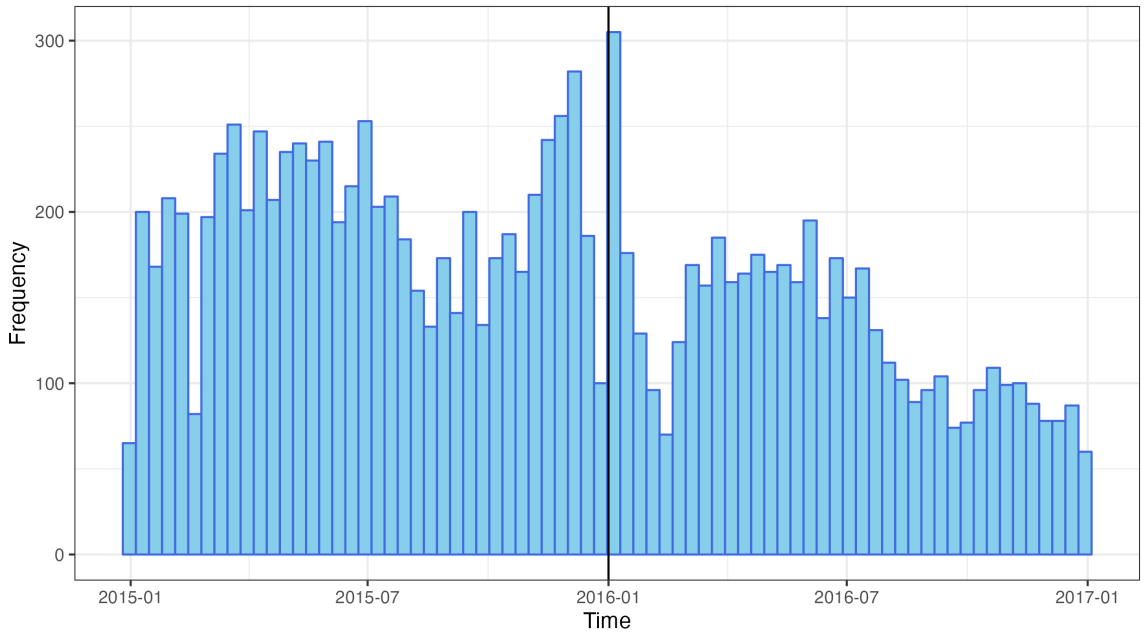
(a) Total Sales Price



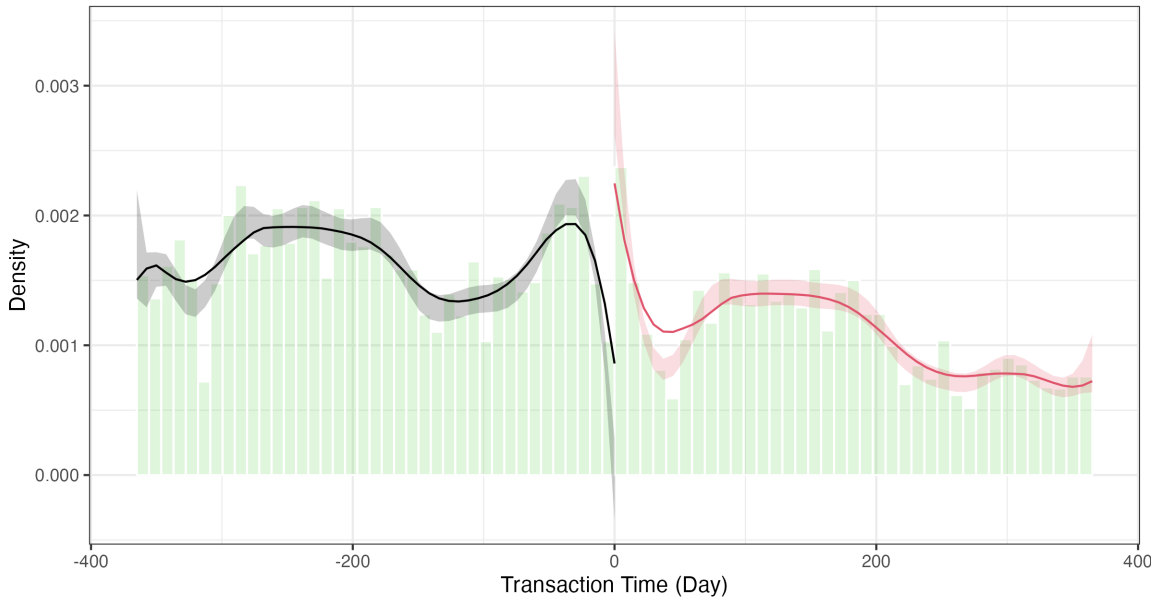
(b) Previous Total Purchase Price

Figure 4: The Effect on Housing Prices: Tax Regimes IV and V

Note: This figure shows the regression discontinuity plot. The x-axis represents the transaction time, and all the observations with the holding period less than two years. The cutoff is at January 1, 2016.



(a) Histogram of Transaction Time



(b) Density Test at the Cutoff

Figure 5: Validity Check: Tax Regimes IV and V

Note: This figure shows the validity check. The x-axis represents the transaction time, and all the observations with the holding period less than two years. The cutoff is at January 1, 2016.

Table 1: Six Regimes: New or Old Tax Regimes, and Tax Rates

Tax Regime	New or Old	Luxury Tax	Capital Gains Tax
Tax Regime I	Old	-	-
Tax Regime II	Old	-	-
Tax Regime III	New	-	15%-20%
Tax Regime IV	Old	10%-15%	-
Tax Regime V	New	-	35%-45%
Tax Regime VI	New	-	35%-45%

Table 2: Summary Statistics

Variables	N	Mean	St. Dev.	Max	Min
Total sale price (million TWD)	191,210	8.380	8.518	766	0
Total previous purchase price (million TWD)	191,210	7.501	8.068	632.630	0.010
Unit sale price (thousand TWD per square meter)	191,210	67.087	46.679	5,574.407	0.000
Unit previous purchase price (thousand TWD per square meter)	191,210	59.609	43.554	2,554.869	0.000
Capital gains (relative to previous purchase price)	191,210	0.211	1.734	719.000	−1.000
Holding period (years)	191,210	2.589	2.028	12.893	0.000
Housing age (years)	191,210	20.833	13.300	106.775	0.008
Size of floor area (square meters)	191,210	128.052	75.876	4,500.870	0.170
Number of bedrooms	191,210	3.004	1.643	72	0
Number of living rooms	191,210	1.715	0.742	60	0
Number of bathrooms	191,210	2.098	1.561	72	0
With parking lot	191,210	0.310	0.463	1	0
Types of buildings:					
Apartments with elevators (11 floors or more)	191,210	0.364	0.481	1	0
Apartments with elevators (10 floors or fewer)	191,210	0.163	0.370	1	0
Apartments without elevators	191,210	0.157	0.364	1	0
Studios	191,210	0.062	0.240	1	0
Townhouses	191,210	0.254	0.435	1	0

Table 3: Summary Statistics by Tax Regime

	Tax Regime					
Variables	I	II	III	IV	V	VI
Total sale price (million TWD)	7.687	9.159	9.103	7.089	8.415	7.668
	(7.412)	(9.141)	(8.075)	(6.990)	(8.965)	(8.603)
Total previous purchase price	6.313	8.253	8.279	5.875	8.205	6.984
(million TWD)	(6.612)	(8.861)	(7.794)	(6.599)	(9.212)	(7.637)
Unit sale price	64.964	70.786	68.696	63.164	62.927	63.879
(thousand TWD per square meter)	(39.872)	(45.998)	(42.346)	(41.827)	(42.783)	(53.416)
Unit previous purchase price	52.780	63.645	62.344	51.924	60.961	57.458
(thousand TWD per square meter)	(36.429)	(45.966)	(39.549)	(37.865)	(43.820)	(45.476)
Capital gains	0.332	0.219	0.165	0.297	0.075	0.175
(relative to previous purchase price)	(0.456)	(2.755)	(0.383)	(0.357)	(0.218)	(0.742)
Holding period (years)	2.350	4.552	3.137	0.617	1.209	0.776
	(0.308)	(1.586)	(0.806)	(0.442)	(0.510)	(0.538)
Housing age (years)	19.589	19.959	19.021	20.120	18.857	24.093
	(12.361)	(12.642)	(13.733)	(12.103)	(13.569)	(14.172)
Size of floor area (square meters)	122.512	133.114	134.312	117.882	135.818	122.735
	(84.211)	(77.791)	(77.145)	(69.405)	(91.115)	(71.399)
Number of bedrooms	2.927	3.012	2.972	2.940	3.066	3.056
	(1.608)	(1.721)	(1.720)	(1.342)	(1.495)	(1.664)
Number of living rooms	1.603	1.692	1.698	1.747	1.747	1.753
	(0.718)	(0.765)	(0.761)	(0.706)	(0.694)	(0.721)
Number of bathrooms	2.053	2.137	2.142	1.916	2.188	2.121
	(1.460)	(1.660)	(1.701)	(1.117)	(1.421)	(1.576)
With parking lot	0.255	0.347	0.391	0.258	0.278	0.250
	(0.436)	(0.476)	(0.488)	(0.438)	(0.448)	(0.433)
Types of buildings						
Apartments with elevators	0.346	0.409	0.445	0.326	0.292	0.284
(11 floors or more)	(0.476)	(0.492)	(0.497)	(0.469)	(0.455)	(0.451)
Apartments with elevators	0.137	0.148	0.170	0.178	0.156	0.178
(10 floors or fewer)	(0.344)	(0.355)	(0.375)	(0.382)	(0.363)	(0.383)
Apartments without elevators	0.163	0.135	0.116	0.210	0.159	0.181
	(0.370)	(0.342)	(0.321)	(0.408)	(0.366)	(0.385)
Studios	0.104	0.077	0.043	0.049	0.077	0.050
	(0.305)	(0.266)	(0.204)	(0.216)	(0.267)	(0.218)
Townhouses	0.250	0.231	0.226	0.237	0.316	0.307
	(0.433)	(0.421)	(0.418)	(0.425)	(0.465)	(0.461)

Table 4: Results of Regression Discontinuity Design: Tax Regimes IV and V

	Capital gains (relative to previous purchase price)				
	(1)	(2)	(3)	(4)	(5)
Treatment	-0.210^{***}	-0.194^{***}	-0.233^{***}	-0.202^{***}	-0.185^{***}
	(0.011)	(0.009)	(0.016)	(0.010)	(0.010)
Constant	0.288^{***}	0.276^{***}	0.312^{***}	0.323^{***}	0.336^{***}
	(0.009)	(0.007)	(0.014)	(0.055)	(0.067)
Observations	12,004	18,407	12,004	12,004	12,004
R^2	0.099	0.089	0.100	0.196	0.252
	log(Total sale price)				
	(1)	(2)	(3)	(4)	(5)
Treatment	0.125^{***}	0.119^{***}	0.081^{**}	0.090^{***}	-0.026^{**}
	(0.028)	(0.023)	(0.040)	(0.024)	(0.010)
Constant	15.449^{***}	15.467^{***}	15.450^{***}	15.313^{***}	10.974^{***}
	(0.017)	(0.014)	(0.026)	(0.096)	(0.080)
Observations	12,004	18,407	12,004	12,004	12,004
R^2	0.007	0.006	0.008	0.288	0.868
	log(Total previous purchase price)				
	(1)	(2)	(3)	(4)	(5)
Treatment	0.282^{***}	0.267^{***}	0.251^{***}	0.240^{***}	0.113^{***}
	(0.029)	(0.024)	(0.042)	(0.025)	(0.011)
Constant	15.230^{***}	15.254^{***}	15.218^{***}	15.064^{***}	10.728^{***}
	(0.019)	(0.015)	(0.028)	(0.111)	(0.083)
Observations	12,004	18,407	12,004	12,004	12,004
R^2	0.029	0.026	0.029	0.323	0.865
function form	linear	linear	quadratic	linear	linear
bandwidth	1 year	1.5 years	1 year	1 year	1 year
township fixed effects	No	No	No	Yes	Yes
housing characteristics	No	No	No	No	Yes

Note: *p<0.1; **p<0.05; ***p<0.01