On the Differential Impact of the Tax Cuts and Jobs Act on the Housing Market: Blue versus Red[*]

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This Version: 20191006

Abstract

This paper identifies and estimates the differential impact of the Tax Cuts and Jobs Act (TCJA) on the housing market, in particular, on the (median) price-to-rent ratio between the metropolitan statistical areas (MSAs) in the blue states and those in the red states by using a difference-in-differences approach. Employing the relevant data from 2017Q1 to 2018Q4 for the top 50 MSAs to implement the analysis, we find that the differential impact is positive and statistically significant, and that its magnitude increases with time. Our findings suggest that taxation plays an important role in the housing market.

Key words: Taxation; Housing Market; Price-to-Rent Ratio; Tax Cuts and Jobs Act
JEL classification: H2; R3

[*]The views expressed herein are those of the author and do not necessarily reflect the views of Fannie Mae or its management. The author thanks Alan J. Auerbach and Feila Zhang for helpful comments.

I. Introduction

The Tax Cuts and Jobs Act (TCJA) was passed in Congress on December 20 and signed into law by President Donald Trump on December 22, 2017. The law came into effect on January 1, 2018. It represents the most sweeping revision of US tax law since the Tax Reform Act of 1986, with many significant changes to the structure of both corporate and personal federal taxes having been introduced.[1]

It is widely believed that the TCJA would generate differential impact on the housing market between the blue and red states. For example, this is suggested by a *Wall Street Journal* article entitled "New Tax Laws Have Home Buyers Checking New Places" by Robyn A. Friedman on June 7, 2018. This is also hinted by an academic article saying that "one suspects that red-state, blue-state politics were also involved" (Slemrod, 2018).[2] To our best knowledge, however, no prior research has been done to quantify the differential impact of the TCJA on the housing market between the blue and red states.

In this paper, we fill in this void by identifying and estimating the differential impact of the TCJA on the housing market, in particular, on the (median) price-to-rent ratio between the metropolitan statistical areas (MSAs) in the blue states and those in the red states. We focus on the price-to-rent ratio for three key reasons. First, the price-to-rent ratio obviously affects households' tenure choice between owning and renting, and hence the homeownership rate. Second, the price-to-rent ratio has been regarded as the analogy of the price-to-dividend ratio in the stock market and viewed as an indicator of valuation in the housing market (for example, Case and Shiller, 1989; Galin, 2008). Finally, previous studies suggest that assessing the effects

[1]See, for example, Auerbach et al. (2018) for a detailed description of the TCJA.
[2]Indeed, no Democrats in either House of Congress voted for the TCJA.

of tax policies on the price-to-rent ratio is the prerequisite to assess their effects on the other aspects of the housing market (for example, Sommer and Sullivan, 2018).

However, the extensiveness of the TCJA makes it difficult to identify the differential impact on the price-to-rent ratio between the MSAs in the blue states and those in the red states, and also suggests that the magnitude of the differential impact is theoretically ambiguous. On one hand, the TCJA has changed the individual tax base by, among other things, limiting the SALT (state and local property, income and sales taxes) deductibility to $10,000. It is widely accepted that these tax changes will have a disproportionate effect on the blue states characterized with higher home prices and higher taxes (for example, Tax Foundation, 2017).[3] On the other hand, the TCJA has cut individual tax rates and changed the bracket breakpoints. The highest individual income tax rate fell from 39.6% to 37%. The results of prior distributional analyses of the TCJA (for example, the Tax Policy Center, 2017; the Congressional Budget Office, 2017; the Joint Committee on Taxation, 2017; Auerbach et al., 2018) consistently suggest that these tax changes will disproportionally benefit the blue states characterized with generally higher-income households. Besides, the TCJA has cut the corporate income tax. A range of estimates suggests that the law is likely to increase US capital investment and cause wages to rise (Auerbach, 2018), which could also contribute to the differential impact.

The qualitative analysis sketched in the last paragraph, hence, drives us to explore and take a reduced-form approach. Specifically, we first base on Altig et al. (2019) to classify the top 50 MSAs into two groups, namely, a blue group and a red group.[4] As a result, the blue group

[3]Tax Foundation is a pro-growth tax-policy nonprofit.

[4]One of the key reasons for us to focus on the top 50 MSAs is that a major mortgage company in the US has recently developed a regional housing market risk indicator (RHMRI) model for these 50 MSAs (An, 2018). This model is designed to produce quarterly housing market downturn risk indicators at MSA level. It outputs the probability of home price to decline & decelerate within next four quarters.

consists of 20 MSAs, whereas the red group is made up of the remaining 30 MSAs. The group assignment will be described in detail shortly after in a later section.

Then, we explore the trend of the average price-to-rent ratio of the two groups around the legislation period (2017Q1~2018Q4), namely, four post- and pre-reform quarters respectively and symmetrically. The results of our exploration suggest that the parallel trend assumption underlying the difference-in-differences method is practically satisfied prior to the TCJA. Hence, it is reasonable to use a difference-in-differences approach to estimate the differential impact of the TCJA on the price-to-rent ratio between the two groups.

Finally, we implement the difference-in-differences approach to estimate the differential impact of the TCJA on the price-to-rent ratio between the blue and red groups. The results of our estimation show that: (1) the differential impact is positive and statistically significant; and (2) the magnitude of the differential impact increases with time. Our findings suggest that taxation plays an important role in the housing market.

We are confident in our difference-in-differences identification strategy as well as our estimation results because, as discussed by Slemrod (2018), "it (*the TCJA*) is a wonderfully generous gift because it provides scores of natural experiments that could help provide credible estimates of the causal effects of tax policy," and "several aspects of the process leading to the new law render it an especially promising laboratory." First, as there was nothing about the state of the business cycle that precipitated the passage of the TCJA, and the law passed largely thanks to a close election tipped in one direction, there is little, if any, concern about the potential endogeneity of timing that has plagued many empirical studies of fiscal policy.[5] Second, the macro economy was well-behaved in the few years leading up to the TCJA, which also helps because the post-reform counterfactual is plausibly to be also fairly placid.

[5]See, for example, Romer and Romer (2010) for a detailed discussion.

The remainder of this paper is organized as follows. In Section II, we review the relevant literature. Section III describes the group assignment in detail. Section IV explores the trend of the average price-to-rent ratio of the blue and red groups from 2017Q1 to 2018Q4 and checks whether the parallel trend assumption is satisfied or not. Section V presents our difference-in-differences models. Section VI describes our data. Section VII reports the estimation results. Finally, Section VIII briefly concludes the paper.

II. Literature Review

Tax policies play an important role in the housing market. Commensurate with this, the impact of tax policies on the housing market has been widely studied. Early seminal contributions include, for example, Aaron (1970), Rosen (1985) and Poterba (1984 and 1992). Following the influential work by Gervais (2002), more recent studies have employed theoretical dynamic models in the quantitative macroeconomic tradition to investigate these issues (for example, Diaz and Luengo-Prado, 2008; Chambers et al., 2009; Nakajima, 2010; Sommer et al., 2013; Floetotto et al., 2016; Sommer and Sullivan, 2018).

The studies in the prior literature have, in general, focused on a specific aspect of tax policies. For example, both Floetotto et al. (2016) and Sommer and Sullivan (2018) concentrate on the impact of mortgage interest deduction on the housing market. This limitation makes it difficult, if not impossible, to employ their models to assess the effects of the TCJA, representing the most significant change in U.S. taxation since the Tax Reform Act of 1986, on the housing market.

Our work contributes to and advances the previous literature by using a reduced-form approach, more specifically, a difference-in-differences method to identify and estimate the

differential impact of the TCJA on the housing market, in particular, on the price-to-rent ratio between the MSAs in the blue states and those in the red states. To our best knowledge, we are the first to make this endeavor.

III. Group Assignment

III.1. Group Assignment — Benchmark

In a recent contribution, Altig et al. (2019) estimate the differential effect of the TCJA on red- and blue-state taxpayers. To achieve their research objective, they first designate states, including the District of Columbia, as blue, red or purple based on the average voter margin over the past five presidential elections. States where the Democratic share of total votes was, on average, five percentage points higher than the Republican share of total votes over the past five presidential elections are classified as blue. States where the Republican share of total votes was, on average, five percentage points higher than the Democratic share of total votes over the past five presidential elections are classified as red. The remaining states are classified as purple.

Then, they use a life-cycle consumption-smoothing program called The Fiscal Analyzer (TFA) to calculate the effect of permanent implementation of the TCJA on households state by state.[6] They find a small but important difference in the effects on households across red- and blue-states.

Our benchmark assignment of the top 50 MSAs to a blue group and a red group is largely based on the aforementioned designation by Altig et al. (2019). Specifically, if a MSA is located in a blue state designated by them, then we assign it to the blue group. Otherwise, we assign it to the red group. Table 1 reports the benchmark group assignment in detail. From Table 1, one can

[6]See Kotlikoff (2019) for a detailed description of TFA.

see that the blue group consists of 20 MSAs, whereas the red group is made up of the remaining 30 MSAs. Honolulu was excluded from our analysis due to missing data.

III.2. Group Assignment — Robustness Check

As Washington is adjacent to both Virginia (a purple state) and Maryland (a blue state), we also conduct a robustness check. Specifically, we switch Washington from the blue group to the red group, and then repeat our analysis. It turns out that this alternative group assignment produces little impact on the analysis results. Hence, we choose not to report the results of the robustness check to save some space, but they are available from us upon request.

IV. Parallel Trend Assumption

IV.1. Visual Check of the Parallel Trend Assumption

To do visual check of the parallel trend assumption, we plot the trends of average price-to-rent ratio of the blue and red groups from 2017Q1 to 2018Q4.[7] The results are reported in Figure 1.

From Figure 1, one can make two key observations. First, the trend of the blue group is basically flat before the TCJA, and becomes upward-sloping after the TCJA. Second, the trend of the red group is merely slightly upward-sloping before the tax reform, but becomes downward-sloping after the tax reform. These two observations suggest that the parallel trend assumption underlying the difference-in-differences method is almost satisfied prior to the TCJA (namely, 2017Q1~2017Q4).

[7]Our price-to-rent ratio data is produced by a major mortgage company in the US with significant presence in both single- and multi-family markets. For the convenience of exposition, we describe our data in detail in a later section.

IV.2. Statistical Test of the Parallel Trend Assumption

In addition, we conduct a formal statistical test of the parallel trend assumption by following the approach of Autor (2003) and Beatty and Shimshack (2011). Specifically, as the legislation took place at the end of 2017Q4, we employ the following model to do the test:

$$\begin{aligned} PtoR_{i,t} = \alpha_i + \lambda_t + \delta_{-3} * \left(Blue \times YQ2017Q1\right)_{i,t} + \delta_{-2} * \left(Blue \times YQ2017Q2\right)_{i,t} + \\ \delta_{-1} * \left(Blue \times YQ2017Q3\right)_{i,t} + \delta_1 * \left(Blue \times YQ2018Q1\right)_{i,t} + \\ \delta_2 * \left(Blue \times YQ2018Q2\right)_{i,t} + \delta_3 * \left(Blue \times YQ2018Q3\right)_{i,t} + \\ \delta_4 * \left(Blue \times YQ2018Q4\right)_{i,t} + \varepsilon_{i,t} \end{aligned}, \quad (1)$$

where $PtoR$ represents the price-to-rent ratio, α_i is the fixed effect for MSA i, λ_t is the fixed effect for YQ t, $Blue$ is an indicator variable indicating whether an MSA is included in the blue group or not, $YQ2017Q1$ denotes the time dummy for 2017Q1,[8] and $\varepsilon_{i,t}$ is the econometric error term.

The literature generally refers to δ_{-3}, δ_{-2} and δ_{-1} as "leads", and δ_1, δ_2, δ_3 and δ_4 as "lags", even though they are actually interactions of the group indicator with time dummies. If the blue and red groups have the same trend prior to the TCJA, then none of the three "leads" should be statistically significant, namely, the difference-in-differences is not significant between the two groups in the pre-reform period.

The regression results of Equation (1) are reported in Table 2. From Column 1 of Table 2, one can see that although δ_{-3} is statistically significant at the 5% level, neither δ_{-2} nor δ_{-1} is statistically significant, which suggests that the parallel trend assumption underlying the difference-in-differences method is narrowly satisfied prior to the TCJA.

[8]Similar definitions apply to $YQ2017Q2 \sim YQ2018Q4$.

IV.3. Summary

In summary, both the visual check and the formal statistical test of the parallel trend assumption have reached a consistent conclusion. That is, the parallel trend assumption is practically satisfied prior to the TCJA. Hence, it is reasonable to use a difference-in-differences approach to estimate the differential impact of the TCJA on the price-to-rent ratio between the blue and red groups.

V. Econometric Models

V.1. Benchmark Difference-in-Differences Model

First, we estimate the following benchmark difference-in-differences model:

$$PtoR_{i,t} = \alpha_i + \lambda_t + \gamma * X_{i,t} + \eta * \left(Blue \times PostReform \right)_{i,t} + \varepsilon_{i,t}, \quad (2)$$

where $PostReform$ is an indicator variable indicating whether an observation was made after the TCJA or not.

To reduce the residual variance of the regression and produce more efficient estimates, we have explored a set of control variables (denoted as $X_{i,t}$) including year-over-year growth rate of real gross metropolitan product (GMP), unemployment rate, year-over-year growth rate of number of households, and year-over-year growth rate of median household income. It turns out that only the year-over-year growth rate of real GMP is statistically significant.

Geography, and in general, local housing supply elasticity, is expected to be a key factor affecting the price-to-rent ratio (Saiz, 2010). As this factor is constant for each MSA, it should have been captured by the MSA fixed effect (namely, α_i) in our econometric models.

As a result, our final econometric model includes only one control variable, namely, year-over-year growth rate of real GMP (denoted as $RealGMP\_GrowthRate$). Nevertheless, we argue

that this should raise little, if any, concern because *ex post*, the regression results, reported in detail in a later section, are insensitive to the inclusion of additional control variables, and hence there is little, if any, gain to explore and include other control variables.

The coefficient of the interaction term $\left(Blue \times PostReform\right)_{i,t}$, namely, η gives us the difference-in-differences estimate of the differential impact of the TCJA on the price-to-rent ratio between the blue and red groups, namely, the difference between the change in the price-to-rent ratio of the blue group and that of the red group before and after the reform. As our previous discussions suggest that the differential impact of the TCJA on the price-to-rent ratio between the two groups is theoretically ambiguous, we hence have no prior expectation regarding its sign.

V.2. Augmented Difference-in-Differences Model

Second, as it might take time for the housing market to adjust in response to the TCJA, we expect to find that the magnitude of the differential impact became greater with time. To test this idea, we employ the following difference-in-differences model to estimate the differential impact by time:

$$\begin{aligned} PtoR_{i,t} = \alpha_i + \lambda_t + \gamma * X_{i,t} + \eta_1 * \left(Blue \times PostReform\right)_{i,t} + \\ \eta_2 * \left(Blue \times PostReform \times YQ2018Q2\right)_{i,t} + \\ \eta_3 * \left(Blue \times PostReform \times YQ2018Q3\right)_{i,t} + \\ \eta_4 * \left(Blue \times PostReform \times YQ2018Q3\right)_{i,t} + \varepsilon_{i,t} \end{aligned} \quad . \quad (3)$$

It is clear to see that Equation (3) includes, relative to Equation (2), three additional terms, namely, $\left(Blue \times PostReform \times YQ2018Q2\right)_{i,t} \sim \left(Blue \times PostReform \times YQ2018Q4\right)_{i,t}$.

By inspecting Equation (3), one can reach four conclusions: (1) η_1 gives us the differential impact for 2018Q1; (2) η_2 gives us the difference between the differential impact for

2018Q2 and that for 2018Q1, and hence $\eta_1 + \eta_2$ gives us the differential impact for 2018Q2; (3) η_3 gives us the difference between the differential impact for 2018Q3 and that for 2018Q1, and hence $\eta_1 + \eta_3$ gives us the differential impact for 2018Q3; and (4) η_4 gives us the difference between the differential impact for 2018Q4 and that for 2018Q1, and hence $\eta_1 + \eta_4$ gives us the differential impact for 2018Q4.

Regarding the relationship between η in Equation (2) and $\eta_1 \sim \eta_4$ in Equation (3), we have $\eta = \left[\eta_1 + (\eta_1 + \eta_2) + (\eta_1 + \eta_3) + (\eta_1 + \eta_4)\right] / 4$.

VI. Data Description

Our data are obtained from two sources. First, as briefly mentioned earlier, the data for the price-to-rent ratio is produced by a major mortgage company in the US with significant presence in both single- and multi-family markets. Second, the raw data for all the other variables, including real GMP, unemployment rate, number of households, and median household income, are downloaded from the IHS Markit® (https://ihsmarkit.com).

Table 3 reports the summary statistics of the two key variables, namely, the price-to-rent ratio and *RealGMP_GrowthRate* (year-over-year growth rate of real GMP) used in our analysis by group and by period.[9]

From Table 3, three notable points stand out. First, for the red group, both the mean and median of the price-to-rent ratio in the post-reform period are less than their counterparts in the pre-reform period, which is consistent with our observation made from Figure 1. Second, for the

[9]As mentioned in the prior section, besides year-over-year growth rate of real GMP, we have explored other control variables including unemployment rate, year-over-year growth rate of number of households, and year-over-year growth rate of median household income. As those control variables turn out to be not statistically significant, we choose not to report their summary statistics here to save some space, but they are available upon request.

blue group, both the mean and median of the price-to-rent ratio in the post-reform period are greater than their counterparts in the pre-reform period, which is also consistent with our observation made from Figure 1. Finally, for both groups, both the mean and median of $RealGMP\_GrowthRate$ in the post-reform period are higher than their counterparts in the pre-reform period, which is consistent with our general impression of the US macro economy.

VII. Estimation Results

We first implement Equation (2) to estimate the differential impact of the TCJA on the price-to-rent ratio between the blue and red groups. We have explored two variants, namely, without or with control variables. The results of these two regressions are reported in Columns 1 & 2 of Table 4.

Three points can be made from Columns 1 & 2 of Table 4. First, the estimated coefficient of $\left(Blue \times PostReform\right)_{i,t}$ is, consistently, positive and statistically significant at the 1% level for both regressions, which suggests that the differential impact of the TCJA on the price-to-rent ratio between the blue and red groups is positive and statistically significant. Second, there is little difference between the estimated coefficient of $\left(Blue \times PostReform\right)_{i,t}$ from the first regression (being 1.01) and that from the second regression (being 0.99), which suggests that our regression results are insensitive to the inclusion of control variables. Finally, the estimated coefficient of $RealGMP\_GrowthRate$ is negative and statistically significant at the 1% level.

Then, we implement Equation (3) to estimate the differential impact by time. Similarly, we have explored two alternatives, namely, excluding or including control variables. The results of these two regressions are reported in Columns 3 & 4 of Table 4.

Three additional points can be made from Columns 3 & 4 of Table 4. First, by comparing the regression results reported in Columns 3 & 4 with those in Columns 1 & 2 of Table 4, it is straightforward to verify that $\eta = \left[\eta_1 + (\eta_1 + \eta_2) + (\eta_1 + \eta_3) + (\eta_1 + \eta_4)\right] / 4$. Second, η_1, η_2, η_3, and η_4 are all positive, and in addition, they are also all statistically significant except η_1. Finally, as $(\eta_1 + \eta_4) > (\eta_1 + \eta_3) > (\eta_1 + \eta_2) > \eta_1 > 0$, we reach the conclusion that the magnitude of the differential impact increases with time, which intuitively makes sense and is consistent with our prior expectation.

In summary, the results of our estimation suggest two key findings. First, the differential impact of the TCJA on the price-to-rent ratio between the blue and red groups is positive and statistically significant. Second, the magnitude of the differential impact increases with time.

VIII. Conclusion

The TCJA presents a great opportunity to study the impact of taxation on the housing market. In this paper, we identify and estimate its differential impact on the housing market, in particular, on the price-to-rent ratio between the MSAs in the blue states and those in the red states by using a difference-in-differences approach. Employing the relevant data from 2017Q1 to 2018Q4 for the top 50 MSAs to implement the analysis, we find that the differential impact is positive and statistically significant, and that its magnitude increases with time. Our findings suggest that taxation matters a lot for the housing market.

APPENDIX

Figure 1. Visual Check of the Parallel Trend Assumption

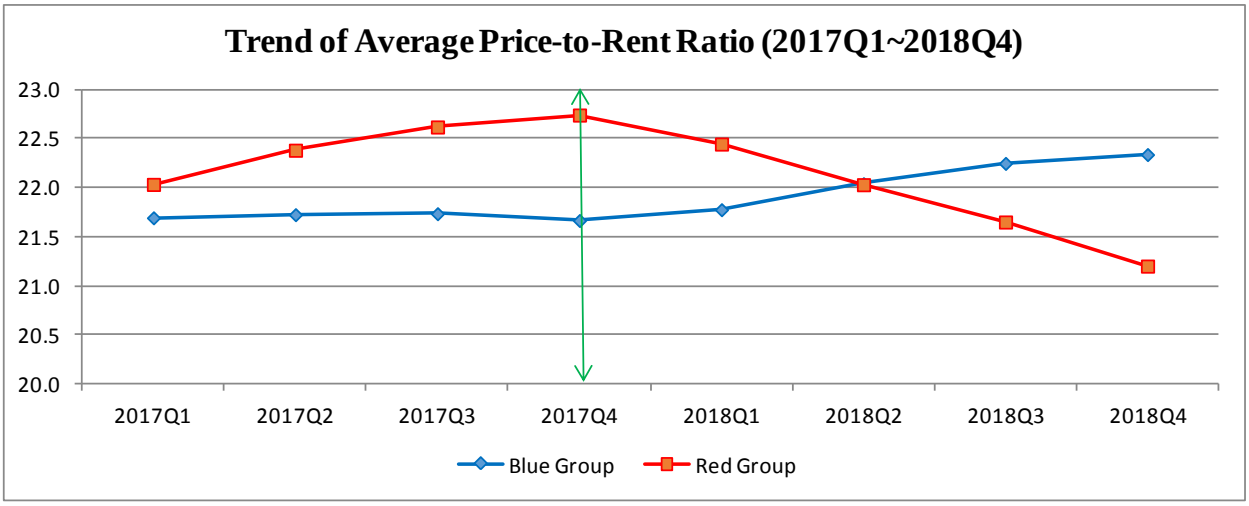

Table 1. Top 50 MSAs and Group Assignment

MSA	Blue (Benchmark)	Blue (RobustnessCheck)
Atlanta	0	0
Austin	0	0
Baltimore	1	1
Birmingham	0	0
Boston	1	1
Bridgeport	1	1
Charlotte	0	0
Chicago	1	1
Cincinnati	0	0
Cleveland	0	0
Columbus	0	0
Dallas	0	0
Denver	0	0
Detroit	1	1
Hartford	1	1
Honolulu	1	1
Houston	0	0
Indianapolis	0	0
Jacksonville	0	0
Kansas City	0	0
Las Vegas	0	0
Los Angeles	1	1
Memphis	0	0
Miami	0	0
Milwaukee	0	0
Minneapolis	1	1
Nashville	0	0
New York	1	1
Orlando	0	0
Oxnard	1	1
Philadelphia	0	0
Phoenix	0	0
Pittsburgh	0	0
Portland	1	1
Providence	1	1
Raleigh	0	0
Richmond	0	0
Riverside	1	1
Sacramento	1	1
Salt Lake City	0	0
San Antonio	0	0
San Diego	1	1
San Francisco	1	1
San Jose	1	1
Seattle	1	1
St. Louis	0	0
Tampa	0	0
Tucson	0	0
Virginia Beach	0	0
Washington	**1**	**0**

Note: Honolulu was excluded from our analysis due to missing data.

Table 2. Statistical Test of the Parallel Trend Assumption

(Dependent Variable: Price-to-Rent Ratio)

Independent Variable	Column 1
(Blue*YQ2017Q1)	0.74**
	(2.33)
(Blue*YQ2017Q2)	0.42
	(1.32)
(Blue*YQ2017Q3)	0.19
	(0.61)
(Blue*YQ2018Q1)	0.41
	(1.29)
(Blue*YQ2018Q2)	1.09***
	(3.44)
(Blue*YQ2018Q3)	1.67***
	(5.30)
(Blue*YQ2018Q4)	2.21***
	(7.00)
Number of Observations	392
R_Square	97.08%
**: statistically significant at the 5% level.	
***: statistically significant at the 1% level.	
The t-statistics are in parentheses.	
The estimated coefficients of the MSA dummies and the YQ dummies are omitted.	

Table 3. Summary Statistics of Key Variables

Variable	N	Mean	Median	Standard Deviation
Price-to-Rent (Red Group & PreReform)	120	22.45	22.24	2.95
Price-to-Rent (Red Group & PostReform)	120	21.83	21.70	3.10
Price-to-Rent (Blue Group & PreReform)	76	21.71	21.03	5.04
Price-to-Rent (Blue Group & PostReform)	76	22.1	21.68	5.71
RealGMP_GrowthRate (Red Group & PreReform)	120	0.54%	0.51%	0.53%
RealGMP_GrowthRate (Red Group & PostReform)	120	0.79%	0.80%	0.49%
RealGMP_GrowthRate (Blue Group & PreReform)	76	0.59%	0.60%	0.73%
RealGMP_GrowthRate (Blue Group & PostReform)	76	0.76%	0.80%	0.44%

Table 4. Difference-in-Differences Regression Results

(Dependent Variable: Price-to-Rent Ratio)

Independent Variable	Column 1	Column 2	Column 3	Column 4
(Blue*PostReform)	1.01***	0.99***	0.07	0.07
	(6.06)	(5.99)	(0.28)	(0.30)
(Blue*PostReform*YQ2018Q2)			0.68**	0.63**
			(2.14)	(2.01)
(Blue*PostReform*YQ2018Q3)			1.27***	1.22***
			(3.99)	(3.90)
(Blue*PostReform*YQ2018Q4)			1.81***	1.79***
			(5.69)	(5.71)
RealGMP_GrowthRate		-0.29***		-0.28***
		(-3.02)		(-3.07)
Number of Observations	392	392	392	392
R_Square	96.71%	96.80%	97.03%	97.11%
**: statistically significant at the 5% level.				
***: statistically significant at the 1% level.				
The t-statistics are in parentheses.				
The estimated coefficients of the MSA dummies and the YQ dummies are omitted.				

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