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Local Fiscal Expenditure and House Price: Theory and Evidence

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Abstract: By analyzing a modified version of static Mundell-Fleming model, I derive that local fiscal expenditure positively affects house price. Then I test the hypothesis with panel data of China seventy upper middle cities from 1998 to 2009 and obtain the supportive evidence for nexus between local fiscal expenditure and house price; 1% change in local fiscal expenditure could result in a 3% change in house price, on the other hand, I ensure the causality between the two with instrumental variable estimation, and discover that when endogenizing the local fiscal expenditure, the magnitude could double. Therefore, local governments could take their fiscal expenditure as an instrument in controlling the house price.

Keywords: Static Mundell-Fleming Model; Local Fiscal Expenditure; House Price; Instrumental Variable Estimation

1. Introduction

House price starts to pick up in the year 2001 and has risen by 94% from the year 2000(China Statistical Yearbook, 2000-2009), more remarkable are upper middle cites. And what is the role of government in this skyrocketing of house price? Up to now, there are few literature addressing such an issue, Liu(2010) analyzes the mechanism through which fiscal expenditure impact the house price by an adapted version of Tiebout(1956)'s model and discovers the positive effect of fiscal expenditure on house price. Zong, Liu and He(2010) utilize 30 provinces' panel data from 1999 to 2008 derive the similar conclusion. Scholars from China abroad mainly discuss the factors that affect house price at individual level and a large proportion rely on Hedonic model.

This paper concentrates on the nexus of fiscal expenditure and house price. In the next section, I illustrate how fiscal expenditure influences the house price with an adapted static Mundell-Fleming Model. Then, I present the data source and their processing techniques with tabulating the regression outcomes. I check the robustness of the model through proxies of the original variables, subsample investigation and ensure the correlation. After that, I employ the instrumental variable estimation to confirm the causality. The final section concludes with some policy advice.

2. Fiscal Expenditure and House Price: Theory

The only extant literature talking about house price and consumption, like Cai(2007), Wang, Xu and Xu(2008) find the wealth effect of house price positively affect the consumption in full accord. Therefore, I lie the assumption:

Assumption 1. House price enters consumption function and positively affect the consumption.

This means that $C_H(Y, H) > 0$, where Y denotes the national income, H be house price and function C indicates the consumption. Since I have endogenized the house price, I should exploit the static Mundell-Fleming Model with no capital flows, and in the context of capital in China that is not totally open, this assumption is valid.

Assumption 2. No capital inflows or outflows, i.e. $r=r^*$。

Then the model is written as:

$$\begin{cases} Y = C(Y, H) + I(R^*) + G + NX\left(E\frac{P}{P^*}\right) \\ \frac{M}{P} = L(R^*, Y) \end{cases}$$

Aside from the redefined consumption function, other properties and assumptions are identical to those of static Mundell-Fleming Model: Y is the national income, C be consumption function which increases with national income Y as well as house price H. I denotes the investment which is a decreasing function with respect to rate R^*, G indicates the government expenditure while NX is the function of net export and has the property of increasing with $E\frac{P}{P^*}$, E represents the exchange rate while P and P^* stand for domestic and foreign price level. The second equation, M denotes the monetary policy and function L decreases with R^* and increases with Y. Then

The third assumption be:

Assumption 3. Endogenous Variables are Y and H.

Take the total differential I get:

$$\begin{cases} dY = C_Y(Y, H)dY + C_H(Y, H)dH + I'(R^*)dR^* + dG \\ \quad + NX'\left(E\frac{P}{P^*}\right)\left(\frac{P}{P^*}dE + \frac{E}{P^*}dP - \frac{EP}{P^{*2}}dP^*\right) \\ \frac{dM}{P} - \frac{Mdp}{P^2} = L_{R^*}(R^*, Y)dR^* + L_Y(R^*, Y)dY \end{cases}$$

under our assumption $dR^* = dP = dP^* = dM = dE = 0$, we have:

$$\begin{pmatrix} 1 - C_Y(Y,H) & C_H(Y,H) \\ L_Y(R^*,Y) & 0 \end{pmatrix} \begin{pmatrix} dY \\ dH \end{pmatrix} = \begin{pmatrix} dG \\ 0 \end{pmatrix}$$

Using the cramer rule , we have $\frac{dH}{dG} = \frac{1}{C_Y(Y,H)} > 0$。

Hypothesis: Fiscal expenditure positively impact the house price.

3. Data and Model

3.1 The Data Source and Processing

I collect panel data of "Seventy Upper Middle Cities" (sixty nine cities genuinely) from the China Economic Internet (CEI), starting from Year 1997, while the data of house price index are obtained from China Statistical Yearbook for the corresponding years. The fiscal revenue (fisexp) is in ten thousand yuan (because ten thousand is "wan" in Chinese, which is a regular unit of China), house price index (hprice) measures the average house price while taking the former month as base 100, GDP per capita (GDPpc) is also in ten thousand yuan, actual utilized foreign investment (ActFI) in ten thousand dollars, developed area ratio (DevRatio) is a percentage and a measure of urbanization.

Moreover, for the section of robustness check, I also collect the average employee's income (W age) in ten thousand yuan. The proxies for foreign investment give raise to the number of foreign institute investment contracts (F IConNum) and contracted foreign institute investment (ConFI), and the latter in ten thousand dollars. Furthermore, as the detection of the robustness across the sample requires, I document the observations' characteristics, and the concrete depiction would be provided at the relevant section. In addition, I gather the number of doctors (DocNum) and number of teach in college (ColTea) for instrumental variable estimation.

All the nominal variables are indexed with Consumer Price Indices. Then I take logarithm form of these macroeconomic variables in order that the cities' data would be more commensurate and size effect dies down, while with exception of house price index (hprice) and developed area ratio (DevRatio).The house price index is measured by current year average price over the previous one, therefore it is already a measurement of change, while developed area ratio (DevRatio) is a percentage term and is kept its original format (See Khattry and Rao, 2002).

3.2 Data Summary

Table I lists the descriptive statistics of the variables, and it is inconspicuous that whether there is no abnormal value in this data set, thus I could proceed with the data and then detect whether the outlier does exist in the robustness check.

We should keep an eye on the correlations. lnfisexp[1] is positively related to lnActFI, DevRatioandlnP opdens, fiscal expenditure pop up the economy and foreign investment could
also increase the fiscal expenditure. Meanwhile, fiscal expenditure push the urbanization so that developed area ratio becomes larger, and foreign investment positively correlated with urbanization and population density since it can attract more people through pushing forward the urbanization. Only the correlation between lnfisexp and lnGDPpc is large, but no serious multicollinearity.

Table 1 Summary of the Data

Panel A	Variables	No.Obs	Mean	Standard Deviation	Min Max
Variables	No.Obs	Mean	Standard	Deviation	Min
hprice	564	102.94	17.00	8.99	155.2
lnfisexp	838	12.78	2.03	66.7	17.19
lnGDPpc	839	10.02	1.38	7.95	12.74
lnActFI	816	9.61	2.16	2.48	13.87
DevRatio	837	10.15	7.74	0.98	47.12
lnPopdens	839	6.92	1.05	4.99	8.6
lnConFI	682	14.2	2.28	2.48	29.75
lnFIConNum	816	4.04	1.67	0	8.37
lnWage	834	9.55	1.27	6.51	11.06
lnDocNum	836	8.43	1.35	7.42	11.01
lnColTea	759	8.16	1.63	8.99	10.95
Panel B	Correlation Matrix Baseline Model Regressors				
	lnfisexp	*lnGDPpc*	*lnActFI*	*DevRatio*	*lnPopdens*
lnfisexp	1	0.90	0.84	0.24	0.58
lnGDPpc	0.90	1	0.77	0.19	0.65
lnActFI	0.84	0.77	1	0.27	0.43
DevRatio	0.24	0.19	0.27	1	0.59
lnPopdens	0.58	0.65	0.43	0.59	1

3.3 Model Setup

GDP per capital acts as an agent for wealth, and Khattry and Rao (2002) utilize GDP per capita also as a scalar, therefore should be considered in the model. Zhang (2009) argues overthe past 10 years, China has witnessed remarkable international capital inflows. International capital favors China because of its prominent economic growth which, during the recent decade, has created far greater opportunities for business and investment. Moreover, I have to deal with the scale problem, Khattry and Rao (2002) utilize GDP per capita to control for the scale effect.

The baseline model is constructed as follows:

[1] The data have be taken logarithm would take letters "ln", like lnfisexp=log(fisexp).

$$hprice_{i,t} = \alpha_1 lnfisexp_{i,t} + \alpha_2 lnGDPpc_{i,t} + \alpha_3 lnActFI_{i,t} + \alpha_4 DevRatio_{i,t} + \alpha_5 lnPopdens_{i,t} + F_i + \varepsilon_{i,t}$$

Where α_i are coefficients (i=1,2,3,4,5), and one percent change in fiscal expenditure could result in α_1 percent change in house price index, one percent change in GDP per capita and foreign investment would bring about α_2 and α_3 percent variation in house price respectively, and one point change in developed area ratio (or ratio of urbanization) would result in α_4 percent alteration in house price. The $\mathbf{F_i}$ denotes a vector of the fixed effect which is invariant of time for these cities.

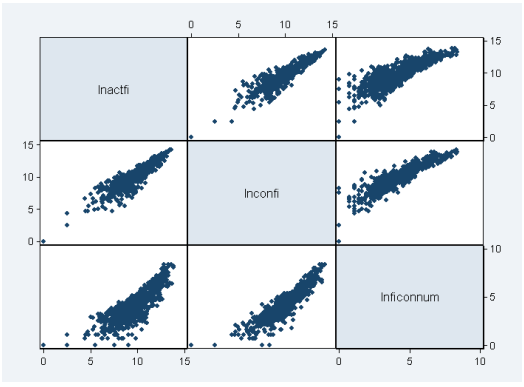
3.4 The Baseline Regression

I exploit fixed effect estimation for this panel, and standard errors are reported below the estimates in parentheses. According to the estimates, the estimates of fiscal expenditure are robust to the stepwise added controls and all of them fluctuates around 3. In other words, 1 percent change in fiscal expenditure could result in 3 percent change in house price, the magnitude is economically significant in addition to its statistical significance. Besides, the lnGDPpc would appreciate the explanatory power remarkably, and enjoy the significance at 1% level under each circumstances.

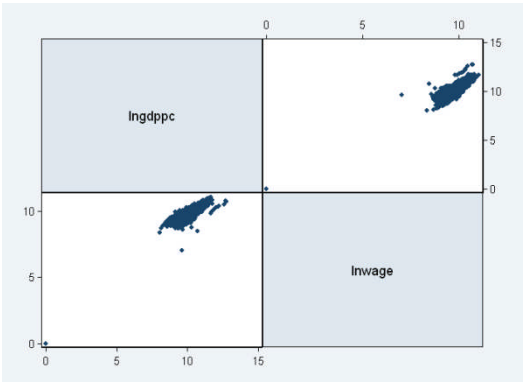
The Column (5) would be the most appropriate specification, and intuitively foreign investment (lnActF I) positively affects house since investment would boost the employment and economy, then the fiscal revenue. Other controls are instable in the model, but the negative effect of GDP per capita might stem from the conjecture that rich area have enjoyed a mature real estate market or residents have owned houses they are unwilling to pay for house a high price.

Table 2 Baseline Regression and Test for Proxies

Regressand	*hprice*							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
lnfisexp	2.52***	3.06***	3.00***	3.00***	3.15***	3.23 ***	3.05***	3.45***
	(0.44)	(0.75)	(0.77)	(0.77)	(0.79)	(0.92)	(0.79)	(.93)
lnGDPpc		-1.21	-2.30	-2.49*	-2.49*	0.77	-1.12	
		(1.35)	(1.48)	(1.45)	(1.45)	(1.90)	(.038)	
lnWage								-2.59
								(1.63)
lnConFI						0.95*		
						(0.54)		
lnFIConNum							1.12*	
							(0.60)	
lnActFI			0.97*	0.93*	0.97*			0.87
			(0.57)	(0.57)	(0.58)			(0.56)
DevRatio				0.10*	0.038	0.068	0.051	0.058
				(0.06)	(0.096)	(0.11)	(0.095)	(0.098)
lnPopdens					1.22	1.56	1.25	1.03
					(1.40)	(1.56)	(1.39)	(1.41)
Adjusted R^2	0.06	0.06	0.07	0.07	0.07	0.15	0.08	0.08
No of Obs	563	563	545	543	543	410	545	539



（a）*lnActFI* and its proxies



（b）*lnGDPpc* and its proxy

Fiure 1 Original Variables and Their Proxies

3.5 The Robustness of the Model

3.5.1 Proxies of the Control Variables

People might worry that foreign investment should be ex ante rather than ex post, or merely number of foreign contracts might count because we don't know whether the foreign investor would bring profits that are tax-due and the amount. Therefore I adopt LnFIConNum and lnConFI to proxy lnActFI. Another noteworthy issue is that it is wage rather than GDP per capita matters in terms of income tax or so, I solve the issues by checking lnWage instead of lnGDP pc.

As we could see in Figure I, foreign investment (lnActFI) keeps good linear relationship with its proxies lnFIConNum and lnConFI, consequently I could use the latter to proxy the former to check the robustness. The same goes for GDP per capita and wage. The estimates of property price are still significantly positive, and the values are 3.23, 3.05 and 3.45, which are similar to those of baseline; 1 percent change in fiscal expenditure could result in 3 percent change in house price.

For the proxied controls, we could see the estimates on them are also similar to their substituted variables, like the parameter on contracted foreign investment is 0.95 and actual utilized

one is 0.97, while the wage's coefficient estimate is -2.59 which is close to -2.49 of GDP per capita. The results back up my argument.

3.5.2 Robustness across the Sample

Even if the cities I chose are "representative", they are different to each other in quite a lot of ways. People might challenge me that the jambalaya of these cities would lose some key information, thus potential outliers might exist, since the transfer payment and other fiscal policy inclination would attract more people to these cities, and thus boost real estate market as well as property price:

(1) Whether the cities are in "Yangtze River Delta" economic zone (YRD) where the natural resources are rich.

(2) As China is more globalized, trade is thus more frequent and some cities are famous for trade and export like Wenzhou, Yantai, etc; these cities would in turn attract more residents and speculations on housing market. As a result, another group characterized by this feature might be potential outliers, or the cities that are contiguous to a trade locations like coast, denoted as "Open Cities on the Coastline" (OCC).

(3) "Special Economic Zone" (SEZ) which contains only two cities Shenzhen and Xiamen.

(4) Metropolitan cities that are directly under the central government or metropolitan city,

namely (Zhixiashi) like Beijing, Shanghai, Tianjin and Chongqing.

(5) Whether There are fifteen cities that own stronger jurisdictional power that is commensurate with quasi-province, we denote them as Fushengji.

As is demonstrated in Table 3, the presence of lnfisexp still signifies at 1% level and resembles the estimates in baseline in magnitude; 1 percent change in fiscal expenditure could result in 3 percent change in house price.

Moreover, the sample which drops observations of Zhixiashi and YRD get smaller estimates, which means that these cities' fiscal expenditure effect is stronger than other cities; Zhixiashi enjoy better transfer from central government and enlarge their expenditure effect while YRD cites could amplify the effect

The controls only deviate a little from the baseline.

Table 3 Regression Results from Subsamples

Regressand			*hprice*		
Group	*Non-YRD*	*Non-OCC*	*Non-SEZ*	*Non-Zhixiashi*	*Non-Fushengji*
lnfisexp	2.72***	3.36***	3.21***	2.65***	3.61***
	(0.81)	(0.82)	(0.82)	(0.85)	(0.98)
lnGDPpc	1.80	-2.83*	-2.53*	-2.55*	-4.25**
	(1.50)	(1.55)	(1.54)	(1.57)	(1.87)
lnActFI	0.88	1.02*	1.00*	1.29*	1.38*
	(0.59)	(0.59)	(0.59)	(0.68)	(0.73)
DevRatio	0.11	0.061	0.0087	0.069	0.0021
	(0.098)	(0.099)	(0.11)	(0.099)	(0.14)
lnPopdens	0.70	2.67*	1.66	0.53	2.07
	(1.48)	(1.49)	(1.56)	(1.49)	(1.78)
adjustedR^2	0.08	0.08	0.07	0.06	0.07
No. of Obs	490	441	519	495	365

4. Endogeneity Issue

For simplicity, I take government expenditure as exogenous previously, yet people might cast doubt on this assumption and challenge the causality. Although articles regarding fiscal expenditure as exogenous are not in abundant. Yang(2012) endogenizes the items of fiscal expenditure with different elasticities into the production function and constructs the model of fiscal expenditure structure that forges optimal economic growth, he then discovers that expenditures on economic construction pull the economy to greatest extent, public service serves

the second while social expenditure takes the last place. I have to be prudent in facing the problem and assume further that government expenditure is endogenous.

Therefore, I investigate further with Instrumental Variable by fixed effect model under the rectified assumption that “House price is endogenous", and deal with causality issue.

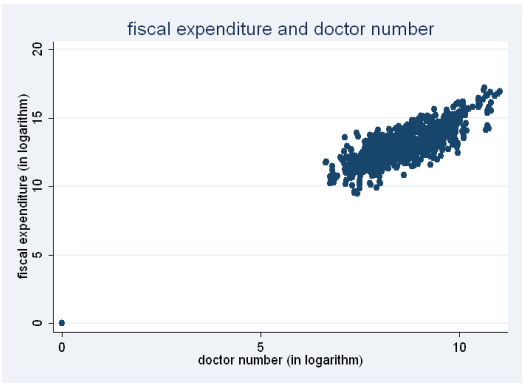
4.1 The Instrumental Variables: Evidence from Theory

Murray (2006) provides nine good strategies for check the validity of Instrumental Variable based on classical arguments and recent studies. In the light of his talented interpretation, I choose contemporary doctors number (take logarithm, lnDocNum) and number of college teachers (take logarithm, lnColTea) as the instruments.

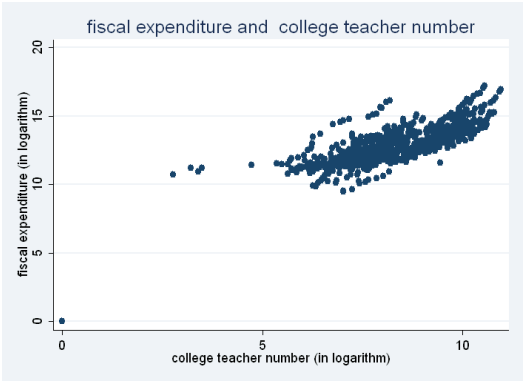
We know the two professions in China enjoy some welfare on house, and most of them are free from anxiety of house price rise since they can own houses from their hospitals of colleges. Moreover, other disturbances are not necessarily related to the two variables since their decision of staying or leaving are affected by the situations of previous years; the two professions are “rigid” and predetermined, these properties could ensure their exogeneity.

On the other hand, science, education, culture and health are the four sectors that government expenditure is compulsory to distribute on, therefore the correlation between endogenous fiscal expenditure and its two instruments exist.

It is not hard to find the relationship between property price and its instruments from the figure.



（a）*lnfisexp* and *lnDocNum*



（b）*lnfisexp* and *lnColTea*

Fiugre 2 *lnfisrev* and its Instruments

Table 4 Instrumental Variable Validity and Regression

列	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Regressand	*lnPopdens*		*hprice*		*hprice*		*hprice*
Instruments			*lnDocNum*	*lnColTea*	*lnArea*	*LagHI*	Both
lnfisexp			7.65***	6.80**	6.59**	7.29**	5.92**
			(0.83)	(3.06)	(3.14)	(3.29)	(2.96)
lnDocNum	0.040			1.78			
	(0.037)			(2.09)			
lnColTea		0.099	2.65				
		(0.12)	(3.07)				
lnGDPpc	-0.14***	-0.11***	0.97	-7.24*	-7.02*	-8.64*	-6.65
	(0.025)	(0.29)	(8.53)	(4.25)	(4.31)	(4.94)	(4.46)
lnActFI	-0.12	-0.013	0.85	0.92*	1.26**	1.37**	1.26**
	(0.12)	(0.011)	(0.54)	(0.055)	(0.59)	(0.62)	(0.060)
DevRatio	0.055***	0.053***	-0.0083	-0.065	-0.022	-0.022	-0.019
	(0.0017)	(0.0019)	(0.13)	(0.12)	(0.11)	(0.12)	(0.12)
lnPopdens			-0.89	1.49	2.46	1.28	0.76
			(3.13)	(2.19)	(1.81)	(2.18)	(2.09)
adjustedR^2	0.63	0.58	0.05	0.03	0.04	0.10	0.2079
No. of Obs	812	737	474	474	542	475	475

4.2 The Validity of the Instruments

4.2.1 The Way Instruments Affect Fiscal Revenue

People might worry that the instruments I choose don't impact the fiscal expenditure, rather they affect the population density, since good education and public health could attract more residents. I detect the concern through the following equations to whether this argument holds:

$$\ln Popdens_{i,t} = \alpha_1 \ln docnum_{i,t} + \alpha_2 \ln GDPpc_{i,t} + \alpha_3 \ln ActFI_{i,t} + \alpha_4 DevRatio_{i,t} + F_i + \varepsilon_{i,t}$$

$$lnPopdens_{i,t} = \beta_1 lncoltea_{i,t} + \beta_2 lnGDPpc_{i,t} + \beta_3 lnActFI_{i,t} + \beta_4 DevRatio_{i,t} + F_i + \varepsilon_{i,t}$$

We could see Column (1) and (2) in Table 4 that the parameters of instruments I picked aren't significant; the instruments wouldn't affect house price through population density, meaning that the worry doesn't sound.

4.2.2 Test Over-identifying Restrictions

Failing to reject the null hypothesis that the remaining potential instrument has zero coefficients in the second stage of two-stage least squares when included in one as explanatory variables would support the validity of those extra variables as instruments (Murray, 2006), as what happens in this data set; the Column (3) and (4) in Table IV. When take lnDocNum as instrument, the presence of lnColTea is insignificant (p-value 0.14), and vice versa (p-value 0.20).

4.2.3 The Comparison of the Two Instruments

Using the instruments, I derive two similar results; by lnDocNum I get estimate as 6.59, significant at 5\% level while by lnColTea I obtain the estimate of lnfisexp as 7.29, signifies at 5\%. People may say that the parameter estimates using different instruments differ and cast doubt on the validity of the instruments, here under the common assumption that the standard errors are independent distributed normal, I construct the t statistic to check whether the difference is significant different from 0.

H_0 : The difference of the two estimates is 0

H_1 : Otherwise.

$$t = \frac{\alpha_2^{lnDocNum} - \alpha_2^{lnColTea}}{\sqrt{\overline{se}^2_{lnDocNum} + \overline{se}^2_{lnColTea}}} \approx t(df_{lnDocNum} + df_{lnColTea})$$

where the $df_{lnDocNum}$ and $df_{lnColTea}$ are degrees of freedom within each instrumental estimation. Then plug in the number, I derive that the p-value is 0.56; lnDocNum and both is 0.44 for p-value while lnColTea and both is 0.38. Hence we fail to reject the null hypothesis even at 10% significance level, and the difference is not significant different from 0.

4.2.4 Reduced Form Check for Two Instruments

I validate the Instruments by checking their reduced forms. According to Murray (2006), the reduced form would be:

$$lnfisexp_{i,t} = \alpha_1 lnDocNum_{i,t} + \alpha_2 lnGDPpc_{i,t} + \alpha_3 lnActFI_{i,t} + \alpha_4 DevRatio_{i,t} + \alpha_5 lnPopdens + F_i + \epsilon_{i,t}$$

$$lnprice_{i,t} = \beta_1 lnDocNum_{i,t} + \beta_2 lnGDPpc_{i,t} + \beta_3 lnActFI_{i,t} + \beta_4 DevRatio_{i,t} + \beta_5 lnPopdens + F_i + \epsilon_{i,t}$$

$$lnfisexp_{i,t} = \gamma_1 lnColTea_{i,t} + \gamma_2 lnGDPpc_{i,t} + \gamma_3 lnActFI_{i,t} + \gamma_4 DevRatio_{i,t} + \gamma_5 lnPopdens + F_i + \epsilon_{i,t}$$

$$lnprice_{i,t} = \delta_1 lnColtea_{i,t} + \delta_2 lnGDPpc_{i,t} + \delta_3 lnActFI_{i,t} + \delta_4 DevRatio_{i,t} + \delta_5 lnPopdens + F_i + \epsilon_{i,t}$$

$$lnfisexp_{i,t} = \theta_1 lnDocNum_{i,t} + \theta_2 lnColtea_{i,t} + \theta_3 lnGDPpc_{i,t} + \theta_4 lnActFI_{i,t} + \theta_5 DevRatio_{i,t} + \theta_6 lnPopdens + F_i + \epsilon_{i,t}$$

$$lnprice_{i,t} = \theta_1 lnDocNum_{i,t} + \theta_2 lnColtea_{i,t} + \theta_3 lnGDPpc_{i,t} + \theta_4 lnActFI_{i,t} + \theta_5 DevRatio_{i,t} + \theta_6 lnPopdens + F_i + \epsilon_{i,t}$$

The significant presence of instruments for the instrumented variable lnfisexp could help to chase the cloud of invalidity away. The lnDocNum is always significant at 1% while that of lnColTea is deprived only by its counterpart lnDocNum and reverse does not hold. The signs are what I expected.

Table 5 Reduced Form Check

Instrument(s)	*lnDocNum*		*lnColTea*		*lnDocNum* 和 *lnColTea*	
Regressand	*lnfisexp*	*hprice*	*lnfisexp*	*hprice*	*lnfisexp*	*hprice*
lnDocNum	0.52***	3.89**			0.33***	0.19
	(0.068)	(1.84)			(0.052)	(1.78)
lnColTea			0.34***	2.34**	0.32***	2.35**
			(0.033)	(1.02)	(0.032)	(1.05)
lnGDPpc	1.20***	0.99	0.98***	0.059	0.94***	0.081
	(0.042)	(1.13)	(0.043)	(1.37)	(0.042)	(1.39)
lnActFI	0.096***	0.92	0.068***	0.86	0.069***	0.86
	(0.021)	(0.59)	(0.16)	(0.54)	(0.015)	(0.54)
DevRatio	0.014***	0.090	0.0041	-0.013	0.0034	-0.015
	(0.0044)	(0.096)	(0.0041)	(0.12)	(0.0040)	(0.12)
lnPopdens	-0.26***	0.50	0.26	-0.60	-0.19***	-0.63
	(0.062)	(1.40)	(0.057)	(1.75)	(0.057)	(1.77)
adjustedR^2	0.77	0.05	0.85	0.06	0.86	0.06
No. of Obs	811	542	736	475	736	475

4.3 The Strength of the Instruments

The previous part have demonstrated that the correlation of lnfisexp and its instruments, someone might still challenge that the parameter of determination R^2s of these regressions that take lnfisexp as explained variable while take the instrument(s) as explanatory variables are not so big, say over 0.90, the instruments are weak.

Let $\hat{\alpha}_1^{2SLS}$ be the estimate of lnfisexp's coefficient, let $\tilde{R}^2$refer to the parameter of determination in the regression of lnfisexp on its instrument(s); in other words, $\tilde{R}^2$ measures the strength of the correlation between the instrumental variable(s) and the troublesome variable lnfisexp. In this simple case, according to Murray(2006), the finite-sample bias of two-stage least squares for the over-identified situation in which the number of instrumental variables exceeds the number of troublesome variables is, to a second-order approximation:

$$E\left(\hat{\alpha}_1^{2SLS}\right) - \alpha_1 = \frac{l\rho(1-\tilde{R}^2)}{n\tilde{R}^2}$$

Decompose the equation, the left-hand side expresses the bias of the two-stage least squares coefficient, while the numerator of the right-hand side shows that the extent of the bias rises with three factors which are the number of instruments used (l), the extent to which the troublesome explanatory variable was correlated with the error term in the original ordinary least squares regression (ρ, in this case it captures the extent of the bias in the original ordinary least squares regression which could be positive or negative, and determines the direction of two-stage least squares' bias), and (1-$\tilde{R}^2$) which will be enlarged when the instrumental variables are weak. The denominator of the right-hand-side expression shows that the bias falls as the sample size n increases.

Then I plug the numerical values into the equation and derive the bias. Refer to the empirical numbers I derived, it is easy to discover the bias for this situation is $7.04*10^5$, the bias is minor.

People may still worry about the strongness of the instruments in that although the bias is close to one standard error in magnitude and relatively small, maybe the fixed effect estimation without instruments would derive an even smaller bias. Therefore, I carry the alternative way of comparison according to Murray(2006):

$$\frac{\text{Bias}\left(\hat{\alpha}_1^{2SLS}\right)}{\text{Bias}\left(\hat{\alpha}_1^{non-2SLS}\right)} \approx \frac{l}{n\tilde{R}^2}$$

Therefore, we could find that the bias of two stage least squares would be 0.0033 or one three-hundredth of that without instruments when we plug in the estimated values, the bias from estimating with instruments is comparative minor to that without them.

4.4 The Instrumental Variable Estimation

From the last three columns of Table IV, we could derive the instrumental variable estimation results. The instrumental variable estimation unanimously agree the significant presence of lnfisexp, and the estimate is around 6. Since fiscal expenditure is in logarithm term while property price is in level term as the latter has already been an index (the measure of increase in house price). Then 1 point change in fiscal expenditure would bring about 0.06 or 6% change in house price, the magnitude is noteworthy, and doubles the effect of assuming exogenous fiscal expenditure.

Foreign investment still positively affect the house price and signifies at 10% level and other controls are still unstable.

5. Conclusion and Policy Considerations

I adapt the static Mundell-Fleming Model with comparative static analysis and figure out that fiscal expenditure could positively affect the house price. I test the theory with panel data of 70

upper middle cities in China from 1998 to 2009 and verifies the positive correlation between fiscal expenditure and house price; fiscal expenditure rises by 1% could generate a 3% rise in house price, the robustness check ensure the relationship. To confirm the causality, I exploit the instrument variable estimation while discover that when endogenizing the fiscal expenditure, the fiscal expenditure's effect on house price doubles.

The pitfalls of this paper are the oversimplified model and no deep discussion on the mechanism of fiscal expenditure on house price like how it happens that when assuming fiscal expenditure as endogenous the effect doubles. These are the furture direction of this paper.

Although the paper suffers from some flaws, the conclusion is still meaningful. Central government is determined to control the house price, and they resort to purchase limit policy, while this paper proposes another approach in dealing with the problem; the restrictions on the local governments' fiscal expenditure.

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Appendix

Table Cities

Beijng	Chongqing	Shanghai	Tianjin	Shenyang	Changchun	Dalian
Harbin	Nanjing	Hangzhou	Ningbo	Xiamen	Jinan	Qingdao
Wuhan	Guangzhou	Shenzhen	Chengdu	Xi’an	Bengbu	Tangshan
Qinhuangdao	Taiyuan	Huhhot	Baotou	Dandong	Jinzhou	Jilin
Mudanjiang	Wuxi	Xuzhou	Yangzhou	Jinhhua	Wenzhou	Hefei
Shijiazhuang	Anqing	Fuzhou	Quanzhou	Nanchang	Jiujiang	Ganzhou
Pingdingshan	Zhengzhou	Jining	Luoyang	Yantai	Xiangfan	Yichang
Changsha	Yueyang	Changde	Shaoguan	Zhanjiang	Huizhou	Beihai
Guilin	Nanning	Haikou	Sanya	Zunyi	Nanchong	Luzhou
Guiyang	Kunming	Dali	Lanzhou	Xining	Yinchuan	Urumqi

For Those Excluded

RD	Shanghai	Nanjing	Wuxi	Yangzhou	Hangzhou	Ningbo
Fushengji	Shenyang	Ningbo	Dalian	Harbin	Nanjing	Hangzhou
Changchun	Xiamen	Jinan	Qingdao	Guangzhou	Wuhan	
Shenzhen	Chengdu	Xi'an				
SEZ	Shenzhen	Xiamen				
Zhixiashi	Beijing	Shanghai	Tianjin	Chongqing		
OCC	Qinhuangdao	Tanjing	Dalian	Shanghai	Ningbo	Wenzhou
Fuzhou	Qingdao	Yantai	Guangzhou	Zhanjiang	Beihai	

Dali 's data are unavailable. They and the posted sixty-nine cities are the “ Seventy Upper Middle Cities" in China.