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THE RELATIONSHIP BETWEEN HOUSING INVESTMENT AND ECONOMIC GROWTH IN CHINA:
A PANEL ANALYSIS USING QUARTERLY PROVINCIAL DATA

JIE CHEN AND AIYONG ZHU

The relationship between housing investment and economic growth in China : A panel analysis using quarterly provincial data

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Abstract: In this paper we investigate the long-run and short-run relationship between housing investment and economic growth in China using the quarterly province-level panel data for the period 1999 q1 to 2007 q4. Recently developed econometric techniques for panel unit root testing and heterogeneous panel cointegration analysis are employed. The empirical results provide clear support of a stable long-run relationship between housing investment, non-housing investment and GDP in China. We then estimate the long-run elasticity of GDP with respect to housing investment for the whole country as well as three sub regions. The variations across regions are detected and reasons for this fact are discussed. Based on the panel ECM, we show that there is bidirectional Granger causality between housing investment and GDP in both short run and long run for the whole country, while the impacts of housing investment on GDP behave strikingly differently in the three sub-regions of China.

Keywords: Housing investment; Economic growth; Panel cointegration; Granger causality;

JEL codes: E22, L74, R31

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The relationship between housing investment and economic growth in China : A panel analysis using quarterly provincial data

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1. Introduction

The relationship between housing investment and economic growth has long been a popular issue of debate in the literature of economic development. Should a less-developed country encourage housing improvement as a part of economic development strategy? Or massive-scale housing improvement is just a necessary outcome of economic growth? Are there any extra returns of investments in housing compared with non-housing investment in the process of economic growth? Even after five decades of discussion and analysis, no conclusive answers to these questions have been reached yet.

In the early post-war decades, most researchers viewed housing investment as a social expenditure and a drag on economic growth (Weissman, 1955; Harris and Gillies, 1963). In the early development state of developing countries, including China, South Korea and many others, governments typically viewed housing as an industry producing lower returns compared with manufacturing and infrastructure industries, and hence discouraged investments in housing (Shen and Liu, 2004; Kim, 2004). For many policy-makers as well as economists, housing improvement was thought as a by-product of economic growth and hence it could be postponed until the late stages of social development.

Only since the 1970s, housing investment has increasingly been considered as a contributor to economic growth, not only because home building business has been found as major economic activity with large multiplier effects but also improvement in housing becomes widely believed to be associated with many external social and economic benefits. Studies on the role of housing in economic development include

Turin (1969, 1973), Burns and Grebler (1977), Wells (1985, 1986), Phang (2001), Ofori and Sheng (2003), Leung (2004), Arku and Harris (2005). These studies examined topics like the employment and income effects, household savings effects, labor productivity effect, health influence and growth effects of housing investment. In short, as Harris and Arku (2006) suggested, the housing investment may affect economic development through its impact on employment, savings, total investment, and labor productivity.

However, recent discussions about the relationship between housing investment and economic growth are still filled with disagreement about the direction of relationship between each other: whether change of housing investment is a leading indicator or a follow-up of fluctuations in economic growth? Empirical studies of this issue include Turin (1978), Drewer (1980), Green (1997), Coulson and Kim (2000), Chang and Nieh (2004), Kim (2004), Wigren and Wilhemsson (2007). While each of them may provide a partial answer to the question, their empirical results contradict each other.

Hence, two questions will be addressed in our paper. First, we will analyze whether there is a stable relationship between housing investment and economic growth in China in the long run. Second, we investigate the Granger causality between housing investment and economic growth to check whether housing investment is growth-leading or growth-following. In the literature, there are a few previous similar works on both issues, for example, Ofori and Han (2003), Zheng (2003), and Shen and Liu(2004). But our study is the first one to employ panel data and our econometric techniques are also up-to-date; thus this paper produce relatively robust answers to the questions.

The rest of the paper is organized as follows. Section 2 reviews the relevant literature and in section 3 we describe the methodology, providing a brief discussion of the panel cointegration procedure. Section 4 describes the data and empirical results are presented in section 5. Section 6 concludes and summarizes the paper.

2 Literature review

Turin (1969, 1973) hypothesized a relationship between construction activity³ and economic development. After analyzing data on all significant countries for period 1955-1965, he concluded that developed countries typically have stronger construction industries which contributed 5-8% to GDP, while in less developed countries the proportion is around 3-5% of GDP. On the basis of cross sectional data for 87 countries, Turin (1978) found that construction industry can play a central role in development strategy of many less-industrialized countries by creating durable and productive employment at relatively low levels of capital intensity. However, Drewer (1980) criticized Turin's analysis on a number of grounds—the reliability of the data, the limitations of the coverage and the methods of analysis employed. He showed that, while some components of construction industry may stimulate economic growth, some others are just consequences of economic growth. Wells (1985, 1986) suggested that, as a nation's GDP increases, the proportion of construction industry in GDP will increase, and changes of this ratio would be faster when the country passes through the middle-income range.

Interestingly, Burns and Grebler (1977) hypothesized that the ratio of housing investment to GDP is linked to the stage of economic development in an inverted U-shape manner: the ratio first rises with the increase of GDP per capita when the economy is taking off but reaches a peak when the economy enters the middle-income period and then tends to decline when the economy becomes mature. World Bank (1993, p102) provided supports for this hypothesis with cross-country data in the post-war period. The found that the ratio of housing investment in GDP tend to be very low, around 2-4%, when GDP per capita is below 1000 US dollar but quickly rise to 8% when GDP per capita falls the range between 1000-5000 dollar, and slowly drops and keeps at a stable level when GDP per capita reaches a higher level.

In addition, Pozdena (1988), Quigley (2001), Davis and Heathcote (2005)

³ Construction is generally referred to the activity of developing physical infrastructure, superstructure and related facilities of buildings, thus includes housing investment but not restricted to it.

studied the role of housing investment fluctuation in business cycle. In a recent noticeable paper titled as “Housing is the business cycle”, Leamer (2007) argued that, within the key components of GDP, residential investment offers by far the best early warning sign of an oncoming recession, and changes in housing starts is “the best forward-looking indicator of the cycle”.

Recent empirical studies of the relationship between housing investment and economic growth are almost entirely approached by the Granger-causality identification. Admittedly, Granger-causality in principle concerns only the predictability between time series variables and does not guarantee true causality relationship among the variables; however, a clear understanding of the Granger-causality between housing investment and economic growth is fairly useful for the business forecast as well as policy-making. Richard Green (1997), based on the quarterly data between 1959 and 1992 in the US, argued that only residential investment can Granger cause GDP, while non-residential investments are Granger caused by GDP- that is, housing leads and other types of investment lag the business cycle. Coulson and Kim (2000) confirmed Green’s result that residential investment Granger causes consumption expenditure and the impacts of residential investment on GDP are far more pronounced than that of non-residential investments. However, they also found that, in US, non-residential investments crowd out residential investments and the cointegrating relationship between residential investments and GDP does not exist. Chang and Nieh (2004) applied the multivariate ECM for Taiwan over the 1979q1-1999q4 period and also found a unidirectional causality running from construction activity to economic growth (both short and long run).

However, Kim (2004), using quarterly data over 1970-2002 period, found that the relationship between residential investment and GDP in Korean is totally different from those reported by Green (1997). His result suggested that housing is not a driver of GDP but a follower of fluctuations of the Korean economy, while non-residential investment is found to be both a driver and a follower of macroeconomic fluctuations. Nonetheless, Wigren and Wilhelmsson (2007), employing the data from 14 Western

Europe countries, reached the conclusion that GDP Granger causes total construction in the short run, but not vice versa, and public infrastructure policies have an effect on the short-run economic growth but only a weak effect in the long run. Furthermore, housing construction does have a long-run effect on GDP growth.

Since Chinese economy is experiencing fast growth and housing industry is said to be able to promote the demand of a long list of its upstream and downstream industries, the importance of housing investment to economic growth is especially warmly discussed in China. According to the estimates of Chinese Statistics Bureau in the year 2000, every 100 ¥ increase of the investment in housing industry is expected to eventually lead to increase 315 ¥ more gross production in the economy (China Statistical Bureau, 2005). In the international literature, Ofori and Han (2003) examined the relationship between construction activity and economic development at the provincial level of China during the period 1990-2000, and show that construction industry has acted as both a stimulus of economic growth and a cause of problems in China. In the Chinese literature, Zheng (2003) found that domestic housing investment has significant short-run impacts on GDP and a cointegrating relationship between housing investment and GDP does exist. Li, Zhang and Chen (2005) concluded that per 1% increase in housing investment will cause 0.16% increase in Chinese GDP. However, Shen and Liu (2004) show that GDP Granger causes housing investment, but not vice versa.

The above mentioned studies of the relationship between housing investment and economic growth in China are largely based on quite short length of time series data. Meanwhile, the existing empirical studies are all conducted on national level data, where aggregation bias could be a big problem. Another big problem of these empirical studies is the possible endogeneity which stems from the pro-cyclical nature of housing investment. The productivity shock or other unobserved factors could cause the co-movements in GDP and housing investment. In order to overcome these limitations, our paper differs from previous works by applying the newly-developed heterogeneous panel cointegration technique to re-examine the relationship between

housing investment, non-housing investment and economic growth using the panel data of 30 Chinese provinces for the period 1997q1 to 2007q4. The use of panel data cointegration test provides much more powerful examination of the cointegration relationship between housing investment and economic growth. In order to control the effect of the endogeneity, we use the fully-modified least squares (FMOLS hereafter, Philips 1995) technique to estimate the coefficient for heterogeneous panels, which corrects the standard OLS for the bias by endogeneity and serial correlation effects in the regressors.

3. Methodology

The cointegration analysis of panel data consist three steps: First, we test for a panel unit root for each variable. Three statistics, one is the Levin-Lin-Chu (LLC) statistics for homogeneous panel and two are the statistics (the Im-Pesaran-Skin (IPS) and the Hadri LM statistics) for heterogeneous panel, are employed; Second, we test for cointegration relationship among the panel data with the test developed by Pedroni (2000, 2004), which allows for different individual effect and cross-sectional interdependency. Third, the long-run relationship is estimated by using FMOLS technique for the panel.

3.1 The panel unit root tests

Investigations into the unit root in the panel data have recently attracted a lot of attention. Levin, Lin and Chu (2002) propose a panel-based ADF test that restricts parameters δ_i by keeping them identical across cross-sectional individuals as follows:

$$\Delta y_{it} = \alpha_i + \delta_i y_{it-1} + \sum_{j=1}^k \alpha_j \Delta y_{it-j} + e_{it} \quad (1)$$

where $t=1, \dots, T$ time periods and $i=1, \dots, N$ members of the panel. LLC tests the null hypothesis of $\delta_i = \delta = 0$ for all i , against the alternative of $\delta_1 = \delta_2 = \dots = \delta < 0$ for all i , with the test based on the statistics $t_\delta = \hat{\delta} / se(\hat{\delta})$.

One drawback is that δ_i is restricted by being kept identical across individuals under both the null and alternative hypothesis. For the above reason, Im, Pesaran and Skin (1997) relax the assumption of the identical first-order autoregressive coefficients of LLC test and allow δ_i to vary across individuals under the alternative hypothesis. The IPS test the null hypothesis of $\delta_i = 0$ for all i , against the alternative of $\delta_i < 0$ for all i . Meanwhile, the IPS test is based on the mean-group approach, which uses the average of the t_{δ_i} statistics to perform the following \tilde{z} statistics:

$$\tilde{z} = \sqrt{N} (\tilde{t} - E(\tilde{t})) / \sqrt{Var(\tilde{t})} \quad (2)$$

where $\tilde{t} = (1/N) \sum_{i=1}^N t_{\delta_i}$, the term $E(\tilde{t})$ and $Var(\tilde{t})$ are, respectively, the mean and variance of each t_{δ_i} statistic and the \tilde{z} converges to a standard normal distribution. Based on Monte Carlo experiment results, IPS illustrate that their test has more favorable finite sample properties than LLC test.

Hadri (2000) argued that the null should be reversed to be the stationary hypothesis in order to have a stronger power test. Hadri's (2000) Lagrange multiplier (LM) statistic can be written as

$$LM = \frac{1}{N} \sum_{i=1}^N \left(\frac{\frac{1}{T^2} \sum_{t=1}^T S_{it}^2}{\hat{\sigma}_\varepsilon^2} \right) \quad (3)$$

where $S_{it} = \sum_{j=1}^t \hat{\varepsilon}_{ij}$, and $\hat{\sigma}_\varepsilon^2$ is the consistent Newly and West (1987) estimate of the long-run variance of the disturbance terms.

3.2 The panel cointegration tests

Pedroni (2000, 2004) consider the following cointegrated system for a panel of $i=1, \dots, N$ members,

$$y_{it} = \alpha_{it} + \delta_i t + \beta_i x_{it} + \varepsilon_{it} \quad (4)$$

Where y_{it} and x_{it} are the observable variable with dimension of $(N \times T) \times 1$ and $(N \times T) \times m$, respectively. Both of them are assumed to be integrated of order one. For each member i of the panel under null of no cointegration, the residual ε_{it} will also be $I(1)$. The parameters α_{it} and δ_i allow for the possibility of member-specific fixed effects and deterministic trends, respectively. The slope coefficients β_i are also permitted to vary by individuals.

Pedroni (2000, 2004) developed asymptotic and finite sample properties of testing statistics to examine the null hypothesis of non-cointegration in the panel. Two types of tests are suggested. The first type is based on the within-dimension approach, which includes four statistics: panel ν -statistic, panel ρ -statistic, panel PP-statistic, and panel ADF-statistic. These statistics pool the autoregressive coefficients across different individuals for the unit root tests on the estimated residuals. The second type is based on the between-dimension approach, which includes three statistics: group ρ -statistic, and group PP-statistic, and group ADF-statistic. These statistics are based on the estimators that simply average the individually estimated coefficients for each member. The details of these statistics are properly defined in Pedroni (2000, 2004) with the appropriate lag length determined by the Newey-West method.

In this paper, defining HI for an appropriate proxy of housing investment and NHI for non-housing investment, we will run the following regression for testing cointegration in the panel data:

$$\ln GDP_{it} = \alpha_i + \beta_i \ln HI_{it} + \delta_i \ln NHI_{it} + \varepsilon_{it} \quad (5)$$

Where it allows for cointegrating vectors of different magnitudes between provinces, as well as individual (α_i) fixed effects. Here we follow Pedroni (2000) to not include the deterministic trends.

3.3 Short-run and long-run Granger-causality tests

The term of Granger-causality, proposed by Granger(1969), is not a true causality

concept but a statistical tool which in principle concerns only the predictability between time-series variables. It could be understood as following: X is said to “Granger cause” Y if and only if Y is better predicted by using the past values of X than by not doing so. Although not a real causality identification, Granger-causality analysis is widely applied in business forecast and policy-modeling.

Granger (1988) pointed out that if there is a cointegrating vector among variables, there must be at least one unidirectional Granger-causality among these variables. In addition, when the series are $I(1)$ but cointegrated, the Granger causality test should not be applied in the common VAR specification but must be carried out in the framework of ECM(Error Correction Model) as following (Engle and Granger, 1997):

$$\Delta \ln GDP_{it} = \alpha_{1i} + \lambda_1 ECT_{it-1} + \sum_k \eta_{11k} \Delta \ln GDP_{it-k} + \sum_k \eta_{12k} \Delta \ln HI_{it-k} + \sum_k \eta_{13k} \Delta \ln NHI_{it-k} + \mu_{1it} \quad (6)$$

$$\Delta \ln HI_{it} = \alpha_{2i} + \lambda_2 ECT_{it-1} + \sum_k \eta_{21k} \Delta \ln HI_{it-k} + \sum_k \eta_{22k} \Delta \ln GDP_{it-k} + \sum_k \eta_{23k} \Delta \ln NHI_{it-k} + \mu_{2it} \quad (7)$$

$$\Delta \ln NHI_{it} = \alpha_{3i} + \lambda_3 ECT_{it-1} + \sum_k \eta_{31k} \Delta \ln NHI_{it-k} + \sum_k \eta_{32k} \Delta \ln GDP_{it-k} + \sum_k \eta_{33k} \Delta \ln HI_{it-k} + \mu_{3it} \quad (8)$$

where Δ denotes first difference ; k is the lag length optimally chosen; and ECT is the error-correction term derived from the long-run cointegrating relationship.

Different from ordinary Granger-causality tests that applied in VAR specification, the ECM above enables us to distinguish between short-run and long-run Granger-causality and also provides weak exogeneity test of the dependent variable in each equation. Since the coefficients of lagged first-differenced terms capture the short-run dynamics of the system, testing the sum significance of each explanatory variable conditional on the optimum lags in each equation, we can evaluate the short-run Granger-causality in each equation (Toda and Phillips, 1994). More exactly, we will apply the joint Wald F -test on $H_0 : \eta_{12k} = 0$ or $H_0 : \eta_{13k} = 0$ for all k in equation (6), $H_0 : \eta_{22k} = 0$ or $H_0 : \eta_{23k} = 0$ for all k in equation (7) and $H_0 : \eta_{32k} = 0$ or $H_0 : \eta_{33k} = 0$ for all k in equation (8). Meanwhile, since the ECT captures the deviation from long-run equilibrium between cointegrated variables, the

t -statistics for the coefficients of the lagged ECT in each equation will give an indication of whether the dependent variable in each equation respond to deviation in long-run equilibrium in period $t-1$. This will imply the existence or not of a long-run Granger-causality in each equation (Toda and Phillips, 1994). The coefficient on the lagged error-correction term has very useful implications. It will suggest at what speed the correction of deviation is made, or equally, how rapid the convergence to equilibrium is, once the system is shocked.

Finally, as suggested by a number of recent works (for example, Asafu-Adjaye, 2000), we implement the joint Wald F -test for hypotheses for the interactive terms between ECT term and explanatory variables. If, for example, λ_1 and both η_{12} and η_{13} for all k are insignificant in the GDP equation, we can say that both housing and non-housing investment do not Granger-cause GDP in the long run. Meanwhile, it will also imply that GDP is weakly exogenous to both housing and non-housing investment. This joint test is also aimed to indicate which variable plays the short-run correction when the long-run equilibrium of the system is disturbed by a shock (Asafu-Adjaye, 2000).

4 Data

Mainland China has 31 province-level regions. The data covers 30 provinces for the first quarter of 1999 to the fourth quarter of 2007 (36 periods). Tibet is excluded for missing too much data. The reason of choosing 1999 as the starting point of our study is mainly because urban housing was a welfare good that allocated by governments and working units in China before 1998 and the complete market-oriented reform of housing sector started only since the spring of 1998 (Zhen, 2003). The data selection is also subject to the availability constraint of data.

The quarterly data of housing investment and total fixed-capital investment are available for all provinces throughout the sample period. Housing investment refers to the gross fixed capital investment in the housing sector. Non-housing investment is what left after housing investment subtracted from total investment. However, not

every province has quarterly data of GDP. Actually, only a few of provinces have a full dataset of quarterly GDP during the whole period, less than one third. In case that only the annual data are available, we use the classical and widely-used proportional Denton method to generate quarterly data (Denton, 1971), where the gross fixed capital investment of these provinces is employed as the quarterly indicator series.

For China as a whole for the period 1999 to 2007, the ratio of housing investment as percent to GDP rose from 5.9% to 11.5% (the annual average level was 8.3% with standard derivation of 1.8%), while for the ratio of non-housing investment to GDP rose from 27.4% to 43.5% (the annual average level was 32.3% and standard deviation was 6.6%). However, housing investment grew at an average annual speed considerably higher than that of non-housing investment, where the former is 22.4% and the latter is 18.8% (cf. Table 1).

As there are vast diversities of economic development as well as very different degrees of housing market maturity in different parts of mainland China, we expect the relationship between housing investment and economic growth to vary significantly across provinces. Then, our whole country panel analysis may suffer aggregate bias. A solution to this issue is to cluster provinces that at similar degree of economic development and test again on these data.

As well known, China is usually geographically decomposed into three parts (cf. Figure1)—east (11 provinces), middle (9 provinces) and west (11 provinces, including Tibet, but Tibet is not analyzed in this paper for data problem). Although there are a few exceptions, nearly all the provinces in the east part are leading prosperous regions and nearly all provinces in the west part are among the poorest (cf. Figure 2). The middle part's situation is just slightly better than the west. In 2007, the population-weighted GDP per capita was 31752 RMB (equivalent to 4536 US dollar at the official exchange rate of 1:7 that prevails in recent years) in the east part, almost only half in the middle part, which is 15939 RMB (2277 US dollar), but lowest in the west part with level of 12072 RMB (1725 US dollar).

Although different degrees of varieties exist, provinces in each part as a whole exhibit fairly similar level of economic development as well as maturity stage of

housing market. For this reason, the whole country data is divided into three sub-panels: the east-part sub-panel, the middle-part panel and the west-part sub-panel. In this paper, we do analysis on sub-panels not only for the robust checks for the results of whole country panel but also for investigations on how the relationship between housing and economic growth vary with degrees of economic development.

Figure 1: China’s provinces and the three regions

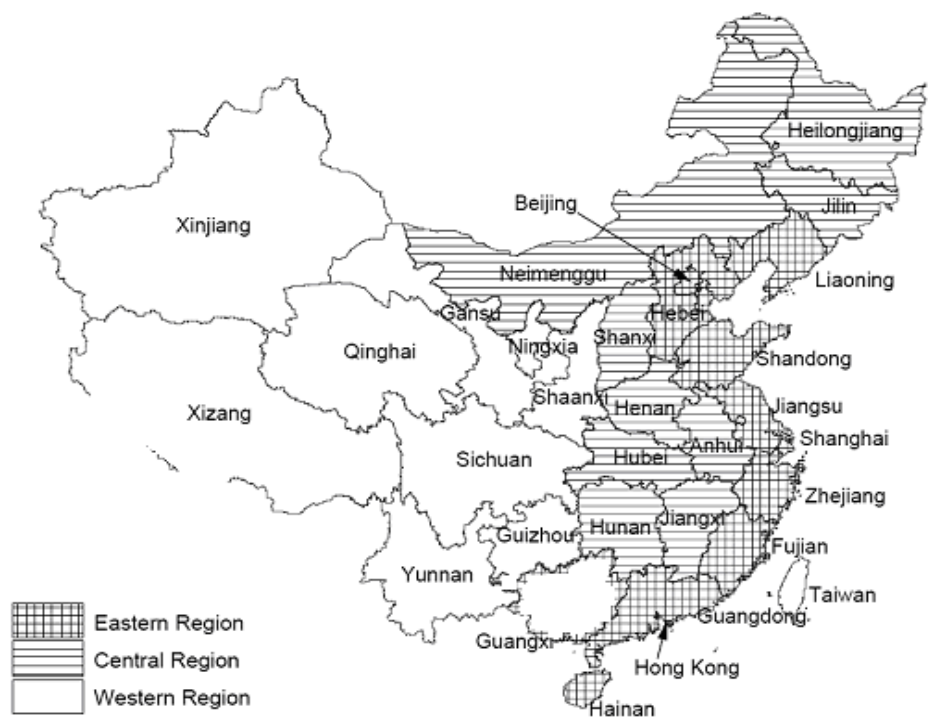
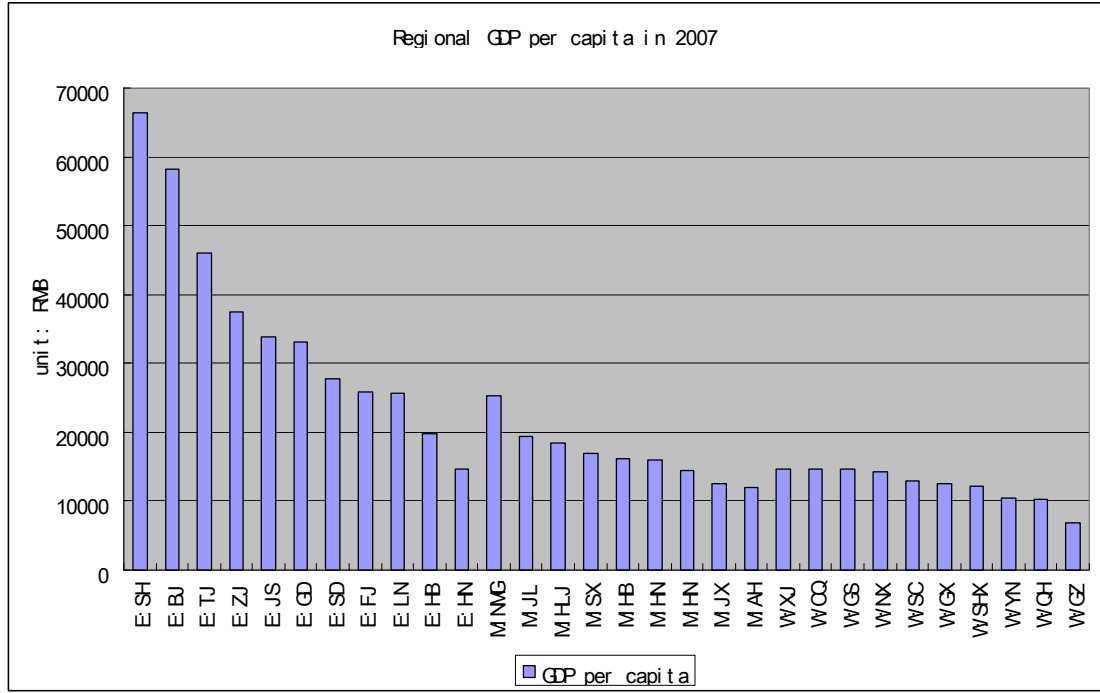


Figure 2: Regional GDP per capita in China, 2007



Note: the leading letter E of each province stands for the east part, M for the middle part and W for the west part. SH: Shanghai; BJ: Beijing; TJ: Tianjin; ZJ: Zhejiang; JS: Jiangsu; GD: Guangdong; SD: Shandong; FJ: Fujian.....

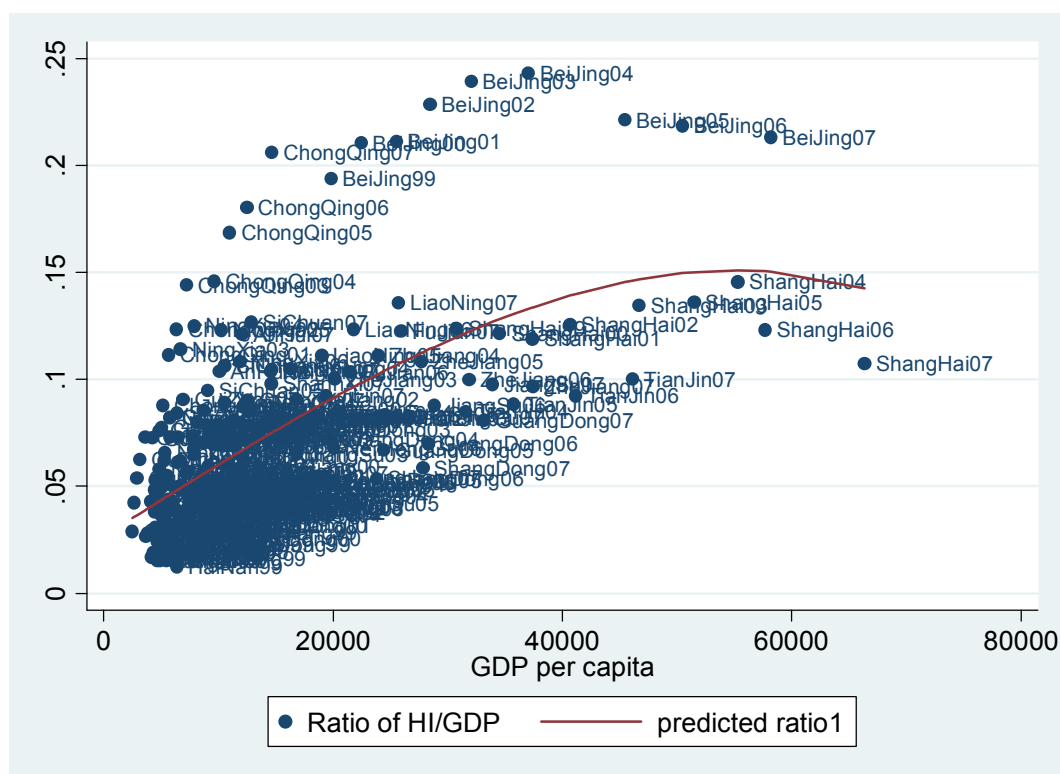
Table1: The growth rates of GDP per capita, housing Investment and non housing investment across provinces in China, nominal levels (1999-2007)

Region	Growth rate of GDP per capita	Growth rate of housing investment (HI)	Growth of ratio of HI/GDP	Growth of non-housing investment	Growth of ratio of NHI/GDP
<u>Country</u>	0.130 (0.033)	0.224 (0.067)	0.087 (0.033)	0.188 (0.092)	0.061 (0.053)
<u>East Part</u>					
Beijing	0.144 (0.037)	0.221 (0.135)	0.014 (0.058)	0.126 (0.108)	<u>-0.053</u> (0.149)
Tianjin	0.142 (0.030)	0.202 (0.057)	0.028 (0.033)	0.209 (0.098)	0.036 (0.073)
Hebei	0.142 (0.047)	0.307 (0.096)	0.140 (0.092)	0.248 (0.207)	0.082 (0.138)
Liaoning	0.125 (0.040)	0.306 (0.099)	0.157 (0.094)	0.288 (0.195)	0.139 (0.157)
Shanghai	0.103 (0.077)	0.132 (0.103)	<u>-0.015</u> (0.080)	0.115 (0.110)	<u>-0.031</u> (0.080)
Jiangsu	0.156 (0.047)	0.299 (0.163)	0.116 (0.123)	0.241 (0.174)	0.066 (0.137)
Zhejiang	0.153 (0.036)	0.282 (0.145)	0.097 (0.135)	0.207 (0.078)	0.032 (0.061)
Fujian	0.117 (0.049)	0.273 (0.162)	0.126 (0.114)	0.211 (0.155)	0.070 (0.102)
Shangdong	0.158 (0.050)	0.315 (0.080)	0.130 (0.094)	0.298 (0.180)	0.112 (0.125)
Guangdong	0.140 (0.054)	0.181 (0.093)	0.005 (0.090)	0.150 (0.145)	<u>-0.023</u> (0.020)
Hainan	0.109 (0.047)	0.489 (0.255)	0.325 (0.248)	0.117 (0.074)	<u>-0.009</u> (0.064)
Mean	0.144 (0.035)	0.234 (0.052)	0.064 (0.050)	0.212 (0.124)	0.043 (0.087)
<u>Middle part</u>					
Shanxi	0.176 (0.097)	0.279 (0.165)	0.080 (0.129)	0.261 (0.097)	0.065 (0.052)
InnerMongoli	0.220 (0.116)	0.451 (0.277)	0.193 (0.231)	0.428 (0.221)	0.173 (0.183)
Jilin	0.151 (0.058)	0.330 (0.180)	0.149 (0.127)	0.303 (0.149)	0.127 (0.111)
Helongjiang	0.117 (0.046)	0.218 (0.126)	0.090 (0.125)	0.184 (0.098)	0.058 (0.063)
Anhui	0.126 (0.059)	0.378 (0.130)	0.225 (0.103)	0.316 (0.141)	0.168 (0.072)
Jiangxi	0.134 (0.057)	0.410 (0.248)	0.241 (0.227)	0.339 (0.160)	0.174 (0.110)
Henan	0.161 (0.060)	0.368 (0.128)	0.178 (0.090)	0.312 (0.178)	0.125 (0.100)
Hubei	0.122 (0.054)	0.251 (0.112)	0.121 (0.085)	0.195 (0.099)	0.071 (0.085)
Hunan	0.140 (0.052)	0.388 (0.089)	0.224 (0.113)	0.251 (0.099)	0.010 (0.046)
Mean	0.145 (0.052)	0.328 (0.067)	0.159 (0.153)	0.278 (0.114)	0.114 (0.052)
<u>West part</u>					
Guangxi	0.150 (0.069)	0.425 (0.150)	0.238 (0.114)	0.261 (0.152)	0.093 (0.088)
Chongqing	0.151 (0.080)	0.289 (0.074)	0.135 (0.076)	0.282 (0.144)	0.125 (0.098)
Sichuan	0.144 (0.067)	0.326 (0.092)	0.166 (0.103)	0.226 (0.093)	0.074 (0.048)
Guizhou	0.138 (0.049)	0.330 (0.136)	0.161 (0.148)	0.235 (0.093)	0.077 (0.102)
Yunnan	0.115 (0.060)	0.231 (0.234)	0.089 (0.163)	0.232 (0.141)	0.094 (0.103)
Shangxi	0.140 (0.032)	0.307 (0.101)	0.117 (0.096)	0.272 (0.096)	0.080 (0.060)
Gansu	0.173 (0.065)	0.241 (0.119)	0.084 (0.083)	0.191 (0.036)	0.042 (0.028)
Qinghai	0.140 (0.069)	0.155 (0.080)	<u>-0.004</u> (0.087)	0.201 (0.089)	0.036 (0.089)
Ningxia	0.151 (0.039)	0.295 (0.198)	0.099 (0.165)	0.223 (0.079)	0.040 (0.084)

Xinjiang	0.162 (0.076)	0.424 (0.701)	0.239 (0.601)	0.170 (0.058)	0.020 (0.056)
Mean	0.143 (0.053)	0.301 (0.061)	0.136 (0.063)	0.232 (0.077)	0.074 (0.037)

Standard deviation in the parentheses. Source: China Statistical Yearbook and the Wind database.

Figure 3: the ratio of HI/GDP vs. GDP per capita in China (unit: province's GDP per capita in each year between 1999 and 2007)



Note: predicted estimates are obtained by pooled regression.

Figure 3 suggests that the province-level ratios of housing investment as percent in GDP are correlated with the levels of GDP per capita in a kind of inverted U-shape manner, except that the Beijing and Chongqing appear as outliers. One should also pay attention that, for the ratio of housing investment as percent in GDP during the study period, Shanghai and Qinghai are the only two cases to encounter negative growth (cf. Table 1). But the changes of HI/GDP ratio in Qinghai over this period are very small, almost insignificant. It is also interesting to note that the ratio of HI/GDP in Qinghai is kept at very low level, only around 4.5%, among the lowest. Qinghai is also one of poorest province in China. In contrast, Shanghai is top rich region in China. Taken together the two findings into account, we think China's case could be a

rough confirmation of the Burns-Grebler (1977) hypothesis, which was discussed in the previous section.

In all provinces, the growth rate of housing investment is higher than that of GDP per capita during the study period (cf. Table 1). In addition, the discrepancy between the two growth rates is usually larger for provinces in the middle and west part than those in the east part. In addition, the growth rates of ratios of housing investment out of GDP in provinces across east part are on average significantly lower than those in the middle and west part. Meanwhile, it is interesting to notice that, not only for the country as a whole but also for most provinces, the standard deviation of growth rates of housing investment is much smaller than that of non-housing investment. This is different from what Davis and Heathcote's (2005) found for the US, where the standard deviation of residential investment is more than twice that of non-residential counterpart.

In the following empirical analysis, all the data are deflated and measured at the 1999 price, taking logarithm, and in the paper denoted as $\ln GDP$, $\ln HI$ (HI stands for Housing investment) and $\ln NHI$ (NHI stands for Non-housing investment), respectively. Due to the limited time series spanning of data, we do not let the data to be seasonally adjusted but instead use three dummy variables to control for seasonal effect (summer, fall, winter and with spring as the base season).

4 Empirical investigations

4.1 Panel unit root tests

Our first concern is to test the stationary feature for the whole country panel and the three-sub panels as well. Since LLC test assumes a homogeneous panel, which may produce a misleading result for our heterogeneous panel, we discard LLC result. Instead we prefer to implement both IPS and HADRI tests for robustness, because they all assume a heterogeneous panel, which seems much closer to the realistic environments. Table 2-5 presents the panel unit root tests for the four panels,

respectively.

Table2: Panel unit root test for the whole country panel

Variable	IPS (P-value)	HADRI (p-value)	
		Z(MU)	Z (TAU)
lnHI	0.829	0.0000***	0.2330
Δ lnHI	0.000***	1.0000	0.9982
lnGDP	0.310	0.0000***	0.9984
Δ lnGDP	0.000***	1.0000	0.9965
lnNHI	0.999	0.0000***	0.7200
Δ lnNHI	0.000***	1.0000	0.9982

Table3: Panel unit root test for the east part sub-panel

Variable	IPS (P-value)	HADRI (p-value)	
		Z(MU)	Z (TAU)
lnHI	0.971	0.0000***	0.0033***
Δ lnHI	0.001***	0.9889	0.9605
lnGDP	0.571	0.0000***	0.9326
Δ lnGDP	0.000***	0.9936	0.9628
lnNHI	0.998	0.0000***	0.1318
Δ lnNHI	0.008***	0.9960	0.9799

Table4: Panel unit root test for the middle part sub-panel

Variable	IPS (P-value)	HADRI (p-value)	
		Z(MU)	Z (TAU)
lnHI	0.969	0.0000***	0.8465
Δ lnHI	0.004***	0.9902	0.9554
lnGDP	0.244	0.0000***	0.9597
Δ lnGDP	0.000***	0.9839	0.9226
lnNHI	1.000	0.0000***	0.8116
Δ lnNHI	0.000***	0.9853	0.9347

Table5: Panel unit root test for the west part sub-panel

Variable	IPS (P-value)	HADRI (p-value)	
		Z(MU)	Z (TAU)
lnHI	0.052*	0.0000***	0.0096***
Δ lnHI	0.000***	0.9729	0.9211
lnGDP	0.456	0.0000***	0.9516
Δ lnGDP	0.000***	0.9894	0.9417
lnNHI	0.087*	0.0000***	0.6629
Δ lnNHI	0.000***	0.9884	0.9508

Note: The null hypothesis of HADRI test is that the panel data are stationary, while the null hypotheses of IPS tests assume that the data has a panel unit root.

Δ denotes first difference of series. *** Rejects the null hypothesis at the 1% level.

** Rejects the null hypothesis at the 5% level. * Rejects the null hypothesis at the 10% level.

At the 1% significance level, the statistics except $Z(\text{TAU})$ as a whole strongly suggest that the four panels at levels contain a panel unit root, while all of their first differences become stationary. Since both test results suggest that housing investment, non-housing investment and GDP should be taken as $I(1)$ panel series, we proceed to test for whether there is a cointegration relationship among the three variables.

4.2 Panel cointegration tests

After using RATS (version 7.0) software to implement the panel cointegration analysis based on the equation (5), we report the estimation results in Table 6, 7, 8, 9, for the four panels, respectively.

Table 6 panel cointegration tests for the whole country panel

Panel	v-stat	-2.567	Group	ρ -stat	-1.516*
Panel	ρ -stat	-2.769***	Group	pp-stat	-11.004***
Panel	pp-stat	-9.378***	Group	ADF-stat	10.270
Panel	ADF-stat	6.308			

Table 7 panel cointegration tests for east part sub-panel

Panel	v-stat	-1.376	Group	ρ -stat	0.450
Panel	ρ -stat	-0.474	Group	pp-stat	-3.508***
Panel	pp-stat	-3.921***	Group	ADF-stat	7.055
Panel	ADF-stat	4.869			

Table 8 panel cointegration tests for middle part sub-panel

Panel	v-stat	-1.036	Group	ρ -stat	-1.747**
Panel	ρ -stat	-2.356***	Group	pp-stat	-8.437***
Panel	pp-stat	-6.728***	Group	ADF-stat	4.564
Panel	ADF-stat	3.544			

Table 9 panel cointegration tests for west part sub-panel

Panel	v-stat	-1.907	Group	ρ -stat	-1.440*
Panel	ρ -stat	-2.202**	Group	pp-stat	-7.375***
Panel	pp-stat	-5.690***	Group	ADF-stat	2.278
Panel	ADF-stat	0.174			

All reported statistics are asymptotically distributed as standard normal under null hypothesis of no

cointegration. The v -stat test is right-sided, while others are left-sided.

*** reject the null of no cointegration at the 1% level. ** reject at 5% level. * reject at 10% level.

Pedroni (2000) shows that group mean estimators have advantage over other estimators in the presence of heterogeneity of the residual dynamics around the cointegration vector, and the small sample properties of group mean statistics are doing well provided that the time series dimension is not smaller than the cross sectional dimension. In our paper, while T (equals 36) is always larger than N (30, 11, 9, 10 for the four panels, respectively), the testing results are more reliable on sub-panels.

For all the four panels, the group pp-statistics significantly reject the null of no cointegration at the 1% level. Except for the Group ρ -statistic in the east-part sub-panel and all Group ADF-statistic in the four panels that can not reject the null hypothesis, all other group statistics reject the null at the 10% level. Confirmation of cointegration implies that the variables in the system, although drifting individually, closely move together in the long run. Hence, we can draw the conclusion that there is a stable long-run relationship between GDP, housing investment and non-housing investment for the whole China as well as its three separate regions. Note that this conclusion is reached after allowing for province-specific effect.

Table 10: FMOLS estimates (dependent variable is $\ln GDP$)

	$\ln HI$	$\ln NHI$
Country-panel	0.18*** (0.0379)	0.85*** (0.0576)
East-sub-panel	0.10*** (0.0400)	0.91*** (0.0537)
Middle-sub-panel	0.37* ** (0.0681)	0.25** (0.1069)
West-sub-panel	0.14** (0.0674)	0.94*** (0.0985)

Standard error in parenthesis. **Indicate statistical significance at the 5% level. * Indicate statistical significance at the 10% level.

The next step is to numerically gauge the long-run relationships. Table 10 reports

the FMOLS results of the whole country panel and sub-panels without time trends in the manner of equation 5. The signs of coefficients of $\ln HI$ and $\ln NHI$ are all positive, as expected. Both the coefficients of $\ln NHI$ and $\ln HI$ are statistically significant at the 5% level for all four panels.

After examining the findings at the national level, we can see the elasticity of housing investment with respect to GDP, which is 0.18, is lower than that of non-housing investment, which is 0.85, in the whole country level.

But when examining at the regional level, it appears that the elasticity of GDP with respect to housing investment in the sub regions is decreasing with the growth rate of housing investment as percent in GDP. That is, the elasticity is highest in the mid part while the level of housing investment as percent in GDP grows much faster than other two parts. It is also important to note that the contribution effect of housing investment to GDP growth in the mid part of China is not only significantly larger than other two parts, but also greater than the impacts of non-housing investment in the mid part itself. For the east and west part, we find that, while it has a weak linkage from housing investment to GDP economic growth, they both have the large elasticity of GDP with respect to non-housing investment, which is almost one unit.

4.3 Granger-causality tests

The next step is to implement the Granger-causality test for the variables.

Table 11 shows the results of the Granger-causality test for the relationship between GDP and housing investment, and between GDP and non-housing investment, respectively. In the case of the whole country, it can be seen that, in the GDP equation, the Wald F -statistics for the coefficients of lagged changes in both $\ln HI$ and $\ln NHI$ are significant at 1% level. In the HI equation, the Wald F -test statistics of the coefficients of lagged changes in both GDP and non-housing investment are also significant at 1% level. In the NHI equation, only the coefficient of lagged $\ln GDP$ is significant, but test statistics of those of $\ln HI$ is not. These results imply that, in the short run, there is strong bidirectional Granger-causality between housing investment

and GDP as well as non-housing investment and GDP.

Meanwhile, the F -test results in the last two columns for the country-panel suggest that, in the long run, both housing and non-housing investment Granger-cause GDP, and GDP also Granger-causes both housing investment and non-housing investment. These findings therefore suggest that there exists both short-run and long-run bidirectional causality between housing investment and GDP as well as non-housing investment and GDP at the whole country level.

In addition, based on the test statistics of the ECT term in each equation, change in GDP responds to deviation from long-run equilibrium in period $t-1$ but changes in housing investment or non-housing investment do not respond. The ECT term in the GDP equation is negative as theoretically expected and its value show the adjustment speed is fairly fast. Given a deviation of GDP from the long-run equilibrium as defined by the cointegration relationship, all three variables interact in a dynamic relationship to correct the disequilibrium. The strong significance of Wald F -statistics in the GDP, HI and NHI equations indicates that all three variables are endogenous in the system. Thus, we conclude that When GDP deviates from the long-run equilibrium; both housing investment and non-housing investment jointly bear the burden of the short-run adjustment to re-establish the long run equilibrium in the whole country level.

Table 11: Granger causality tests

	Source of causation: Explanatory Variables						
Dependent Variable	Short run			Long run & variables to correct disequilibrium			
	$\Delta \ln GDP$	$\Delta \ln HI$	$\Delta \ln NHI$	ECT only	$\Delta \ln GDP$, ECT	$\Delta \ln HI$, ECT	$\Delta \ln NHI$, ECT
	Wald <i>F</i> -statistics			<i>Coefficient</i>	Wald <i>F</i> -statistics		
Country-panel							
$\Delta \ln GDP$	—	4.855***	5.033***	-0.82(0.375)**	—	5.545***	4.715***
$\Delta \ln HI$	3.091***	—	3.228***	-0.21(0.233)	2.737**	—	2.767***
$\Delta \ln NHI$	11.642***	1.840	—	0.28(0.0276)	14.560***	1.704	—
The East-sub-panel							
$\Delta \ln GDP$	—	4.110***	1.862*	-0.89(1.178)	—	3.805***	2.410**
$\Delta \ln HI$	4.302***	—	2.669**	1.43(0.644)**	3.983***	—	2.316**
$\Delta \ln NHI$	2.335***	1.111	—	0.009(0.426)	3.726***	0.966	—
The Middle-sub-panel							

$\Delta \ln GDP$	—	3.623***	3.415***	-0.82(0.378)**	—	5.650***	5.033***
$\Delta \ln HI$	0.299	—	0.136	0.49(3.185)	1.107	—	0.873
$\Delta \ln NHI$	2.464**	1.702	—	1.80(0.899)**	3.633***	1.537	—
The West-sub-panel							
$\Delta \ln GDP$	—	2.132*	1.783	-0.84(0.508)*	—	1.801	1.446
$\Delta \ln HI$	1.917	—	1.242	0.11(0.198)	1.847	—	1.119
$\Delta \ln NHI$	8.074***	1.288	—	0.25(0.248)	6.956***	1.252	—

Standard error in parenthesis. *** Indicate statistical significance at the 1% level.

** Indicate statistical significance at the 5% level. * Indicate statistical significance at the 10% level.

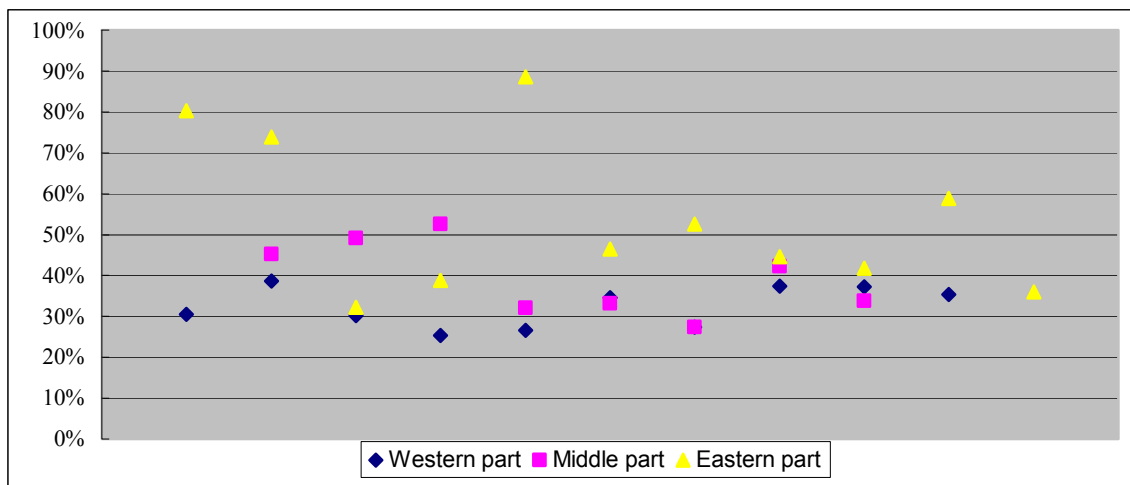
The Granger-causality results for the three sub-panels vary widely different from each other.

In the east part, the relationships among the three variables are very similar to those at the whole country level. That is, there is a strong bidirectional Granger-causality between housing investment and GDP as well as non-housing investment and GDP in both the short and long run. Again, we find GDP, housing and non-housing investment are all endogenous in the system; however the difference is that neither change in GDP nor non-housing investment do not respond to deviation from long-run equilibrium in period $t-1$ but change in housing investment does. Accordingly, when housing investment deviates from the long-run equilibrium, GDP and non-housing investment together conduct the short-run adjustments to re-establish the long-run equilibrium with a high adjustment speed.

However, in the middle part, we find that only non-housing investment appears to have strong bidirectional Granger-causality with GDP both in the short and long run. Meanwhile, housing investment Granger causes GDP both in the short and long run, but not vice versa. In this setting, changes in both non-housing investment and GDP do respond to deviation from long-run equilibrium in period $t-1$ but change in housing investment does not. When GDP deviates from the long-run equilibrium, housing investment and non-housing investment together conduct the short-run adjustments to re-establish the long-run equilibrium, and when non-housing investment deviates from the long-run equilibrium, GDP takes the corrections to eliminate the disequilibrium. Both adjustment speeds are high.

In the west part, it is interesting to notice that a unidirectional Granger-causality now exists only from GDP to non-housing investment in both short and long run; while no Granger connections are found between housing investment and GDP in long run, but a weakly unidirectional Granger-causality from housing investment to GDP in the short run. Now we find housing investment is weakly exogenous in the system. Change in GDP responds to deviation in from long-run equilibrium in period $t-1$ and the other two do not, indicating when GDP deviates from the long-run equilibrium, non-housing investment bears the burden of the short-run adjustment to re-establish the long run equilibrium.

Figure3. The average ratio of urbanization in three sub-panels of China



The vast diversity of the Granger-causality relationship between housing investment and GDP across the three regions can be attributed to the very different contribution roles of housing investment in economic growth in these regions. Quigley(2008) reviews the linkages between urbanization and economic development, illustrating that urban density promotes potential increase in productivity through specialization, complementarities in production, through the diffusion of knowledge and mimicry, and simply through size and scale. Housing investment will Granger cause GDP only at regions that have reached a high level economic development often characterized by a high level of urbanization (cf. Figure3); Nevertheless, if the

- cross-spectral methods, *Econometrica* 37 424–438.
- Granger, C.W.J. 1988. Some recent developments in a concept of causality. *Journal of Econometrics*, 39, 199-211
- Green, R. 1997. Follow the Leader: How changes in housing and non-housing investment predict changes in GDP. *Real Estate Economics*, 25: 253-270
- Hadri, K., 2000. Testing for stationarity in heterogeneous panel data. *Econometric Journal*, 3, 148-161
- Harris, W. D., & Gillies, J. (Eds.)1963. Capital formation and housing in Latin America. Washington, DC.: Pan American Union
- Harris, R. & Arku, G. 2006. Housing and economic development: the evolution of an idea since 1945. *Habitat International*, 30:1007-10017
- Im, K.S., Pesaran, M.H., Shin, Y., 1997. Testing for unit roots in heterogeneous panels. Working paper. University of Cambridge.
- Kim, K.H. 2004. Housing and the Korean economy. *Journal of housing economics*, 13: 321-341
- Leung, C. 2004. Macroeconomics and housing: a review of the literature. *Journal of Housing Economics*, 13: 249-267
- Levin, A. &Lin, C.F. &Chu, C.S. 2002. Unit root tests in panel data: asymptotic and finite-sample properties. *Journal of Econometrics*, 108: 1-24
- Li, X.S. &Zhang, Y. &Chen, G.Y. 2005. A Demand Side Analysis on China's Engines of Economic Growth. *Quantitative & Technical Economics (in Chinese)*. Vol.11
- Ofori G and Han S S 2003. Testing hypothesis on construction and development using data on China's provinces, 1990-2000. *Habitat International*, 27 (1): 37-62
- Pedroni, P. 1999. Fully modified OLS for heterogeneous cointegrated panels. Current Version: December 1999
- Pedroni, P. 2004. Panel cointegration: asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric Theory*, 20: 597-625
- Phang, S.Y. 2001. Housing policy, wealth formation and the Singapore economy. *Housing Studies*, 16(4), 443-459
- Philips, P.C.B. 1995. Fully modified least squares and vector autoregression. *Econometrica*, Vol. 63, 1023-1078
- Pozdena, R. 1988. The Modern Economics of Housing Quorum Books: New York.
- Quigley, J.M. 2001 Real estate and Asian crisis. *Journal of Housing Economics*, 10, 129-161
- Quigley, J.M. 2008. Urbanization, agglomeration and economic development. Dialogue on Urbanization and National Growth Strategies.
- Rune, W. &Mats, W. 2007. Construction investments and economic growth in Western Europe. *Journal of Policy Modeling*, 29: 439-451
- Shen, Y. & Liu, H.Y. 2004. The relationship between housing investment and GDP in

- China. *Journal of Tsinghua University Science and Technology (in Chinese)*, Vol.9.
- Toda, H & Phillips, P. 1994 Vector autoregression and causality: a theoretical overview and simulation study, *Econometric Reviews* 13, 259–285
- Turin, D. A. 1969. The construction industry. Vienna: UNIDO.
- Turin, D. A. 1973. The construction industry: Its economic significance and its role in development (2nd ed.) London: University College Environment Research Group.
- Turin, D. A. 1978. Construction and development. *Habitat International*. Vol.3. pp.33-45, 1978
- Weissmann, E. 1955. Importance of physical planning in economic development. In B. Kelly (Ed).Housing and economic development. MA: A report of a Conference Sponsored at the Massachusetts Institute of Technology by the Albert Farwell Bemis Foundation.
- Wells, J. 1985. The role of construction in economic growth and development. *Habitat International*. Vol. 9. pp.55-70, 1985
- Wells, J. 1986. The construction industry in developing countries: Alternative strategies for development. London: Croom Helm.
- World Bank, 1993. Housing: Enabling the Markets to Work, World Bank, Washington, DC.
- Zhen, S.Q. 2003. The harmonious development between housing investment and GDP. *Urban Development (in Chinese)*. Vol.10.

ⁱ Construction is generally referred to the activity of developing physical infrastructure, superstructure and related facilities of buildings, thus including housing but not restricted to it.

ⁱⁱ Pedroni (1997) shows that group mean estimators have advantage over other estimators in the presence of heterogeneity of the residual dynamics around the cointegration vector, and the small sample properties of group mean statistics are found to do extremely well provided that the time series dimension is not smaller than the cross sectional dimension. In our paper, while T (equals 36) is always larger than N (30, 11, 9, 10 for the four panels, respectively), the testing results are more reliable on sub-panels.

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