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# Income Inequality, Rapidly Rising Housing Prices and Overdevelopment of Houses in China

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**INCOME INEQUALITY, RAPIDLY RISING HOUSING  
PRICES AND OVERDEVELOPMENT OF HOUSES IN CHINA**

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A Dissertation  
Presented to  
the Graduate School of  
Clemson University

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In Partial Fulfillment  
of the Requirements for the Degree  
Doctor of Philosophy  
Planning, Design and the Built Environment

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by  
Tao Guan  
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## ABSTRACT

Four phenomena can be observed in China's housing market in the past 16 years. First, the vacancy rate of new condominium properties has increased significantly. Second, housing prices have been increasing very rapidly. In fact, the prices have rarely decreased even when strict housing policies have been mandated. Third, housing transactions are active, as indicated by the new condominiums that have been recently developed and have been sold very quickly. Finally, new construction/development had also been very active. Phenomena 2, 3, and 4 are inherently consistent, but the coexistence of phenomena 2, 3, and 4 with phenomenon 1 is very perplexing. Thus, the following research questions can be raised. 1. How can housing prices keep increasing despite high vacancy rates? 2. How can new condominiums be sold quickly when vacancy rates are high? 3. How can construction activities continue when vacancy rates are high? This is a puzzle.

This puzzle is connected with another puzzle, the excessive liquidity in China's housing market has been oddly coexisting with insufficient demand in China's consumer market over the past 16 years. The second puzzle can be easily observed even though it has been largely ignored over past 16 years.

The following hypotheses are put forward: Hypothesis 1: At a certain time point, higher-income households will spend a lower proportion of their income on consumption compared with lower-income households. If this hypothesis can be verified, then severe income inequality will lead to an overly-high aggregate savings rate and an extremely low aggregate consumption rate; Hypothesis 2: Overly-high aggregate savings rates and extremely low aggregate consumption rates caused by severe income inequality will induce high investment demand in the virtual sector rather than the real sector. As a result, the virtual sector will boom while the real sector will decline. Hypothesis 3: Given a declining real sector, investors will prefer houses as investments as opposed to other assets in the virtual sector due to their unique features. This leads to rapidly rising housing prices and overdevelopment.

Testing the three hypotheses above is a big challenge because the typical measure for income inequality for a country, the Gini Coefficient, announced by China's government is not trustworthy. The data about GDP and per capita disposable

income are also not reliable. For this research, a significant amount of effort was exerted to collect primary data on these variables. These efforts include establishing rapport with officials in the National Bureau of Statistics of China, obtaining special access to the database of academic and non-profit research institutes and buying data from private institutes in China. Through these efforts, improved quarterly data of GDP, housing policy, and monetary supply for 70 cities from 2000 to 2016 were obtained.

The theoretical work in this study includes:

First, the economic relationship between income levels and consumption rates, that is, higher-income households will spend a lower proportion of their income on consumption compared with lower-income households, is confirmed by economic data. Moreover, the new economic relationship is explained using Modern Portfolio Theory and information cost.

Second, by mathematical proof, it is shown that a more severe income inequality will lead to a higher aggregate savings rate as well as a lower aggregate consumption rate under this economic relationship.

Third, a theoretical model further shows that the aggregate savings rate caused by income equality will result in investor's preference for virtual assets rather than real assets or consumption goods.

Fourth, unique feature of houses is found, which can be used to explain why houses are preferred over other virtual assets and why housing bubbles can last longer than speculative bubbles of other virtual assets, such as commercial properties, stocks and mutual funds. The unique feature of housing is that the utility an owner obtains from living in his own house is greater than the utility a tenant gets from living in the same house if it was leased. Therefore, market rents, which are the "price" of the utility a tenant get, does not fully reflect the market fundamentals of a house due to the existence of non-rent utility. As a result, house prices lose the signal for market fundamentals and, in the case of China, have continuously increased in the long term. This is the reason why houses are preferred by investors.

Finally, a new measure which we call the Ratio of Gross Domestic Income to Gross Domestic Product (RGG) is built to replace of the Gini coefficient as a measure of income equality. Since, the official data are not trustworthy due to the absence of

unreported income  $a$ , a better measure for income inequality can be obtained. The following is the problem-solving process used to create the new measure. First it is basic fact that the high income level families possess nearly all of the unreported income in China. Therefore, a high proportion of unreported income in total income implies a severe income inequality. Step 2, Gross Domestic Product (GDP) should be equal to Gross Domestic Income (GDI). Hence, when GDI is less than the GDP, the gap between the two statistics represents the unreported income in an economy. As a result, a high Ratio of GDI to GDP (RGG) indicates a severe income inequality. In this way, a new index RGG is built to be used to measure inequality.

The empirical study is conducted after the theoretical work and the results show the following:

First, for all of the econometric models and for all of the groupings of the 70 Chinese cities, the coefficient of RGG, or our measure for income inequality, is consistently negative. Since a high RGG implies severe income inequality, the negative coefficient shows that the correlation between income inequality and housing prices is positive. In other words, the more severe the income inequality the higher the housing prices will be.

Second, for all of the econometric models and for all of the groupings of the 70 Chinese cities, the housing prices are always significantly affected by RGG. The positive correlation between the income inequality and the housing prices is confirmed statistically.

Third, in order to show how important income inequality is to the determination of housing prices, the degree of fit ( $R^2$ ) is checked after the independent variables are removed one by one from the econometric models. In all models, we find that the goodness of fit drops the most when the RGG variable is removed. This again shows that income inequality plays the most important role in housing prices.

Finally, the coefficient of Housing Policies ( $X_3$ ) is positive, which means the enactment of housing policies is correlated with the high housing prices. This result is counterintuitive because the purpose of restrictive housing policies is to suppress rapidly rising housing prices. But this result is reasonable. On one hand, it is the fact that all housing policies could rarely suppress housing prices in past 16 years

in China. On the other hand, releasing the housing policies was actually a reaction to the rapidly rising housing prices, and terminating the housing policies is a response to the stagnant or slightly decreasing housing prices. In other words, when housing prices increased rapidly, the housing policies were enacted but rarely served to stop the increasing housing prices. And, when the housing prices were stagnant or decreasing slightly for some reason, the restrictive housing policies were not enacted or were terminated and as a result, the relationship between housing prices and housing policies is was found to be positive in the models.

Then the following conclusions are drawn based on the theoretical models and the empirical evidences.

1. At a given point in time, a high-income family will spend a lower proportion of their income on consumption compared with a low-income family. As a result, severe income inequality will lead to very -high aggregate savings rate and very low aggregate consumption rate.
2. Very high aggregate savings rate and very low aggregate consumption rate caused by severe income inequality will induce high investment demand in the virtual sector and weak demand in the real sector. As a result, the virtual sector will progress, whereas the real sector will decline.
3. In the context of a declining real sector, investors prefer houses to other types of assets in the virtual sector owing to the unique features of houses. Thus, housing prices will increase even though there is a high vacant rate, increased new construction and the high transaction volume for the housing construction. Those phenomena are “weird” but can be observed everywhere in China in 2017.

The theoretical innovations of this study include: (1) illustrating the new relationship between income level and consumption rate which can bridge income inequality and the aggregate savings rate; (2) establishing RGG as a new measure for income inequality that can be a substitute for the Gini coefficient when there is a large amount of unreported income in an economy; (3) determining the unique feature of house which can explain why investors prefer houses to the other assets in the virtual market.

As a result, the study has the following theoretical contributions: (1) it

provides empirical evidence that rapidly increasing housing prices are positively related to income inequality; (2) it adds a new explanation for housing bubbles by revealing the linkage between income inequality to the housing bubble; (3) it details a new channel through which income inequality can damage the sustainability of economic growth in a developing country, thus enhancing the importance of income inequality issue in economics.

At least two implications which are of great significance to developing countries can be drawn from this study. First, severe income distribution inequality gives rise to the abnormal coexistence of excess liquidity and insufficient demand, further deepening a recession found in the real sector, as well as the an increasing prosperity within the virtual sector of an economy. Secondly, an increasingly overheated virtual economy can bring a significant amount of risk to the whole financial system of a country. A dwindling economy gradually deteriorates employment and further threatens the long-term economic growth potential of a developing country and also weakens their competitive advantage in the global economy.

Since many countries, including the U.S., have also been experiencing increasing income inequality and real estate bubbles, this research will ultimately remind policy-makers to take income inequality into account when they make policies to deal with both housing bubbles and the overdevelopment of the housing sector fueled by the increased interest in the virtual economy, in particular the housing market. This can lead to instability in the financial markets and unsustainable economic growth in both developing countries and developed countries.

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# CHAPTER 1: INTRODUCTION

## 1.1 Background

In many cities in China, a significant number of newly developed condominiums have been sold but have remained vacant for several years. For example, from 2006–2015, condominiums covering more than 18 million square meters were built in a 63.9-square-kilometer beach area in Rushan Yintan, Weihai, Shangdong Province, China. However, over 85% of these condominiums have remained vacant since their completion<sup>1</sup>.

Similar cases can be observed in other cities in China, such as Ordos, Inner Mongolia; Fangchenggang, Guangxi; Chenggong, Yunnan; Shiyan, Hubei; Changzhou, Jiangsu; Jiaxing, Zhejiang; Lanzhou New District, Gansu; and Zhumadian, Henan. In fact, there are so many vacant condominiums in those cities that those cities are called “ghost cities”. In fact, in 2015 a Chinese institute identified the top 50 “ghost cities” in China (see Table 1.1). Although this ranking may not be trustworthy, the cities on the list are all identified as “ghost cities” by the data from the Statistical Yearbook of those cities.

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<sup>1</sup> <http://jingji.cntv.cn/2015/12/20/VIDE1450621076642271.shtml> April.2<sup>nd</sup>, 2017



Table 1.1 Top 50 Ghost Cities in China (2015)

Rank	City	Index*	Province	Rank	City	Index	Province
1	Erenhot	0.2692	Inner Mongolia	26	Xilinhot	0.4719	Inner Mongolia
2	Alaer	0.2726	Xinjiang	27	Jinchang	0.4731	Gansu
3	Beitun	0.2825	Xinjiang	28	Fangchenggang	0.4737	Guangxi
4	Aletai	0.2906	Xinjiang	29	Chengde	0.4773	Hebei
5	Zhangye	0.2983	Gansu	30	Taicang	0.4885	Jiangsu
6	Suifenhe	0.3232	Heilongjiang	31	Zhoukou	0.4914	Henan
7	Qinzhou	0.3524	Guangxi	32	Dehui	0.4918	Jilin
8	Jiayuguan	0.3591	Gansu	33	Laiwu	0.4997	Shandong
9	Yumen	0.3594	Gansu	34	Quzhou	0.5023	Zhejiang
10	Shigatse	0.3843	Tibet	35	Chongzhou	0.5037	Sichuan
11	Golmud	0.3933	Qinghai	36	Donggang	0.5139	Liaoning
12	Ruili	0.4004	Yunnan	37	Heshan	0.5173	Canton
13	Turpan	0.4172	Xinjiang	38	Shulan	0.5201	Jilin
14	Mishan	0.4214	Heilongjiang	39	Yantai	0.5268	Shandong
15	Weihai	0.4231	Shandong	40	Korla	0.5294	Xinjiang
16	Changshu	0.4267	Jiangsu	41	Kashgar	0.5349	Xinjiang
17	Wuzhong	0.4296	Ningxia	42	Sanya	0.5369	Hainan
18	Kaiping	0.4393	Guangdong	43	Ordos	0.5372	Inner Mongolia
19	Fukang	0.4507	Xinjiang	44	Hulunbeier	0.5372	Inner Mongolia
20	Guixi	0.4577	Jiangxi	45	Taian	0.5388	Shandong
21	Yichun	0.4579	Heilongjiang	46	Yichang	0.5441	Hubei
22	Shizuishan	0.4621	Ningxia	47	Xianning	0.5441	Hubei
23	Chuzhou	0.4628	Anhui	48	Lasa	0.5498	Tibet
24	Haining	0.4689	Zhejiang	49	Lianyungang	0.5522	Jiangsu
25	Maoming	0.4717	Guangdong	50	Huoerguole	0.5529	Inner Mongolia

\* The index refers to the population per square kilometers in housing communities. Population is measured by 10 thousand. For example, 0.2692 means there are living 2692 residents per square kilometers in the housing communities

Source:

<http://finance.sina.com.cn/china/20151117/223123790511.shtml> Nov. 17, 2015

High vacancy rates typically translate to low rents. Theoretically, low rents should

result in low housing prices. However, even though the vacancy rates in these cities are high, housing prices continue to soar. For example, the average housing price in Sanya, China (# 42 in Table 1.1) in 2016 is over 13 times higher than that in 2003, although the vacancy rate remained over 40% from 2003 to 2016<sup>2</sup>.

Furthermore, newly developed condominiums can always be sold quickly despite the high vacancy rates. From 2003–2016, an average of more than 93% of the condominiums built in China were sold within three months of their completion<sup>3</sup>.

## **1.2 A Puzzle**

There are four phenomena that can be observed in China's housing market over the past 16 years:

1. The vacancy rate of new condominiums projects has been increasing.
2. Housing prices keep increasing at a rapid rate. In fact, prices have rarely decreased even when strict housing policies are mandated.
3. Housing transaction volume is high as evidenced by the low average days on market.
4. And, finally, new construction activities have also been very active.

When housing prices are increasing rapidly, investors can profit substantially from purchasing and selling home units. In this kind of seller's market, new and second-hand condominiums sell quickly. When properties trade quickly and money is made, housing developers will strive to build more houses. Thus, phenomena 2, 3, and 4 are inherently consistent.

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<sup>2</sup> Hainan Statistical Yearbook, 2003 and Sanya Statistical Yearbook, 2016.

<sup>3</sup> China Statistical Yearbook (2003–2012).

The coexistence of phenomena 2, 3, and 4 with phenomenon 1 is very perplexing. Thus, the following research questions, although essentially the same, can be raised:

1. How can housing prices keep increasing despite high vacancy rates?
2. How can new condominiums be sold very quickly when vacancy rates are high?
3. How can construction activities keep being very active when vacancy rates are high?

In this study, we attempt to answer these questions in a systematic manner.

## **1.3 Exploration**

### **1.3.1. What Factors Influence the Rapid Increase in House Prices?**

#### **1. Factors Relevant to Houses**

Factors relevant to the value of houses include such things as location, age, floor area ratio and water view. These factors certainly influence housing prices. Nevertheless, this dissertation focuses on the factors that influence the price dynamics of the entire housing market and not on those that affect the price variations of a specific condominium. More precisely, the housing prices discussed in this dissertation pertain to housing prices at the market level, namely, the average price of all condominiums in a housing market.

Springer and Worzala (2013)<sup>4</sup> contend that, at the market level, aggregated data obscure any effect induced by individual properties, thereby isolating the market influences on transaction volume. Given the association of property transaction prices

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<sup>4</sup> Springer T. and E. Worzala (2013). "Time-on-the-market as an Indicator of Housing Market Conditions Using a Varying Coefficient Model," *The Journal of the Center for Real Estate Studies*, Realtor® University, 1:2, 2013

with transaction volume, at the market level, the aggregated data may obscure any influence of individual properties. Hence, when we consider the market as a whole, individual factors are negligible.

## **2. Market Fundamentals**

Many fundamental factors in the market, like Gross Domestic Product (GDP), disposable income per capita and migration of the population from the countryside to cities are all factors that could drive the housing prices up or down. However, almost all studies of the Chinese housing market show that these fundamental factors do not fully explain the quickly rising housing prices (Kuang, 2008<sup>5</sup>; Wu et al., 2010<sup>6</sup>; Lu, 2010<sup>7</sup>). This finding is consistent with a snap shot view of the data. Housing prices in China have increased by 25.3% per year on the average in the first 16 years of the 21<sup>st</sup> century, whereas the average growth rates of GDP and household disposable income were only 7.5% and 3.7%, respectively, during the same period<sup>8</sup>.

## **3. Housing Policies in China**

Housing policies include housing-related tax policies, land supply Policies, home loan restriction Policies, and home purchase restriction policies. Studies have shown that housing-related taxes, including contract tax, income tax, and value-added tax, property tax all can play an important role in the fluctuation of housing prices (Poterba, 1991<sup>9</sup>;

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<sup>5</sup> Kuang, Z. (2008). “Does There Exist Bubble in China’s Housing Market?”, *World Economy* (Chinese), Issue 12. 2008.

<sup>6</sup> Wu, J., J. Gyourko, and Y. Deng (2012). “Evaluating Conditions in Major Chinese Housing Markets”, *Regional Science and Urban Economics*, Elsevier, vol. 42(3).

<sup>7</sup> Lu J. (2010). “Measuring the Bubble in China’s Housing Market”. *Economic Review*. Issue 6, 2010.

<sup>8</sup> China Statistical Yearbook. (2000–2010)

<sup>9</sup> Poterba. J.M. (1991). *House Price Dynamics: The Role of Tax Policy and Demography*. *Brookings Papers on Economic Activity*, Vol. 22, Issue 2 pp. 143–183 and 200–203, (1991) *Brookings Papers on Economic*

Harris, 2010<sup>10</sup>; Harris, 2013<sup>11</sup>). Land supply restriction policies may also drive housing prices to go up. When land supply constraint policies are enacted, the land supply will be reduced and the supply elasticity of the housing market will decrease. Glaeser, Gyourko, and Saiz (2008)<sup>12</sup> show that cities with a low elasticity housing of supply have higher and longer housing bubbles than cities with a high elasticity. Meanwhile, cities with a high elasticity of housing supply have fewer and shorter housing bubbles than cities with low elasticity. As to China, however, housing-related tax policies and land supply restriction policies do not have significant influences on housing markets (Zheng and Zhang, 2013<sup>13</sup>; Bai, Li and Quyang, 2014<sup>14</sup>).

Unlike housing-related tax policies and land supply restriction policies, home loan restriction policies and home purchase restriction policies play an important role in housing markets. Xu and Chen (2012)<sup>15</sup> find that China's home loan constraint policies are one important factor behind the dynamics of housing markets. Sun et al. (2016)<sup>16</sup> find that home purchase restrictions greatly influenced housing prices and housing transaction volumes in Beijing, China. "Beijing's HPR policy triggered a 17%–32% decrease in

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Activity, no.n2, 1991 Fall, p143(61) (ISSN: 0007-2303)

<sup>10</sup> Harris B. H. (2010). The Effect of Proposed Tax Reforms on Metropolitan Housing Prices. Washington, DC: Urban-Brookings Tax Policy Centre.

<sup>11</sup> Harris B. H. (2013). Tax Reform, Transaction Costs, and Metropolitan Housing in the United States. Washington, DC: Urban-Brookings Tax Policy Centre.

<sup>12</sup> Glaeser, E. L. and Gyourko, Joseph and Saiz, Albert, 2008. Housing Supply and Housing Bubbles. *Journal of Urban Economics*, Elsevier, vol. 64(2), pages 198-217, September

<sup>13</sup> Zheng H. and Zhang Q. (2013). Property Tax in China: Is It Effective in Curbing Housing Price? *Economics Bulletin*. Volume: 33 (2013). Issue: 4. Pages: 2465–2474

<sup>14</sup> Bai C., Q. Li, M. Ouyang (2014). Property Taxes and Home Prices: A Tale of Two Cities. *Journal of Econometrics* Volume 180, Issue 1, May 2014, Pages 1–15.

<sup>15</sup> Xu, X. and T. Chen (2012). The Effect of Monetary Policy on Real Estate Price Growth in China. *Pacific-Basin Finance Journal*. Volume 20, Issue 1, January 2012, Pages 62–77

<sup>16</sup> Sun, Weizeng; Zheng, Siqi; Geltner, David; Wang, Rui (2016). "The Housing Market Effects of Local Home Purchase Restrictions: Evidence from Beijing". *The Journal of Real Estate Finance and Economics*. Volume 53, issue 3, 364-367

resale price, a drop in the price-to-rent ratio of about a quarter of its mean value, and a deep (50-75%) reduction in the transaction volume of the for-sale<sup>17</sup> market, with no significant change in the rent or the transaction volume of rental units.”

The studies above shows that home loan and home purchase restriction policies have significant influences in housing prices and transactions, so the termination of those policies might be one important reason why housing prices increases so rapidly. However, the significant influences on housing prices are only “true” in very short period, long-term data on house prices in China indicates otherwise. Since 2005, the Chinese government has been issuing various housing policies to slow down the rapid increase of housing prices. Although these policies were effective within a short period (3–12 months) after they were enacted, they did not significantly change the rapidly increasing housing prices since 2000. In fact, housing prices have been increasing rapidly in the whole period of 2005-2016, expect for very short period, such as Oct. 2007-May, 2008 and Mar. 2010-May. 2010. Therefore, it is not the termination of housing policies that boosts the housing prices in China over the past 16 years. Thus, the question still remains: What is the essential reason for rapidly increasing housing prices in China?

#### **4. Rational Expectations and Psychological Factors**

Muth (1961)<sup>18</sup> proposes the concept of “rational expectations.” Information is scarce, and the market generally does not waste information. The pricing of a market based on the expectations that everyone gets and acts on accurate market information is called

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<sup>17</sup> “For-sale market” here is used in this article (Sun et al., 2016) , which refers to the market where houses are sold or bought. It is distinguished from the rental housing market, where houses are leased or rented.

<sup>18</sup> Muth J. F. (1961) "Rational Expectations and the Theory of Price Movements" reprinted in *The New Classical Macroeconomics*. Volume 1. (1992): 3–23 (International Library of Critical Writings in Economics, vol. 19. Aldershot, UK: Elgar.)

rational expectation.

Lucas (1972)<sup>19</sup> develops this concept and contends that market participants will utilize all available information to make predictions about the performance of the investment. In the long run, investment decisions are always accurate or approximately accurate, although bias and error can happen in the short run.

Rational expectation models have been popular in economics since the 1970s. Recent studies still show that rational expectations can effectively explain some housing bubbles. Granziera and Kozicki (2012)<sup>20</sup> demonstrate that a rational expectations asset pricing model effectively describes and emulates the run-up in US house prices from 2000 to 2006. Gelain et al (2013)<sup>21</sup> investigate the behavior of the equilibrium price–rent ratio for housing in a standard asset pricing model, which is shown to be capable of approximately matching the price–rent ratio volatility if market agents are almost rational.

Although rational expectation models are widely accepted in economics, few researchers in the real estate field believe that the models can sufficiently account for the volatility of housing prices. Hamilton and Schwab (1985)<sup>22</sup>, Case and Shiller (1988, 1989)<sup>23</sup>, Mankiw and Weil (1989)<sup>24</sup>, Hosios and Pesando (1991)<sup>25</sup>, and Meese and

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<sup>19</sup> Lucas, Robert Jr., 1972. "Expectations and the neutrality of money," *Journal of Economic Theory*, Elsevier, vol. 4(2), pages 103–124, April.

<sup>20</sup> Granziera, E. and S. Kozicki (2012). House price dynamics: Fundamentals and expectations, *Journal of Economic Dynamics & Control*, v.60, 2015 Nov, p.152(14) (ISSN: 0165-1889)

<sup>21</sup> Paolo Gelain, Kevin J. Lansing and Caterina Mendicino, 2013. "House Prices, Credit Growth, and Excess Volatility: Implications for Monetary and Macprudential Policy," *International Journal of Central Banking*, *International Journal of Central Banking*, vol. 9(2), pages 219–276, June.

<sup>22</sup> Hamilton, B. W. and R. Schwab 1985. "Expected Appreciation in Urban Housing Markets" *Journal of Urban Economics*, Volume 18, Issue 1, July 1985, Pages 103–118

<sup>23</sup> Karl E. Case & Robert J. Shiller, 1988. "The behavior of home buyers in boom and post-boom markets," *New England Economic Review*, Federal Reserve Bank of Boston, issue Nov, pages 29-46.

Case, Karl E & Shiller, Robert J, 1989. "The Efficiency of the Market for Single-Family Homes," *American Economic Review*, American Economic Association, vol. 79(1), 125-137, March

Wallace (1994)<sup>26</sup> report that housing price movements are often positively self-correlated over a considerably long period. Hence, investors often make expectations based on a previous price movement and do not make decisions based on all available information. Investors do not always make rational expectations even in the long term. They conclude that irrational expectations and psychological factors can significantly influence housing price dynamics.

Clayton (1996)<sup>27</sup> asserts and tests an asset-based housing price model that explicitly incorporates the hypothesis of rational house price expectations. The model fails to fully capture observed house price dynamics. Granziera and Kozicki (2012)<sup>28</sup> also recognize that their rational models cannot emulate the sharp decrease or increase unless “limited-rational expectation” (e.g., backward-looking expectations (adaptive expectations) and extrapolative-type expectations) are integrated into those models.

Numerous scholars integrated irrational expectations in their theoretical or empirical models. Huh and Lansing (2000)<sup>29</sup> illustrate a model with backward-looking expectations that explains the fluctuation of housing prices to some extent. Evans and Ramey (2006)<sup>30</sup>,

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<sup>24</sup> Mankiw, N. Gregory and Weil, David N. 1989. “The Baby Boom, the Baby Bust, and the Housing Market”, *Regional Science and Urban Economics* 19, 235–258.

<sup>25</sup> Hosios, A. J and J. E Pesando. 1991. “Measuring Prices in Resale Housing Markets in Canada: Evidence and Implications”. *Journal of Housing Economics* 1: 303–317.

<sup>26</sup> Meese, R., and N. Wallace. 1994. “Testing the Present Value Relation for Housing Prices: Should I Leave My House in San Francisco?” *Journal of Urban Economics* 35, pp. 245–266.

<sup>27</sup> Jim Clayton(1996).Rational Expectations, Market Fundamentals and Housing Price Volatility. *Real Estate Economics*, Vol. 24 No. 4 Winter 1996

<sup>28</sup> Granziera, E. and S. Kozicki(2012). House price dynamics: Fundamentals and expectations, *Journal of Economic Dynamics & Control*, v.60, 2015 Nov, p.152(14) (ISSN: 0165-1889)

<sup>29</sup> Huh, C.G. and K.J. Lansing (2000). Expectations, credibility and disinflation in a small macroeconomic model, *Journal of Economics and Business* 52, 51–86.

<sup>30</sup> Evans, G.W. and G. Ramey( 2006). Adaptive expectations, underparameterization, and the Lucas critique, *Journal of Monetary Economics* 53, 249–264.



Lansing (2006, 2009)<sup>31</sup>, and Huang et al. (2009)<sup>32</sup> also incorporate adaptive expectations into their empirical models. The researchers find that this model can describe the price dynamics in the housing market for specific time intervals.

Rational and irrational models can explain quickly rising housing prices for some time intervals but they cannot explain them in the long run. Moreover, both models share the assumption that investors can borrow money without limitation, which holds only for partial equilibrium analysis. When the entire market is considered, the money available for investment, which comes from the total savings of an economy, is always limited and scarce. As the difference between Gross Domestic Product (GDP) and Gross Domestic Consumption (GDC), Gross Domestic Savings (GDS) are always limited and scarce.

Hence, at the market level, the expectation that housing prices will increase in the future will not necessarily lead to an actual increase in housing prices unless the money available for investment is sufficient. Hence, neither rational nor irrational expectations alone can result in increasing housing prices without sufficient capital. The following question should be asked: Where does the substantial capital (investment fund) come from?

### **1.3.2 How Can Housing Prices Increase very Rapidly When the Housing Rent is very Low?**

Although the various studies aforementioned do not perfectly explain the reason for

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<sup>31</sup> Lansing K.J. (2006). Lock-in of extrapolative expectations in an asset pricing model, *Macroeconomic Dynamics* 10, 317–348.

Lansing, K.J. (2009). Time-varying U.S. inflation dynamics and the New Keynesian Phillips curve, *Review of Economic Dynamics* 12, 304–326.

<sup>32</sup> Huang, K., Z. Liu, and T. Zha (2009). Learning, adaptive expectations, and technology shocks, *Economic Journal* 119, 377–405.

the quickly rising housing prices, they do provide very reasonable explanations. However, they fail to answer one question: How can housing prices continue to increase rapidly when housing rents are low?

Irrational expectations may explain this issue by assuming that the anomaly only occurs because people are irrational or have bias and errors. However, high house prices and low rent have coexisted in China for the past 16 years. Investors are unlikely to have holding bias or errors for 16 years because irrational behaviors can only occur in the short or middle run. As a result, investors must have rational reasons to continuously buy vacant houses. The following conclusions can be drawn based on their behaviors.

First, investors appear to continuously purchase vacant but expensive houses because they believe they can make higher returns by investing money on these houses than on other assets. Given the low rent, the investors must be anticipating considerable profits from the sale. In other words, investors can profit by investing money on vacant houses because they expect housing prices to increase. Hence, we return to the original question: Why would investors believe that housing prices will increase when the housing rent is low?

A second reason why investors are able to purchase vacant but expensive houses is because they can afford them. That is, they have cash. Such a fact cannot be neglected: not only some specific type of houses, but also almost all types of houses have been experiencing quickly rising-up prices; not only in some specific areas, but almost all areas on mainland China have been experiencing rapidly increasing housing prices. In other words, not only some specific individuals, but also almost all the individuals in this

whole society love buying vacant and expensive houses. It can be concluded that this society has enough money to afford houses.

The answer to the research question is twofold: 1) capital is substantial, or, sufficient for many vacant but expensive houses to be purchased. And, 2) capital can make higher returns by being invested in houses than other alternative assets, even though the housing rent is low and the vacancy rate is high.

However, other questions are now raised. First, why is capital substantial, or why is investment so high? Second, how can capital make higher returns from houses than other investments, even when there are so many vacant houses and the rent is so low?

### **1.3.3 Why Is the Capital/Investment Money So High?**

Based on macroeconomic fundamentals (e.g. Samuelson and Nordhaus(2009)<sup>33</sup>), aggregate product (AP) produced by a country at a specific period is always equal to the aggregate income (AI) in this specific period because each product must be distributed to someone as income, that is,

$$AP=AI \quad (1.1).$$

Aggregate product (AP) produced by a country at a specific period is called Gross Domestic Product (GDP), and aggregate income (AI) in this specific period is called gross domestic income (GDI). So (1.1) can be replaced by:

$$GDP=GDI \quad (1.2).$$

On one hand, Gross Domestic Product (GDP) can be used either for consumption goods or for investment goods, no other choices than there is no remainder. This means,

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<sup>33</sup> Paul Samuelson and William Nordhaus, Economics (19th Edition). McGraw-Hill/Irwin, 2009

$$\text{GDP}=\text{C}+\text{I} \quad (1.3)$$

where  $C$  stands for aggregate consumption and  $I$  refers to aggregate investment.

On the other hand, Gross Domestic Income will be used for consumption or will be saved. This means,

$$\text{GDI}=\text{C}+\text{S} \quad (1.4)$$

Where  $S$  stands for aggregate savings.

Substituting (1.3) and (1.4) into (1.2) gives,

$$\text{C}+\text{I}=\text{C}+\text{S} \quad (1.5)$$

This gives,

$$\text{I}=\text{S} \quad (1.6)$$

Equation (1.6) implies that aggregate investment is equal to aggregate savings. Therefore, if investment is substantially high, then aggregate savings must also be substantially high.

The reason why investment is so high is because savings is very high. A new question emerges at once: why is savings so high? This is the first key question for this study (Question 1).

#### **1.3.4 Why Can Capital Make More Profit from Houses than Other Assets When the Housing Rent is Low?**

High savings is not necessarily “good news” for an economy. High savings could boost economic growth if it is put into the production processes, namely, being spent on production factors (land, capital and labor). However, it will retard economic growth if it is invested in speculative assets.

China has one of the highest savings rates in the world. Over the last 16 years, many companies have been suffering from a very weak consumption market, and thus their profitability has been decreasing rapidly. As a result, many companies went into bankruptcy. In sharp contrast, asset markets (such as the housing market) have been experiencing significant growth and substantial returns. To sum up, high savings has contributed less and less to the Chinese overall economy because it has not been spent on production factors but it has been invested in speculative assets.

In order to show the relationship between production factors and speculative assets, two concepts, “real assets” and “virtual assets”, are introduced. This is important because these asset prices are related to whether or not the high savings can support the economic growth. Real assets are production factors and virtual assets are speculative assets. Why are real assets and virtual assets introduced in place of production factors and speculative assets? The answer is that it is much easier to uncover the relationship between real assets and virtual assets, but it is very hard to find the relationship between production factors and speculative assets.

Real assets are the production factors used in the production process, including land, factories, machines, facilities, and raw materials. As an extension of “real assets,” assets used for household consumption, such as cars and houses, are also real assets. Although buyers cannot earn profits from these assets, they can obtain consumption utility from them and thus save substantial living expenses. For example, owner-occupied housing allows the owner to save home rent expenses and car owners can save on other transportation costs. In economics, expenses saved are equivalent to profits earned. Thus,

an asset used for household consumption implies profits or returns to the owner in the future. Thus, it is also considered a real asset in this analysis. Therefore, in this dissertation, real assets refer to the production factors.

Virtual assets are rights to claim returns in the future and include stocks, bonds, funds, and shares. These assets are not necessarily connected with the production or consumption process. In other words, as rights to claim returns, benefits, or yields in the future, they are not production factors or consumption goods. For example, a small shareholder of Apple Inc. has the right to claim the dividend from Apple Inc., but he/she cannot use or operate the machines and other facilities in an Apple factory.

Houses are real assets when they are bought for consumption or production. Houses are virtual assets when they are bought as an investment in order to receive returns in the future. In a similar manner, asset markets can be divided into two market, real asset market and virtual asset market.

Real asset investors make profit by producing and selling products. Virtual asset investors make money from holding period returns (rents, dividends, interest) and capital gains (the difference between buying and reselling those assets). In other words, virtual assets are return-oriented capital, but real assets are profit-oriented capital.

If there are no bubbles in the asset markets, namely, the asset prices can always reflect market fundamentals, the return from virtual assets will be very close to the profit from real assets. An investor has two ways to invest. In other words, an investor makes almost the same profits no matter whether he buys the production factors and then creates a new company, or purchases the stock of this company after other people create it.

However, the asset prices do not always reflect market fundamentals. In this case, the return from virtual assets will be different from the profit from real assets. The prices of real assets are always connected to the profit from them in the future, but the prices of real assets can deviate very far from its income returns (dividend, rent, or interest). Profit is the only return for real assets, but income return and the appreciation or capital gain when the asset is sold are both returns for the virtual assets. When the holding-period return is very low, the price of virtual assets can be very high as long as the capital gain is very big. This is the unique feature belonging to virtual assets.

As to houses, when the rent is very low, housing prices can be very high if investors expect the appreciation or capital gains from houses to be very big in the future. Why can capital make more profit from houses than from other assets although the housing rent is low? The answer is as follows: the houses can bring the investors very high capital gains but other assets cannot.

Capital gain is the difference between the current purchase price and the future resale price. Large capital gains for houses mean that future resale prices are much higher than the current purchase prices. In other words, large expected capital gains mean that housing prices are expected to increase rapidly. What makes housing prices increase rapidly? First, there is sufficient money available for investment. This is because, as said before, the savings rate is very high. Second, investors “love” houses so they invest a lot of money into the housing market. In other words, investors prefer houses to other virtual assets due to the high expected capital gains. That is, the high savings of the Chinese are invested into the housing markets and housing prices increase despite low rent.

Two new questions emerge. Why can't the real assets bring investors high profits and then attract the savings? Why don't the prices of other assets than houses increase rapidly and bring investors high capital gains, and then attract savings to pour in? In other words, first, why do investors prefer virtual assets to real assets? Second, why do investors prefer houses to other virtual assets?

Currently, one possible answer for the first question is that the virtual assets are more profitable than real assets for some reason. One possible answer for the second question is that the houses have some unique features that make investors believe that houses will continue to appreciate.

## **1.4 Research questions**

Now we put the questions discussed above together.

Question1: **Why are aggregate savings high?** This key question will be the focus of subsequent discussions.

High aggregate savings will not necessarily lead to asset bubbles if high aggregate savings can come into the real asset market as a productive investment. Thus, we must also ask: **why are high aggregate savings invested in the virtual asset market rather than the real asset market?** This key question will also be answered.

Finally, various types of assets exist in a virtual asset market, such as bonds, stocks, mutual or hedge funds, houses, and so on. **Why do high aggregate savings prefer houses to other virtual assets in a virtual asset market and potentially causing housing bubbles?** This key question will be discussed.



# CHAPTER 2: LITERATURE REVIEW

## 2.1 Consumption and Savings

### 2.1.1 Neoclassical Economics: Interest Rate Determines Savings and Consumption

In the neoclassical economics framework (Marshall, 1890<sup>34</sup>; Fisher, 1930<sup>35</sup>), the interest rate can adjust capital supply (CS) and capital demand (CD), as well as savings and consumption.

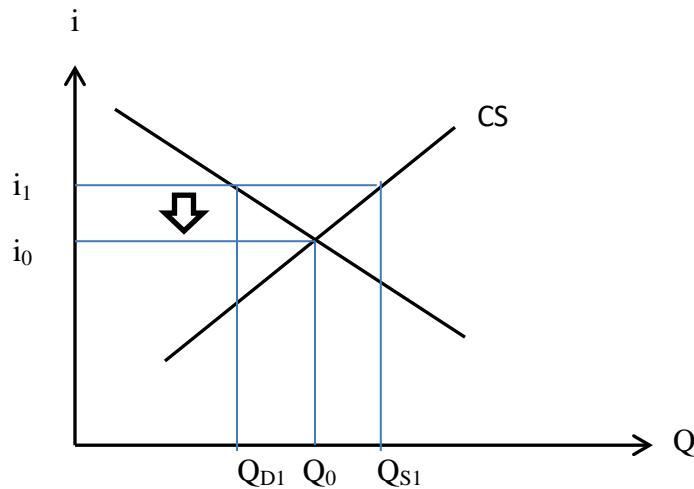


Figure 2.1: Capital Demand and Capital Supply

Figure 2.1 shows that CS exhibits an upward curve, whereas CD is a downward one. Because CS comes from savings, the capital suppliers or lenders, households must reduce their consumption to supply the capital given their income. The negative utility of the capital lenders increases when consumption is reduced. Lenders will ask for a high

<sup>34</sup> Marshal A (1890). Principles of Economics (Palgrave Classics in Economics). Palgrave Macmillan; 8th edition (January 7, 2014)

<sup>35</sup> Fisher R. (1930). The Theory of Interest: As Determined by Impatience to Spend Income and Opportunity to Invest It. Porcupine Press (June 1930).

interest rate to compensate for their utility loss, which causes the interest rates to increase. Hence, the CS curve shifts upward. Meanwhile, CD is determined by the marginal returns of capital. When capital increases, marginal returns of capital will decrease. Hence, the CD curve goes downwards.

The intersection point of CD and CS (E) is the equilibrium point, where the marginal return to capital borrowers is equal to the marginal negative utility of capital lenders. In a similar manner, Q and i are called equilibrium capital quantity and equilibrium capital price (interest rate), respectively.

What if a distraction from equilibrium occurs, such as when interest rate is currently at  $i_1$ ? In this case, the current interest rate is higher than the equilibrium interest rate. Thus, capital supply will increase while capital demand will decrease. Capital is oversupplied, then the interest rate will drop. Eventually, the interest rate will return to the equilibrium interest rate  $i_0$ .

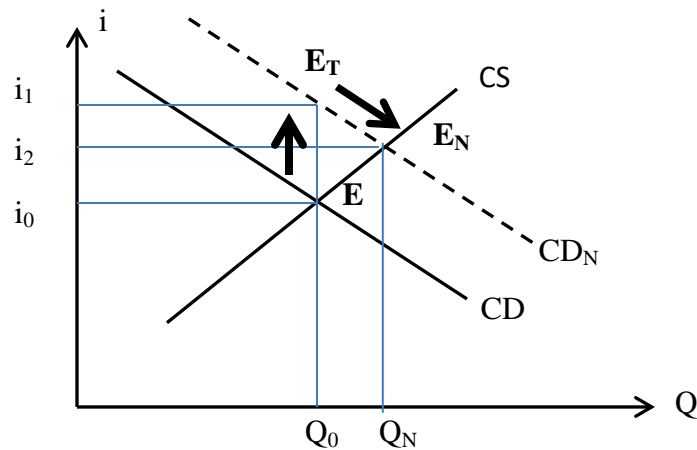


Figure 2.2: Interest rates and transaction adjustment caused by higher capital demand

If some event, such as strong economic growth, causes investments to be profitable,

the investment demand for capital will increase and CD will move to  $CD_N$ . Capital supply cannot increase immediately, then the interest rates will increase from the previous  $i_0$  to  $i_1$ , and the equilibrium will rise from E to  $E_T$ . When the interest rates increase, households will reduce their consumption to increase savings, which increases capital supply. Along with increasing capital supply, the interest rates will decrease gradually and finally arrive in  $i_2$ , and the equilibrium will drop from  $E_T$  to  $E_s$ . In this new equilibrium, the interest rate and capital quantity are higher than before, as shown in Figure 2.2. This new equilibrium also means that households save more and consume less than before because the capital supply is more than before.

To sum up, neo-classical economics holds that interest rate determines household saving rate and consumption rate. When interest rate goes up, households will save more and consume less, which means a high saving rate and a low consumption rate.

### **2.1.2 Keynesian Economics: A Psychological Law (Marginal Propensity to Consume) Determines Consumption and Savings**

However, Keynes (1936)<sup>36</sup> goes in a different direction by considering an important concept, Marginal Propensity to Consume (MPC). MPC refers to how much a household will consume with \$1 added to its income (marginal income). For example, if one household's income increases by \$100 and this household's consumption rises by \$70, then the MPC of this family is 0.7.

By this concept, if  $MPC=0.9$ , 90% of any increase in the current income will translate to an immediate increase in consumption. But why does this happen? Namely,

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<sup>36</sup> Keynes J.M. (1936). The General Theory of Employment, Interest, And Money. Create Space Independent Publishing Platform (November 15, 2011)

why does a household always spend 90% of any increase in the current income on consumption? Keynes attributes it to human being's psychological structure, that is, a psychological law. Precisely, it is because of such a psychological law that the household always spends 90% of any increase in the current income on consumption.

So Keynes argues that it is MPC, not the interest rate that determines the savings and consumption. The proportion of increased income spent on consumption, represented by  $c$ , is called the MPC. Therefore,  $(1-c)$  is called Marginal Propensity to Save (MPS). In Keynes's theory, when a person makes decisions between consumption and savings, he does not consider the interest rate but merely follows the MPC, a psychological law.

### **2.1.3 Life-cycle Hypothesis (LCH) and Permanent Income Hypothesis (PIH): Life-cycle Income or Permanent Income Determines Consumption and Savings**

Keynes' argument about MPC is not convincing for many economists. Then they subsequently investigated the factors that determine consumption and savings. They generally draw upon a common theoretical framework by assuming that consumers base their expenditures on a rational and informed assessment of current and future economic circumstances. The rational optimization framework provides two main approaches. Modigliani and Brumberg (1954)<sup>37</sup> posit the Life-cycle Hypothesis and propose that the spending decisions of households are driven by household members' assessments of expenditure needs and income throughout the remainder of their lives. In this approach, household members consider predictable events, such as a precipitous drop in income

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<sup>37</sup> Modigliani F. and Brumberg R. (1954). Utility Analysis and the Consumption Function. An essay in Modigliani, Franco, Andrew B. Abel, and Simon Johnson (1980). The collected papers of Franco Modigliani. Cambridge, Mass: MIT Press.

upon retirement. The standard version of the life-cycle model assumes that consumers prefer to spend all their resources before they die (i.e., a bequest motive is not expected). Life-cycle hypothesis are most commonly employed by micro-economists to model household-level data on consumption, income, or wealth.

Macroeconomists tend to use a simplified version of the optimization framework called the Permanent Income Hypothesis, whose origins can be traced back to Friedman (1957)<sup>38</sup>. The permanent income hypothesis omits the detailed treatment of demographics and retirement included in the life-cycle model. Instead, it focuses on the aspects that are essential in macroeconomic analysis, including predictions about the nature of the consumption function, which relates consumer spending to factors such as income, wealth, and interest rates, among others.

Both models focus on individuals and their life span, specifically, the factors that determine their consumption and savings throughout their lives. Modigliani states that an increase in the total life income of an individual will raise consumption in each period, while Friedman states that the increase of permanent income elevates consumption.

LCH and PIH are much more convincing than Keynesian MPC theory because they base their arguments on the individual's rational, NOT psychological, consumption decision. Therefore, LCH and PIH are widely employed to model household consumption behavior. However, neither LCH nor PIH has ever considered such question: at a point when people with different income levels have very stable expectations about their life-cycle income or permanent, will they have the same

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<sup>38</sup> Friedman M.(1957). Theory of the Consumption Function. Princeton University Press (August 17, 2008).

propensity to consume? In fact, LCH and PIH both assume the propensity to consume is homogeneous for households at different income level. But the economic data will show it is not the fact.

## 2.2 Savings, Investments and Product

### 2.2.1 Production Function in Neoclassical Economics: More Savings can Bring out More Products

Will More Savings can Bring out More Products? Neoclassical economics maintain the truth in this statement. First, effect capital market will adjust the capital supply (household savings) to be equal to capital demand (Firm investment), then more savings can always lead to more investments. Second, more investments, including capital and labor, can always bring out more products because the partial derivative of products (P) with respect to capital(K) or labor (L) is positive.

The production function<sup>39</sup> in neoclassical economics is:

$$P = f(K, L) \quad \frac{\partial P}{\partial K} > 0 \quad \frac{\partial P}{\partial L} > 0 \quad (2.5)$$

where  $P$  is products,  $K$  is capital (includes land),  $L$  is labor, and  $f$  is the production function that can also be affected by the technological level.

$\frac{\partial P}{\partial K} > 0$  and  $\frac{\partial P}{\partial L} > 0$  imply that products are positively correlated with capital and

labor. Thus, more savings will result in more products through more investments.

Increased savings will lead to high production by neoclassical production function. However, it is not always true because the production will not always continue to

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<sup>39</sup> Samuelson P. and W. Nordhaus (2009). *Economics* (19th Edition). McGraw-Hill/Irwin

increase when savings keep rising. Along with increasing savings, the marginal return decreases although the total returns increase. After some time, the decreasing marginal return will finally cause the total return to decrease. This phenomenon is called the “Law of Diminishing Marginal Returns.”<sup>40</sup>

### **2.2.2 Solow Growth Model: More Savings does not Necessarily Lead to More Products due to the Existence of Optimal Savings Rate**

Solow (1956, 1957)<sup>41</sup> and Swan (1956)<sup>42</sup> show the existence of an optimal savings rate. On one hand, when capital stock  $K$  increases, output  $f(k)$  rises at a diminishing rate. As a proportion(s) of output, savings  $sf(k)$  will also increase at a diminishing rate. On the other hand, when capital stock  $K$  increases, investment depreciation  $\delta k$ , as a proportion of capital stock  $K(t)$ , will also increase. The relationship between  $\delta k$  and  $sf(k)$  will bring about three outcomes.

When  $\delta k > sf(k)$ , capital stock will reduce because the newly added capital is less than the lost capital.

When  $\delta k < sf(k)$ , capital stock will increase because the newly added capital is more than the capital loss because of depreciation.

When  $\delta k = sf(k)$ , the capital stock will be stable because the newly added capital

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<sup>40</sup> See Footnote 42.

<sup>41</sup> This model was introduced developed in the following several papers.

Solow R.M.(1956). A Contribution to the Theory of Economic Growth. *The Quarterly Journal of Economics*, Vol. 70, No. 1. pp. 65–94 Solow, Robert M. (1957). "Technical change and the aggregate production function". *Review of Economics and Statistics*. The MIT Press. 39 (3): 312–320.

Swan, Trevor W. (November 1956). "Economic growth and capital accumulation". *Economic Record*. Wiley. 32 (2): 334–361.

Solow, Robert M. (1957). "Technical change and the aggregate production function". *Review of Economics and Statistics*. The MIT Press. 39 (3): 312–320.

<sup>42</sup> Swan, Trevor W. (November 1956). "Economic growth and capital accumulation". *Economic Record*. Wiley. 32 (2): 334–361

is equal to the capital loss due to depreciation

The aggregate consumption should be maximized in order to realize the maximal welfare. That is,

$$\text{Max}\{f(k) - sf(k)\} \quad (2.6)$$

Sustainable capital stock  $sf(k)$  is always equal to  $\delta f(k)$ . Thus, the problem above becomes:

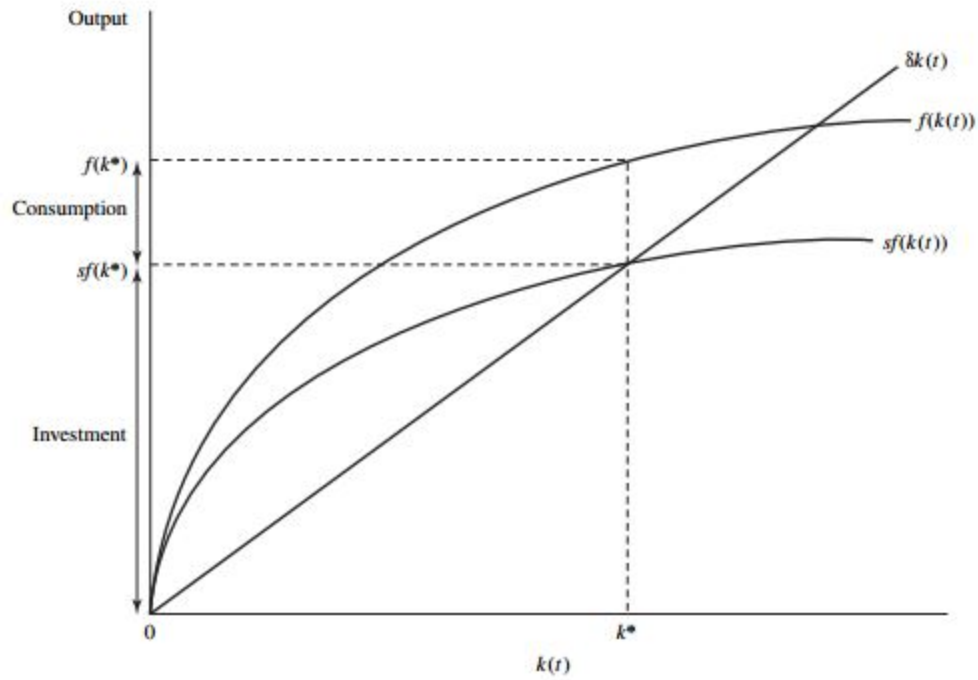
$$\text{Max}\{f(k) - \delta k\} \quad (2.7)$$

Its first-order condition is:

$$\frac{df(L)}{dk} = \delta \quad (2.8)$$

Let  $k^*$  be solution of this equation,  $k^*$  be the optimal capital stock,  $f(k^*)$  be the optimal Output,  $sf(k^*)$  be the optimal savings, and  $s$  is the optimal savings rate.





**Figure 2.3: Solow-Swan Growth Model**

where

- $k(t)$  Capital stock,
- $S$ , savings rate,
- $\delta$  Depreciation rate,
- $f(k^*)$  Optimal output,
- $f(k(t))$  output,
- $sf(k(t))$  savings (investments),
- $k^*$  Optimal capital stock, and
- $sf(k^*)$  Optimal savings (investments).

Sources: Acemoglu, Daron (2009). "The Solow Growth Model". Introduction to Modern Economic Growth. Princeton: Princeton University Press. pp. 26–76.

The Solow–Swan growth model (Figure 2.3) shows that an optimal savings rate exists. If an economy’s savings rate is higher than this optimal level, the output will also be high. However, the output increases slower than the investments and the aggregate consumption of the economy will drop. This economy does not maximize aggregate consumption, which is supposed to be the welfare target of the economy.

Furthermore, when the savings rate is too high, substantial social resources will be wasted because a high savings rate means high investments or excessive input of land, raw materials, machine and facilities, and labor. Due to the very low output or zero output, all those social resources are wasted.

### **2.2.3 The Consequences of Overly-high Savings Rate**

The analysis can be extended further. Aside from all the consequences above, an overly-high savings rate gives rise to other consequences for the entire economy both at the micro- and macro-levels. When the savings rate is high, the consumption rate is low and the money available for consumption funds will be less. Therefore, the demand for commodities will weaken and a high savings rate will lead to high profits in the asset markets because the demand for the assets is strong. Meanwhile, a high savings rate will result in low profits in the consumption market because the demand for consumption becomes weaker and weaker. Consequently, the asset markets will be increasingly prosperous while the consumption markets will become more and more recessive. Since the demand for production factors (machine, facilities, raw materials, factories) are driven by the demand for consumption goods, the production factor markets will also be recessive. In other words, the virtual economy (the virtual asset market) will be

prosperous, but the real economy (the consumption market plus the asset market) will be recessive.

Prosperous asset markets and recessive consumption markets will bring out further consequences. First, through time, firms in the consumption market will not be interested in the products they specialize in as they transfer their money to the housing market. The asset market will become more prosperous while consumption markets become more recessive. Second, the core competency of a country lies in its manufacturing, high-technology, and other modern service industries, all of which can be considered fundamental industries. If the fundamental industries grow weaker in time, the core competency of the country will considerably falter.

As stated before, an economy is divided into the asset market and the consumption market. The former includes monetary, exchange, financial derivative markets, and mutual and hedge funds, among others. The latter includes all the markets of various types of products and the services that different industries, such as manufacturing, high-technology, entertainment, and medical industries, provide for people's consumption or other firms' production.

Theoretically, asset markets are supposed to be channels through which firms (including project initiators) can borrow money to finance their projects. For example, firms can borrow money from the stock market. When a considerable amount of money pours into an overly-heated asset market, will the money finally go to firms that produce products or provide services for society in the consumption market? If so, an overly-heated asset market is not entirely a negative phenomenon because substantial capital can

be brought into the consumption market.

However, this situation does not occur in actual settings. A high savings rate means a low consumption rate, so the high demand for assets is always accompanied by the low demand for consumption goods. High demand for assets will lead to high profit in the asset market, while low demand for consumption goods will result in low profit in consumption market and the production factor market. So the money placed into the consumption market or production can only earn low profits and even suffer losses. Consequently, investors become unwilling to invest their money into the real assets in the consumption markets and production factor market.

Furthermore, they are reluctant to buy any virtual assets whose returns closely depend on the operating performance of the companies in the consumption markets or the production markets. For example, they would shy away from buying the stock of a manufacturing company. First, the dividend from this company will not be considerable due to the poor performance of this company. Second, the stock price of this company cannot increase in the long run for the same reason, which means the capital gains from an investment in this company would not be considerable, either. So, the overall return from the stock of this company will low. The virtual assets, whose returns depend on the operational performance in the consumption market or the production factor market, can be called “normal assets” because those assets are consistent with popular economic theories.

What types of assets do investors prefer over “normal assets”? The answer is they prefer “abnormal” assets, or those whose returns primarily come from appreciation (buy–

sell-price difference or capital gains) and not from regular dividends. “Abnormal” assets have limited correlations to a firm’s performance in the consumption market. In this research, we will call this type of asset a “virtual” or speculative asset. When a prosperous asset market coexists with a recessive consumption market we propose investors will choose speculative assets, which means that investment funds (or savings) will not go into real economies or the industries in consumption markets but will be invested into other assets that are speculative.

## **2.3 Income Inequality and Aggregate Savings**

The basic argument in this study is that income inequality will affect asset prices through aggregate saving rate, so the studies about the relationship between income inequality and aggregate savings be reviewed.

### **2.3.1 Income Level and Household’s Savings Rate**

Venieris and Gupta (1986)<sup>43</sup> find that poorer households have the lowest savings propensities from aggregate data for 49 countries. Dynan, Skinner and Zeldes (2004)<sup>44</sup> employ new empirical methods applied to the Panel Study of Income Dynamics, the Survey of Consumer Finances, and the Consumer Expenditure Survey in the US. They find a strong positive relationship between savings rates and lifetime income and a weaker but still positive relationship between the marginal propensity to save and lifetime income. Those studies show that the families with high lifetime income will save more than the families with low lifetime income.

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<sup>43</sup> Venieris and Gupta (1986). Income distribution and sociopolitical instability as determinants of savings: a cross-sectional model. *Journal of Political Economy* 94, 873–883

<sup>44</sup> Dynan, Skinner, Zeldes (2004). Do the Rich Save More? *Journal of Political Economy*, 2004, vol. 112, no.2

Gan (2013)<sup>45</sup> conducts a survey in 2011 with a sample of 8,438 households and 29,450 individuals. This study reports that Savings rates across income levels differ. The Top5 percent income households (the highest income level group) have an average savings rate of 73.5 percent in 2010, which is the highest saving rate among all the income-level groups. In fact, about 45 percent of households saved nothing in 2010. This study based on China's data draw similar conclusion that high income level household saves more than low income level households.

The findings in the above studies are significant. They show that the relationship between savings and income of the households at different income levels at the same point in time, and they show that households at different income levels have different propensities to consume. Results from these studies are in contrast to the assumptions in the Keynesian's MPC theory, LCH and PIH, where households are assumed to have the same propensity to consume at different income levels. However, the researchers do not provide a convincing explanation for this phenomenon.

### **2.3.2 The Relationship between the Income Level and the Aggregate Savings Rate**

#### **1. Significantly Positive Relationship**

Brady and Friedman (1947)<sup>46</sup> argue that the percentage of income saved at each income level turns out to be closely related to the income distribution throughout the data from all the recent sample surveys. They conclude that "In general, the smaller the percentage of families in the higher income brackets, the greater the percentage of

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<sup>45</sup> Li Gan. Income Inequality and Consumptions in China.

[https://international.uiowa.edu/sites/international.uiowa.edu/files/file\\_uploads/incomeinequalityinchina.pdf](https://international.uiowa.edu/sites/international.uiowa.edu/files/file_uploads/incomeinequalityinchina.pdf)

<sup>46</sup> Brady and Friedman, 1947. "Part IV: Savings and the Income Distribution," NBER Chapters, in: *Studies in Income and Wealth*, pages 247-265 National Bureau of Economic Research, Inc.

income saved.”(p248) The smaller percentage of families in the higher income brackets indicated more severe income inequality, so this study shows that the more equal the income distribution, the greater the aggregate savings rate.

Based on data on 65 industrial and developing countries for the year 1975, Sohota (1993)<sup>47</sup> finds a positive relation between the aggregate savings rate and the Gini coefficient.<sup>48</sup> Cook (1995)<sup>49</sup> uses several inequality measures and tests the relationships of these measures to the savings rate (GDS/GDP) in the 1970’s in 49 less developed countries. He reports that inequality has a positive and significant impact on the savings rate.

Bunting(1991)<sup>50</sup> uses 1984 Consumer Expenditure Surveys (CES) data with 9,401 households to estimates marginal propensities and shows that the propensity to save increases when the quintile income share of highest income groups increases. He concludes, “Aggregate savings statistics do not accurately measure household savings behavior. They implicitly reflect the distribution of income and largely describe the economic behavior of the highest income groups”.(p157) The increasing quintile share of income indicates more higher saving rate.

Smith (2001)<sup>51</sup> conducts a cross-sectional and panel regression and shows that

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<sup>47</sup> Sahota, G., 1993. Savings and distribution. In: Gapinski, J.H. Ed., The Economics of Savings. KluwerAcademic Publishers, Boston.

<sup>48</sup> Gini coefficient is a measure of statistical income or wealth dispersion. A Gini coefficient of zero expresses perfect equality. Gini coefficient of one expresses maximal. See: Gini, Corrado (1921). "Measurement of Inequality of Incomes". The Economic Journal. Blackwell Publishing. 31 (121): 124–126.

<sup>49</sup> Cook, C., 1995. Savings rates and income distribution: further evidence from LDCs. *Applied Economics*. 27, 71–82.

<sup>50</sup> David Bunting (1991) . Savings and the Distribution of Income. *Journal of Post Keynesian Economics*. Vol. 14, No. 1, 3-37

<sup>51</sup>Smith (2001). International Evidence on How Income Inequality and Credit Market Imperfections Affect

income inequality has a robust, positive effect on private savings rates that depends on financial market development and the quality of credit available to the private sector. In other words, credit market imperfections are the likely reason for the income inequality and the private savings positive correlation.

Li and Zou (2004)<sup>52</sup> employ a panel data of 49 industrial and developing countries to examine the relationship between savings and income inequality. Their empirical examination renders weak support for a very weak negative association between them. But, subsamples of OECD countries and Asian countries show that income inequality and the savings rate can be very positively and significantly associated.

Scheuermeyer and Bofinger (2014)<sup>53</sup> provide a new understanding about the relationship between savings rates and income inequality. Using panel data from 21 developed economies from 1970-2007, the authors show that while the marginal impact of income inequality is positive at low levels of inequality, the relationship becomes negative after some point of time. This study argues that the positive relationship between income inequality and aggregate savings might only exist in some specific time interval.

## 2. Insignificant Relationship

There are also studies showing that the relationship between income inequality and aggregate savings is uncertain. Schmit-Hebbel and Serven (2000)<sup>54</sup> provide no

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Private Savings Rates. *Journal of Development Economics*. Vol. 64 2001. 103–127

<sup>52</sup> Hongyi Li and Heng-fu Zou(2004). Savings and Income Distribution. *Annals of Economics and Finance* 5, 245–270 (2004)

<sup>53</sup> Scheuermeyer, Philipp; Bofinger, Peter (2016) : Income Distribution and Household Savings: A Non-Monotonic Relationship. *Applied Microeconomics II*, No. F01-V2

<sup>54</sup> Klaus Schmit-Hebbel, Luis Serven(2000). Does income inequality raise aggregate savings? *Journal*



support for the notion that income inequality has any systematic effect on aggregate savings. Della Valle and Oguchi (1976)<sup>55</sup> and Musgrove (1980)<sup>56</sup> find that the effect of income distribution on savings is not statistically significant using a cross country dataset. Edwards (1996)<sup>57</sup> reaches similar conclusions from a panel data of developing countries and OECD countries for the years 1970-1992. Using the data from the Consumer Expenditure Survey, Kruger and Perri (2006)<sup>58</sup> contend that the increase in income inequality in the United States has not been accompanied by a corresponding rise in consumption inequality. In their opinion, this means the relationship between income inequality and aggregate consumption is insignificant. But their explanation for a negative relationship is not clear. Why is the relationship insignificant? Preliminary test shows there might be problems with the selection of control variables.

Although some studies show that the relationship between income inequality and saving rate is insignificant, most studies above shows that the positive impacts of income inequality on the aggregate savings rate exist. However, those studies do not give a reasonable explanation for this positive relation.

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*of Development Economics*. Vol. 61. 417–446. They have drawn those conclusion in 1996, see Klaus Schmidt-Hebbel and Luis Serven(1996). Income Inequality and Aggregate Savings. The Cross-Country Evidence. Policy Research Working Paper. The World Bank. Policy Research Department Macroeconomics and Growth Division, January 1996.

<sup>55</sup> Della Valle, P., Oguchi, N., 1976. Distribution, the aggregate consumption function, and the level of economic development: some cross-country results. *Journal of Political Economy* 84, 1325–1334

<sup>56</sup> Musgrove, P., 1980. Income distribution and the aggregate consumption function. *Journal of Political Economy* 88, 504–525.

<sup>57</sup> Edwards, S., 1996. Why are Latin America's savings rates so low? An International Comparative Analysis *Journal of Development Economics* 51 (1), 5–44.

<sup>58</sup> Dirk Kruger and Fabrizio Perri(2005). Does Income Inequality Lead to Consumption Inequality? Evidence and Theory. *The Review of Economic Studies*, 2006. Vol. 73 ,Issue 1, 163-193

## **2.4 Income Inequality, Asset Prices and Economic Growth**

After the studies on the relationship between income inequality and saving rate are reviewed, the next is to review the studies and income inequality and asset prices. As an extension of this sector, the studies between income inequality and economic growth are reviewed.

### **2.4.1 Income Inequality and Asset Prices**

#### **1. Positive Relationship**

Zhang (2013)<sup>59</sup> builds a model based on the hypothesis that a market with high income inequality will imply that only the top small percentage of the population (the 1%) can buy stocks. This underpins the ability of investors to hedge risks. The trading illiquidity of the securities then increases the risk of making a stock investment and will also increase the return. Zhang measures the stock market aggregate performance using the market average Price/Dividend (P/D) ratio and predicts that the rate of return on stocks in a highly unequal society would be higher due to a lower rate of market participation. This research was based on panel data from 154 countries from 1950 to 2008. Zhang found that a rise in the Gini coefficient of 0.01 is associated with up to a 2% lower stock price/dividend ratio. This finding suggests that an increase in income inequality increases the rate of return in the stock market due to a lower overall price level. The author also shows that the risk-free rate of a country is positively related to the income inequality variable. Each additional unit of income inequality is accompanied by a 0.18% increase in the risk-free rate.

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<sup>59</sup> Zhang, Yilin, Income Inequality and Asset Prices: A Cross-Country Study (August 1, 2013). Available at SSRN: <https://ssrn.com/abstract=2021287> or <http://dx.doi.org/10.2139/ssrn.2021287>

Nguyen (2013)<sup>60</sup> measures income inequality by the share of national income going to the wealthiest 10% of the nation in the U.S.. He tests the relationship between income inequality and stock market returns in the U.S. from 1927 to 2012. By utilizing the Fama-French three factor model,<sup>61</sup> he obtains the inequality beta coefficient and the inequality risk premium. He finds that the income inequality factor is correlated with the rate of market participation which in turn increases returns on the stock market.

## 2. Uncertain Relationship

Johnson (2012)<sup>62</sup> argues that the relationship between income inequality and asset prices can be either positive, negative or zero. According to his model, the asset (A1) that the rich prefer is different from asset (A2) that the poor prefer. The increase in the price of A1 will bring about higher income inequality and an increase in the price of A2 will lead to a lower income inequality.

## 3. Negative Relationship

Määttä and Terviö (2014)<sup>63</sup> build an assignment model to investigate the relationship between the distributions of income and house. In this model, households are heterogeneous by incomes and houses by quality. Each household is potentially both a

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<sup>60</sup> Nguyen (2013). *Income Inequality and Stock Pricing in The U.S. Market*. LAP LAMBERT Academic Publishing (August 2, 2013)

<sup>61</sup> The Fama and French Three Factor Model is an asset pricing model that expands on the capital asset pricing model (CAPM) by adding size and value factors to the market risk factor in CAPM. This model considers the fact that value and small-cap stocks outperform markets on a regular basis. By including these two additional factors, the model adjusts for the outperformance tendency, which is thought to make it a better tool for evaluating manager performance. It was developed in the following two papers: Fama, E. F.; French, K. R. (1993). "Common risk factors in the returns on stocks and bonds". *Journal of Financial Economics*. 33: 3.

Jump up ^ Fama, E. F.; French, K. R. (1992). "The Cross-Section of Expected Stock Returns". *The Journal of Finance*. 47 (2): 427.

<sup>62</sup> Johnson (2012) "Inequality Risk Premia." *Journal of Monetary Economics*, 59(6), 565-580

<sup>63</sup> Niku Määttä and Marko Terviö (2014). Income distribution and housing prices: An assignment model approach. *Journal of Economic Theory*. Volume 151, May 2014, Pages 381–410

buyer and a seller because everyone owns one house and wishes to live in one house. This model tries to show how the impact of more severe income inequality on housing prices depends on the shapes of the distributions. The empirical study shows that income inequality between 1998 and 2007 is negatively correlated with average house prices in six US metropolitan areas.

Although some studies draw a different conclusion, like Johnson (2012) and Määttä and Terviö (2014), most studies show that the income inequality has positive influences on asset prices. But Johnson (2012) shows that the relationship is not clear.

#### **2.4.2 Income Inequality and Economic Growth**

Treec and Sturn (2012)<sup>64</sup> try to find the relationship between income equality and the Great Recession. They discuss the macroeconomic effects of income distribution in China and Germany. In their opinion, both China and Germany experienced pronounced declines in the share of wages and household income in national income, strong increases in income inequality, rising savings rates, weak private consumption demand and strong improvements in the current account before the Great Recession. In other words, severe income inequality, high savings rates and weak consumption are all positively correlated. Furthermore, all the conditions are a signal for an economic recession. They finally conclude that reducing income inequality is of great importance to overcoming macroeconomic instabilities.

Goda and Lysandrou (2014)<sup>65</sup> investigated the relationship between income

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<sup>64</sup> Till van Treeck; Simon Sturn (2012). Income Inequality as a Cause of the Great Recession? A Survey of Current Debates. Working paper. Conditions of Work and Employment Series No. 39

<sup>65</sup> Thomas and Lysandrou (2014). The contribution of wealth concentration to the subprime crisis: A

inequality and crisis by comparing Marxian, Post Keynesian and Mainstream Crisis Theories. Marxist theory focuses on overproduction. Capitalists try to make the most profit by producing more and paying the workers less. Accumulating output will finally become “product excess” due to the declining demand resulting from the wage reduction, thus the economic crisis will emerge.

Conclusions in the two studies above are very insightful, thus are highly valued by this study. Both of them points out that severe income inequality will result in weak consumption while leading to high savings, as a result, severe income inequality, high savings rates and weak consumption are all positively correlated. However, those studies have not given an explanation why this phenomenon can happen.

## **2.5 Real Estate Asset Market and Real Estate Consumption Market**

Is the housing market an asset or a consumption market? DiPasquale and Wheaton (1992)<sup>66</sup> argue that the real estate market is a consumption market when properties are rented. It is an asset market when properties are bought or sold. These two markets are closely connected. Their interactions can be described in one model.

1) The demand for space and the stock of real estate  $R$  determine the rent  $R$ . Hence, rent is determined in a real estate consumption market,  $R = f(S)$  (Quadrant I).

2) Rent  $R$  and discount rate  $i$  in a real estate asset market determine the real estate price

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quantitative estimation. *Cambridge Journal of Economics* 38(2):301-327 • March 2014

<sup>66</sup> Denise DiPasquale<sup>1</sup> and William C. Wheaton (1992). The Markets for Real Estate Assets and Space: A Conceptual Framework. *Real Estate Economics*. Volume 20, Issue 2, pages 181–198, June 1992

P. Hence, price is determined in the real estate asset market,  $P = \frac{R}{i}$  (Quadrant II).

3) Given the construction supply functions, real estate price P determines new construction C,  $C = g(P)$  (Quadrant III).

4) New construction C and the depreciation rate determine the stock of real estate, which can be stable only if the newly developed real estate C is equal to the depreciation ( $\delta S$ , where  $\delta$  is the depreciation rate) of the real estate stock. As  $\delta S = C$ , we then have

$$S = \frac{C}{\delta} \text{ (Quadrant IV).}$$

The relationship above is shown in Figure 2.4.

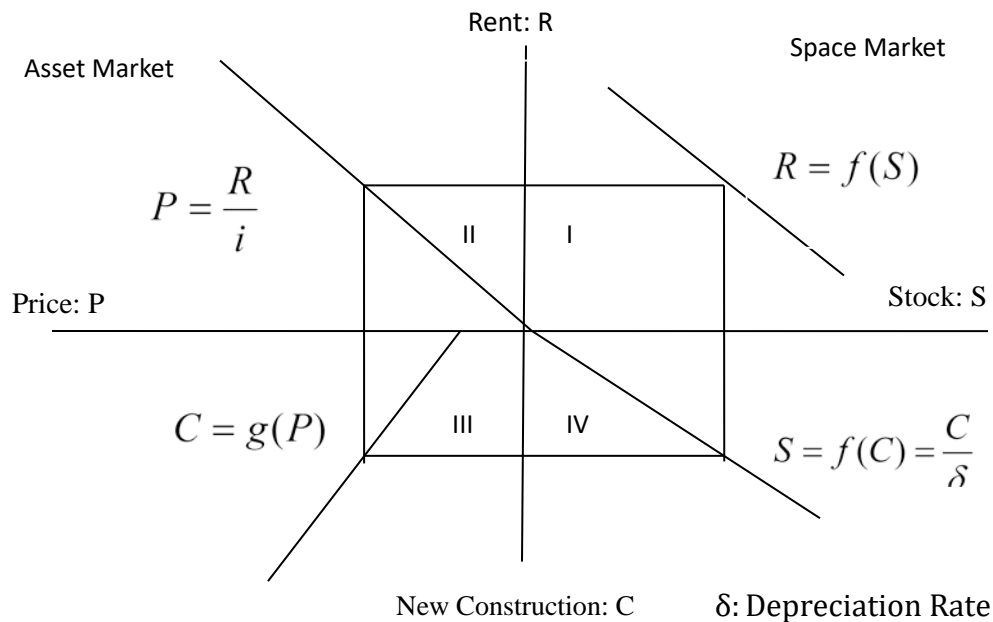


Figure 2.4: DiPasquale-Wheaton Four-Quadrant Model of Real Estate Market

The four-quadrant model is an insightful model in real estate because it uncovers the basic operating mechanisms of real estate markets. This model combines the real estate

consumption market with the real estate asset market in the history of real estate studies.

This model also has some limitations because of its strict assumptions. For example, the rent and discount rate determine the prices in commercial property. However, this condition does not apply for houses. Rent reflects all the utility users receive from commercial properties, but it does not fully reflect all the utility that users receive from housing properties. In addition to the rent and discount rate, other factors, such as expected capital gains, also influence housing prices.

Nonetheless, the four-quadrant model clearly shows that real estate has the features of consumption goods as well as assets (investments).

## **2.6 Explanations for Asset Bubbles and Housing Bubbles**

By Thornton (2006)<sup>67</sup>, there exist three basic views of bubbles that are held by economists. The first view, held by the Chicago school and the proponents of Supply-side economics, is to deny the existence of bubbles. Keynesians and the proponents of Behavioral Finance advocate the second view that psychological factors lead to bubbles. The third view is espoused by the Austrian school, which sees bubbles as consisting of real and psychological changes caused by manipulations of monetary policy. The second theory and the third theory are essentially the same, so they could be put into one type. In addition, there also exists a fourth view, which is the rational bubble (Blanchard and Watson, 1982)<sup>68</sup>

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<sup>67</sup> Thornton (2006), "The Economics of Housing Bubbles  
[https://www.researchgate.net/publication/250052991\\_The\\_Economics\\_of\\_Housing\\_Bubbles](https://www.researchgate.net/publication/250052991_The_Economics_of_Housing_Bubbles)

<sup>68</sup> Blanchard and Watson (1982), Bubbles, Rational Expectations, and Financial Markets, in Paul Wachter (ed.) *Crises in the Economic and Financial Structure*. Lexington, MA: Lexington Books, pp. 295–315

### 2.6.1 No Asset Bubbles

Chicago school economists contend that the assertion of the existence of a bubble is a violation to the rationality of “economic man”. Even if it exists for some irrational factors, it will be ruled out very quickly because rational market agents could profit by arbitrage activities (Hülsmann, 1998).<sup>69</sup>

As the former Chairman of Federal Reserve, Greenspan (2002)<sup>70</sup> argues that housing bubbles rarely happen due to the unique features of real estate. “The analogy often made to the building and bursting of a stock price bubble is imperfect. First, unlike in the stock market, sales in the housing market incur substantial transactions costs and, when most homes are sold, the seller must physically move out. ·····Thus, while stock market turnover is more than 100 percent annually, the turnover of home ownership is less than 10 percent annually--scarcely tinder for speculative conflagration. Second, arbitrage opportunities are much more limited in housing markets than in securities markets. ·····the housing market is better understood as a collection of small, local housing markets. These factors certainly do not mean that bubbles cannot develop in housing markets and that home prices cannot decline·····. But because the turnover of homes is so much smaller than that of stocks and because the underlying demand for living space tends to be revised very gradually, the speed and magnitude of price rises and declines often observed in markets for securities are more difficult to create in markets for homes.”

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<sup>69</sup> Hülsmann. 1998. Toward a General Theory of Error Cycles. *Quarterly Review of Austrian Economics*. 4 (winter): 1-23.

<sup>70</sup> This was said by Greenspan, Alan at Joint Economic Committee Meeting (April 17, 2002), available at [http://www.nytimes.com/2007/08/22/business/22leonsidebar-web.html?pagewanted=all&\\_r=0](http://www.nytimes.com/2007/08/22/business/22leonsidebar-web.html?pagewanted=all&_r=0)



As the housing price was reaching its peak, Greenspan (2005)<sup>71</sup> admits there are some “bubbles”, but only in some local housing markets. Basically, in 2005, he still argues that housing market conditions are good. Shortly after he left office in 2005, he maintained that housing prices would not go down even though the housing boom was over. As another former Chairman of Federal Reserve, Bernanke (2006a)<sup>72</sup> admits that it is possible for housing prices to go down, but just slightly”. Bernanke (2006b)<sup>73</sup> also believes that the mortgage market is more stable and the appraisal practice is better than before.

### **2.6.2 Irrational Asset Bubbles**

Keynesian economists, like Paul Krugman, and the economists of behavioral finance, such as Robert Shiller, hold that the real estate cycles are the ebb and flow of aggregate emotions and consciousness. They recognize the role of fundamental factors, but they prefer the psychological factors in that they are the main reason for deviations in the real estate cycles.

Shiller (2004)<sup>74</sup> lists three main psychological factors that boosted the most recent housing bubble of the 2000’s in the US. First, the anxiety and insecurity emanating from the burst of the technology bubble and the terrorist attack of 9/11 pushed money into

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<sup>71</sup> Greenspan, Alan. 2005b. Mortgage Banking. Speech to the American Bankers Association Annual Convention, Palm Desert, California (via satellite), September 26. Available at: <http://www.federalreserve.gov/BOARDDOCS/SPEECHES/2005/200509262/default.ht>

<sup>72</sup> Bernanke, Ben S. 2006a. Reflections on the Yield Curve and Monetary Policy. Remarks before the Economic Club of New York, March 20. Available at: <http://www.federalreserve.gov/boarddocs/speeches/2006/20060320/default.htm>.

<sup>73</sup> Bernanke, Ben S. 2006b. Speech to the Independent Community Bankers of America National Convention and Techworld, Las Vegas, Nevada, March 8. Available at: <http://www.federalreserve.gov/BoardDocs/Speeches/2006/20060308/default.htm>

<sup>74</sup> Shiller (2004), "Macro Markets: Managing Risks to National Economies," in *Public Finance in a Globalizing World: Innovations in Theory and Practice*, New York: United Nations Development Program. 132-147

tangible and thus safe assets, houses. Second, the growth in global communications has upgraded the attraction of living in the world's leading cities such as New York, San Francisco. Third, there is "the speculative contagion that underlies any bubble". (p134)

Krugman (2005a)<sup>75</sup> points out, "in parts of the country there's a speculative fever among people who shouldn't be speculators that seems all too familiar from past bubbles - the shoeshine boys with stock tips in the 1920's, the beer-and-pizza joints showing CNBC, not ESPN, on their TV sets in the 1990's". In another articles, Krugman (2005b)<sup>76</sup> distinguishes Zoned Zone with Flatland. The former refers to the coast areas while the latter refers to the middle of the country. Housing bubbles often emerge in the Zoned Zone rather than the Flatland. "In the Zoned Zone, which lies along the coasts, a combination of high population density and land-use restrictions – hence 'zoned' – makes it hard to build new houses. So when people become willing to spend more on houses, say because of a fall in mortgage rates, some houses get built, but the prices of existing houses also go up. And if people think that prices will continue to rise, they become willing to spend even more, driving prices still higher, and so on. In other words, the Zoned Zone is prone to housing bubbles. And Zoned Zone housing prices, which have risen much faster than the national average, clearly point to a bubble" (in 2005). However, "In Flatland, which occupies the middle of the country, it's easy to build houses. When the demand for houses rises, Flatland metropolitan areas, which don't

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<sup>75</sup> Krugman (2005a). Running Out of Bubbles. *New York Times*. May 27. Available at: <http://www.nytimes.com/2005/05/27/opinion/27krugman.html?ex=1274846400&en=ee73a0d5d3c35710&ei=5088&partner=rssnyt&emc=rss>

<sup>76</sup> Krugman (2005b). "That Hissing Sound". *New York Times*, August 8. Available at: <http://www.nytimes.com/2005/08/08/opinion/08krugman.html?ex=1281153600&en=7125767d2baf3fae&ei=5088&partner=rssnyt&emc=rss>. He repeated this point in 2007. "The two Americas", available at [http://krugman.blogs.nytimes.com/2007/10/20/the-two-americas/?\\_r=0](http://krugman.blogs.nytimes.com/2007/10/20/the-two-americas/?_r=0)

really have traditional downtowns, just sprawl some more. As a result, housing prices are basically determined by the cost of construction. In Flatland, a housing bubble can't even get started." (p58)

Browne and Case (1992)<sup>77</sup> argue that construction of office buildings, is inherently cyclical after they examine how the glut of commercial real estate space developed. They further report that the cycle of the 1980s was magnified by tax and institutional changes and by a faith that real estate was a high-return, low-risk investment. The banks were severely damaged as a consequence.

As Case and Shiller (2003)<sup>78</sup> point out, the term "bubble" is widely used but rarely clearly defined. They believe that the term, in its widespread use, refers to "a situation in which excessive public expectations of future price increases causes prices to be temporarily elevated. During a housing price bubble, homebuyers think that a home that they would normally consider too expensive for them is now an acceptable purchase because they will be compensated by significant further price increases. They will not need to save as much as they otherwise might, because they expect the increased value of their home to do the savings for them. First-time homebuyers may also worry during a housing bubble that if they do not buy now, they will not be able to afford a home later. Then, they argue that "the basic questions that still must be answered are whether expectations of large future price increases are sustaining the market, whether these expectations are salient enough to generate anxieties among potential homebuyers, and

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<sup>77</sup> Browne, Lynn E. and Karl E. Case (1992). How the Commercial Real Estate Boom Undid the Banks. Federal Bank of Boston Conference Series, Volume 36, Page 57-113.

<sup>78</sup> Case, Karl E. and Robert J. Shiller (2003). Is There a Bubble in the Housing Market? Brookings Papers on Economic Activity, 2003, No. 2.

whether there is sufficient confidence in such expectations to motivate action”. (p194)

White (2009)<sup>79</sup> analyzes the reason for 1920-1926 housing bubble. He contends that fundamental factors such as a post-war construction catch-up, low interest rates and a “Greenspan put”<sup>80</sup> ignite the boom in the twenties.

However, mortgage securitization, a reduction in lending standards (subprime loans) and weaker supervision are factors that produced the housing bubble in first decade of 21st century.

Levitin and Wachter (2013)<sup>81</sup> explore the factors boosting the commercial bubble between 2004 and 2008. They argue that it is the shift in the commercial mortgage securitization market that caused the commercial bubble. The securitization has been a main channel through which the commercial market was financed since 1998. Commercial mortgage backed securities (CMBS) are quickly replaced by collateralized debt obligations (CDOs). Savvy, sophisticated, experienced commercial mortgage securitization investors were outbid by investors who merely wanted “product” to securitize. The result was a decline in underwriting standards in commercial mortgage backed securities (CMBS).

Holt (2009)<sup>82</sup> maintains there were four primary factors that resulted in the housing bubble in the first decade of 21st century: low mortgage interest rates, low short-

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<sup>79</sup> Eugene N. White(2009). Lessons from the Great American Real Estate Boom and Bust of the 1920s. Available at [http://s3.amazonaws.com/zanran\\_storage/www.nber.org/ContentPages/19997974.pdf](http://s3.amazonaws.com/zanran_storage/www.nber.org/ContentPages/19997974.pdf)

<sup>80</sup> The "Greenspan put" refers to the monetary policy approach that Alan Greenspan, the former Chairman of the United States Federal Reserve Board, and other Fed members exercised from late 1987 to 2000.

<sup>81</sup> Adam J. Levitin and Susan M. Wachter(2013). The Commercial Real Estate Bubble. Harvard Business Law Review, Vol. 3, pp. 83-118

<sup>82</sup> Holt (2009). A Summary of the Primary Causes of the Housing Bubble and the Resulting Credit Crisis: A Non-Technical Paper. *Journal of Business Inquiry: Research, Education & Application*, 8(1), P120

term interest rates, relaxed standards for mortgage loans, and irrational exuberance. Shiratsuka (2003)<sup>83</sup> argues that Japan's experience of asset price bubble is characterized by euphoria, that is, excessively optimistic expectations. Thornton (2006)<sup>84</sup> contends that the 2000-2008 housing bubble is a case of government failure. The effort that the government attempts to improve home ownership through the policy of "easy finance" eventually leaves many Americans in an economic pitfall.

### 2.6.3 Rational Asset Bubbles

Steimetz (2008)<sup>85</sup> points out: "To see how prices might persistently deviate from traditional market fundamentals, imagine that you are considering an investment in the publicly held firm Bootstrap Microdevices (BM), which is trading at fifty dollars per share. You know that BM will not declare any dividends and have ample reason to believe that one year from now BM will be trading at only ten dollars per share. Yet you also firmly believe that you can sell your BM shares in six months for one hundred dollars each. It would be entirely rational for you to purchase BM shares now and plan to sell them in six months. If you did so, you and those who shared your beliefs would be "riding a bubble" and would bid up the price of BM shares in the process".

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<sup>83</sup> Shiratsuka (2003). Asset Price Bubble in Japan in the 1980s: Lesson for Financial and Macroeconomic stability. A chapter in *Real Estate Indicators and Financial Stability*, 2005, vol. 21, pp 42-62

<sup>83</sup> Thornton, Mark(2006), "The Economics of Housing Bubbles"

<sup>84</sup> Thornton, Mark(2006), "The Economics of Housing Bubbles"

[https://www.researchgate.net/publication/250052991\\_The\\_Economics\\_of\\_Housing\\_Bubbles](https://www.researchgate.net/publication/250052991_The_Economics_of_Housing_Bubbles)

<sup>85</sup> Steimetz, Seiji S. C. (2008). "Bubbles". In David R. Henderson (ed.). *Concise Encyclopedia of Economics* (2nd ed.). Indianapolis: Library of Economics and Liberty. He also points out: "*Economists often refer to these types of bubble conditions as "bootstrap equilibria." High prices are thought to be held high by self-fulfilling prophecies, just as one might attempt to hold himself high off the ground by pulling up on his bootstraps.*"

Steimetz (2008)<sup>86</sup> further argues: “This example illustrates that if bubbles exist, they might be perpetuated in a manner that would be difficult to call irrational. The key to understanding this is in recalling that an asset’s fundamental value includes its expected price when sold. If investors rationally expect an asset’s selling price to increase, then including this in their assessment of the asset’s fundamental value would be justified. It is possible, then, that the price of such an asset could grow and persist even if the viability of its issuing company is unlikely to support these prices indefinitely. This situation can be called a ‘rational bubble’.” (p148)

From the studies about bubbles, the following conclusions can be drawn:

First, Chicago school economists do not deny the existence of asset bubbles. What they contend is that asset bubbles cannot exist in the long term due to human being’s ration. In a very short term, asset bubbles can exist.

Second, Keynesian economists follows the “tradition” of John M. Keynes and emphasize the role psychological factors play in the investors’ decision-making process. So they contend that the asset bubble can often appear and last for a while because human beings are not always rational. However, they also agree that assets bubbles cannot exist in the long term because investors cannot be always irrational in the long term. In this sense, they are in accordance with Chicago school economists.

Third, rational bubbles theory argues it is “ration” that drives asset prices to go up

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<sup>86</sup> Steimetz, Seiji S. C. (2008). "Bubbles". In David R. Henderson (ed.). *Concise Encyclopedia of Economics* (2nd ed.). Indianapolis: Library of Economics and Liberty. He also points out: “Economists often refer to these types of bubble conditions as “bootstrap equilibria.” High prices are thought to be held high by self-fulfilling prophecies, just as one might attempt to hold himself high off the ground by pulling up on his bootstraps.”

and create asset bubbles. It is rational to buy assets when asset prices is expected to increase and it is also rational to ask for a much higher resale prices because only a much higher resale prices can compensate the very high risk that asset prices will go down. Since investors love to buy assets and ask for a much higher asset prices in order to compensate the risk, the asset prices will rise very quickly. However, if investors know that assets have been overprices but still want to “fish in troubled water”, they are not irrational. Therefore, rational bubbles theory is not convincing. What this theory does is actually to explain asset bubble by psychological factors, which is what Keynesian economists has done.

To sum up, although Chicago school economists and Keynesian economists hold different viewpoints about assets bubbles, they both agree that asset bubbles can appear within some time interval for the sake of investors’ irrational factors, but they will disappear in the long term. Their difference or dispute only lies in how long the time interval is. Chicago school economists hold that the bubbles can only exist in very short time, that is, the time interval is very short. Keynesian economists insist that the bubbles can exist not only in the short time, but also in the middle time, that is, the time interval is pretty long.

However, neither Chicago school economists nor Keynesian economists can explain the housing bubbles happening in China. Although China’s stock market has experienced three-time bubble rising and breaking in past 16 years, the housing prices have been continuously increasing in the same period of time. The housing bubbles happening in China is obviously long-term bubbles, but all current bubbles theories deny

long-term bubbles. Therefore, it is an important task for this study to give an satisfactory explanation for this long-term housing bubbles in China.



## **CHAPTER 3: KEY CONCEPTS, RESEARCH HYPOTHESIS AND FRAMEWORK**

From Chapter 1, we can find that whether high savings can contribute to economic growth really depends on what the high savings is spent on. If high savings is spent on productions factors, it will boost economic growth of a country. By contrast, if high savings is invested in speculative assets (like non owner-occupied housing), it will not lead to economic growth but could also create an asset bubble. In order to analyze the relationship between production factors and speculative assets in one research framework, the concept “Real Assets” and “Virtual Assets” should be introduced.<sup>87</sup> In order to explore the source of high savings, the concepts of Gross Domestic Product (GDP) and Gross Domestic Income (GDI), Gross Domestic Consumption (GDC) and Gross Domestic Savings (GDS), Marginal Propensity to Consume (MPC) and Marginal Propensity to Save (MPS), Average Propensity to Consume (APC) and Average Propensity to Save (APS) will be used. Therefore, all these key concepts should be clarified. Next, three hypotheses are put forward based on the discussion in Chapter 1 and Chapter 2. And, finally, the research framework of this study is built.

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<sup>87</sup> It is often risky for a study to introduce new concepts. After due consideration, I still decide to introduce two new concepts, “real assets” and “virtual assets”. It is very hard to discuss the relationship between production factors and speculative assets, but the relationship between real assets and virtual assets can be clarified very easily in the paradigm of neoclassical economics. By doing so, the relationship between production factors and speculative assets is uncovered, and the reasons and consequences of preference in speculative assets is expounded.

## 3.1 Key Concepts

### 3.1.1 Gross Domestic Product (GDP) and Gross Domestic Income (GDI)

Gross Domestic Product (GDP) represents the total currency value of all goods and services produced during a specific time period in an economy.<sup>88</sup> It is also called “aggregated product of an economy.” A similar concept is gross national product (GNP), which represents the total value of all the final products and services produced in a given period through the production owned by a country's citizens.<sup>89</sup> GNP is an economic statistic that is equal to GDP plus any income earned by citizens from overseas investments minus the income earned within the domestic economy by overseas citizens.<sup>90</sup> Many countries do not declare their GNP because this statistic is difficult to collect and calculate.

Gross Domestic Income (GDI) represents the total income received by all sectors of an economy. It includes the sum of all wages, profits, and taxes minus subsidies. It can also be called “aggregated income”(AP) of an economy. In theory, all income is derived from production including the production of services. Thus, the GDI of an economy should be exactly equal to its GDP. In reality, however, GDI is often lower than GDP because underground or grey income exists and not all income is reported. As a result, the difference between GDI and GDP is actually the measure of underground/invisible/unreported income.

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<sup>88</sup> Coyle, Diane (2014). *GDP: A Brief but Affectionate History*. Princeton University Press. Mankiw, N.G.; Taylor, M.P. (2011). *Economics* (2nd ed., revised ed.). Andover: Cengage Learning.

<sup>89</sup> Mankiw, N.G.; Taylor, M.P. (2011). *Economics* (2nd ed., revised ed.). Andover: Cengage Learning.

<sup>90</sup> Dawson, Graham (2006). *Economics and Economic Change*. FT / Prentice Hall. p. 205

### **3.1.2 Gross Domestic Consumption (GDC) and Gross Domestic Savings (GDS)**

Gross Domestic Consumption (GDC) represents the total consumption of all households of an economy. It can also be called “Aggregated Consumption” of an economy

GDS represents the total savings of all households of an economy. It can also be called “aggregated savings” of an economy.  $GDC+GDS=GDI$ . Thus,  $GDS=GDI-GDC$ . We also have  $GDS=GDP-GDC$  when  $GDI=GDP$ .

### **3.1.3 Marginal Propensity to Consume (MPC), Marginal Propensity to Save (MPS), Average Propensity to Consume (APC), Average Propensity to Save (APS)**

Marginal Propensity to Consume (MPC) measures the proportion of extra income that is spent on consumption<sup>91</sup>. It is equal to  $\Delta C/\Delta Y$ , where  $\Delta C$  is the change in consumption (Marginal Consumption) and  $\Delta Y$  is the change in income (Marginal Income). Marginal Propensity to Save (MPS) measures the proportion of extra income that is held as savings. It is equal to  $\Delta S/\Delta Y$ , where  $\Delta S$  is the change in savings (Marginal Savings) and  $\Delta Y$  is the change in income (Marginal Income).  $\text{Marginal Income}=\text{Marginal Consumption} + \text{Marginal Savings}$ . Thus,  $MPC+MPS=1$  or  $MPS=1-MPC$ .

Average Propensity to Consume (APC) refers to the percentage of income spent on consumption (goods and services) rather than on savings. Average Propensity to Save (APS) refers to the proportion of income that is saved rather than spent on consumption.

What is the relationship between MPC and APC? When there exists autonomous

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<sup>91</sup> Hall, Robert E.; Taylor, John B. (1986). "Consumption and Income". *Macroeconomics: Theory, Performance, and Policy*. New York: W. W. Norton. pp. 63–67. ISBN 0-393-95398-X.

expenditure<sup>92</sup>, APC will be bigger than MPC. When there does not exist autonomous expenditure, APC will be equal than MPC. This argument can be shown by a simple mathematical proof.

Keynes' consumption function<sup>93</sup> can be expressed by,

$$C = a + cY \quad (3.1)$$

where  $C$  denotes consumption,  $Y$  denotes income,  $a$  denotes and  $c$  denotes a coefficient.

Then by definition, APC is can be calculated as:

$$APC = \frac{a + cY}{Y} = \frac{a}{Y} + c \quad (3.2)$$

In order to calculate MPC, assume that consumption increases from  $C_0$  to  $C_1$  when income increases from  $Y_0$  to  $Y_1$ , Then,

$$MPC = \frac{\Delta C}{\Delta Y} = \frac{C_1 - C_0}{Y_1 - Y_0} = \frac{(a + cY_1) - (a + cY_0)}{Y_1 - Y_0} = \frac{c(Y_1 - Y_0)}{Y_1 - Y_0} = c \quad (3.3)$$

Therefore, when there exists autonomous expenditure( $a \neq 0$ ),

$$APC = \frac{a + cY}{Y} = \frac{a}{Y} + c > c = MPC \quad (3.4)$$

Therefore, when there does not exists autonomous expenditure ( $a=0$ ),

$$APC = \frac{a + cY}{Y} = c = MPC \quad (3.5)$$

In this study, “a” is assumed to be 0, then  $MPC=APC$ . Given that they are equal,

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<sup>92</sup> Autonomous consumption (also exogenous consumption) is consumption expenditure that does not vary with changes in income. Generally, is the income for life necessities because it always exists even if the income level of one household is zero. Autonomous consumption contrasts with induced consumption which systematically fluctuate with income. See: Colander, David C. (2004). *Macroeconomics* (Fifth ed.). Boston, MA: McGraw-Hill/Irwin. pp. G-1 & G-4 (Glossary).

<sup>93</sup> Samuelson, P. and W. Nordhaus. *Economics* (19th Edition). McGraw-Hill/Irwin: The Columbia University Press, 2009.

“Propensity to Consume (PC) ” can be used to represent both of them.

### **3.1.4 Real Assets and Real Asset Market, Virtual Assets and Virtual Asset Market**

#### 1. Real Assets and Real Asset Markets

An asset is any economic resource that can produce value in the future. It is a resource controlled by the entity as a result of past events and from which future economic benefits are expected to flow to the entity<sup>94</sup>.

All asset returns (benefits, profits, gains) come from production or operation activities of economic entities. An asset that directly serves the production or operation process of an economic entity is called a real asset. Examples of real assets include tangible assets (land, raw and processed materials, machines and equipment, manufacturing plant, inventory, and human resources) and intangible assets (patents, trademarks, copyrights, and business methodologies). The money possessed by a production entity and the money borrowed from banks or raised from capital markets are also real assets, because all the money will serve the production or operation process.

Assets used for long term household consumption, such as cars, houses, and other durable goods, are also real assets. Although buyers cannot earn profit from these assets, they can gain consumption utility from them and thus save on living expenses. For example, home owners can save on home rental expenses and car owners can save on transportation costs. In economics, expenses saved are equivalent to profits earned. In this sense, an asset used for household consumption can bring buyers the profits or returns in this future; thus, it can be also called a real asset. In most situations, real assets

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<sup>94</sup> O'Sullivan, Arthur; Sheffrin, Steven M. (2003). *Economics: Principles in Action*. Upper Saddle River, New Jersey: Pearson Prentice Hall. p. 272. ISBN 0-13-063085-3.

refer to production factors. In fact, a real asset is a right. It is the right to possess and use.

Real asset markets are the markets where real assets are exchanged. Real assets include factors of production and durable goods for consumption. Thus real asset markets include factor markets and durable goods markets. Factor markets include raw material markets, machine and equipment markets, commercial real estate markets, and intellectual property rights. Durable goods markets include owner occupied housing markets and auto markets (Figure 3.1.)

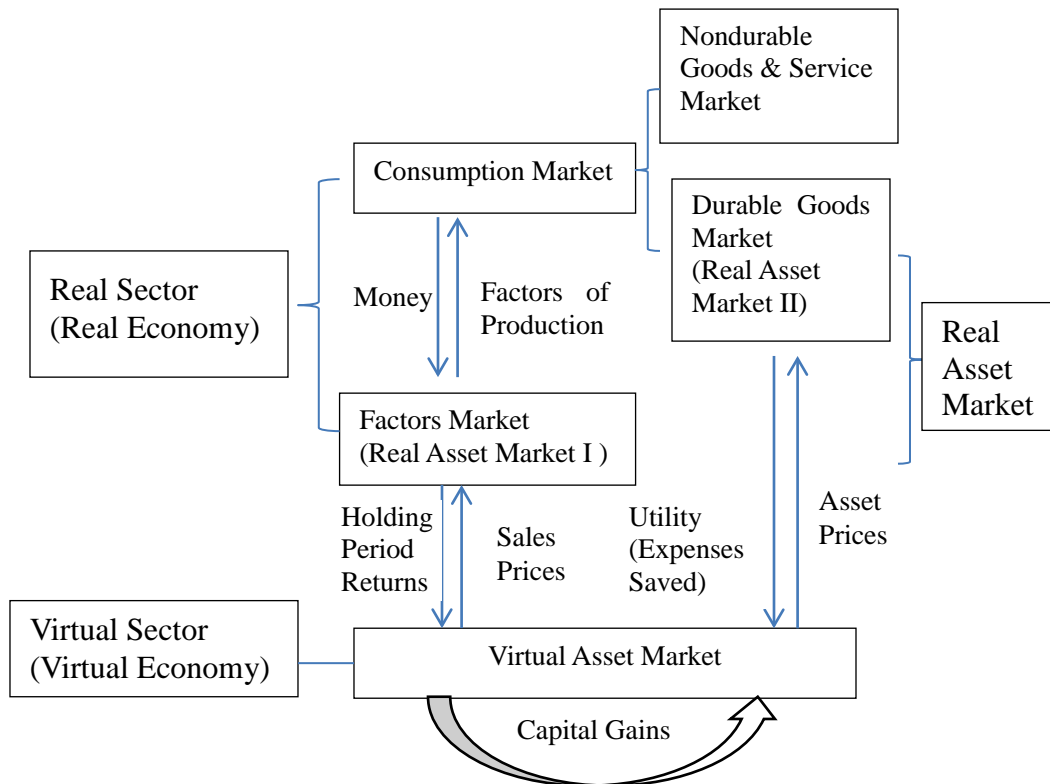


Figure 3.1: Real & Virtual Sector and Real & Virtual Asset Market

Source: Author

## 2. Virtual Assets and Virtual Asset Markets

A virtual asset refers to an asset that is essentially a right to claim the return of real assets in the future. Examples of virtual assets include stocks, funds, bonds, and the ownership of real estate and gold.

The difference between real assets and virtual assets is whether they serve the production process directly. Real assets are factors of production, and their value will be transferred into the final products or services. Virtual assets do not serve the production process directly, and their values will not be transferred into the final products or services. Their values are equal to the discounted values of all the future returns of the associated real assets.

Virtual asset markets are the markets where virtual assets are exchanged. Thus, the stock market, bond market, funds market, and gold market are all virtual asset markets.

### 3. The relationship between real assets and virtual assets

Real assets are closely related to virtual assets. First, all virtual assets depend on real assets. When a company issues stocks or bonds, it creates virtual assets based on its real assets. Second, in theory, the values of virtual assets are determined by the profit earned by real assets and the discount rate. Given the discount rate, the values of virtual assets will increase when real assets are expected to earn more profit. Third, in practice, the values of real assets are not determined by their production cost but by the values of virtual assets.

A factory is usually managed and operated by its owner. This owner is a real asset investor as well as a virtual asset investor, because he can use and operate the machine or facilities in this firm, meanwhile he has the right to claim the profit earned from this

factory. Modern corporations are characterized by the separation of ownership and management. All shareholders are not willing or able to commit themselves to corporate management except perhaps for some of the large shareholders. Small shareholders have the right to claim the dividends from this corporation and eventually the capital gain or loss when the stock is sold. Large shareholders have the rights to the dividends and because of their larger stake they may choose to take a management role. Thus, small shareholders only have virtual assets, whereas large shareholders have both virtual and real assets.

If an investor buys a piece of land, a factory building, or a machine but does not include this asset in the production process, he or she has three ways to deal with these assets. First, the investor leases these production factors to a company and the investor becomes the lessor. Second, the investor can give them to a company and become a small shareholder. Third, the investor merely holds these assets for a while and then resells them. In all these situations, land, factory buildings, and machines are not real assets but virtual assets for the investor, because the investor does not include these assets in the production process and make a profit from them but instead the investor takes them as pure rights to claim annual earnings or capital gains or both over time. These assets are seen as real assets only for large shareholders who use them as production factors.

### **3.1.5 Real Sector (Economy) and Virtual Sector (Economy)**

1. Real Sector: The consumption market and the factor market (the real asset market)

Firms in the consumption market provide people with the necessary goods and services. To produce the necessary goods and services, firms buy factors of production



from the factor market. Thus, both the consumption market and the factor market are indispensable in people's daily lives and are real economic sectors.

## 2. Virtual Sector: The virtual asset market

The virtual asset market is the market where rights to claim returns are exchanged because virtual assets are the rights to claim the future returns. When the rights are exchanged, money is transferred from a buyer to a seller, but no new goods or services are created because the money does not directly go to the production process. The virtual asset market is also called the virtual sector of the economy. The difference between the real sector, the virtual sector, the real asset and virtual asset markets are detailed in Figure

### **3.1.6 Houses: Real Assets or Virtual Assets?**

We end this section with a discussion on the housing markets. Is a house a real asset or a virtual asset?

When a house is bought to possess or use, namely, live in or occupy, it is a real asset. On the contrary, when it is bought in order to make profit by renting it out and potentially reselling it at higher prices in the future, it is a virtual asset.

So a house is both a real asset and a virtual asset because the home owner not only has the right to possess and use it, but also has the right to claim the rent and capital gain from it. Therefore, a house is not a "pure" real asset although it is "very" tangible.

In current China, such a phenomenon can be observed very easily: a person buys a house, but he neither uses it nor leases it to a tenant. Rather, he holds it and keeps it vacant for several month or years, then reselling it at a potentially higher price. When he buys this house, he knows he will never live in it. His purpose is to make money, which is

very “pure”. For some people, this purpose is so “pure” that they never stay in the house, never see it and never know its exact location before and after buying it. They only know that they own a house somewhere in this city and can potentially make money from owning this house. In this situation, although a house is tangible, it has the same investment characteristics as a stock, a bond, or a fund share because it has become an investment, a mechanism to make money. Therefore, it has become a pure virtual asset, or a speculative asset. To sum up, when a house is taken as a speculative asset, it loses its identity as “a real asset” and becomes a pure virtual asset.

Similarly, gold is not necessarily a real asset. In most situations, gold is a virtual asset because it is bought not to possess and use, but to make money by reselling it in the future. Only when gold is bought to produce rings, earrings or other ornaments is it a real asset.

### **3.2 Research Hypothesis**

The excessive liquidity of China’s housing market oddly coexists with a contradictory phenomenon, which is the insufficient demand for consumption goods. The former attracts significant attention, but the latter has been overlooked for a long time. Thus, one question that needs to be answered is as follows: **Why do these two seemingly conflicting phenomena coexist?** The following hypotheses are drawn.

**Hypothesis 1:** At a certain point, a high-income family spends a lower proportion of its income on consumption compared with a low-income family. In other words, the higher the level of a family’s income in a society at a certain time point, the lower the proportion of its consumption is accounted for in its income.

This hypothesis is about the interactive relationship between consumption and income, one that has never been investigated by classical consumption theories (theory of MPC, life cycle theory, and permanent theory). Although previous empirical studies identified this relationship, they did not provide satisfactory explanations for this relationship based on economic theories. The studies did not expound the implication of the relationship to total savings rates, asset prices, and economic growth.

If this hypothesis can be verified, severe income inequality will lead to very high aggregate savings rate and very low aggregate consumption rate.

**Hypothesis 2:** Very high aggregate savings rates and very low aggregate consumption rates caused by severe income inequality will induce high investment demand in the virtual sector and weak demand in the real sector. As a result, the virtual sector will progress, whereas the real sector will decline.

**Hypothesis 3:** In the context of a declining real sector, investors prefer houses to other types of assets in the virtual sector owing to the unique features of houses. Thus, housing prices will increase.

### **3.3 Theoretical Framework**

Base on the 3 hypotheses above, the theoretical Framework for this study can be built, which is presented in Figure 3.2.

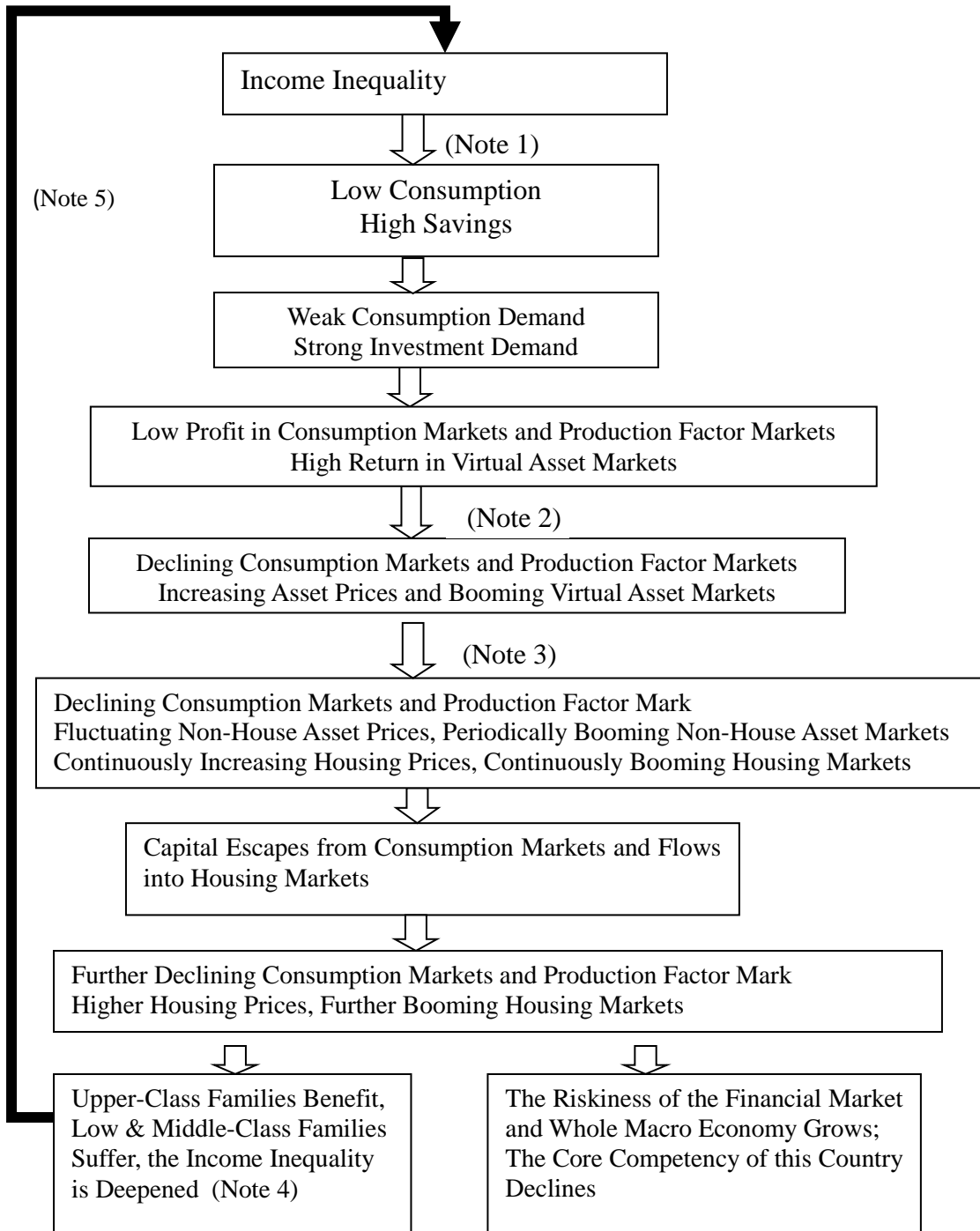


Figure 3.2: Theoretical Framework of This Study

Next, Note 1-5 should be clarified one by one.

Note 1. As previously mentioned, the causality chain between income inequality and consumption depends on Hypothesis 1, that is, the new relationship between income inequality and aggregate savings rate: more severe income inequality will lead to high aggregate savings rate.

Note 2. The causality chain between high savings and increasing assets prices depends on Hypothesis 2, that is, overly-high aggregate savings rates and overly-low aggregate consumption rates caused by severe income inequality will induce high investment demand in the virtual sector and weak demand in the real sector.

Note 3. The causality chain between increasing asset prices and rapidly rising housing prices depends on Hypothesis 3, that is, in the context of a declining real sector, investors prefer houses to other types of assets in the virtual sector owing to the features of houses.

Note 4. A declining consumption market is indicative of low profits and low wages, which further contributes to the overall decline in the income of low- and middle-income families. Most investors in the virtual asset markets are wealthy people belonging to upper-income families who have high accessibility to capital and loan markets. Thus, their income and wealth rapidly increase, at least until the virtual asset market fails. Low-income and middle-income families do not have sufficient capital for investment, which makes borrowing money from capital or loan markets difficult for them. As a result, these families do not benefit from the asset market. Furthermore, when real estate prices

increase, they suffer significantly because real estate is a necessity for them to live. That is their real housing costs go up if the housing market in general goes up.

Note 5. The chain indicates that a self-intensifying mechanism exists: income distribution inequality will exacerbate the inequality in income distribution by causing the decline of consumption markets and the rise of the virtual asset markets, particularly housing. The by-product of this mechanism is that the risk for the financial markets and the entire economy will adversely affect the core competency of the country.

### **3.4 Basic Logic**

#### **3.4.1 The Assumption**

Three types of families exist in a country.

1) High-income families, denoted by H, whose total wealth is WH, total consumption is CH and total savings is SH. The proportion of the total wealth spent on consumption and savings is denoted by Hc and Hs, respectively.

2) Middle-income families, denoted by M, whose total wealth is WM, total consumption is CM and total savings is SM. The proportion of the total wealth spent on consumption and savings is denoted by Mc and Ms, respectively.

3) Low-income families, denoted by L, whose total wealth is WL, total consumption is CL and total savings is SL. The proportion of the total wealth spent on consumption and savings is denoted by Lc and Ls, respectively.

Naturally,

$$WH > WM > WL \quad (3.6)$$

### 3.4.2 Starting the Model with the First Hypothesis

Recall the first hypothesis, at a certain point, a high-income family spends a lower proportion of its income on consumption compared with a low-income family. In other words, the higher the level of a family's income in a society at a certain time point, the lower the proportion of its consumption accounted for in its income. Thus,

$$H_s > M_s > L_s \quad (3.7)$$

This relationship should be carefully explained theoretically and tested empirically because it is the foundation of this dissertation.

Given (3.7) and a fixed  $Y$  or Gross Domestic Product (GDP) of a country, we can obtain

$$c = f(G) \quad \text{where} \quad \frac{dc}{dG} < 0 \quad (3.8)$$

where  $G$  is the Gini coefficient, which is an index of income inequality; and  $c$  is the proportion of the aggregate income spent on consumption goods and services.

Equation (3.8) shows that when  $G$  is large,  $c$  is small. In other words, a negative relationship exists between income inequality and the aggregate savings rate; when income is unequal, the aggregate consumption rate is low.

The aggregate consumption is equal to  $Y$  times the aggregate consumption rate:

$$C = cY = f(G)Y \quad (3.9)$$

The aggregate savings ( $S$ ) is equal to the  $Y$  minus the aggregate consumption:

$$S = Y - cY = Y - f(G)Y = (1 - f(G))Y \quad (3.10)$$

When  $G$  increases,  $f(G)$  decreases and then  $S$  rises.

### 3.4.3 Extending the Model with the Second and Third Hypotheses

Recall the second hypothesis: very high aggregate savings rate and very low aggregate consumption rate caused by severe income inequality will induce high investment demand in the virtual sector rather than the real sector. Hence, we obtain

$$I_v = \alpha S = \alpha(1 - f(G)Y) \text{ where } 0.5 < \alpha < 1 \quad (3.11)$$

Where  $I_v$  is the investments into the virtual sector, and  $\alpha$  is the proportion of  $I_v$  of the aggregate investment, which is equal to aggregate savings.

Recall the third hypothesis: under the context of a declining real sector, investors prefer houses to other types of assets in the virtual sector owing to the features of houses, a preference that increases housing prices. Those features might include:

1. Stocks and mutual funds are pure assets that do not have consumptive features. By contrast, food and clothes are pure consumption goods that do not have asset features. However, houses can be considered both an asset and consumption good. The asset features of houses can bring buyers investment returns in the future that regular consumption goods cannot. The consumptive features of houses bring buyers more security than the pure assets can.

2. As an asset, a house is also a consumption product. An owner can rent his house to himself (owner-occupied) or rent the house to a tenant for an income stream. In the first case, the owner gets utility from housing. In the second way, he receives rent. Theoretically, the value of the utility should be equal to the rent. In practice, however, the owner considers the value of the utility to be much more than the rent. A detailed analysis will be done in the following chapters. Rent cannot fully reflect the returns of self-



occupied houses and thus will not be an effective signal for the market fundamentals of houses. Consequently, even if the rent is very low, a home buyer can still think the market fundamentals of houses are not bad and expect that the house prices will go up.

3. The scarcity of land convinces investors that the supply of real estate is limited. In a developing country undergoing the process of urbanization, such belief is significant. As a result, the price of real estate is expected to increase quickly, bringing investors considerable profit even though returns from rent are low.

Aside from real estate, some “concept” stocks, including financial derivatives, gold and antiques, can also be invested in as virtual assets. However, the two characteristics discussed above make houses preferred virtual assets among investors.

In response to the increasing house prices, overdevelopment will emerge and a series of negative consequences will occur.

Hence, we obtain

$$I_h = \beta I_v = \beta \alpha S = \beta \alpha (1 - f(G)Y) \text{ where } 0.5 < \beta < 1 \quad (3.12)$$

Where  $I_h$  is the aggregate investment into the housing market, and  $\alpha$  is the proportion of  $I_v$  in the aggregate investment into the virtual sector, which is the demand for houses.

#### 3.4.4 Finalizing the Model

According to neoclassical economics, real estate, as a real asset, is priced (P) by its expected returns (R) and discount rate or expected return (i). Keeping R and i constant and using a simple perpetuity valuation model:

$$P = \frac{R}{i} \quad (3.13)$$

In the virtual housing market, the investment return will depend on the perceived benefits gained from buying the house at a low price and hopefully selling it at a high price. The return heavily depends on the capital gains benefits and the return from the rent is negligible for these investors.

Price changes in the past have become an overwhelming important factor in the decision-making process of investors and cannot be ignored. Based on the price changes in the past, additional money is invested into the housing market and the higher the housing prices. That is, the money significant investment into housing market is an amplifier that strengthens the relationship between price changes in the past and the expected price changes in the future.

Thus, we obtain the following equation:

$$P_r = g(I_h) \frac{dP_r}{dt} \quad (3.14)$$

where  $g(I_h)$  is a monotone increasing function of  $I_h$  (social savings).

In a linear manner, we can set  $g(I_h) = \gamma I_h$ , where  $\gamma > 0$ . Thus,

$$P_r = \gamma I_h \frac{dP_r}{dt} \quad (3.15)$$

The solution for this equation is

$$P_r = e^{\frac{t}{\gamma I_h}} = \exp\left(\frac{t}{\gamma I_h}\right) \quad (3.16)$$

Substituting (3.12) into (3.16) gives:

$$P_r = e^{\frac{t}{\gamma I_h}} = \exp\left(\frac{t}{\gamma I_h}\right) = \exp\left(\frac{t}{\gamma \beta \delta (1 - f(G)) Y}\right) \quad (3.17)$$

A positive relationship exists between real estate development and real estate prices.

In a linear manner, we obtain,

$$D = \kappa P_r = \kappa e^{\frac{t}{\beta h}} = \kappa \exp\left(\frac{t}{\mathcal{M}_h}\right) = \kappa \exp\left(\frac{t}{\gamma \beta \delta (1 - f(G)) Y}\right) \quad (3.18)$$

Where  $D$  is the new construction quantity, and  $\gamma$  is the positive coefficient.

Driven by the increase in housing prices, real estate developers construct an increasing number of houses. Therefore, as long as the money to support construction is sufficient, investors in housing markets can profit. Investors will also turn to housing markets, which will result in the development of numerous houses.

This process, however, is not sustainable. The capital invested into the housing market is limited by the national wealth, which increases only when the economy of the country rises. Given that economic growth is always limited, the growth rate of the entire national wealth is likewise limited. The limited growth rate cannot sustain the continuous increase of housing prices.

# **CHAPTER 4: HOUSEHOLD INCOME AND HOUSEHOLD CONSUMPTION: A NEW ECONOMIC RELATIONSHIP**

## **4.1 Previous Research: Propensity to Consume is Homogeneous for Different Income Level Household**

Chapter 2 reviewed several classical consumption theories, namely, the theory of Marginal Propensity to Consume (Keynes 1936), the life-cycle hypothesis (Modigliani, 1966), and the permanent income hypothesis (Friedman, 1957).

All these theories are helpful because they resulted in breakthroughs in the research on consumption. However, the real concern is as follows. For a specific household, what happens to consumption if the household income increases? The underlying assumption behind these theories is the proportion of their consumption in its income is homogeneous for everyone at a specific time point. One question that has never been asked: At the same time point, do families of different income levels have a heterogeneous propensity to consume?

## **4.2 Economic Data: Propensity to Consume is Heterogeneous for Different Income Level Households**

High-income-level households spend more money on both consumption and investment than low-income-level families. Our question is this: **will high-income-level**

**households spend a lower proportion of income on their consumption or a higher proportion of their income on investment than low-income-level families?**

Considering that the previous studies did not address this question, the relationship uncovered by this question can be called a new economic relationship between consumption and income. This new relationship will contribute to consumption and income theories in economics if proven by empirical studies and explained by economic theories.

The new economic relationship between income level and the proportion of household income spent on consumption is easy to demonstrate using data.

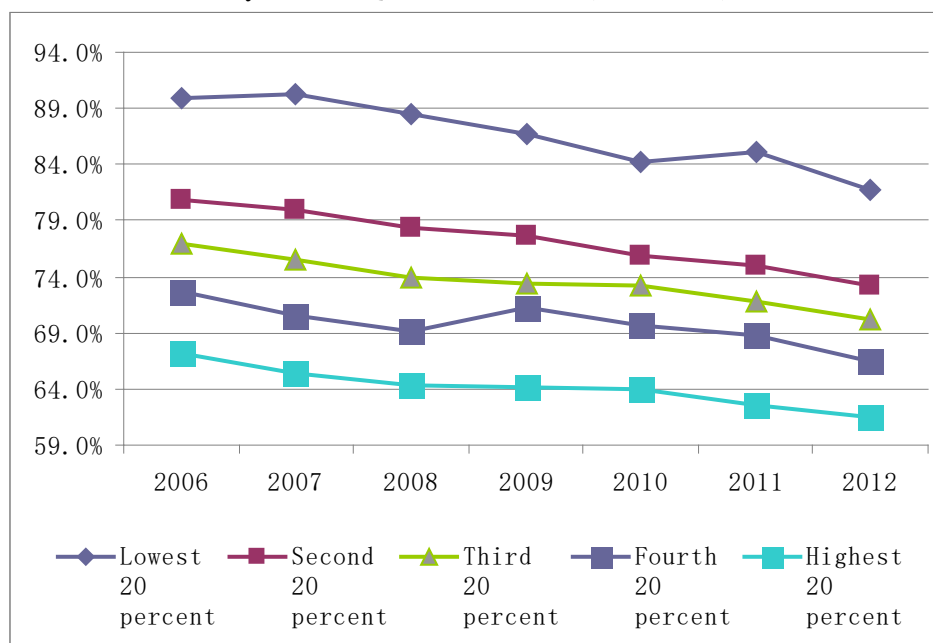
First at all, we use China's expenditure and income data(2006-2012) to demonstrate this new relationship, see Table 4.1 and Figure 4.1。

Table 4.1: Ratio of Average Annual Expenditures to Average Annual Income of Households by Income Quintiles in China (2006-2012)

	2006	2007	2008	2009	2010	2011	2012
<b>Lowest 20 percent</b>	89.8%	90.2%	88.5%	86.7%	84.3%	85.1%	81.7%
<b>Second 20 percent</b>	80.9%	80.0%	78.4%	77.7%	76.0%	75.0%	73.3%
<b>Third 20 percent</b>	77.0%	75.5%	74.0%	73.4%	73.2%	71.8%	70.1%
<b>Fourth 20 percent</b>	72.7%	70.6%	69.2%	71.2%	69.6%	68.7%	66.5%
<b>Highest 20 percent</b>	67.1%	65.5%	64.3%	64.2%	64.0%	62.6%	61.4%

Source: China Statistical Abstract (2007-2103), National Bureau of Statistics of China

Table 4.1: Ratio of Average Annual Expenditures to Average Annual Income of Households by Income Quintiles in China (2006-2012)



Source: the same to Table 4.1

These results from table 4.1 and Figure 4.1 confirm the new economic relationship between consumption rate and income level, that is, at a certain point, a high-income family spends a lower proportion of its income on consumption compared with a low-income family.

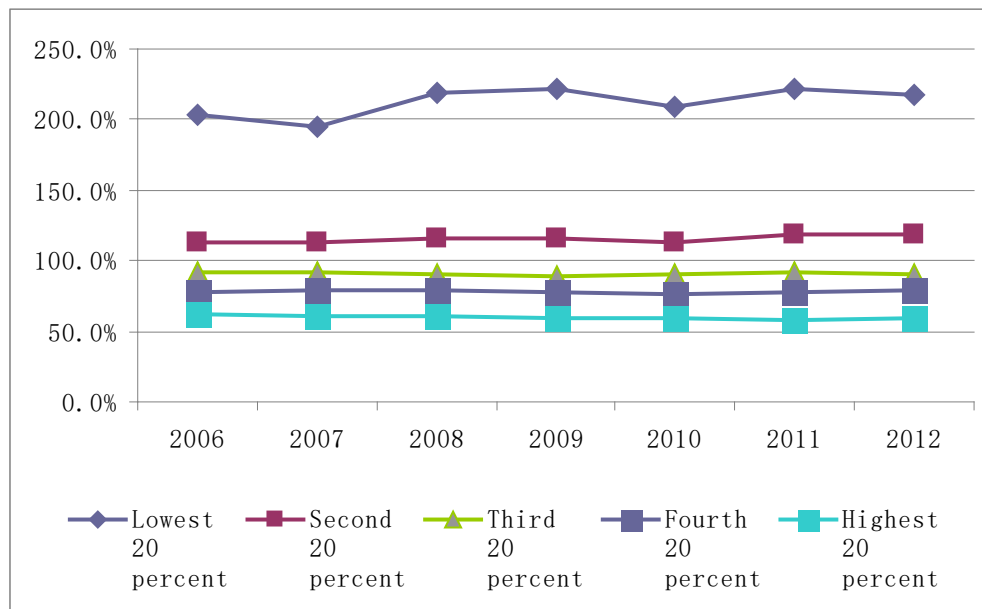
This new economic relationship is not specific relationship only for China. It can also be confirmed by U.S. expenditure and income data. See Table 4.2 and figure 4.2.

Table 4.2: Ratio of Aggregate Average Annual Expenditures to Aggregate Average Annual Income by Income Quintiles of Income In U.S. (2006 To 2012)

	2006	2007	2008	2009	2010	2011	2012
<b>Lowest 20 percent</b>	203.4%	195.5%	218.3%	221.6%	209.3%	221.4%	217.5%
<b>Second 20 percent</b>	113.5%	112.6%	116.3%	116.2%	112.8%	118.4%	118.5%
<b>Third 20 percent</b>	92.3%	92.1%	90.1%	89.2%	90.1%	92.0%	90.9%
<b>Fourth 20 percent</b>	78.2%	79.0%	79.1%	77.7%	75.6%	77.7%	79.1%
<b>Highest 20 percent</b>	62.7%	61.0%	61.1%	59.9%	58.9%	58.6%	59.5%

Data Source: U.S. Bureau of Labor <http://www.bls.gov/cex/csxashar.htm>

Figure 4.2: Ratio of Aggregate Average Annual Expenditures to Aggregate Average Annual Income by Income Quintiles of Income In U.S. (2006 To 2012)



Source: the same to Table 4.2

Again, these results based on U.S. data confirm the new economic relationship

between consumption rate and income level: high-income families spend a lower proportion of their income on consumption compared to low-income families. In fact, the ratio of expenditure to income for the lowest-income 20% families was so high that it was always greater than 1 from 2006 to 2012, which means that the expenditure of the lowest-income 20% families is more than what they earned, namely, their income. The reason for that is because they received a great deal of income transfer payment from U.S. governments. As to China, since the bottom income-level families received very less transfer payment government, the ratio of expenditure of bottom income-level families to income is less than 1.

### **4.3 Theoretical Explanation by Modern Portfolio Theory and Information Cost**

After we prove the new relationship, the next step is to explain why this law holds by modern economic theories. We cannot just attribute the reasons why this law can hold to the psychological factors.

Modern Portfolio Theory(MPT) can help to explain this law. According to modern portfolio theory (Markowitz, 1952, 1959<sup>95</sup>), investors base their asset-selection decisions not only on the returns generated by investment opportunities but also on the risk contained in these opportunities. Most importantly, MPT was the first theory to clearly and rigorously show how the variance of a portfolio can be reduced through the impact of diversification.

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<sup>95</sup> Markowitz, H.M. (March 1952). "Portfolio Selection". *The Journal of Finance* 7 (1): 77–91  
Markowitz, H.M. (1959). *Portfolio Selection: Efficient Diversification of Investments*. New York: John Wiley & Sons.



$$E(r_p) = \sum_{i=1}^n w_i E(r_i) \quad (4.1)$$

Risk of a portfolio:

$$\text{Var}(r_p) = \sigma_p^2 = \sum_{i=1}^n \sum_{j=1}^n w_i w_j \text{Cov}(r_i, r_j) \quad (4.2)$$

Covariance can also be expressed in terms of the correlation coefficient as follows:

$$\text{Cov}(r_i, r_j) = \rho_{ij} \sigma_i \sigma_j = \sigma_{ij} \quad (4.3)$$

where  $\rho_{ij}$  is the correlation coefficient between the rates of return on security i,  $r_i$ , and the rates of return on security j,  $r_j$ ; and  $\sigma_i$  and  $\sigma_j$  represent the standard deviations of  $r_i$  and  $r_j$  respectively. Therefore,

$$\text{Var}(r_p) = \sum_{i=1}^n \sum_{j=1}^n w_i w_j \rho_{ij} \sigma_i \sigma_j \quad (4.4)$$

However, information is a “commodity.” *To construct a fully diversified portfolio, investors have to spend “searching cost,” including time and money, on new assets (Grossman and Stiglitz, 1980<sup>96</sup>). Most importantly, searching cost is almost fixed and can thus be considered a fixed cost for a specific investor, though the return coming from this searching is marginal.*

For example, \$1000 spent to find the true information about a new asset can result in a 1% increase of the portfolio return.

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<sup>96</sup> Grossman, S. J. and Stiglitz, J. E. "On the Impossibility of Informationally Efficient Markets." *The American Economic Review*, Vol. 70, No. 3, (June 1980), pp. 393–408

What does this outcome imply for high-income and low-income families?

H: \$200,000 is available for investment.

Net profit=\$200,000×1%-1000=\$1000

Do it!

L: \$ 50,000 is available for investment

Net profit=\$50,000×1%-1000=-\$500

Give it up!

Hence, low-income families have a significantly lower motivation to search for and invest on new assets compared with high-income families. As a result, the portfolio of high-income families will be more diversified than that of low-income families. The point further implies that the portfolio of low-income families has a greater risk than that of high-income families. That is,

$$\text{Var}(R_p^L) > \text{Var}(R_p^H) \quad (4.5)$$

However, based on the Sharpe Ratio (Sharpe, 1994),

$$S = \frac{R_i - R_f}{\sigma} \quad (4.6)$$

Where  $R_i$  is the return of the asset or portfolio  $i$ ,  $R_f$  is the return on a benchmark asset or risk-free return rate, and  $\sigma$  is the standard deviation of this return of the asset or portfolio and measures the risk.

Investors require a higher return rate for a high-risk portfolio than for a low-risk portfolio because  $S$  is almost constant in an open or fully arbitrary market.

As a result, the return rate required by a low-income family will be higher than that

required by a high-income family:

$$E(r_p^L) > E(r_p^H) \quad (4.7)$$

Alternatively,

$$R_p^L > R_p^H \quad (4.8)$$

When the required return (subject discount rate) increases, the present value of a fixed amount of future benefit will decrease. This result implies that low-income families do not like savings and investing, but will rather spend a large proportion of their income on current consumption.

***High-income families like to save and invest and tend to spend a large proportion of their income on savings and investments.*** If the nominal return of a portfolio is the same for H and L, but  $Var(r_p^L) > Var(r_p^H)$ , then the real return for L will be lower than that for H.

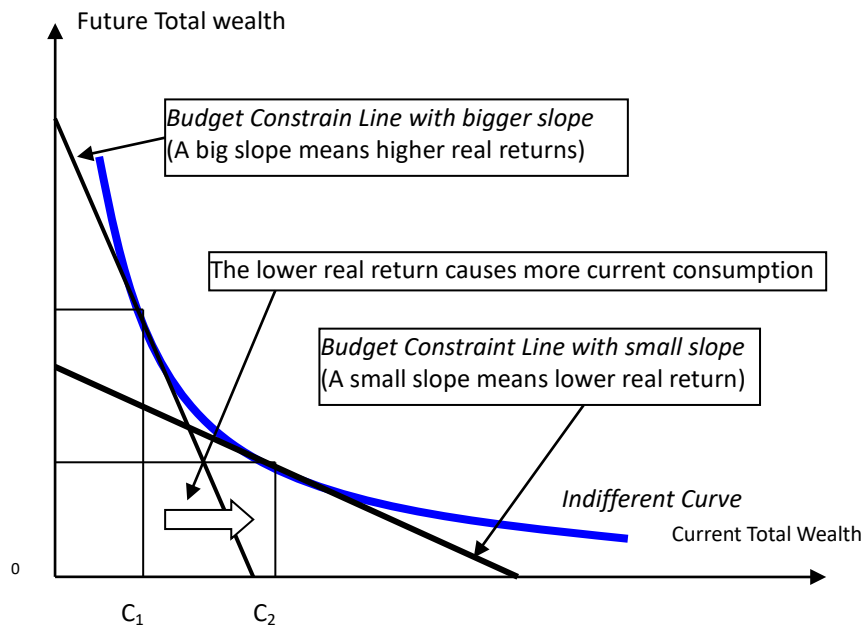


Figure 4.3: Intertemporal Choice of Investors

On the basis of the two-period consumption model (Fisher, 1930),<sup>97</sup> it is easy to establish that the current consumption will increase while the real return will decrease or that the slope of the budget constraint line will decrease. See figure 4.3.

<sup>97</sup> Fisher R. (1930). The Theory of Interest: As Determined by Impatience to Spend Income and Opportunity to Invest It. Porcupine Press (June 1930).

# **CHAPTER 5: INCOME INEQUALITY: A NEW MEASURE**

## **5.1 Income Inequality Measures or Metrics**

### **5.1.1 Importance of Income Inequality Measure**

Income inequality metrics are used by economists, sociologists, and other social scientists to measure the distribution of income among individuals in a particular economy.

Income distribution is a key concept in economic theory and economic policy. Classical economists, such as Adam Smith, Thomas Malthus, and David Ricardo, were mainly concerned with the distribution of income between land owners, laborers, and capitalists, who respectively supply the production factors land, labor, and capital. The most popular topic related to this issue is the relationship between income inequality and economic growth.<sup>98</sup>

However, good inequality metrics are the prerequisites to conducting research on income inequality. Research about income inequality attempts to explain how income inequality occurs and what income inequality will bring about. However, income inequality metrics simply provide a system of measurement to determine the dispersion of incomes.

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<sup>98</sup> See Ricardo, David (1937). *The principles of Political Economy and Taxation*. London. p. 73. And Malthus, Robert. T. (1951). *Principles of Political Economics*. New York. p. 317.

Income inequality is distinct from poverty and fairness. Poverty is severe income inequality. Complete income equality or complete fairness, however, does not exist, either. Thus, moderate income inequality is always seen as unfairness and not poverty. Additionally, income inequality metrics are used not to measure poverty or fairness but to measure the unequal extent of income distribution.

A close and similar concept to income inequality is wealth distribution. They are tightly related. High income can be accumulated to gain substantial wealth, and substantial wealth will produce “income.” However, these concepts are not the same. Income is what an individual or a family earns within a time interval (e.g., one month or one year), but wealth is what an individual or a family owns at some time point. Income is a flow, whereas wealth is a stock. On one hand, income cannot be accumulated into wealth if the income is overspent. In other words, if income is high but the consumption is higher, the wealth growth can be negative. On the other hand, if wealth is high but wealth is non-productive, considerable wealth cannot bring about income. Hence, income inequality metrics are not the same as wealth inequality metrics.

### **5.1.2 Defining Income and Its Components**

In measuring income inequality of a country in this study, “income” refers to all kinds of income.

1. Wages and Salaries. Those are the main source of income.
2. Profits and Dividends. For sole proprietorships, the profit made are the income of the owner. For a Limited Liability Company or Stock Corporation, the dividend from the profit made by the company or corporation is the income of the shareholder.

3. Rents. Two types of rent exist. One is movable-property rent and the other is real (immovable) property rent. The former includes rents from leasing machines, vehicles, and tools (movable property), while the latter includes rents from leasing houses or commercial properties (real property). Rent is the income to the owner for renting out the movable property or real property.

4. Interest Payments. Interest is the income to the capital supplier. Interest includes bank interest and bond interest. The former is paid by the bank, and the latter is paid by the companies or governments that issue those bonds.

5. Capital Gains. The difference between the purchase price at time point A and the resale price at time point B is called the capital gain. Different assets have different capital gains but essentially they are the same idea and represent the appreciation or depreciation in value over the holding period.

Note that not all capital gains are calculated into the National Income Account. Financial asset transactions in the secondary market will not add more products or services to the economy and will, therefore, not improve the Gross Domestic Product or the Gross Domestic Income. A financial asset transaction is essentially a process of social wealth transfer. In the example of a secondary stock market, the money the stock seller receives is equal to the money the stock buyer pays. When a stock price continuously goes up, all participants seem to make profits from the buying and–holding–selling strategy. However, when the stock price drops from its highest points to the original purchase price, all the profit the previous investors earned is actually coming from the one who buys the stock at the highest price. Regardless of the frequency of transactions

and the number of people earning or losing, the aggregate payment is always zero in the absence of a transaction tax and commissions. The result is very similar to a casino, where the winner's benefit is always equal to the loser's loss, so the aggregate profit is always zero (when the casinos do not charge the winners or the losers). When transaction taxes and commissions exist, all the profit the previous investors earned is lower than the loss the one who buys the stock at the highest price suffered. Therefore, the aggregate payment would be negative. Similarly, when the casinos charge the winners or the losers some money, the winner's benefit is lower than the loser's loss, so the aggregate profit will be negative.

The same thing goes with real estate and gold. For example, a person bought a house at \$100,000 and then sold it in two years at \$168,000. The price difference of \$68,000 is his capital gain. Obviously, \$68,000 comes from the buyer. This transaction did not add a \$1 value to the house. Similarly, a person who bought 10 ounces of gold at \$15,000 and sold it at \$17,000 after six months will have capital gains of \$2,000, which is paid by the buyer. However, their transaction did not add any value to the gold.

Given this fact, do we still need to calculate capital gains into an individual's or a family's income? The answer is yes, because capital gains have a huge influence on income distribution even though they never affect Gross Domestic Income. In many developing countries, including China, the stock market has actually been a critical factor that has worsened the income distribution because the stock market is a "legal" tool by which a small group takes money from a large number of small investors. This topic will be discussed in detail in the following chapter.



6. Goods and Services. One form of income is the total amount of goods and services that a person receives; money or cash is not necessarily involved. Services like public health and education are also counted.

7. Unreported Income. As discussed in the following sectors, the unreported income is a major source of income for China's upper-income class. There are several types of underground income.

a) Bribery and embezzlement. Government officials, high-position employees in the public sector, senior managers of state-owned companies, and some senior managers of private-owned companies might be the recipient of bribery and/or embezzlement cash.

b) Unreported income from supplemental employment. Employees in the public sector or those of state-owned companies might be the recipient of this kind of income. Strictly speaking, income from supplemental employment is not underground income because it is derived from legal activities. However, because most of those activities are not allowed by the employers, the income from supplemental employment will never be reported to the employer.

c) Consumption that is taken into the cost account of the company. The owners of private-owned companies or the senior managers in state-owned companies might be the receiver of those kinds of income.<sup>99</sup>

d) Other illegal or criminal income, such as drug sales and money laundering.

Numerous researchers defined "income" as "the taxed income per individual or per household." Such a definition is not applicable to China and many other developing

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<sup>99</sup> An example about (c) is given 5.4.3.

countries because underground, grey, or illegal income is a considerable part of the GDI. To show income inequality accurately, all types of incomes should be taken into account.

## **5.2 Gini Coefficient: A Well-Known Measure for Income Inequality**

### **5.2.1 Lorenz curve**

Max O. Lorenz (1905)<sup>100</sup> developed a graphical representation of the distribution of income or wealth. The curve is a graph showing the proportion of overall income or wealth owned by the bottom  $x\%$  of the people. In detail, it shows for the bottom  $x$  ( $0\% \leq x \leq 100\%$ ) households what percentage  $y$  ( $0\% \leq y \leq 100\%$ ) of the total income they have. The percentage of households is plotted on the x-axis, and the percentage of income is plotted on the y-axis (Figure 5.1).

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<sup>100</sup> Lorenz, M. O. (1905). "Methods of measuring the concentration of wealth". Publications of the American Statistical Association, Vol. 9, No. 70. 9 (70): 209–219.

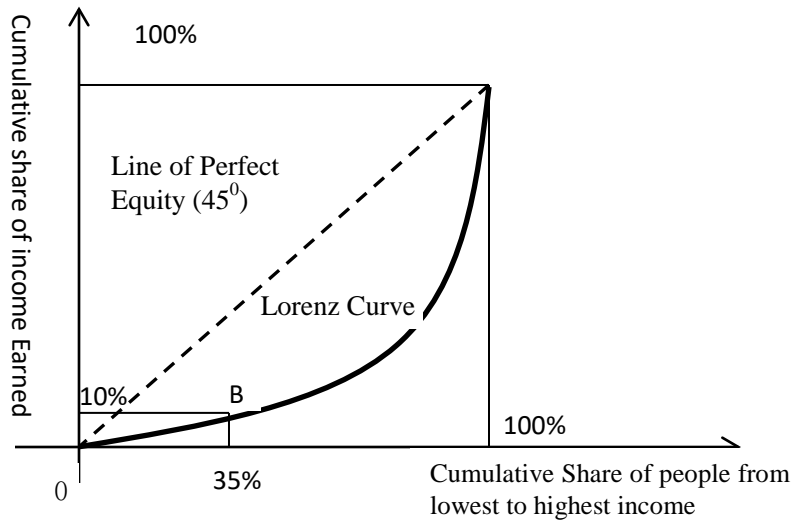


Figure 5.1: Lorenz Curve and the Line of Perfect Equity

The points on the Lorenz curve represent statements that the bottom  $x$  of all households have  $y$  of the total income. For instance, Point B indicates that the bottom 35% of all households has 10% of the total income.

A Lorenz curve always starts at  $(0,0)$  and ends at  $(1,1)$ . It cannot rise above the line of perfect equality. If the variable being measured cannot take negative values, then the Lorenz curve, which cannot sink below the line of perfect inequality, increases. Note, however, that a Lorenz curve for net worth starts out by going negative owing to the fact that some people have a negative net worth because of debt.

A perfectly equal income distribution is one in which every person has the same income. In this case, the bottom  $x$  of society will always have  $x$  of the income. This case can be depicted by the straight line  $y=x$  ( $0\% \leq x \leq 100\%$ ,  $0\% \leq y \leq 100\%$ ), which is called the "line of perfect equality."

By contrast, a perfectly unequal distribution is one in which one person has all the income and everyone else has none. In that case, the curve will be at  $y=0\%$  for all  $x<100\%$  and at  $y=100\%$  when  $x=100\%$ . This curve is called the "line of perfect inequality."

The Lorenz curve for a probability distribution is a continuous function. However, Lorenz curves representing discontinuous functions can be constructed as the limit of Lorenz curves of probability distributions, the line of perfect inequality being an example.

### **5.2.2 Concept of the Gini Coefficient**

Gini (1912)<sup>101</sup> put forward a measure of statistical dispersion intended to represent the income or wealth distribution of a country. This measure became so famous in economics and sociology that it was called the Gini coefficient.

The Gini coefficient is defined mathematically based on the Lorenz curve. It is equal to the ratio of the area that lies between the line of perfect equality and the Lorenz curve (marked M in the diagram) over the total area under the line of equality [marked (M+N) in the diagram], i.e.,  $G = M / (M + N)$  (Figure 5.2).<sup>102</sup>

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<sup>101</sup> Gini, C. (1909). "Concentration and dependency ratios" (in Italian). English translation in *Rivista di Politica Economica*, 87 (1997), 769–789.

<sup>102</sup> Sen, Amartya (1977), *On Economic Inequality* (2nd ed.), Oxford: Oxford University Press, 179

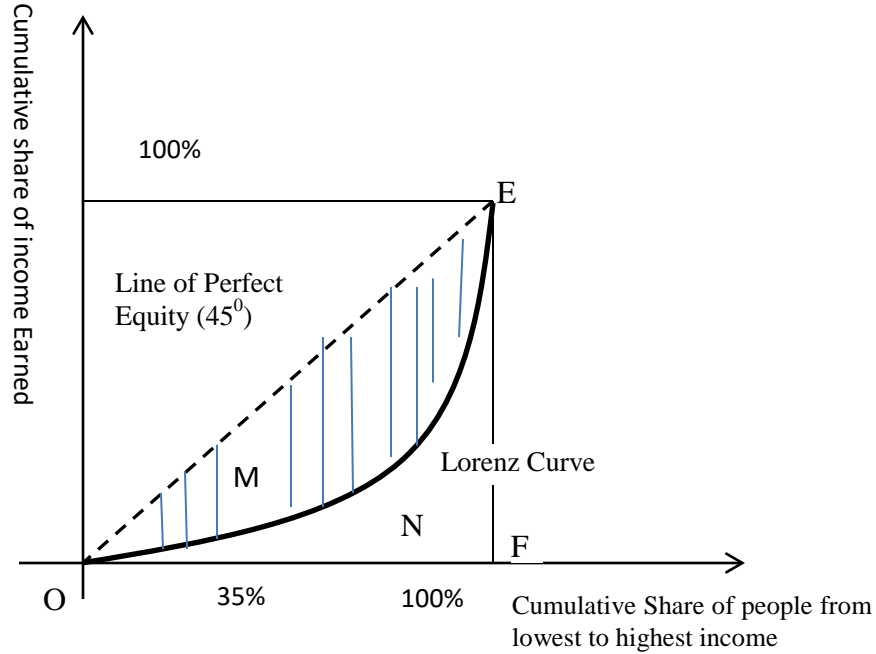


Figure 5.2: Gini Coefficient= $M/(M+N)$

There are two extreme cases of the Gini coefficient.

Case 1:  $G=0$  means perfect income equality.

When the Lorenz curve and the line of perfect equality are the same, the income distribution of this country is perfectly equal. In this situation,  $M=0$ , and thus  $G=M/(M+N)=0$ . On the other hand, if  $G=0$  then  $M=0$ . This case means the Lorenz curve is overlapped with the line of perfect equality. The income distribution is perfectly equal.

Case 2:  $G=1$  means perfect income inequality.

When the Lorenz curve is so convex to F that it becomes a broken line, O-F-E, the income distribution of this country is perfect unequal. In this situation,  $N=0$ , and  $M=M+0=M+N$ . As a result,  $G=M/(M+N)=1$ . On the contrary, if  $G=1$ , then  $M=M+N$  and  $N=0$ . This case means that the Lorenz curve becomes the broken line O-F-E. The income

distribution is perfectly unequal.

In the regular case, when  $G$  is bigger, the income inequality is more severe.

## 5.3 Other Income Inequality Measures

The Gini coefficient, although used very widely, is only one of the metrics used to measure inequality. Others include the 20:20 ratio, the Palma ratio and the Hoover index.

### 5.3.1 The 20:20 Ratio <sup>103</sup>

The 20:20 or 20/20 ratio defined as the wealth owned by the top 20% of the population divided by the wealth held by the bottom 20% of the population. The measure is used by the United Nations Development Program as one of their Human Development Indicators. Because this ratio ignores the middle 60% population, it is too simple to reflect the true level of income distribution in a country.

### 5.3.2 The Palma Ratio

The Palma ratio is equal to the ratio of the wealth share of the top 10% of the population divided by the bottom 40% of the population. It was put forward by Gabriel Palma (2011), <sup>104</sup> who found that the wealth share owned by the middle class was always 50% with the rest split between the upper class the bottom class.

Since the middle class wealth is about 50%, the Gini coefficient will be very sensitive to changes in the wealth share of the middle class, and will be every insensitive

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<sup>103</sup> Baltagi, Badi H. Panel Data Econometrics: Theoretical Contributions And Empirical Applications. In Badi H. Baltagi and Professor Efraim Sadka, Contributions to Economic Analysis. Emerald Publishing, Volume 286, Pages 1-216 (2008) ISSN: 0573-8555

<sup>104</sup> Palma, José Gabriel (January 2011). "Homogeneous middles vs. heterogeneous tails, and the end of the 'Inverted-U': the share of the rich is what it's all about" (PDF). Cambridge Working Papers in Economics (CWPE) 1111. Cambridge University. Retrieved 19 March 2013.

to changes in the wealth shares of the upper and bottom classes. Hence, the Palma ratio can more accurately reflect the true wealth distribution of a society.

However, the income share of middle class is not always equal to 50%. In many countries, the share might be much less than 50%. As a result, the Gini coefficient might not be overly sensitive to changes in the income share of middle class. The suggested advantages of the Palma ratio might not exist.

By contrast, the disadvantage of the Palma ratio might be very evident for many countries. First, it ignores the income share of middle class of the country. Second, in many countries, the top 5% of the population might own over 80% of total wealth, while the other 95% own less than 20% of total income. In this instance, the Palma ratio might not be a good measure for the income distribution.

### **5.3.3 Hoover Index** <sup>105</sup>

The Hoover index is the proportion of all income that has to be redistributed to achieve the perfect income equality. If the income distribution is perfectly equal, no income needs to be redistributed to achieve equal distribution, so the Hoover index is 0. If the income distribution is perfectly unequal, all income needs to be redistributed to achieve equal distribution, so the Hoover index is 1. Thus, the Hoover index ranges between 0 and 1.

However, how is the Hoover index calculated? In order to get how much income that has to be to be redistributed to achieve the perfect equality, the percentage of total income owned by x% of population should be calculated. When the percentage of total

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<sup>105</sup> Edgar Malone Hoover jr. (1936) The Measurement of Industrial Localization, Review of Economics and Statistics, Vola 18, issue 4 162-171

income owned by x% of population is found, the Gini coefficient comes out immediately. In this situation, the Hoover index is not needed any more.

## **5.4 A New Measure for Income Inequality: The Ratio of Gross Income and Gross Domestic Product**

### **5.4.1 Limitations of the Gini Coefficient**

Across all measures for income inequality, the Gini coefficient is most widely used. The reason for that is because it includes much more information than the others. However, as all measures including the Gini Coefficient are actually summing an entire distribution of incomes into a single index, detailed information on the measured inequality is always reduced.

Furthermore, the Gini coefficient is a relative measure. The Gini coefficient of a developing country can rise while the number of people in absolute poverty decreases because the Gini coefficient measures relative, not absolute, income. Two countries might have the same Gini coefficient although one country is very rich but the other one is very poor.

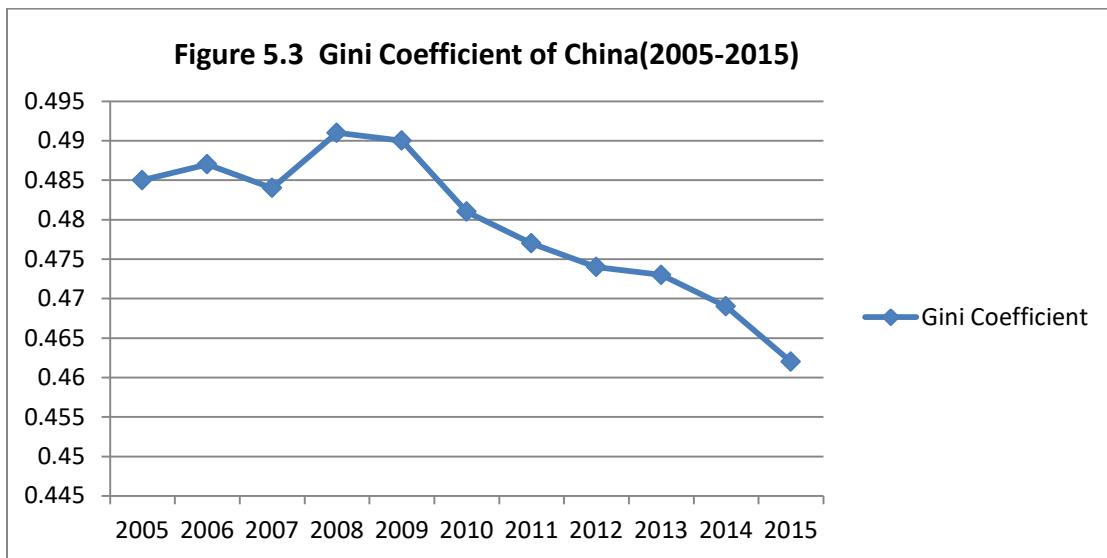
In addition, the Gini Coefficient has the following shortcomings. First, different income distributions may have the same Gini coefficient; Second, identical income distributions can have different Gini coefficients and third, the income inequality can be extreme but the income Gini coefficient can be very low.

### **5.4.2 The Gini Coefficient Announced by China's Government is Not Trustworthy**

The Gini coefficient is a widely accepted measure for income inequality. Many counties in China announce their Gini every year. The Chinese government has



announced China's Gini since 2005 (Figure 5.1).



Data Source:

<https://www.statista.com/statistics/250400/inequality-of-income-distribution-in-china-based-on-the-gini-index/>

The Gini coefficients in the table above are not reliable. Various reports by widely respected economists estimate that the Gini coefficient was above 0.6 in 2010 and has been increasing since 2010. In fact, even the trend reflected in the table is not reliable because the income distribution has been getting worse since 2000. However, the information from the government tells us that China's Gini coefficient has been decreasing since 2005.

The answer lies in the politics of a non-democratic country. A high Gini coefficient indicates high income inequality, something a non-democratic country is not likely to admit to. Socialism theory by Karl Marx argues that capitalism must lead to severe income polarization, while socialism will create a society with income equality. Karl Marx and his followers insist that income equality is actually a unique advantage owned

by socialist countries. Declaring that China is a socialist country, China's Communist Party has to show that the income of China is much more evenly distributed than that of capitalist countries. A specific leader of a communist party will think it is his big achievement that the Gini coefficient has decreased during his tenure. This can explain the fact that although almost all Chinese people think that the income inequality has become more severe over the past 16 years, but the data shows that income inequality has actually been continuously decreasing.

If the Gini Coefficients announced by the Chinese government are not trustworthy, how do we find the true Gini Coefficient? It is very hard to do so. The true Gini Coefficients can only be determined after the true household income is measured, but the data on true household income is hard to collect due to the existence of substantial grey income. Grey income will never be reported by its beneficiaries because most of it is illegal. As a result, other indices or coefficients need to be developed to measure the true income equality of a country.

#### **5.4.3 Why is Gross Income Lower than Gross Domestic Product? Who Owns the Unreported Income?**

According to macroeconomic fundamentals, the Gross Domestic Product (GDP) of a country must be equal to the Gross Domestic Income (GDI) of this country. Therefore, if the GDI is less than the GDP, invisible income or underground income that is not detected by census must exist, which is called unreported income. The question is who owns the unreported income.

It is a basic fact that almost all the people in the upper income levels are

businessmen in U.S, European countries, Japan, Canada, Australia and other democratic and market-oriented countries. However, wealthy businessmen are only a very small proportion of the upper income class in China. It is a basic fact that government officials, high & middle-position employees in public sectors and state-owned companies are the main part of the upper income class in China. However, it is also a basic fact their salary (visible income) are very low. Therefore, those people with low visible income and high total income can be called “invisible millionaires” or “the invisible wealthy”.

Similar to government officials, high & middle-position employees in public sectors and state-owned companies are also they groups with low visible income but high total income. We discuss their salary and other underground income one by one.

#### 1. Government Officials

China’s officials have a very strict hierarchical system. There are totally 12 levels from the lowest to the highest in this system, which are Banshiyuan, Keyuan, Vice Ke, Ke(Town Governor), Vice Chu, Chu(County Governor), Vice Ju, Ju(City Governor), Vice Bu, Bu(Provinces Governor), Vice Guo, and Guo(President or Prime Minister). According to the Salary Standardization Rates of China’s Government Employees (2016)<sup>106</sup>, the total salary of lowest-level official is less than ¥ 3000 (434.78.50) per month. It is too low to believe, but it is the truth. The total salary of the highest-level official, President or Prime Minister, is ¥ 11,385 (about \$1,830) per month or ¥ 136,620 (\$21,960) per year.<sup>107</sup>

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<sup>106</sup> [http://www.chachaba.com/news/html/peixun/zhiyepx/20121018\\_94168.html](http://www.chachaba.com/news/html/peixun/zhiyepx/20121018_94168.html)

<sup>107</sup> For comparison, US president Barack Obama earned \$400,000 a year, and Hong Kong’s controversial chief executive earns about \$545,000 a year.

Although China's officials' salary (visible income) is very low, they lead very luxurious lives. They consume the most expensive food and clothes. Furthermore, they have very luxurious purses, watches, gold, diamonds, and luxury cars. They not only own the most expensive houses in the cities where they are working but also in China's main large cities, like Beijing, Shanghai, and Guangzhou. That is the reason why they are called "invisible millionaires" or "the invisible wealthy".

How can this happen? The only answer is that they have numerous sources of invisible income apart from their salary (visible income). In fact, Every Chinese knows that their salary is only a very small part of their total and real income, and every Chinese knows why they would not like to report their invisible income.

Where does their unreported income come from? Their unreported income is from bribery and embezzlement. In addition, they also have another kind of income, which is their personal expenditure but paid not by themselves. They always have dinner in the best restaurants in a city, but the bills are often paid by the individuals or corporations that want to bribe them or by the government budget. The same goes for their car, gas, insurance, domestic or overseas luxury travel, entertainment or erotic activity in night clubs, and gambling in casinos. This is also a basic fact in China.

## 2. Employees in Non-government Public Sectors

### 1) Employees in Non-government institutions with public power or functions

There are many non-government institutes or organizations that have the public power in non-government public sectors. Many employees in those institutes or organizations are also "visible millionaire". Here several examples are taken.

#### A. Office of Public Notary

The Office of Public Notary is a monopolistic non-government public institution. Chinese laws require that many civil activities can only be done through public notary services. As the only institution to provide public notary services, the Office of Public Notary can profit by charging high prices but not taking any responsibilities. However, this high profit does not go into government accounts, but are rather shared by the employees in the office.

#### B. Construction Quality and Safe Supervision Office

Similar to the Office of Public Notary, the Construction Quality and Safe Supervision Office has the power to supervise the construction process but never has the responsibility for the construction quality and safety. Whether this office confirms to the construction quality and safety only depends on how much money the contractors will bribe the office.

#### C. Red Cross Society of China

Red Cross always refers to the humanitarian institution or movement worldwide. The International Committee of the Red Cross (ICRC) is the oldest and most honored organization within the movement and one of the most widely recognized organizations in the world, having won three Nobel Peace Prizes in 1917, 1944, and 1963. The American Red Cross, Canadian Red Cross, British Red Cross, German Red Cross, and other countries' Red Cross always provide the society with charitable services.

The exception is China's Red Cross Society. Although China's Red Cross Society is a non-government and non-profit organization by law, it is actually affiliated to the

National Health and Family Planning Commission of China. All senior managers of Red Cross Society in different area of China are designated by the local government, and all employees have the same salary, medical insurance, pension as government officials.

The Chinese government controls the Red Cross Society in order for the government to take possession of the large amounts of money donated by the society. To accumulate more and more money, the government requires that only the donation given to Red Cross from companies is tax deductible. Although some charitable organizations exist in China, those organizations have big difficulties to raise charitable money because people or companies cannot claim tax deductions if they donate their money to those organizations. As a result, Red Cross Society became the richest charitable organization in China.

The visible salary of the employees of China's Red Cross Society is also very low. Their luxurious lives are supported not by their basic salary but by their underground income, which comes from donations from society. A typical example is "Red Cross Scandal with Guo Meimei" that happened in Juen, 2011.<sup>108</sup> Although Red Cross of China has declared many times that Red Cross of China was totally innocent, they have never shown any convincing evidences that can refute what Guo Meimei said.

## 2) Teachers of Elementary school, middle school, and high school

Some teachers of Elementary school, middle school, and high school have a great deal of unreported income, which is Buke (Out-of-School Classes) Income. It should be emphasized here that Buke Income is just unreported income, not illegal income.

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<sup>108</sup> <http://time.com/3078429/yunnan-earthquake-red-cross-society-of-china-guo-meimei-sex-scandal/>

It is the biggest dream for most parents in China to have their children to be enrolled to the best universities in the country. Thus, in current China, each parent employs all means possible to improve their children's grades and thus increase their chances of getting into a leading university. Such competition begins in kindergarten. Many parents want their children to go to the best kindergartens, the best elementary schools, middle schools, and high schools. They consider this the best way to ensure their children go to the best universities.

Before 2000, middle school and high school students learned at school. To improve the students' grades, every school tries to extend the study time of students. Then, many key schools started enforcing a boarding system from the beginning of the first year of middle school, in which students can only go home once a week and rest one day. Upon reaching their third year in middle school, the students only go home every two weeks and rest one day. While in high school, the students go home only once a month and rest one day. Under such circumstances, students have a longer time to study, and the parents do not need to find tutors for their children because the children have almost no time outside of school.

After 2000, the Chinese Ministry of Education began the so-called education reform, which aimed to shorten the learning time of students and lighten their burden. According to the new policy, students can only have a maximum of eight classes a day up to five days a week. On Saturday and Sunday, students must be allowed to rest. From Monday to Friday, students must be allowed to go home after 4 p.m.

This education reform, reasonable at first sight, ignored a basic fact. As long as academic pressures continue to exist, students and parents will use up all the possible time to study because they understand that entering a leading university with only eight hours a day of learning is impossible. Then, when students' study times are forcibly shortened, parents will absolutely not allow students to rest for a long time outside school. They will start searching for excellent teachers outside school to make up lessons for their children.

The competition for good tutors is so fierce that the incomes of many excellent teachers for making up lessons outside school can reach up to ¥2,000 per hour (US\$300). In Shanghai, many of these teachers can earn \$10,000 per week because they have so much time from 5 p.m. to 8 p.m. Monday to Friday, and from 9 a.m. to 8 p.m. Saturday to Sunday).

In fact, many parents look for teachers to give extra classes to their children such that almost all teachers have the opportunity to teach out-of-school classes. Although the regular teachers do not get paid so well, they can still make big money.

### 3) Professors in universities and colleges

Unlike teachers in elementary school, middle school, and high school, professors in universities and colleges do not have opportunities to receive bribes or teach out-of-school classes. Owing to their low salaries, many professors have been living on very tight budgets in China. Nonetheless, there are some very rich professors in China's universities and colleges. Obviously, their luxurious lives are not supported by their salaries. What supports their luxurious lives?



A. Research Grant. Strictly speaking, a research grant is not a grey or underground income. In the United States and European countries, some proportion of a research grant is the professor's income. However, in China, any cent in the research grant cannot be paid to the professor. Therefore, no matter how many grants a professor receives, no one cent of these grants is counted into his/her income. However, his/her salary is so low that he/she has to figure out some ways to transfer the money from his grant to his own bank account or spend some money from the grant for his/her personal consumption. The grant money that is transferred to his/her personal income or spent on personal consumption is the grey or underground income.

B. Income from Part-time Jobs. Many professors in China are unwilling to commit themselves to teaching and research because of the low salary. They have considerable free time due to their very light teaching and research tasks such that they can regard their profession as unimportant. Consequently, many professors take a second job out of campus. In fact, those professors spend more time in this second job than in their jobs in the universities. By doing so, they earn a large amount of money. However, because universities forbid professors from engaging in jobs outside of campus, these professors will never report the income from their second job. The big money is also the grey or underground income for these professors.

It should be emphasized here that the income above is just unreported income, not illegal income.

#### 4) Doctors in hospitals

Doctors in hospitals also have very low incomes, a situation that is very similar to

those of professors. Some doctors live frugally, though very rich doctors also exist in China. Where does their extra money come from?

A. Bribery. Doctors are always the persons to whom medicine companies want to give bribes to. The form of bribery used is kickback. For example, the acceptable price of a heart stent is \$1,200 for a medicine company. The salesman of this medicine company will tell doctors that his company will pay 20%, that is, \$240, back to doctors if they choose to buy the heart stents for their patients from their medicine company. If a doctor has 200 patients a year, and each patient needs two stents on average, then this doctor can earn  $200 \times 2 \times 240 = \$96,000$ .

B. Out-of-Hospital jobs. Doctors have many opportunities to provide medical service for other hospitals. For example, excellent surgeons are often invited by other hospitals to perform surgery for patients there. Although surgeons are paid very little in their own hospitals, they are paid much higher by other hospitals. For example, an ophthalmic surgeon is only paid ¥300 (\$43) for an extracapsular cataract extraction in Shanghai Changhai Hospitals. However, if this surgeon is invited to a hospital in Suzhou, Jiangsu Province, he will be paid ¥1800 (\$258).

Again, the income above doctors earn is just unreported income, not illegal income.

### 3. Senior Managers of State-Owned Companies

Two kinds of state-owned companies exist. The first is monopolistic state-owned companies, including State Grid Corporation of China, Water Supply Companies, China Gas Holdings Ltd., China Grain Reserves Corporation, China National Petroleum

Corporation, China Petroleum and Chemical Corporation. The second is non-monopolistic state-owned companies, including the Big Three mobile operators (China Mobile Co. Ltd., China United Telecommunications Co. Ltd., China Telecommunications Co. Ltd.), the Big Four state-owned commercial banks (Industrial and Commercial Bank of China, Bank of China, China Construction Bank, Agricultural Bank of China), Shanghai Baosteel Group Corporation, and China Poly Group Corporation.

The first kind of companies earns significantly more than the second kind owing to monopoly. In fact, many of the first kind are semi-government companies. For example, the China Railway Corporation Ministry of Railways is affiliated with the State Council of the People's Republic of China.

Similar to the government officials in China, the senior managers of state-owned companies also live very luxurious lives even though their salaries are very low. How can this happen?

State-owned companies do not have one owner or one person who is actually responsible for it, although they have a nominal one, say, the company board. In reality, the senior managers become the true controller of the company. In other words, the senior managers often make almost all of the decisions without supervision. This is the big problem with state-owned companies worldwide.

As a result, senior managers can easily take advantage of their power to make extra money in addition to their salaries. In fact, numerous cases like these can be found in China. However, this is only the tip of the iceberg. They could make extra money in the following ways.

A. Senior managers could “steal” money from state-owned companies. For example, they could fake the company’s profit, give a portion of the profit to the government, and then keep the remaining portion for themselves.

B. Senior managers could include all of their personal consumption expenses into the company’s cost account. In other words, all of their personal consumption could be paid by their companies. A portion of the consumption of their spouse, parents, and children can also be paid by the companies. In fact, they could use company money to bribe important persons, for example, the presidents of a good high school. Their children could go to this school even if their children are not qualified.

C. Senior managers could earn money by selling their power. Unlike the owners of private-owned companies, the managers of state-owned companies do not try to maximize the company’s profits. What they always do is to try to maximize their own profits. Here we have two examples.

Example 1: A state-owned housing development company has 200 newly developed condominiums for sale. However, senior managers have the power to give 10% discount to some persons. For example, if one condo is \$1,000,000, then the senior managers have the power to give \$100,000 to some persons. Only the persons who give bribes to the managers can get this discount. Some managers give a bribery amount, for instance, \$30,000, which means the person who gives \$30,000 to the manager could buy the condo at a 10% discount.

Example 2: A state-owned mobile service company plans to build a new signal station in a city. The total budget for this new signal station is \$1,000,000. The general

manager has the power to choose the contractors. If three contractors want to undertake the project, the one who gives the largest bribe to the general manager will be chosen.

#### 4. Owners of Small or Middle Private-owned Companies

Owners or senior managers of private-owned companies have very few opportunities to conduct bribery and embezzlement. Do they also have grey income, just like officials do?

First, there is no tax return/deduction of personal income for personal expenditure. In U.S. and many other western countries, some specific expenditure, for example, the monthly payment for a housing loan, are income-tax-free. In other words, they could result in income tax reduction. However, in China, no expenditure could result in an income tax return.

Second, the tax rate on corporate income is at least 25% in China. The simple formula is  $\text{Corporate Tax} = (\text{Corporate Earning} - \text{Corporate Cost}) \times 25\%$ . This equation means that if the corporate cost rises because of corporate earnings, the corporate tax will go down.

Third, in China, no clear boundary exists between the owner's personal expenditure and the company's cost because neither the content of tax law nor the execution of tax law is strict.

Thus, owners of private companies can easily include their personal expenditures into the cost accounts of their companies. In this way, on the one hand, they will not spend their own salaries on their expenditures, and thus save a lot of money. On the other hand, their companies will save tremendously on corporate tax.

Owners can and will take their expenditures into the accounts of their companies. The companies will have higher costs and lower profits before tax and then lower profit after tax, because the owners include their expenditures into the accounts of their companies. The owners' dividend (their income) will also go down because the profits after tax are lower. As a result, their nominal income is much lower. We take an example below.

Assume that Mr. Li is the only owner of H Company, and all his income comes from the after-tax profit of the company. He used a credit card to pay his expenditures within a year. At the end of this year, he will use his income to pay back the credit card.

We also assume the following:

Total expenditure of Mr. Li in 2016: ¥ 300,000

Total earnings of H Company: ¥ 2,000,000

Total cost of H Company: ¥ 1,200,000

In China, the corporate tax rate is 25%.

Scenario 1: Mr. Li does not take all his expenditures into the cost account of H Company.

The tax paid by H Company:  $(2,000,000 - 1,200,000) \times 25\% = 200,000$

His income will be:  $(2,000,000 - 1,200,000) \times (1 - 25\%) = 600,000$

If we conduct a survey about income, we will obtain the result that Mr. Li's income in 2016 is ¥ 600,000.

Scenario 2: Mr. Li includes all his expenditures into the cost account of H Company.

If Mr. Li includes all his expenditures into the cost account of H Company, then the cost of H Company will be:  $1,200,000+300,000=1,500,000$

The tax paid by H Company:  $(2,000,000-1,500,000)\times 25\%=125,000$

His nominal income will be:  $(2,000,000-1,500,000)\times (1-25\%)=375,000$ , which is also his actual income.

Then the corporate tax he saved is:  $200,000-125,000=75,000$

His nominal income is: 375,000

His actual Income is:  $375,000+300,000=675,000$

If we conduct a survey about income, we will obtain the result that Mr. Li's income in 2016 is ¥375,000. This income is severely underestimated.

#### **5.4.4 Ratio of Gross Domestic Income and Gross Domestic Product (RGG): A New Measure for Income Inequality**

##### **1. Why is RGG constructed as a new measure?**

As previously mentioned, all high-income individuals in China, except the owners or senior managers of big private-owned companies, have very low salaries (their visible income). Therefore, their high income does not come from their salary but from underground or grey income. More precisely, most of the grey income is earned by the high-income class, which includes officials, employees in public institutions, senior managers of state-owned companies, and owners of private-owned companies. Grey income brings them to the high-level-income class because their salary is insufficient.

As indicated in Chapter 1, GDP should be equal to GDI because every dollar in GDP produced in China must belong to someone in this economy. As a result, if all the income

of the high income class, including the small salary (nominal income) and the big underground income, can be uncovered, collected and calculated, then the national total income or GDI will be equal to the nation's total product or GDP. By contrast, if one cannot account for the underground income, then the GDI will be based on salary and will be less than the GDP.

Given the difficulties in collecting underground income, the data on average individual income that the China National Bureau of Statistics announces or that other data-service companies in China own are all only based on the salaries, capital gains, and other types of reportable income. Thus, the data on China's average individual income is actually visible income. Then the GDI can be much lower than the GDP.

Although the GDI has disappointed numerous researchers because it is inaccurate, it can still deliver crucial information about China. All underground income is earned by the high income class. Thus, the lower the GDI is than the GDP, the more evidence of the grey income earned and the more severe the income inequality will be as detailed in Figure 5.5.



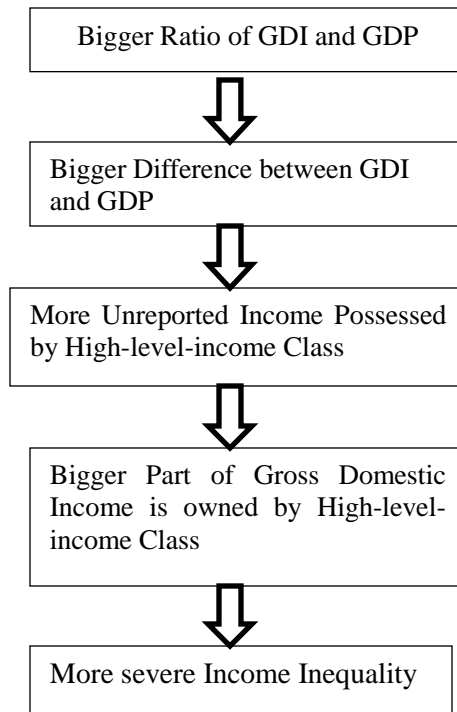


Figure 5.4: Why RGG can be a Measure for Income Inequality

Consequently, along with the Gini coefficient, we can use the ratios of GDI and GDP, what we will call RGG, to be a measure of the income inequality of China. Therefore, although salary-based GDI is inaccurate, the ratio of GDI and GDP can indicate the severity of China's income inequality.

## 2. The Process of Calculating RGG

In order to make RGG easier to understand, the calculation process of RGG should be showed step by step.<sup>109</sup>

<sup>109</sup> In China, GDP can be used not only for the whole country, but also a province or a city. In U.S., GDP is often used for the whole country. The aggregate product of a metropolitan area is called Gross Metropolitan Product(GMP). In the process of calculating, "GDP" means the aggregate product of different cities, which is equivalent to GMP in U.S. In fact, GDP in this whole study including empirical study(chapter 8), is always equivalent to GMP in U.S.

Step 1: The quarterly GDP of four municipalities in China from 2000 to 2003 is detailed in Table 5.3.

	Beijing	Tianjin	Shanghai	Chongqing
2000 Q1	449.10	335.18	985.30	354.94
2000 Q2	595.00	409.03	1104.48	349.09
2000 Q3	649.30	426.56	1109.32	410.84
2000 Q4	1467.60	468.64	1572.07	676.13
2001 Q1	550.50	376.66	1081.86	386.99
2001 Q2	683.17	459.31	1221.08	393.42
2001 Q3	736.63	478.43	1268.93	441.79
2001 Q4	1740.20	512.27	1638.25	754.66
2002 Q1	584.50	426.95	1159.53	424.18
2002 Q2	762.30	488.87	1363.81	451.38
2002 Q3	806.10	534.77	1378.81	500.02
2002 Q4	2177.50	572.01	1838.88	857.28
2003 Q1	666.30	490.57	1325.86	478.23
2003 Q2	849.80	588.74	1499.84	517.06
2003 Q3	945.87	620.46	1584.12	568.36
2003 Q4	2561.83	687.17	2284.41	992.07

Table 5.1 Quarterly GDP of Four Cities

Step 2: The quarterly disposable income per capita of four municipalities from 2000 to 2003 is obtained.

	Beijing	Tianjin	Shanghai	Chongqing
2000Q1	2727.79	1796.61	2594.68	1232.10
2000Q2	2526.09	1874.50	2674.27	1298.31
2000Q3	2382.61	1840.40	2721.65	1353.20
2000Q4	2576.59	1891.33	2804.26	1361.30
2001Q1	3000.57	1981.00	2885.93	1392.22
2001Q2	2778.70	1943.20	2931.70	1429.04
2001Q3	2884.41	1951.25	3029.53	1466.45
2001Q4	2894.53	2040.55	3098.44	1532.44
2002Q1	2938.09	2060.44	3146.94	1588.07
2002Q2	2979.81	2097.56	3234.24	1632.59
2002Q3	3023.99	2160.64	3391.21	1689.23
2002Q4	3152.30	2398.69	3466.45	1744.98
2003Q1	3292.08	2692.22	3526.03	1765.23
2003Q2	3317.42	2777.15	3615.81	1779.73
2003Q3	3348.30	2844.96	3684.43	1804.02
2003Q4	3494.41	3000.32	3767.24	1848.76

Table 5.2 Quarterly Disposable Income per capita of Four Cities

Step 3: The quarterly residential population data of the four municipalities from 2000 to 2003 is gathered.

Population				
	Beijing	Tianjin	Shanghai	Chongqing
2000 Q1	937.42	998.50	1605.75	2675.53
2000 Q2	991.00	999.29	1617.34	2678.61
2000 Q3	1047.65	1000.09	1629.01	2681.68
2000 Q4	1107.53	1000.88	1640.77	2684.76
2001 Q1	1170.84	1001.67	1652.61	2687.84
2001 Q2	1237.76	1002.47	1664.54	2690.93
2001 Q3	1308.51	1003.26	1676.55	2694.02
2001 Q4	1383.31	1004.06	1688.65	2697.11
2002 Q1	1393.19	1004.84	1691.26	2706.65
2002 Q2	1403.13	1005.62	1693.88	2716.23
2002 Q3	1413.15	1006.40	1696.50	2725.84
2002 Q4	1423.24	1007.18	1699.12	2735.48
2003 Q1	1431.46	1008.21	1704.43	2745.92
2003 Q2	1439.72	1009.24	1709.76	2756.40
2003 Q3	1448.03	1010.27	1715.10	2766.91
2003 Q4	1456.39	1011.30	1720.46	2777.47

Table 5.3 Quarterly Residential Population of Four Cities

Step 4: The quarterly population is multiplied with the quarterly disposable income per capita to obtain the GDI.

	Beijing	Tianjin	Shanghai	Chongqing
2000 Q1	255.71	179.39	416.64	329.65
2000 Q2	250.34	187.32	432.52	347.77
2000 Q3	249.61	184.06	443.36	362.89
2000 Q4	285.37	189.30	460.11	365.48
2001 Q1	351.32	198.43	476.93	374.21
2001 Q2	343.94	194.80	487.99	384.54
2001 Q3	377.43	195.76	507.92	395.06
2001 Q4	400.40	204.88	523.22	413.32
2002 Q1	409.33	207.04	532.23	429.84
2002 Q2	418.11	210.93	547.84	443.45
2002 Q3	427.34	217.45	575.32	460.46
2002 Q4	448.65	241.59	588.99	477.34
2003 Q1	471.25	271.43	600.99	484.72
2003 Q2	477.62	280.28	618.22	490.56
2003 Q3	484.84	287.42	631.92	499.16
2003 Q4	508.92	303.42	648.14	513.49

Table 5.4 Quarterly Gross Domestic Income of Four Cities

Step 5: GDP is divided by GDI to derive the RGG.

	Beijing	Tianjin	Shanghai	Chongqing
2000 Q1	0.339893	0.46445	0.378356	0.794392
2000 Q2	0.323245	0.463525	0.369109	0.802042
2000 Q3	0.309673	0.446045	0.361998	0.798015
2000 Q4	0.344568	0.433764	0.36132	0.749404
2001 Q1	0.401249	0.462453	0.390527	0.803794
2001 Q2	0.381504	0.432274	0.384967	0.792031
2001 Q3	0.397394	0.421426	0.383654	0.784626
2001 Q4	0.407266	0.424696	0.374435	0.791359
2002 Q1	0.409237	0.437079	0.38838	0.830476
2002 Q2	0.392522	0.428291	0.387122	0.806338
2002 Q3	0.381049	0.423762	0.395937	0.820933
2002 Q4	0.392477	0.444698	0.392027	0.789722
2003 Q1	0.394192	0.481641	0.379606	0.801267
2003 Q2	0.384962	0.474051	0.372682	0.77743
2003 Q3	0.381521	0.475	0.368307	0.76622
2003 Q4	0.386711	0.483889	0.373248	0.768325

Table 5.5 Quarterly Ration of GDI to GDP of Four Cities

### 3. The Comparison between RGG and Gini Coefficient

In order to clarify the feature of RGG, a comparison is made here between RGG and Gini Coefficient.

#### (1) Common Features of Gini Coefficient and RGG

First, they are both nonnegative.

Second, they are both bounded by 0 and 1.

Third, they are both a proportion, not an absolute value.

#### (2) Differences between Gini Coefficient and RGG

First, they are calculated differently and based on different economic information.

Second, RGG is suitable for a country where the majority of the income of the upper class is coming from grey income. It is not a good measure for a country where the

proportion of grey income in a household's income for every class is very low. The Gini coefficient can be used everywhere, but it is very hard to get the true Gini coefficient when there is a large amount of grey income in the economy.

Third, there exists a negative relation between RGG and income inequality. In other words, a smaller RGG means more extreme income inequality, or a larger RGG means less income inequality. However, the relationship between the Gini coefficient and income inequality is positive.

# **CHAPTER 6: TRANSMISSION MECHANISM FROM INCOME INEQUALITY TO RAPIDLY RISING HOUSING PRICES**

## **6.1 Under the New Economic Relationship, Increasing Income Inequality will Cause High Aggregate Savings Rate**

In the literature review in Chapter 2, many studies have been conducted on income inequality and gross savings rate. However, the relationship between the two are rarely examined.

Research on the relationship between income inequality and the gross savings rate is rare because most previous studies assume that the MPC and MPS are both homogeneous for all households at different income levels. If households at different income levels have the same MPC and MPS, then income inequality will have no effect on the gross savings rate. As a result, the relationship between income inequality and the gross savings rate has been ignored. However, income inequality is crucial to the gross savings rate if the MPC and MPS are heterogeneous, that is, households at different income levels have different MPCs and MPSs.

Under the new law, a more severe income inequality will increase the gross savings rate. The proof is as follows.



## 6.1.1 The Proof that More Severe Income Inequality Leads to Higher Gross Saving

### Rate: Discrete Income-level

1. Two income levels and two different propensities to save

Assumptions: there are two income-level household in an economy. One is high-income household, the other is low-income household. Let  $\alpha_1$   $\alpha_2$  be the proportion of total income of high-income and low-income households in Gross Domestic Product, respectively. Obviously,  $\alpha_1 > \alpha_2$  and  $\alpha_1 + \alpha_2 = 1$ . The bigger  $\alpha_1$ , the more severe income inequality.

Let  $c_1$   $c_2$  be the propensity to consume for high-income and low-income households, respectively. According to the new economic law discussed in Chapter 4, we know  $0 < c_1 < c_2 \leq 1$ .

Denote  $Y$  to be Gross Domestic Products and denote  $S$  to be aggregate saving rate.

We have:

$$S = \frac{\alpha_1 Y(1 - c_1) + \alpha_2 Y(1 - c_2)}{Y} \quad (6.1)$$

Want to show:  $S$  will increase if  $\alpha_1$  increases, in other words, more severe income inequality will cause higher aggregate saving rate.

Proof:

$\alpha_1 + \alpha_2 = 1$  gives  $\alpha_1 = 1 - \alpha_2$ . Then,

$$S = \frac{\alpha_1 Y(1 - c_1) + \alpha_2 Y(1 - c_2)}{Y} = \alpha_1(1 - c_1) + \alpha_2(1 - c_2) = \alpha_1(1 - c_1) + (1 - \alpha_1)(1 - c_2) \quad (6.2)$$

$$\text{Therefore, } \frac{dS}{d\alpha_1} = (1 - c_1) - (1 - c_2) = c_2 - c_1 > 0 \quad (6.3)$$

This means that the aggregate saving rate will increase when income inequality becomes severe.

## 2. Three income levels and three different propensities to save

Assumptions: there are three income-level household in an economy: high, middle and low. Let  $\alpha_1 \alpha_2 \alpha_3$  be the proportion of total income of high-income, middle-income, low-income households in Gross Domestic Product, respectively. Obviously,  $\alpha_1 > \alpha_2 > \alpha_3$  and  $\alpha_1 + \alpha_2 + \alpha_3 = 1$ .

Let  $c_1 c_2 c_3$  be the propensity to consume for high-income, middle income and low-income households, respectively. According to the new economic law discussed in Chapter 4, we know  $0 < c_1 < c_2 < c_3 \leq 1$ .

Denote  $Y$  to be Gross Domestic Products and denote  $S$  to be aggregate saving rate.

We have:

$$S = \frac{\alpha_1 Y(1 - c_1) + \alpha_2 Y(1 - c_2) + \alpha_3 Y(1 - c_3)}{Y} \quad (6.4)$$

When income inequality becomes severe, we have the following scenarios:

### **Scenario 1: $\alpha_1$ becomes bigger**

Want to show:  $S$  will increase if  $\alpha_1$  increases, in other words, more severe income inequality will cause higher aggregate saving rate.

Proof:

Sub-scenarios 1:  $\alpha_1$  becomes bigger, both  $\alpha_2$  and  $\alpha_3$  become smaller

$$\text{So } \frac{\partial \alpha_2}{\partial \alpha_1} < 0 \quad \text{Since } |\Delta \alpha_2| \leq |\Delta \alpha_1|, \text{ Then } \left| \frac{\partial \alpha_2}{\partial \alpha_1} \right| \leq 1 \quad (6.5)$$

Sub-scenarios 2:  $\alpha_1$  becomes bigger,  $\alpha_2$  become smaller,  $\alpha_3$  does not change

$$\text{So } \frac{\partial \alpha_2}{\partial \alpha_1} < 0 \quad \text{Since } |\Delta \alpha_2| = |\Delta \alpha_1|, \text{ Then } \frac{\partial \alpha_2}{\partial \alpha_1} = -1$$

Sub-scenarios 3:  $\alpha_1$  becomes bigger,  $\alpha_2$  does not change,  $\alpha_3$  become smaller

$$\text{So } \frac{\partial \alpha_2}{\partial \alpha_1} = 0$$

Sub-scenarios 4:  $\alpha_1$  becomes bigger,  $\alpha_2$  becomes bigger,  $\alpha_3$  become much smaller

$$\text{So } \frac{\partial \alpha_2}{\partial \alpha_1} > 0$$

Then,

$$S = \frac{\alpha_1 Y(1-c_1) + \alpha_2 Y(1-c_2) + \alpha_3 Y(1-c_3)}{Y} = \alpha_1(1-c_1) + \alpha_2(1-c_2) + \alpha_3(1-c_3) \Rightarrow$$

$$S = \alpha_1(1-c_1) + \alpha_2(1-c_2) + (1-\alpha_1-\alpha_2)(1-c_3) \Rightarrow$$

$$\frac{\partial S}{\partial \alpha_1} = (1-c_1) + \frac{\partial \alpha_2}{\partial \alpha_1}(1-c_2) + (-1 - \frac{\partial \alpha_2}{\partial \alpha_1})(1-c_3) \Rightarrow$$

$$\frac{\partial S}{\partial \alpha_1} = (1-c_1) + \frac{\partial \alpha_2}{\partial \alpha_1} - \frac{\partial \alpha_2}{\partial \alpha_1} c_2 - 1 + c_3 - \frac{\partial \alpha_2}{\partial \alpha_1} + \frac{\partial \alpha_2}{\partial \alpha_1} c_3 \Rightarrow$$

$$\frac{\partial S}{\partial \alpha_1} = (c_3 - c_1) + \frac{\partial \alpha_2}{\partial \alpha_1}(c_3 - c_2) \quad (6.6)$$

Since  $c_1 < c_2 < c_3$

we have:

$$c_3 - c_1 > 0 \quad c_3 - c_2 > 0 \quad c_3 - c_1 > c_3 - c_2$$

For Sub-scenarios 1, we also know  $\left| \frac{\partial \alpha_2}{\partial \alpha_1} \right| \leq 1$

Then we have:

$$\frac{\partial S}{\partial \alpha_1} = (c_3 - c_1) + \frac{\partial \alpha_2}{\partial \alpha_1} (c_3 - c_2) = (c_3 - c_1) - \left| \frac{\partial \alpha_2}{\partial \alpha_1} \right| (c_3 - c_2) > 0 \quad (6.7)$$

Sub-scenarios 2: We also know  $\frac{\partial \alpha_2}{\partial \alpha_1} = -1$

Then we have:

$$\frac{\partial S}{\partial \alpha_1} = (c_3 - c_1) + \frac{\partial \alpha_2}{\partial \alpha_1} (c_3 - c_2) = (c_3 - c_1) - (c_3 - c_2) = c_1 - c_2 > 0 \quad (6.8)$$

Sub-scenarios 3: We also know  $\frac{\partial \alpha_2}{\partial \alpha_1} = 0$

Then we have:

$$\frac{\partial S}{\partial \alpha_1} = (c_3 - c_1) + \frac{\partial \alpha_2}{\partial \alpha_1} (c_3 - c_2) = c_3 - c_1 > 0 \quad (6.9)$$

Sub-scenarios 4: We also know  $\frac{\partial \alpha_2}{\partial \alpha_1} > 0$

Then we have:

$$\frac{\partial S}{\partial \alpha_1} = (c_3 - c_1) + \frac{\partial \alpha_2}{\partial \alpha_1} (c_3 - c_2) > 0 \quad (6.10)$$

This means that the saving rate will go up when income inequality become severe.

Sub-scenarios 5:  $\alpha_1$  becomes bigger,  $\alpha_2$  becomes much smaller,  $\alpha_3$  become bigger

$$\text{So } \frac{\partial \alpha_3}{\partial \alpha_1} > 0$$

Then,

$$S = \frac{\alpha_1 Y(1-c_1) + \alpha_2 Y(1-c_2) + \alpha_3 Y(1-c_3)}{Y} = \alpha_1(1-c_1) + \alpha_2(1-c_2) + \alpha_3(1-c_3) \Rightarrow$$

$$S = \alpha_1(1-c_1) + (1-\alpha_1-\alpha_3)(1-c_2) + \alpha_3(1-c_3) \Rightarrow$$

$$\frac{\partial S}{\partial \alpha_1} = (1-c_1) + (-1 - \frac{\partial \alpha_3}{\partial \alpha_1})(1-c_2) + \frac{\partial \alpha_3}{\partial \alpha_1}(1-c_3) \Rightarrow$$

$$\frac{\partial S}{\partial \alpha_1} = (1-c_1) + -1 + c_2 - \frac{\partial \alpha_3}{\partial \alpha_1} + \frac{\partial \alpha_3}{\partial \alpha_1} c_2 + \frac{\partial \alpha_3}{\partial \alpha_1} - \frac{\partial \alpha_3}{\partial \alpha_1} c_3 \Rightarrow$$

$$\frac{\partial S}{\partial \alpha_1} = (c_2 - c_1) + \frac{\partial \alpha_3}{\partial \alpha_1}(c_3 - c_2) \quad (6.11)$$

Since  $c_1 < c_2 < c_3$

we have:

$$c_3 - c_1 > 0 \quad c_3 - c_2 > 0$$

We also know  $\frac{\partial \alpha_3}{\partial \alpha_1} > 0$

Then

$$\frac{\partial S}{\partial \alpha_1} = (c_2 - c_1) + \frac{\partial \alpha_3}{\partial \alpha_1}(c_3 - c_2) > 0$$

**Scenario 2:  $\alpha_1$  does not change,  $\alpha_2$  becomes bigger,  $\alpha_3$  become smaller**

In this scenario, When  $\alpha_2$  increases, the income inequality becomes more severe.

Want to show:  $S$  will increase if  $\alpha_2$  increases, in other words, more severe income inequality will cause higher aggregate saving rate.

Proof:

$$\text{Then we have: } \frac{\partial \alpha_1}{\partial \alpha_2} = 0 \quad \frac{\partial \alpha_3}{\partial \alpha_2} = -1$$

$$S = \frac{\alpha_1 Y(1-c_1) + \alpha_2 Y(1-c_2) + \alpha_3 Y(1-c_3)}{Y} = \alpha_1(1-c_1) + \alpha_2(1-c_2) + \alpha_3(1-c_3) \Rightarrow$$

$$S = \alpha_1(1-c_1) + \alpha_2(1-c_2) + (1-\alpha_1-\alpha_2)(1-c_3) \Rightarrow$$

$$\frac{\partial S}{\partial \alpha_2} = \frac{\partial \alpha_1}{\partial \alpha_2}(1-c_1) + (1-c_2) + \left(-\frac{\partial \alpha_1}{\partial \alpha_2} - 1\right)(1-c_3) \Rightarrow$$

$$\frac{\partial S}{\partial \alpha_2} = 0 + (1-c_1) - (1-c_3) = c_3 - c_1 \quad (6.12)$$

Since  $c_1 < c_2 < c_3$

We have:

$$\frac{\partial S}{\partial \alpha_2} = c_3 - c_1 > 0 \quad (6.13)$$

This means that the aggregate saving rate will go up when income inequality become severe.

### **6.1.2 A Simple Simulation on the Relationship between Income Inequality and Aggregate Saving Rate at Discrete Income-level**

In order to show the relationship between income inequality and aggregate saving rate at Discrete Income-level, a simple simulation is run here.

General Assumptions:

1. The population is 100
2. Total income is \$5,000,000 in a specific year
3. Three income level: Low, Middle and High

There are four scenarios.

### 1. Scenario 1: Income Inequality

Assumptions:

1) There are 10 low-level income families, 80 middle-level income families, 10 high-level income families.

2) Each low-level income family earns \$10,000; Each middle-level income family earns \$50,000; Each high-level income family earns \$90,000 this year.

3) The Propensity to Consume of low-level income families is 100%; The Propensity to Consume of middle-level income families is 80%; The Propensity to Consume of high-level income families is 40%.

The results are shown in Table 6.1.

Table 6.1 Income Distribution and Social Saving Rate (Scenario 1)

Population: 100 Total Income: \$ 5,000,000							
	Population	Income Per Capita (\$)	Total Income of Each Class	Propensity to Consume	Consumption Per Year (\$)	Propensity to Save	Savings Per Year
Low-Level Income Families	10	10000	100000	100%	100000	0%	0
Low-Level Income Families	80	50000	4000000	80%	3200000	20%	800000
Low-Level Income Families	10	90000	900000	40%	360000	60%	540000
Sum	100		5000000		3660000		1340000

Aggregate Consumption Rate  
0.732

Aggregate Savings Rate  
0.268

Table 6.1 shows the aggregate savings rate is 0.268 when income distribution is equal.

### 2. Scenario 2: Not Severe Income Inequality

Assumptions:

1) There are 70 low-level income families, 20 middle-level income families, 10 high-level income families.

2) Each low-level income family earns \$10,000; Each middle-level income family earns \$50,000; Each high-level income families earn \$330,000 this year.

3) The Propensity to Consume of low-level income families is 100%; The Propensity to Consume of middle-level income families is 80%; The Propensity to Consume of high-level income families is 40%. (Same as before)

The results are shown in Table 6.2.

Table 6.2 Income Distribution and Social Saving Rate (Scenario 2)

Population: 100 Total Income: \$ 5,000,000							
	Population	Income Per Capita (\$)	Total Income of Each Class	Propensity to Consume	Consumption Per Year(\$)	Propensity to Save	Savings Per Year (\$)
Low-Level Income Families	70	10000	700000	100%	700000	0%	0
Low-Level Income Families	20	50000	1000000	80%	800000	20%	200000
Low-Level Income Families	10	330000	3300000	40%	1320000	60%	1980000
Sum	100		5000000		2820000		2180000

Aggregate Consumption Rate  
0.564

Aggregate Savings Rate  
0.436

Table 6.3 shows the aggregate savings rate is 0.46 when income inequality is not severe.

### 3. Scenario 3: Severe Income Inequality

Assumptions:

1) There are 90 low-level income families, 8 middle-level income families, 2 high-level income families.

2) Each low-level income family earns \$10,000; Each middle-level income



family earns \$50,000; Each high-level income family earns \$1,850,000 this year.

3) The Propensity to Consume of low-level income families is 100%; The Propensity to Consume of middle-level income families is 80%; The Propensity to Consume of high-level income families is 40%. (Same as before)

The results are shown in Table 6.3.

Table 6.3 Income Distribution and Social Saving Rate (Scenario 3)

Population: 100 Total Income: \$ 5,000,000							
	Population	Income Per Capita (\$)	Total Income of Each Class	Propensity to Consume	Consumption Per Year	Propensity to Save	Savings Per Year
Low-Level Income Families	90	10000	900000	100%	900000	0%	0
Low-Level Income Families	8	50000	400000	80%	320000	20%	80000
Low-Level Income Families	2	1850000	3700000	40%	1480000	60%	2220000
Sum	100		5000000		2700000		2300000

Aggregate Consumption Rate

0.54

Aggregate Savings Rate

0.46

Table 6.3 shows the aggregate savings rate is 0.46 when income inequality is severe.

#### 4. Scenario 4: Very Severe Income Inequality

Assumptions;

1) There are 70 low-level income families, 10 middle-level income families, 20 high-level income families.

2) Each low-level income family earns \$10,000; Each middle-level income family earns \$50,000; Each high-level income family earns \$180,000 this year.

3) The Propensity to Consume of low-level income families is 100%; The Propensity to Consume of middle-level income families is 80%; The Propensity to

Consume of high-level income families is 40%. (Same as before)

The results are shown in Table 6.4.

Table 6.4 Income Distribution and Social Saving Rate (Scenario 4)

Population: 100 Total Income: \$ 5,000,000							
	Population	Income Per Capita (\$)	Total Income of Each Class	Propensity to Consume	Consumption Per Year	Propensity to Save	Savings Per Year
Low-Level Income Families	70	10000	700000	100%	700000	0%	0
Low-Level Income Families	10	50000	500000	80%	400000	20%	100000
Low-Level Income Families	20	180000	3600000	40%	1440000	60%	2160000
Sum	100		4800000		2540000		2260000

Aggregate Consumption Rate

0.529

Aggregate Savings Rate

0.471

Table 6.4 shows the aggregate savings rate is 0.471 when income inequality is very severe.

### 6.1.3 The Proof that More Severe Income Inequality Leads to Higher Aggregate Savings Rate: Continuous Income-level

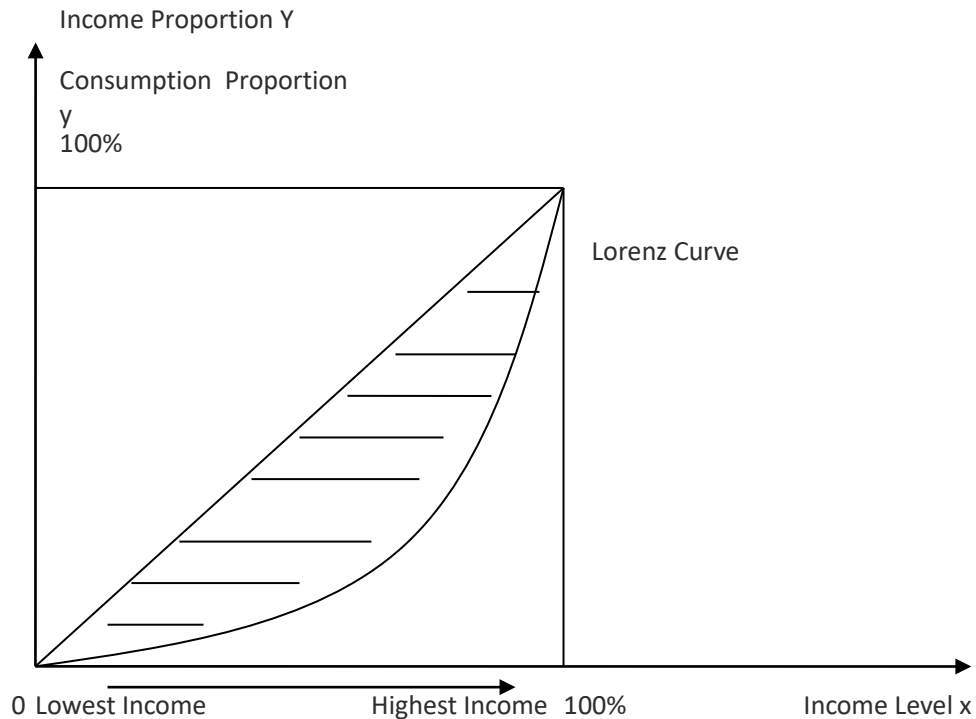


Figure 6.1: Lorenz Curve and Gini Coefficient

Assume that Lorenz Curve is expressed by:

$$Y = x^a \quad 0 \leq x \leq 1 \quad a \geq 1 \quad (6.14)$$

Y: the percentage of income, or the proportion of overall income possessed by the bottom x of the people.

If we assume the Gross Domestic Product (GDP) of this country is equal to 1, Y is also the total income possessed by the bottom x of the people.

x: The bottom x of the people

Then we have:

$$Y \begin{cases} = x & a = 1 & \text{A diagonal Line} \\ = x^a & a > 1 & \text{A curve convex to (0,1)} \\ = \begin{cases} 0 & 0 \leq x < 1 \\ 1 & x = 1 \end{cases} & a = \infty & \text{A broken Line} \end{cases} \tag{6.15}$$

So,  $Y = x^a$  is a function that describes Lorenz Curve very well. We also see that “a” is the coefficient that represents the income inequality.

The Gini coefficient G, can be obtained by:

$$G = (0.5 - \int_0^1 x^a dx) / 0.5 = 1 - 2 \int_0^1 x^a dx \tag{6.16}$$

we have:

$$\frac{1}{a+1} x^{a+1} \Big|_0^1 = 0.5 - 0.5G \tag{6.17}$$

$$a = \frac{1}{1-G} - 2 = \frac{1+G}{1-G} \tag{6.18}$$

Obviously, when G is bigger, a is bigger. So, “a” represents the income inequality.

When G=0, a=1, which means the income is totally equal for all people in this country.

When G=1,  $a = \infty$ , which means the income is the most extremely unequal, or the wealthiest one possesses all the wealth of this country.

As said before, when we assume this country’s GDP is equal to 1, Y is the income owned by the bottom x of the people, that is, the accumulated income owned by the

bottom  $x$  of the people. Then the derivative of  $Y$  is the income owned by the  $x$ th person, which is denoted by  $y$ .

$$\text{That is: } y = \frac{dY}{dx} = ax^{a-1} \quad (6.19)$$

The savings of the  $x$ th person,  $s$ , is a proportion of  $y$ :

$$s = b(x)y = b(x)ax^{a-1} \quad (6.20)$$

Where  $b$  is the savings rate

We know that,  $s$  becomes larger when  $x$  becomes larger due to the new economic relationship established in Chapter 4. That is:

$$b = f(x) \text{ with } \frac{db}{dx} > 0 \quad (6.21)$$

Let us assume  $b$  and  $x$  have a positively linear relation and the savings rate for the most lowest income level and most highest income level are 0 and  $m$  ( $m$  is less than 1 but very close to 1), respectively.

$$\text{Then we have: } b = mx \quad 0 < m < 1$$

When  $x=0$ ,  $b=0$ , which means the savings rate for the lowest income family is equal to 0, that is,  $b(0)=0$ . When  $x=1$ ,  $b=m$ , which means the savings rate for the highest income family is  $m$ , that is,  $b(1)=m$ . All these conclusions are exactly consistent with the assumptions.

Substituting  $b = mx$  into (6.21) gives:

$$s = by = (mx)(ax^{a-1}) = max^a \quad (6.22)$$

Then the aggregate savings rate, which is also equal to total savings of this

economy because  $Y=1$ , is the integral of  $s$ , that is,

$$S = \int_0^1 \max^a dx = \frac{am}{a+1} x^{a+1} \Big|_0^1 = \frac{am}{a+1} \quad (6.23)$$

Substitute  $a = \frac{1+G}{1-G}$  into (6.23) gives:

$$S = m \times \frac{\frac{1+G}{1-G}}{\frac{1+G}{1-G} + 1} = 0.5m(1+G) \quad (6.24)$$

Since  $m > 0$ ,  $S$  will increase when  $G$  increases. In other words, when income inequality becomes more severe, the savings rates will go up. This is exactly what we want to prove.

Let's end this discussion by adding consumptions curve and savings curve to Lorenz curve.

Denote  $c$  to be the consumption of the  $x$ th person. We know

$$s = by = mx \times ax^{a-1} = \max^a \quad (6.25)$$

we have:

$$c = (1-b)y = (1-mx) \times ax^{a-1} = ax^{a-1} - amx^a \quad (6.26)$$

The accumulated consumption  $C$  of the bottom  $x$  of the people is the integral of  $c$ , that is,

$$C = \int_0^x (az^{a-1} - amz^a) dz = z^a \Big|_0^x - \frac{ma}{a+1} z^{a+1} \Big|_0^x = x^a - \frac{ma}{a+1} x^{a+1} \quad (6.27)$$

The accumulated savings , S of the bottom x of the people is:

$$S = Y - C = x^a - \left(x^a - \frac{ma}{a+1}x^{a+1}\right) = \frac{ma}{a+1}x^{a+1} \quad (6.28)$$

The consumption curve and saving curve are shown in Figure 6.2.

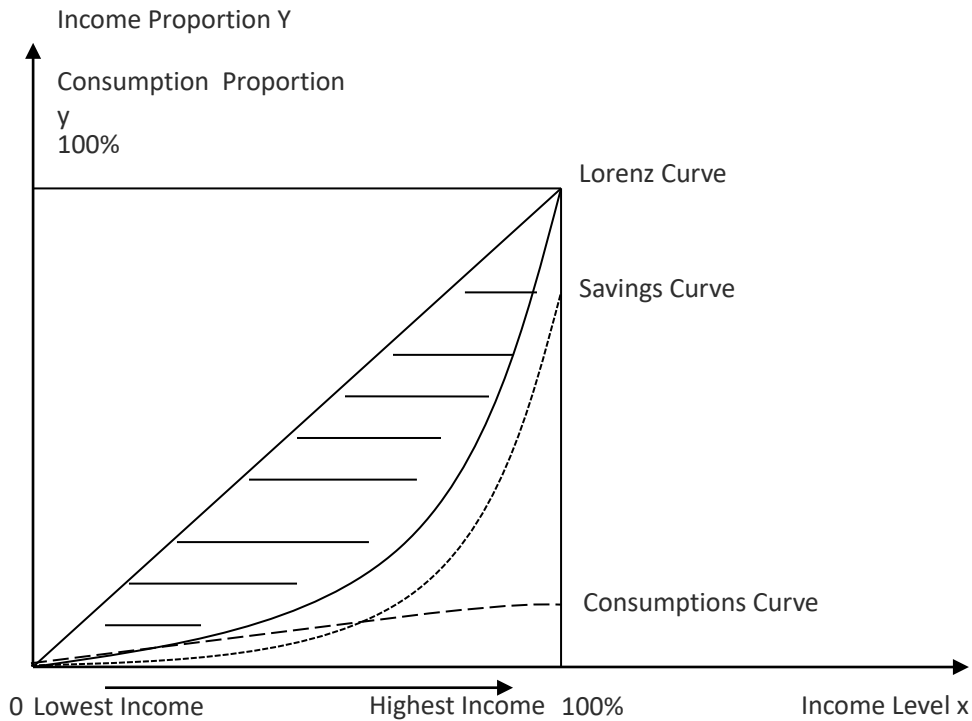


Figure 6.2: Lorenz Curve, Savings Curves and Consumptions Curve

## 6.2 High Gross Savings Rate Will Cause High Demand for Virtual Assets and Low Demand for Real Assets

A high gross savings rate is not necessarily a negative thing. By contrast, a high gross savings rate is a good signal for a country in most situations. According to neoclassical theories, the basic production function is as follows:

$$Y = f(K, L) \quad \frac{\partial Y}{\partial K} > 0 \quad \frac{\partial Y}{\partial L} > 0 \quad (6.30)$$

where  $Y$  denotes production,  $K$  denotes capitals, and  $L$ , denotes labor.

The equations show that production will rise when capital increases because the latter will increase when the gross savings rate increases given the GDP. Therefore, a high savings rate will bring about high production and, consequently, boost the economic growth of this country. This result is a mainstream viewpoint in economics.

The underlying assumption for this viewpoint is that all savings can be transferred to production capital. Thus, a high savings rate will increase production capital. However, it is not necessary for all savings to be transferred to production capital under some conditions.

Companies base their product supply decisions on how much profit they will earn from the product. If the demand for consumption goods is strong, the prices of consumption goods will go up and then the benefit to the companies will increase. As a result, the company will produce and supply more. When demand, supply, and transactions all increase, the prosperity of the consumption market increases.

The demand for production factors (materials, machines, assembly lines, facilities, land, and labor) is a derivative demand from the consumption market. In other words, the demand for production factors is caused by the demand for consumption goods. For example, the demand for cotton, sewing machines, and spinning mills will rise when the demand for clothes, quilts, and sheets is high. Consequently, the production factor market will be prosperous if the consumption market is strong. By contrast, if the consumption



market is weak, the production factor market will be recessive.

In addition, profits will go up if both prices and transactions increase. Assuming that a country's GDP is  $Y$  and the total savings is  $S$ , then the consumption  $C$  is

$$C = Y - S \quad (6.31)$$

Obviously, when  $C$  becomes bigger (demand line shifts right), both the prices ( $P$ ) and transactions ( $Q$ ) of goods will increase. On the other hand, when the  $C$  becomes smaller (demand line shifts left), both the prices ( $P$ ) and transactions ( $Q$ ) of goods will decrease (Figure 6.3).

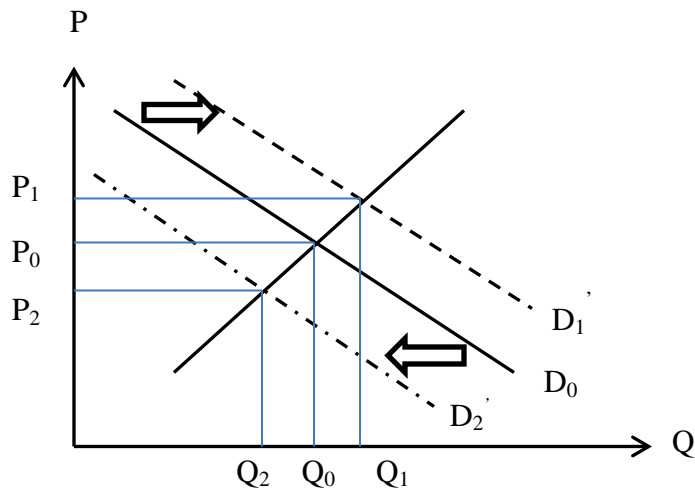


Figure 6.3 Both Demand and Transaction will Change When  $C$  Changes

Denote sales revenue by  $H$ , then  $H=PQ$ , which is the measure for the consumption market's prosperity. Since  $P$  and  $Q$  are both increasing functions of  $C$ , then  $H$  is also an increasing function of  $C$ . That is,

$$H = f(C) \quad f'(C) > 0 \quad (6.32)$$

We know  $C=Y-S$ . When  $Y$  is fixed, we have:

$$\frac{dC}{dS} = -1 \quad (6.33)$$

Given (6.32) and (6.33), we have,

$$\frac{dH}{dS} = \frac{dH}{dC} \cdot \frac{dC}{dS} = -\frac{dH}{dC} < 0 \quad (6.34)$$

Assume the cost per product is stable. Then profits will go up if H becomes larger.

Let  $\pi$  be the profit. We then have

$$\pi = g(H) \quad g'(H) > 0 \quad (6.35)$$

Combining (6.32) and (6.35) gives:

$$\pi = g(f(C)) = g(f(K - S)) \quad (6.36)$$

Since  $\frac{dH}{dS} < 0$  and  $\frac{d\pi}{dH} > 0$

we have

$$\frac{d\pi}{dS} = \frac{d\pi}{dH} \times \frac{dH}{dS} < 0 \quad (6.37)$$

We find that the profits will decrease if savings,  $S$ , increases. Then, companies will reduce their supply instead of extending production. Therefore, the consumption markets and production factor markets will be recessive. In other words, when savings increases, the increased savings will not transfer into production capital and boost the real sector to be prosperous, which is an opposite conclusion to that expected for mainstream economies.

When the savings continuously increases but is not invested into the real sector, where will those savings go? The answer is that they will go to the asset markets. In other

words, they will be used to buy stocks, bonds, funds, gold, houses, and so on.

If the return from an asset market, say, the stock market, can totally reflect the performance of consumption markets, then the return from asset markets is always the same as or very close to that from consumption or factor markets. Then, the return from asset markets will not be higher than that from consumption or factor markets, and high savings will not be motivated to pursue after assets.

However, the return from asset markets does not always reflect the performance of consumption markets. The prices of assets depend on the expected return of consumption or factor markets, not the current return of consumption or factor markets. Consequently, the prices of assets actually depend on the prices of consumption goods or factors expected in the future, not the current prices of consumption or factors goods. Asset prices do not always reflect the performance of consumption markets because expectations are not always accurate. In fact, investors often build their expectation on what has happened in the past. That is, the asset prices built on the expected return will be affected by the historical trend of the asset prices. For example, when asset prices continuously increase in the past 12 months, people will often predict that asset prices will also go up in the next 3 months.

Even if we admit that the return from asset markets does not always follow the return from consumption or factor markets very closely, we cannot conclude that the return from asset markets is higher than that from consumption or factor markets. For example, if the return from asset markets is lower than the return from consumption or factor markets, then why will savings still flow into the asset markets?

The reason lies in the unique feature of asset markets. When a person spends his/her money founding a manufacturing company (real assets) and then manages this company, his/her return is determined by the profits the company earns. However, when a person invests money into the stock (virtual assets) of a manufacturing company, his/her return not only depends on the holding period returns (dividends) coming from the profits but also on the difference between purchase prices and expected resale prices (capital gains). When the capital gains are high, the investor will prefer the virtual assets to real assets even if the ratio of dividends/price of virtual assets is much lower than that of profit/investment of real assets (a company).

However, how can the capital gains be high if the D/P ratio of virtual assets is extremely low? The answer is the difference between the purchase price and the expected sale price, because the capital gains will be determined by the price trend. If the asset prices are expected to increase, then the capital gain will increase by expectation.

Consequently, even if the dividend of one asset is very low, the asset can still be attractive if investors expect the prices to increase, that is, the expected capital gains will increase. Hence, once investors expect that the price will rise for some reason, they will transfer their money into this asset market. Once a huge amount of money hits this asset, the asset price will go up, thus confirming the investors' expectation. They will transfer more money into this asset market when their expectations are confirmed. Consequently, the asset price will continue to rise, and the positive feedback cycle appears.

If there is any factor that helps investors build the expectation that asset prices will go up, then savings will pour into this asset market and push the asset prices up. The

increasing asset prices will confirm the expectation and then attract more savings to this market, further boosting the asset prices to rise.

This mechanism is called a self-reinforcing or self-actualizing mechanism. Owing to this mechanism, when the savings increase and the consumption and factor markets are recessive, the savings will flow into the asset markets. As long as there is information that helps investors build the expectation that the asset prices will go up, the savings will pour into the asset markets and lead to the prosperity of these markets.

Next, when savings increased, the savings will not flow to the consumption markets but will flow into the asset markets instead. The reason is that the high savings caused by income inequality is always accompanied by low consumption, which will lead to a very weak demand for consumption goods and recessive consumption and factor markets. Recessive consumption and factor markets reap low profits, which stifles the new savings from coming in and chases the capital out of the market.

### **6.3 High Demand for Virtual Assets and Increasing Housing Prices: Why Are Houses Preferred to Other Assets?**

The previous part has concluded that high savings caused by income inequality will flow into the asset markets. The next question is this: In China, why are houses preferred over other assets given that high savings result from severe income inequality?

There are many types of assets in capital markets:

1. Stocks
2. Bonds
3. Commercial Real Estate (Office, Retail, Industrial, and Other Commercial Real

Estate) and Real Estate Investment Trusts

4. Gold

5. Houses

To answer the question, we can analyze the different types of assets one by one.

### **1. Stock**

Theoretically, a stock value is determined by the present value of all expected dividends from the company in the future. In practice, however, a stock price is determined by the present value of the expected dividends before sale and the expected price at sale.

In the short run, the stock price often deviates from the market fundamentals because the expected price at sale is affected by the previous price. The stock prices, however, have rarely been away from the market fundamentals in the long run.

Given that the expected dividend is coming from the profit the company is expected to earn in the future, a stock price relies on the profits the company is expected to earn and the expected price when it is sold. The expected price essentially relies on the expected profit the company is expected to earn in the long run. Therefore, the stock price is essentially determined by the expected profit of the company in the future, which is called the market fundamentals of this stock. If the consumption markets are recessive, the profit from consumption markets will decrease, and then the stock price will go down due to the low expected profit and the low expected price at sale.

Therefore, only when the market fundamentals are very good will investors conduct a long-term investment on this stock. If the market fundamentals have a poor

performance, investors will take a short-time strategy of buying stocks and then selling them in very short time. This behavior has thus become a pure speculation behavior and the market has become a speculative market.

When severe income inequality leads to high savings and low consumption, the consumption markets will be recessive and will bring investors a poor market fundamental. The stock market will become a speculative market, which is always a very risky market. Therefore, when the market fundamentals are poor, the stock market becomes a very risky market. A very risky market is less attractive and prevents investors from investing into this market. This is the reason the stock market is not preferred by investors under the condition of severe income inequality.

## **2. Bonds**

In practice, a bond price is determined by the present value of the interest paid by the company before sale and the expected price at sale. However, the interest payments from a bond are typically all equal to the fixed value by the bond contract. The discount rate is the determining factor for bond prices. Future discount rates are hard to predict. The same goes for bond prices. When bond prices are unpredictable, bonds will be less attractive to investors.

When the income inequality is severe and the consumption market is recessive, corporate bonds and government bonds will be unable to pay high interest rates to the bond holder. The low interests plus very risky capital gains make the debt unattractive to the investors.

## **3. Commercial Real Estate**

Similar to a stock, the price of a piece of commercial real estate is determined by the expected rent collected from the real estate before sale and the price at sale. Moreover, similar to a stock, the price at sale is essentially determined by expected rents, though it is affected by the previous prices of this real estate in the short run. When income inequality is severe and the consumption market is recessive, the affordability of consumers and companies will go down. As a result, the expected rents from commercial real estate, for example, retail, office, and industrial property, will decline. Subsequently, a commercial real estate investment will have poor performance.

Consequently, the return from investment on commercial real estate deteriorates if the consumption markets are recessive. When the consumption markets are recessive and the savings increase, those savings are not likely to flow into commercial real estate or REITs.

#### **4. Foreign Exchanges**

Exchange rates are the ratios between the currencies of different countries. The reasons for an exchange rate change are very complex.

1) In the short term, only “arbitrage opportunities” are available for the exchange market. In reality, arbitrage opportunities are very few because the exchange market is very efficient. Even if arbitrage opportunities appear, they disappear very quickly because of arbitrage.

2) In the middle term, there are “speculation opportunities” in the exchange market. But the opportunities could only show up in a monetary crisis. Since monetary crises appear rarely; thus, speculation opportunities are also rare.



3) In the long term, there are “investment opportunities” in exchange markets. When the investors expect that one country’s currency will appreciate in the long term, they will buy this country’s currency right now and sell them in the future. The reason this country’s currency increases is rooted in the real economy or the financial systems. Those opportunities are also very few.

## **5. Financial Derivatives**

Derivatives are one of the three main categories of financial instruments, with the other two being stocks (i.e., equities or shares) and debt (i.e., bonds and mortgages).

Financial derivatives include forwards, futures, options, and swaps. A derivative is essentially a contract that derives its value from the performance of an underlying entity. Derivatives can be used for a number of purposes, including insuring against price movements (hedging), increasing exposure to price movements for speculation, or getting access to otherwise hard-to-trade assets or markets<sup>110</sup>.

The prices of the derivatives will be mainly determined by the fluctuations of the underlying asset prices. The derivatives are risky because the prices of underlying assets change frequently over time. In addition, most derivatives are bought by leverage, which adds more risks to derivatives. Therefore, financial derivatives are not preferred by many investors.

## **6. Gold**

The most distinguished feature of gold is that it has very strong liquidity. In fact, it is the one with the strongest liquidity in all assets except currency. Due to the very strong

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<sup>110</sup> Koehler, Christian. "The Relationship Between the Complexity of Financial Derivatives and Systemic Risk". Working Paper: 10–11

liquidity, gold will be overpriced than any other assets. So the return of gold is lower than many other assets.

In addition, investment in gold is a pure speculation behavior because investors do not get income from holding gold. The only profit the investors get is from the capital gains. Due to no periodical returns, the return of gold is much lower than many other assets.

As a result, The purpose of investment on gold is to avoid wealth loss, not to get a high return. Gold is preferred only in very uncertain economic environments, say, in a period of war, a big economic crisis, or a severe natural disaster, when the risk of wealth loss is high.

## **7. Funds and Insurances**

An investment fund is a supply of capital belonging to numerous investors used to collectively purchase securities while each investor retains ownership and control of his own shares<sup>111</sup>. Mutual funds and hedge funds are the two main types of investment funds.

Mutual funds pool money from numerous investors to purchase securities and build an asset portfolio. There are stocks, bonds, and exchanges in this portfolio. In other words, various types of funds and insurances make profits by investing on stocks, bonds, and exchanges. Hence, the performance of funds and insurances depends on the performance of those assets. A hedge fund is an investment vehicle that is open only to investors who are qualified in some way. A hedge fund employs a number of different strategies to earn an active return or alpha for their investors. Hedge funds may be

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<sup>111</sup> <http://www.investopedia.com/terms/i/investment-fund.asp>

aggressively managed or make use of derivatives and leverage in both domestic and international markets with the goal of generating high returns<sup>112</sup>.

A mutual fund sets its goals as “low risk, reasonable return, and steady growth.” In other words, investors can hardly make a big fortune by investing funds. The exception is a hedge fund, which sets its goals as “high return and reasonable risk,” but it is only accessible to accredited investors.

Moreover, as discussed earlier, very few opportunities are available to make big profits from exchanges and gold. There may be opportunities to make big money in stock markets and bond markets, but these are very short-term and risky when the market fundamentals are poor.

## **8. House**

A house is very similar to a commercial property or a stock when it is invested in as an asset, but it also has distinct differences.

1) House purchase is both a consumption decision and an investment decision

The reason is rooted in the characteristics of houses. A house is not only an investment asset but also a consumption good. When a person buys a house, his purpose may be to consume, to invest, or to consume and invest.

When a person conducts a pure investment behavior, for example, buying a stock or a retail property, his decision purely relies on the profits he expects to earn. When a person makes a consumption purchase, the decision relies on the utility from the consumption good. However, if a person buys an object that is both a consumption good

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<sup>112</sup> <http://www.investopedia.com/terms/h/hedgefund.asp>

and an asset, the decision can become very complex.

On one hand, home buyers may consider the home purchase as an investment decision. When they do this, they will consider how much they will expect to earn when they sell the house in the future. Even if they are not sure when and if they will sell the house, they still consider if the current housing prices are reasonable and if the housing prices will rise in the future. In this situation, whether they will accept the current housing prices will only depend on the expectation for the price trend. What factors will help the buyers build the expectation for the price trend? Those factors could be GDP growth, population growth, land supply, monetary supply, and historical housing prices.

On the other hand, home buyers may also view a home purchase as a consumption decision, especially for owner-occupied houses. When they do that, they consider if the house meets their living demands. Subsequently, the consumption characteristics, like location, area, and decoration, will be emphasized. Furthermore, the freedom to redesign the inner space of a house, and the feeling of settlement and identity will also be emphasized.<sup>113</sup>

## 2) Housing Prices depend on both rents and non-rent factors

The freedom to redesign the inner space, and the feeling of settlement and identity, are called non-rent factors. The most important characteristics of those non-rent factors is that they are difficult to quantify. Therefore, in the eyes of the house buyers, it is very possible that those non-rent factors are more valuable than the rent earned from houses. In other words, when the non-rent factors are emphasized by the house buyers, the buyers

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<sup>113</sup> All those factors including the freedom to redesign the inner space of a house, and the feeling of settlement and identity will be discussed in detailed in the next chapter.

will ignore how much rent they could earn from the houses. As a result, the expected rents of the house have a limited influence on their decisions.

Nonetheless, the rent level reflects the true demand and supply in housing markets (market fundamentals). Therefore, the housing prices can become disconnected with the market fundamentals.

What if houses become disconnected from the market fundamentals at some extent? The answer is that any change in market fundamentals will have a limited influence on housing prices. When the severe income inequality causes weak consumption and factor markets, the housing rents will decrease. However, house prices could still increase. If houses have been disconnected from the market fundamentals, housing prices will have more freedom to rise rapidly or to crash.

When the weak consumption and factor markets make the market fundamentals of all assets weak, the assets whose prices are disconnected from the market fundamentals will be preferred by investors. Therefore, houses become more preferred than other kinds of assets. This is what has been happening for the past 16 years in China. A more detailed analysis on the housing market is presented in the following chapter.

# CHAPTER 7: ASSET DICHOTOMY, SUPPLY ELASTICITY AND PRICE ADJUSTMENT: THE PARTICULARITY OF HOUSES

## 7.1 Asset Dichotomy: Real Assets and Virtual Assets

As discussed in Chapters 1 and 3, real assets refer directly to the production process of assets, including tangible assets (land, raw materials, machinery and equipment, plant, human capital, and stock) and intangible assets (patent, trademark, and solid industrial secrets, i.e., the intellectual property rights). Real asset users are production units (generally refers to enterprises) or persons. These assets may be purchased or leased by the enterprises in the form of equity or debt.

The market for trading real assets is called the real asset market, also called the production factor market, including the raw material market, machinery and equipment market, and labor market.

The concept of real assets can actually be expanded to the consumer sector. For example, land, houses, cars, and other durable consumer goods can also be considered as real assets. These assets can continuously provide consumers with utility for a long period in the future, which is the consumers' return.

A **Virtual Asset** is a right to claim return, which is normally attached to a certain real asset (capital, equipment, or intellectual property rights), but it is not the real asset itself. Stocks, bonds, fund shares and financial derivatives are purely virtual assets. A virtual asset and a real asset have the following differences.

First, the same quantity of money or other real assets may not bring investors the same right to claim return.

Second, no stable relationship exists between the value of return claims and the value of real assets. Real asset value is determined by current market conditions, namely, the demand and the supply. Generally, the value of real assets decreases over time. Virtual asset value, or the value of the right to claim return, depends on the present value of the expected return, and with the passage of time, its value may not be reduced and may even unexpectedly increase.

Third, a real asset could correspond to multiple virtual assets, and a virtual asset could correspond to a number of real assets.

## **7.2 Two Types of Virtual Assets and Their Creation Process**

### **7.2.1 Two Types of Virtual Assets**

#### 1. Non-pure virtual assets

Non-pure virtual assets refer to the virtual assets mixed with real assets or embedded in real assets. For example, a person uses his own money to set up a family workshop specializing in the production of noodles. The money on hand and the money used to purchase the equipment, and the processing workshop are all real assets.

At the same time, as the sole shareholder of the family workshop, he has full right to own all profits that are made through the family workshop. This claim is his virtual asset. Although he had to spend money buying equipment and setting up the workshop in order to obtain the right to claim return (virtual assets), this right to claim return is not equivalent to these real assets. The value of the residual claim he has is not necessarily

equal to the value of the real assets. Thus, the virtual asset he owns is not the same as the real assets he owns.

Note as well that in this family workshop, his real assets and virtual assets are mixed together. In other words, he not only has the ownership of these raw materials, machinery, and plant but also has the right to claim the profits of the raw materials, machinery, and plant in the future. Although there is a difference between the two, the value of both may not always be equal, but the two are mixed together.

## 2. Pure virtual assets

Financial assets, including stocks, bonds, are all pure assets. No one-to-one corresponding relationship exists between these virtual assets and real assets. Moreover, there is no relationship between these virtual assets and specific production and management. Hence, these assets are called pure virtual assets.

### **7.2.2 Virtual Asset Creation Process**

#### 1. Non-pure virtual assets: direct creation

As previously mentioned, non-pure virtual assets refer to those assets that have no clear separation of the power to use real assets from the rights to claim the future returns.

When individuals use their own real assets to make profit, they also have the right to claim the return. Therefore, there is no an independent process to create virtual assets, because when one person possesses and uses the real asset, he would have the right to claim the future returns as while. In other words, non-pure virtual assets are created directly from the ownership of real assets.

#### 2. Pure virtual assets created through equity and debt



A company can acquire production factors (real assets) in three ways. First, it can spend money in buying those production factors. That is essentially an exchange of one kind of real asset “money” for another kind of real asset (production factors). The seller does not get the right to claim the returns (virtual assets) but they get the money (real assets). Second, it can lease these production factors from the lessor and pay rent to the leaser. The lessor loses the power to possess and use the production factors, but gets the right to claim the rent during the lease term (virtual assets) . Third, it exchanges its equity share for production factors. As a result, the owner of production factors loses its real assets, but obtains the right to claim the residual of the enterprise. In the second way and the third way, pure virtual assets are created.

When the company purchases production factors, pure virtual assets are not created. When this company pays rent to lease the real assets or exchanges its shares for real assets, the pure virtual asset is created. In other words, virtual assets are created in two forms: debt or equity.

### **7.2.3 Relation between Virtual Assets and Real Assets**

Real assets must contain virtual assets. If a person has ownership or the power to possess or use the real asset, he/she must have the right to claim the future return of the asset at the same time. However, in turn, virtual assets may not contain real assets. That is to say, owning virtual assets may not entail having the power to possess and use the real assets.

## **7.3 Virtual Asset Prices and Real Asset Prices**

In this sector, some basic financial models in Finance will be reviewed in order to

analyze the relationship between virtual assets and real assets.

### 7.3.1 The Price of Virtual Assets: Depending on Future Returns and Discount Rates

Theoretically, the price of a virtual asset is determined by the total present value of all expected returns from the real assets in the future.

$$V_{virtual} = \frac{CF_1}{(1+i)} + \frac{CF_2}{(1+i)^2} + \dots = \sum_{m=1}^{\infty} \frac{CF_m}{(1+i)^m} \quad (7.1)$$

### 7.3.2 The Price of Real Assets: Depending on Supply and Demand in Production Factor Markets

As a production factor price, a real asset price is determined by the demand and the supply in this factor market (see Figure 7.1).

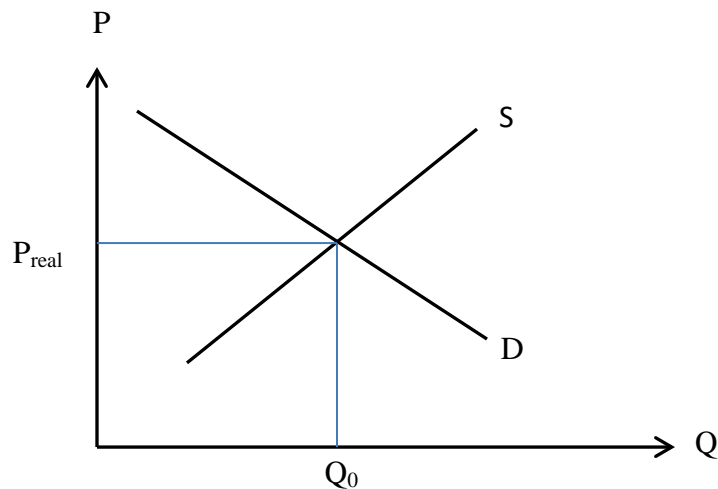


Figure 7.1: Asset Supply and Asset Demand

$$P_{real} = f(D, S)$$

### 7.3.3 Why Must Virtual Asset Prices and Real Asset Prices Be Equal?

Regardless of the kind of market structure, the price of virtual assets ( $P_{virtual}$ )

associated with real assets (production factors) is bound to be equal to the price of real assets ( $P_{real}$ ). That is,  $P_{real} = P_{virtual}$  (see Figure 7.2).

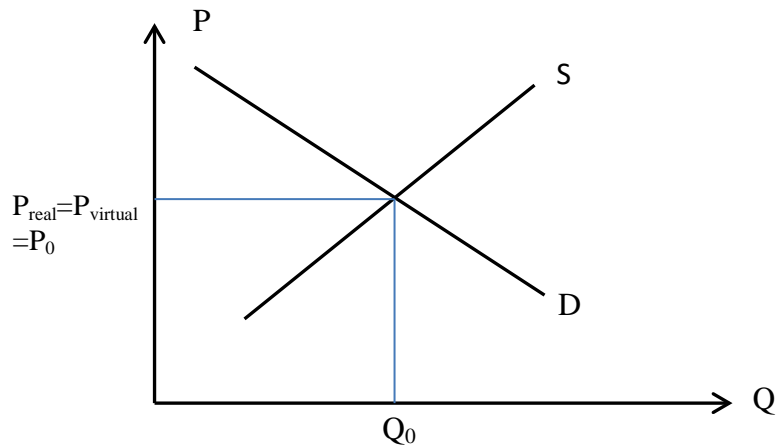


Figure 7.2: Real Asset Prices is Equal to Virtual Asset Prices when market is efficient

1. The value of each point on the demand curve of the real asset market (factor market) is equal to the marginal product value, which is equal to the sum of all the discounted cash flows in the future brought by one added unit of real assets. Namely, the value of each point on the demand curve is the marginal value of the virtual assets.

The value of each point of the supply curve of real assets is the marginal cost of producing real assets. The value of each point of the supply curve is the marginal cost of the real assets.

When a factor market attains its equilibrium, the marginal value of virtual asset equals the marginal cost of the real asset. Thus the price of virtual asset is equal to the price of the real asset.

2. Non-pure virtual assets: an increase of the virtual asset price will directly increase

the demand for real assets. As a result, the price of real assets will increase.

When one equipment is owned by its user, the user has the right to possess and use this equipment as well as having the right to claim the return from this equipment. In this situation, the virtual asset is a non-pure virtual assets because it is mixed with real asset.

In this case, if the owner expects that the future return of real assets will increase, the price of virtual assets goes up. Therefore, investors are willing to purchase real assets at a higher price. As a result, the price of real assets will increase, eventually making the two equal.

3. Pure virtual assets: the increase of the virtual asset price will increase the demand for real assets through Tobin Q,<sup>114</sup> thereby increasing the price of real assets.

When the real assets and virtual assets are separated, how can virtual asset prices affect real asset prices?

Tobin Q is the bridge between a real asset and a virtual asset. When the asset price rises but its replacement cost is fixed, the asset price is greater than replace cost (Tobin  $Q > 1$ ), then corporate refinancing is favorable and companies can have capital to purchase real assets, so the price of real assets will rise. Eventually, the price of real assets will be equal to the price of virtual assets.

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<sup>114</sup> Tobin's Q, or the Q ratio, is the ratio of the market value of a company's assets (as measured by the market value of its outstanding stock and debt) divided by the replacement cost of the company's assets (book value). See <http://lexicon.ft.com/Term?term=Tobin%27s-q-ratio>

## 7.4 Adjustment of Real Asset Prices under Different Supply

### Elasticity: A Comparative Static Analysis

#### 7.4.1 Adjustment of Real Asset and Virtual Asset Prices under Elastic Supply

The supply of physical assets is elastic, which means that when the real asset prices rise (fall), the supply will increase (decrease) very soon.

##### 1. Good news on the demand side of the assets

When good news comes, the demand curve moves to the right. Within very short time, the virtual asset price quickly rises to  $P_1$ . The price of real assets will rise to the same point because the supply cannot increase within very short time.

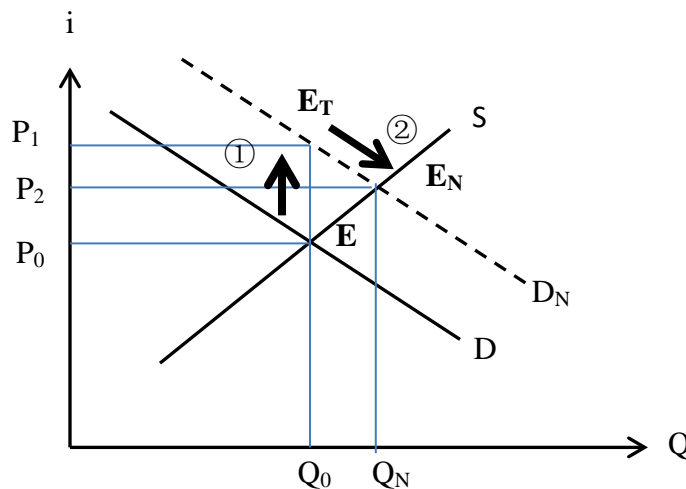


Figure 7.3 : Higher Asset Demand and Price Adjustment

As time goes by, the supply side of a real asset reacts to rising prices and the market supply increases. With the increase of real market supply, marginal return on a real asset falls and the virtual asset prices begin to decrease, and the real asset demand is also reduced, which leads to the decline of real asset prices.

Eventually, the market equilibrium lies at  $E_N$ ; the final equilibrium price is at  $P_2$ . At this point, the equilibrium price of assets and asset quantity are both higher than the original equilibrium price of assets and asset quantity (see Figure 7.3).

The following phenomena are observed:

First, when good news comes out, the virtual asset prices first rise, which then leads to the rise of real asset prices.

Second, when the supply of real assets cannot respond in an extremely short period, real and virtual asset prices rise rapidly to a high level.

Third, the increase of real asset supply is the force that lowers the high level of asset prices. The specific mechanism is as follows: the increase in the supply of real assets will reduce the marginal future return of the assets, thereby reducing the price of virtual assets and ultimately decreasing the price of real assets.

Fourth, in summary, the most active variable is virtual asset price. Supply is the force that drives virtual and real asset prices up to a new equilibrium level.

## 2. Good news on the supply side of the assets

If some technological improvement happens, the production cost of the real assets will be greatly reduced. As a result, the profits of the manufacturing company will be improved significantly. Thus, the supply curve shifts to the right. In this case, how do the asset prices adjust to the change?

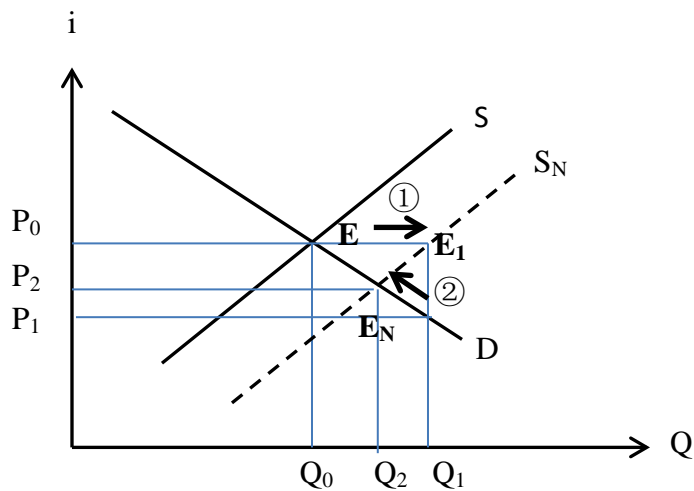


Figure 7.4: Higher Asset Supply and Price Adjustment

In the short term, asset prices will not adjust. Because of the decline in the cost, supply rapidly increased to  $Q_1$ . Along with the supply increases to  $Q_1$ , real assets' marginal return will decline. When real assets' marginal return declines, the price of virtual assets falls to  $P_1$ , which will drive the price of real assets to falls to  $P_1$ .

Lower market prices will dampen the enthusiasm of the supplier, and the supplier of real assets will reduce the supply. With the reduction in supply, the future return of real assets rises, and the final price will return to  $P_2$ , which is a new equilibrium price, with the corresponding equilibrium yield of  $Q_2$  (see Figure 7.4).

### 3. Fake Good News on the Demand Side

If there is fake good news on the demand side, investors will think that the future returns of real assets will rise and that the demand curve will move right from the original  $D$  to  $D_1$ , as shown in Figure 7.5.

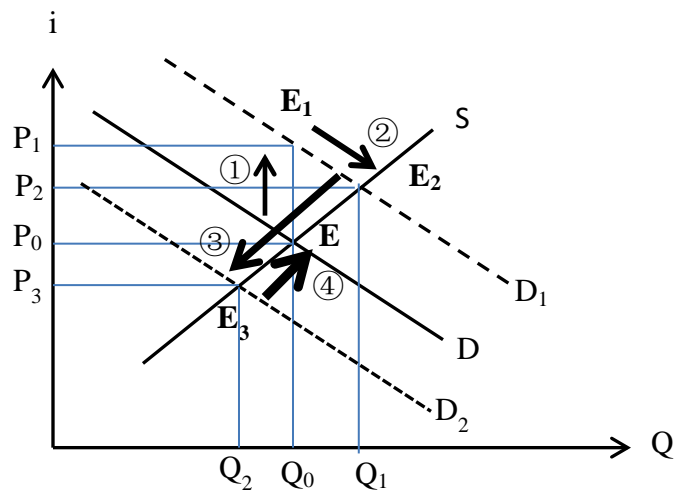


Figure 7.5: Fake News and Asset Market Fluctuation

Virtual asset prices will rise, resulting in an increase in demand for real assets. Thus, the price of real assets will also rise. Given that the supply of real assets cannot keep up with the increase in the very short run, the virtual asset and real asset prices will be adjusted to  $P_1$ .

Along with the increase in the supply of real assets, asset prices will fall from  $P_1$  to  $P_2$  in the middle run. Nonetheless,  $P_2$  is not the ultimate equilibrium. On one hand, the future return of real assets did not increase because the good news is false. On the other hand, because of the increased supply, the return on real assets will be lower than the initial level. When investors observe this, the expectations will be reversed, which drives the asset demand curve to the left. In fact, the asset demand curve goes so far that it crosses the original demand curve  $D$  and arrives at  $D_2$ . At this time, the new equilibrium point is  $E_3$ , and the new asset price is  $P_3$ .

However,  $E_3$  is not the ultimate equilibrium point, either. At this point, the price is



very low, so the supply of real assets will be reduced. Along with the reduced supply, the marginal return on real assets will increase. With the increase of marginal return, the price of virtual assets and real assets will also increase, and the final equilibrium will return to E, which is the initial equilibrium point.

We see that a false information will result in sharp fluctuations in the price and quantity of the entire factor market (real asset market). The fluctuation follows four stages:

Step 1: Supply is unchanged, and prices rise sharply to the highest point.

Step 2: Supply increases, and prices decrease slowly.

Step 3: Increases in supply leads to a decline in returns, a further decline in prices, and a sharp decline to a lower level than the original price.

Step 4: Supply decreases, returns rise, and prices rise slowly to the original equilibrium level (see Figure 7.5).

This phenomenon can be observed in various industries in a economy.

4. Good news on the demand side is true, but an overreaction (investors are overoptimistic) occurs.

If there is good news in the market and if investors reflect moderately, asset prices should rise from  $P_0$  to  $P_1$  and then fall back to a new level of equilibrium  $P_N$ .

However, if investors are overoptimistic about the good news, it means that the future return of real assets is overestimated. Therefore, in a very short period of time, the asset price is not increased from  $P_0$  to  $P_1$  but directly up to  $P_2$ . With the increase in the supply of real assets, asset prices fall from  $P_2$  to  $P_3$ . However, at this point, too many real

asset supplies will lead to a decline in return, thereby pushing the asset demand curve to shift left sharply toward  $D_2$ . At this point, asset prices fall to  $P_4$ . Nonetheless, at this point, the supply of assets is too small; hence, the return on assets will increase, and the price of assets will rise, eventually returning to the equilibrium price of  $P_N$  (see Figure 7.6).

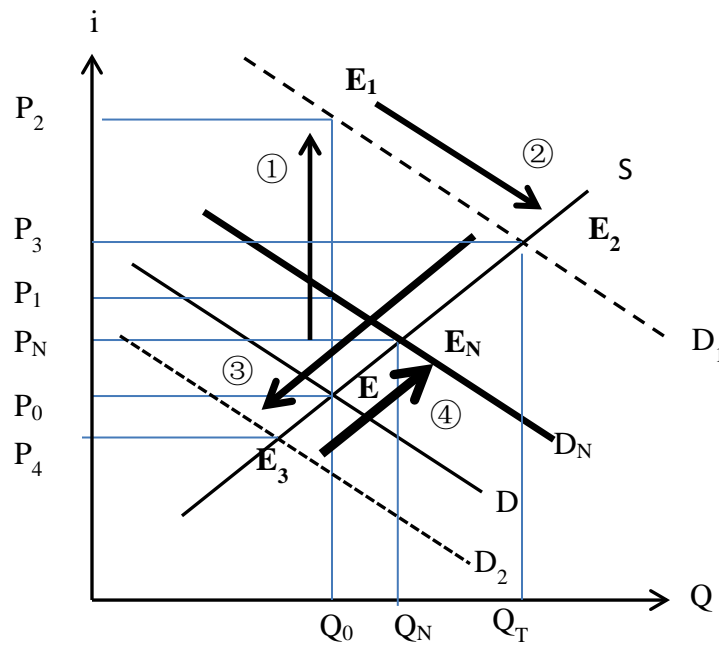


Figure 7.6: Over-Optimistic Reaction and Assets Market Fluctuation

From the analysis of (3) and (4), we see that:

First, when there is false good news, the virtual asset prices will rise and then cause the real asset price to go up.

Second, when the real asset supply cannot respond in a very short time, asset prices will rise rapidly to a very high level.

Third, the increase of supply in real assets is substantial to the decline in the high level asset prices. The specific mechanism is as follows: the increase in the supply of real

assets will lead to the decline in returns. As the expected rise in returns is not achieved, the return falls to a lower level than the original return. Hence, the false price of the assets will fall sharply and lead to a rapid decline in the price of real assets and then to a substantial decline in supply.

Fourth, the low level of supply will increase the return on assets, thereby increasing the price of virtual assets and the price of real assets.

Fifth, the market fluctuations are caused by the false information, that is, the most active variable is virtual asset price, and the return of asset price to equilibrium is caused by the supply changes as a result of unit return on asset changes.

#### **7.4.2 Adjustment of Real Assets and Virtual Assets Prices under Complete Inelasticity**

When the supply of real assets is completely inelastic, the supply curve is perpendicular to the horizontal axis.

1. Good news on demand side

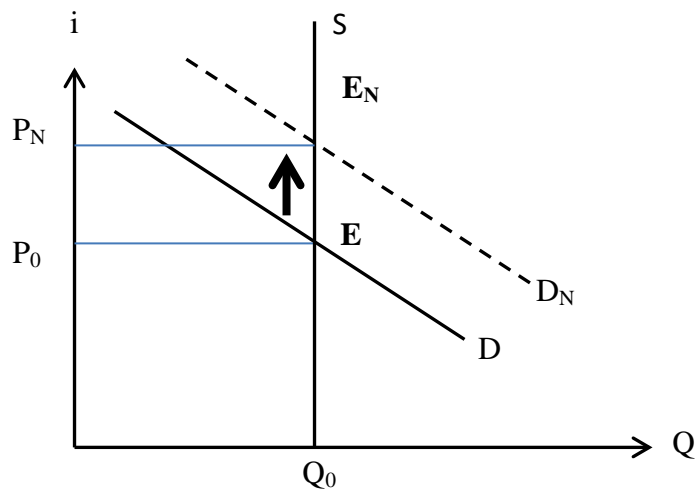


Figure 7.7 The asset supply is completely inelastic

The demand side of good news means that the future returns will rise, thereby pushing the demand's dotted line to the right. In the absence of any flexibility in supply, the price of virtual assets and real assets will increase to  $P_N$ . For the sake of no new supply, asset prices have no incentive to fall (see Figure 7.7).

This outcome is not surprising, but it is not the focus of our attention. Our focus is the following: What if the demand side of good information is false?

## 2. Good news on demand side is false

### A. Short term

When the good news on the demand side is false, investors have the false expectations that future returns will increase. Therefore, the real asset demand curve will be shifted right to  $D_N$ . In this case, the price of virtual assets will increase to  $P_N$ . With the rise of virtual asset prices, the price of real assets will also increase to  $P_N$ .

When the supply of real assets is elastic, supply as a positive variable will bring the

virtual asset prices back to normal levels. In other words, when the supply of real assets is elastic, the final price of the asset is determined by the demand and supply together. However, in the current situation (the supply is completely inelastic), the supply cannot function as a driving force. Consequently, the price of the assets depends entirely on the demand. For example, the supply of high-quality human resources is inelastic (such as basketball star Yao Ming). Thus, the “price” of Yao Ming as a basketball star depends entirely on the club’s expectation of how much profit he will be able to earn for club make in the future. When Yao Ming is expected to bring high profits, the “price” of Yao Ming will increase. This expectation is not related to the production cost of "Yao Ming" which is the cost of living and training costs during the growth of Yao Ming.

The supply of a premium-located retail estate is also inelastic. The market price of this retail shop depends entirely on the expected return this shop can bring to investors. The price of the real estate has nothing to do with the production cost (see Figure 7.8).

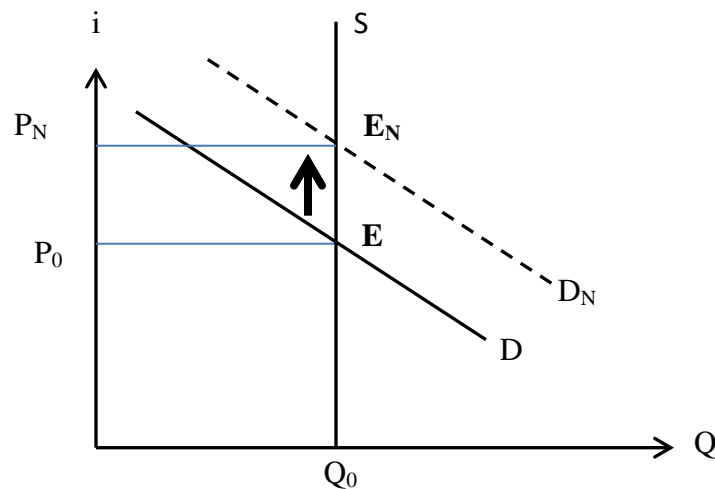


Figure 7.8: High Price will increase in short term

## B. Medium term

In the medium term, investors find that the actual return on assets does not go up and thus realize that the previous expectations are wrong. However, this does not necessarily cause investors to sell their real assets, thereby pushing the price of real assets back to the original level. The reason is that the curve is lower than expected, but it does not mean that future earnings are still below the expected level. If investors still believe that the real asset prices will increase, the investor's total return will not be low because the earning from increased capital gains will compensate the loss from the reduced holding return. In details, investors' rate of return depends not only on each period of income (such as rent, dividends) but also on future capital gains. If the current income of each period is relatively low but investors expect that the future income will be higher, the capital gain will be large. The high capital gains in the future can be used to make up for the current loss of income.

Even if investors find that the original good news is indeed false, they will choose to continue to hold the asset as long as investors still believe that the real assets will continue to appreciate in the future. Even if the investor himself does not believe that the price of the asset will rise, he will think this asset will continue to appreciate as long as the investor believes that other investors will expect the asset price to rise. Thus, he will continue to hold the assets, and the price of the assets will not fall. He and other investors are also likely to continue to purchase the assets; hence, the price of the asset will likely to continue to rise from  $P_{N1}$  to  $P_{N2}$ .

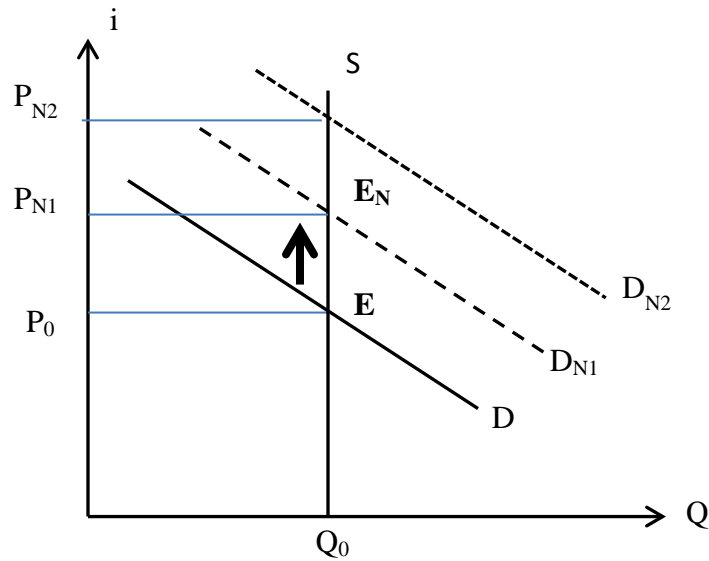


Figure 7.9: High Price will go up higher in middle term

The fundamental reason for this phenomenon is that the supply of real assets is inelastic, which disallows the decrease in overvalued asset prices. If the supply of the real assets is elastic, the supply will rise as the price of the asset rises and then push the price to go down. In this case, investors' expectation of rising future returns or asset prices will be destroyed, so asset prices will return to the original level. In contrast, if the supply of the asset is inelastic, the return on assets will not fall when the rate of return is declining. In this case, investors can continue to expect that the return of the asset and the asset price will continue to rise (see Figure 7.9). Thus, even in the medium term, asset prices will not return to their original level.

We see that when the supply of real assets is not elastic, such that even the increase in asset prices is caused by the false good news, it is difficult to return the price to the original level because the mediation function of supply to the asset price has disappeared.

### C. Long term

In the long run, the false news is finally proved to be false. Any expectations that asset prices will continue to rise will not be supported. Hence, asset prices will fall to the original level of  $P_1$  (see Figure 7.10.)

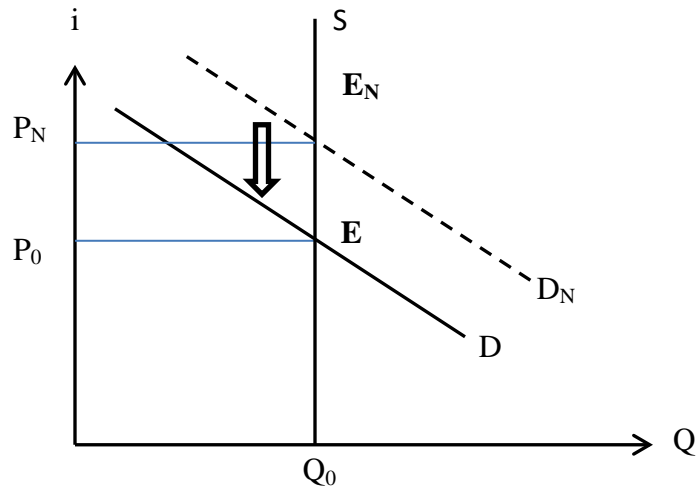


Figure 7.10: Asset Prices will Go back in the Long Run

### 7.4.3 The Adjustment of the Real Assets and Virtual Assets Under Less Elasticity

When the real asset supply is lack of elasticity, the slope of the supply asset curve is large and close to a vertical line. In this case, the adjustment of real asset and virtual asset prices is very similar to the condition of complete inelasticity.

1. Good news on the demand side:



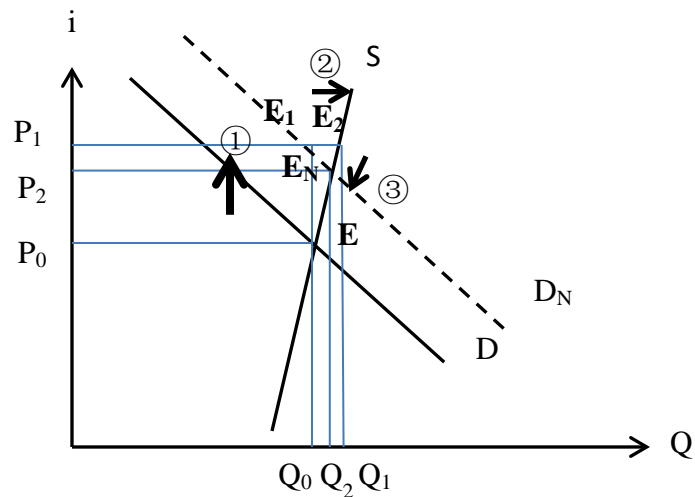


Figure 7.11: Higher Asset Demand and Price Adjustment

When the return on assets is expected to rise, the demand curve moves right to  $D_N$ .

In the short term, the supply cannot react quickly; thus, the price of assets rises to  $P_1$ ; see arrow ①.

In the medium term, the supply will increase a little, which will cause the reduced marginal return. Because of the limited supply of assets, however, the decline in return on assets is so small that investors will consider it a normal market deviation. Thus, investors' expectations of rising asset prices, which are based on an increase in return on assets, will not break. In other words, despite the increase in supply, the price will not be reduced to  $P_2$  but will be maintained at  $P_1$ . At this time, the supply will increase to  $Q_1$ . See arrow ②.

In the long run, because of the considerable supply of  $Q_1$ , the marginal return on unit assets will continue to go down. Therefore, investors will begin to sell the assets. At this time, the price will drop to  $P_2$ , while the supply of assets will decline slowly; see arrow

③ (see Figure 7.11).

## 2. Good news on the demand side is false

When there is false good news on the market, according to this news, investors expects that future asset returns will increase; hence, the demand curve moves right to  $D_1$ .

In the short term, the supply cannot immediately increase, so the price of assets will rise to  $P_1$ .

In the middle term, the supply of assets is so small and thus asset returns fall so slightly that investors considered it as normal market bias. Consequently, investors' expectation that asset prices will rise will not be broken. Despite the increase in supply, the price will not be reduced to  $P_2$  but will be maintained at  $P_1$ ; see arrow ②. (If the asset supply is sufficiently elastic, the supply will increase rapidly and thus the asset returns will fall very fast. A fast decline in asset return will break expectations on the rising return or asset prices, real estate price will go down)

In the long run, when investors find that the return on assets is relatively low, investors will realize that the original good information is false. As a result, prices will begin to fall. Because of the increase in the supply of assets, the return of the unit asset is relatively low, which makes the demand curve move to the left side of the original demand curve. Thus, the price dropped to  $P_3$ . At this price level, the supply is low; thus, the return will begin to rise, and the price and the supply of assets will return to the original level,  $P_0$  and  $D_0$  (see Figure 7.12).

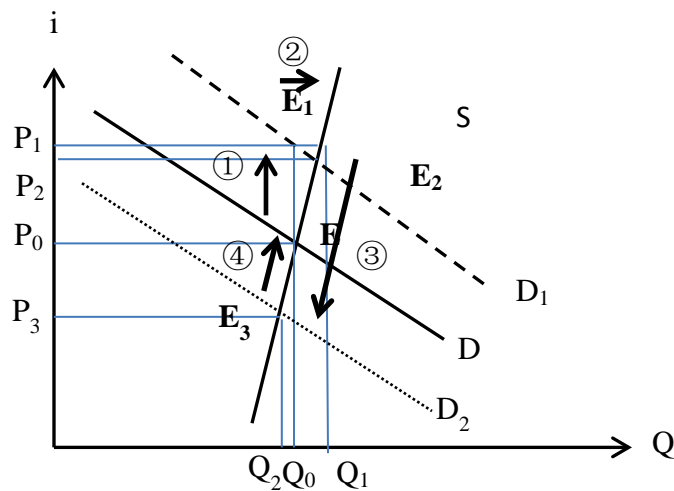


Figure 7.12: False Information and Asset Market Fluctuation

In summary, we have:

1. When the supply is elastic, the overvalued asset prices will be pulled back to normal levels regardless of what causes the overvalued asset price.

2. When the supply is elastic, the supply change can also affect the price of assets. If the supply has a substantial increase due to the decline in the cost of the real assets, it will certainly lead to a decline in the return of the assets (diminishing marginal rate of return), thereby reducing the price of assets. Thus, when supply is elastic, both demand and supply will affect the price of the asset. When we value assets, the income method and cost method can both be used.

3. The mechanism for regulating the price of assets is as follows: when the expected return increases, resulting in asset price rise, the supply of assets will rise. Given the role of diminishing marginal returns, when the supply of assets increases, the marginal product of the unit assets diminishes, and so the return of the unit assets will inevitably

decline. Moreover, the return of asset will eventually reduce asset prices.

4. When the supply is completely inelastic or almost inelastic, no matter what causes the overvalued assets, this overestimation will be kept not only in the short term but also in the middle term. The intuitional reason is the following: the market lack the signal that pulls the overvalued price back to normal.

When the supply cannot increase or hardly increase, the marginal income of the unit assets will not fall at all (completely inelastic) or drop very little (lack of flexibility).

When the marginal income of assets does not change or change very little, asset return is still in decline if the asset price increases. Theoretically, declining return should pull the overvalued asset prices back to its normal level. In reality, however, even if the return of each asset does not rise as expected, investor will still think that the return on investment will not decline in the future as long as the return does not decline. As a result, the force to pull down the overvalued price does not exist anymore. Overvalued prices will remain high for considerably long periods.

If the supply is elastic, everything will change. As mentioned earlier, when the expected return increases and thus cause asset price to rise, the supply of assets will rise. Given the role of diminishing marginal returns, the marginal product of the unit assets diminishes when the supply of assets increases. Thus, the return of the unit assets will inevitably decline, which the investors cannot ignore or deny. With this signal, the expectation that the return on the unit asset will be expected to rise in the future cannot be established; correspondingly, neither does the rising expectation on future sales price of assets. In a word, overvalued asset prices will inevitably fall back to normal.

We see that the elastic supply is the force to pull the overvalued asset prices back to normal. What's more, the elastic supply can offer the market a signal that the overvalued market price is unlikely to maintain.

5. When supply is completely inelastic or almost inelastic, a piece of false information can also affect the asset price in a long period of time. Therefore, when supply is completely inelastic or almost inelastic, the cost approach method cannot be used to evaluate assets. Income approach will be a suitable appraisal method.

Inferences from the conclusion above are as follows:

1. The more inelastic the supply of real assets is, the longer the overvalued price will last. The more elastic the supply of real assets is, the shorter the overvalued the price will last. This is not the same as in the consumer goods market. For the consumer goods market, regardless of the elasticity of the supply of consumer goods, the prices of overvalued consumer goods can quickly return to equilibrium.

2. In the mechanism of asset price adjustment by supply, the key variable is the marginal return of asset and the key relationship is that between the return and the price. In fact, we have:

The asset supply increases---the marginal return decreases---the asset price decreases.

The asset supply decreases---the marginal return increases---the asset price will increase.

Then we could ask such a question: if the relation between asset price and asset return does not exist any longer, namely, the price of an asset does not depend on its holding period return in the future, what will happen?

First at all, we could guess that if the relationship between the price and the marginal return is separated, the mechanism of asset price adjustment by supply will not work even though the assets are elastic.

Secondly, we could go further to guess that the asset price can be very high and continues to rise even if the asset return is very low.

But, what is the reason that the price of an asset does not depend on its holding period return in the future any more?

The holding period returns we are talking about above are actually “cash” or “monetary” returns. When owning the real assets could bring the owners something much more than monetary returns, namely, some non-monetary returns, the purpose of investors in buying this asset will be to get not only monetary returns but also non-monetary returns. In this case, even if the current monetary returns on assets are very low, as long as investors believe their non-monetary returns are high, investors do not feel that their returns on investment are very low. What’s more, even if an investor expects that the cash returns on the asset in the future are still very low, he still expects that the price of the asset will rise as long as the investor believes that the non-monetary returns brought by the asset in the future are very high.

Does such an asset exist? Yes, a house is such an asset. We will discuss houses in details later.

Then we could give some possible answers for such a question: why can the asset price be very high and continues to rise when the asset return is very low?

First, the asset return is only the monetary return. It does not reflect all the return the investors can get from the asset due to the existence of non-monetary return.

Second, although the current cash returns are very low, investors expect the future cash returns might be very high.

Third, one investor expect the future cash returns are low. Moreover, he/she also expect that assets are currently overvalued and will fall sharply one day. However, this investor thinks that other investors believe that the asset prices will continue to rise in the future. This means that the current assets can be sold to them at higher prices in the future. Then this investor would like to buy more assets to make profit.

Fourth, even if this investor believe that other investors, like himself/herself, also see that the assets are overvalued and the asset bubbles are bound to burst one day. However, as long as the investor believes that the day is still far away and that he/she can run ahead before its arrival, he/she will also continue to buy the assets, thereby boasting the appreciation of asset prices. In other words, he believes that a bigger fool exists and this fool would be the buyer of his asset.

## **7.5 The Consequences of Asset Prices Deviating from Market**

### **Fundamentals**

1. Asset prices cannot reflect the asset market fundamentals

When asset prices fully reflect the asset market fundamentals, namely, the holding period returns, assets cannot be overpriced for long. Asset markets will function very well as a tool to uncover the true price of assets and add value to those assets. In this case, all investors can only get the normal returns.

Now let's focus on the welfare effect which asset markets bring to society. When the asset market is efficient, very little speculative money will come into this market because there are very few opportunities to make profit from speculation. What's more, because investment can only get normal returns, investors are not highly motivated to buy and sell assets very frequently. As a result, the turnover rate is not high.

Moreover, a virtual asset market can function as a tool of value discovery and value. When good news appears, the prices of virtual assets will increase immediately. This is the function of price discovery. When virtual asset prices rise but the replacement costs of real assets remain the same, enterprises will then expand the scale of production or start new projects by issuing new shares. In addition, these virtual assets have such attractive returns that market investors are willing to purchase new shares. Subsequently, profitable projects are financed through the virtual asset market. This is the function of value creation or wealth creation.

Note as well that in the process of price discovery and value creation, investors will not overreact or underreact to new information. Therefore, the situation is the same as previously discussed. First, because price does not rise continuously, money entering the capital market does not increase quickly because the speculative opportunities are low. Second, although the future returns of real assets rise because of the rapid rise in the price of virtual assets, investors can only get a normal return. Therefore, they are not highly motivated to buy and sell the assets on a frequent basis. This is the basic feature of efficient asset markets: they could discover value and create value, but hardly entails excessive speculation and speculation.



Case 1: An investor is expected to receive \$1 per share from one stock; the discount rate is 4%. If the price per share of this stock is equal to the sum of discounted value of all future yield per share, the stock price per share should be as follows:

$$P = \frac{\$1}{1 + 4\%} + \frac{\$1}{(1 + 4\%)^2} + \dots + \dots = \sum_{n=1}^{\infty} \frac{\$1}{(1 + 4\%)^n} = \frac{\$1}{4\%} = \$25 \quad (7.3)$$

If the market price always reflect market fundamentals, its price is always \$25 whenever the stock is sold.

$$P = \frac{\$1}{4\%} = \$25$$

In this case, if the stock is exchanged once, the money newly entering the stock is \$25. Given that the stock price does not rise, investors also get nothing but the income return (4%). Therefore, investors are not highly motivated to buy and sell the stock and the turnover rate will be very low. We could assume that it is exchanged four times a year, then the total money newly entering into the market is  $\$25 \times 4 = \$100$ .

Three points should be emphasized here.

First, due to the stable stock price, each transfer does not bring more money to stock market. (By contrast, if the stock price keeps going up, each transfer always bring more money to this market.)

Second, because of lack of excess returns, the stock holders are very likely to withdraw these funds from the stock market and transfer them to the real economy after they sell the stock. In any case, the money taken out from real economy and spent on speculation is not large. Thus, the real economy will be well supported by enough working capitals.

Third, since every investor can only get a normal return, no redistribution of wealth happens and income inequality will not be worsened.

Case 2: A stock is the same as in case 1. Each share of this stock is expected to bring \$1 to its investor and the discount rate is 4%. By flow discounted model, the stock price per share should be \$25 because of:

$$P = \frac{\$1}{4\%} = \$25$$

In the next one year, we assume good news appears at the end of each quarter. For example, the government announces that it will loosen some regulation on some. Assume that the appearance of every piece of good news can upgrade the yield per share by \$0.2, and there will be no good news in one year. If the market is efficient, the price of the stock will react quickly after the good news appears. At the end of each quarter, the stock price is as follows:

$$P = \frac{\$1.2}{4\%} = \$30$$

$$P = \frac{\$1.4}{4\%} = \$35$$

$$P = \frac{\$1.6}{4\%} = \$40$$

$$P = \frac{\$1.8}{4\%} = \$45$$

Assume that the stock is sold after each price rise. The following table lists the price, the holder, the dividend, and the capital gain of the stock in the year.

Table 7.1 Price, Holder, Dividend and Capital Gain

Season	Beginning of 1 <sup>st</sup> Season	End of 1 <sup>st</sup> Season	End of 2 <sup>nd</sup> Season	End of 3 <sup>rd</sup> Season	End of 4 <sup>th</sup> Season	After 4 <sup>th</sup> Season
Stock Price	25	30	35	40	45	45
Holder	Holder A	Holder A	Holder B	Holder C	Holder D	Holder D
Dividends	-	1	1.2	1.4	1.6	1.8
Capital Gains	0	5	5	5	5	0

Total money newly coming into the stock market is:  $30 + 35 + 40 + 45 = \$150$

The following are what we can observe.

First, the stock price experienced a rise before transfer at the end of every quarter. Because stock price was not caused by the false information or overly optimistic investors but by the changing of market fundamentals, the stock price rose reasonably. Hence, the times of transfers did not significantly increase. Although funds into stocks now are more than the previous example, the rise is not large.

Second, because the stock price rose quickly after the good news came, the opportunity to excess returns is fleeting. In addition, after an excess return appears, it is difficult to predict when the next excess return will come. Thus, after selling shares to obtain excess return, each stockholder will withdraw these funds from the stock market and transfer them to the real economy or for consumption. In this case, the development of the real economy can be well supported.

Third, in addition to dividends, holders A, B, C, and D obtained the excess return because of the capital gains. The capital gains are asset price appreciations brought about by the ascension of expected returns. They are parts of investor benefits and also one of

the purposes of investors. Consequently, no redistribution of wealth occurs because no one loses.

## 2. Virtual assets deviate from market fundamentals

When virtual assets deviates from market fundamentals, virtual markets will attract more and funds for speculation and eventually lead to a changed wealth distribution. Meanwhile, virtual markets will not function as a tool of value discovery and value creation.

When virtual assets deviate from market fundamentals, the asset price could rise continuously even though the market has poor fundamentals. In this situation, the main purpose of the investors in buying assets is not to get holding period returns but rather the future price appreciation, namely, capital gains. Therefore, although more money flows into the market accompanied by rising asset prices, most of the money cannot be transferred effectively to the real economy as production factors because investors are pursuing after the assets with high price appreciation, not the assets with high holding period return. The virtual asset market becomes a big casino: assets are swapped very frequently, but the new value created is zero. Money are not working as production factors, but as a tool to take money from other investors. To sum up, in such an asset market, there is not value discovery and value creation, but the wealth redistribution and wealth waste.

Case 3: A stock is the same as before. When an IPO is offered, the issue price of stock should be as follows:

$$P = \frac{\$1}{4\%} = \$25$$

Assume the dividend does not change within one year but the asset price keeps going up. Also, assume that stocks are transferred 12 times in a year and stock price rises by \$3 at the end of each month when the transfer happens. Since the rising prices are not supported by market fundamentals, asset prices will fall to the original level. Assume that stock prices fall to the original level (\$25 per share) in the 13th month.

The holders, prices, dividends, and capital gains of this stock at the end of each month in the whole year will be as follows.

Table 7.2 Price, Holder, Dividend and Capital Gain

Month	Before 1 <sup>st</sup>	1 <sup>st</sup>	2 <sup>nd</sup>	3 <sup>rd</sup>	4 <sup>th</sup>	5 <sup>th</sup>	6 <sup>th</sup>	7 <sup>th</sup>	8 <sup>th</sup>	9 <sup>th</sup>	10 <sup>th</sup>	11 <sup>th</sup>	12 <sup>th</sup>	13 <sup>th</sup>
Investor	A	A	B	C	D	E	F	G	H	I	J	K	L	L
Dividends	-	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1	\$1
Prices	\$25	\$28	\$31	\$34	\$37	\$40	\$43	\$46	\$49	\$52	\$55	\$58	\$61	\$25

Source: Author

Here, three points should also be emphasized.

First, the market fundamentals have not changed, but for some reason, the asset price rises away from fundamentals. Rising asset prices will lead to more-rapidly-increasing asset prices, asset prices will be deviating from fundamentals. Driven by rising expectations, turnover increases. With the increasing turnover rate and asset prices, more and more funds flow into the asset market to buy this stock.

Within 12 months, new funds pouring into the stock market to buy the stock are as follows:  $28 + 31 + 34 + \dots + 61 = \$523$

In case 1, the funds pouring into the stock market to buy the stock is only \$100 in a

year; in case 2, it increases to \$150. Compared with case 1, there is \$423 more flowing into the stock market in case 3; compared with case 2, there is \$375 flowing into the stock market in case 3.

Second, much money flows into the stock market and but it rarely come out. In cases 1 and 2, the seller will very likely put the money received into the real economy after selling the stock because the opportunities for excess returns in the stock market are very limited. In current case, investors will not invest the money into the real economy after they sell the stock. They will continue to wait and look for opportunities of obtain excessive returns in the stock market.

With so much money pouring into the virtual asset market and remaining there, we have the following consequences. First, funds originally invested in the real economy are tied up in virtual assets market. Second, funds originally intended for consumption are also tied up in virtual assets market. As a result, aggregate demand for consumptions and aggregate output will be reduced.

Third, when stocks are swapped, wealth is redistributed. In other words, the process of stock swapping is the process of wealth distribution. As previously mentioned, the rising prices are not supported by market fundamentals; hence, asset prices are bound to fall to the original level. Suppose that stock prices fall to the original level (\$25 per share) in the 13th month. Thus, the net loss of holder L at then end of a year is as follows:

$$\text{Loss of L} = 61 - 25 - 3 = \$33$$

We can also calculate the total gains of other investors. Obviously,

$$\text{GainA} = \text{GainB} = \dots = \text{GainK} = \$3, \text{ and}$$

$$\text{GainA} + \text{GainB} + \dots + \text{GainK} = \$33$$

Subsequently, our results confirmed that the loss of L is equal to the sum of the gain of A, B, ..... D.

$$\text{LossL} = \text{GainA} + \text{GainB} + \dots + \text{GainK} \quad (7.4)$$

This means that the wealth of investor L is redistributed to the other 11 investors. However, the total wealth they created in this economy is zero.

Fourth, the rise of asset prices will attract a large sum of money to buy these assets. If the asset is a real asset, the rise of asset prices will directly promote its supply increases, even far beyond social demands, and result in an enormous waste of resources. If the asset is a pure virtual asset, the increase of the asset prices will increase demand for real assets and then increase the supply of real assets. Similarly, it will exceed social demand and cause a huge waste of social resources.

Generally, when the price of pure virtual assets is deviating from market fundamentals and the price is rising, the following will occur.

First, new funds would flow into virtual asset markets to purchase the assets, which means money constantly escapes from the real economy.

Second, continuously-rising asset prices would prompt investors to build the expectations that the prices will go higher. Under such an expectation, investors are unwilling to leave the asset market and return the money to the real economy after they have sold their assets and taken large profit. Hence, increasing amounts of money are detained in asset market merely for speculation but not for real economy production.

Third, the virtual asset market becomes a casino. Social wealth redistribution

happens and the income inequality worsens. Nevertheless, no new social wealth is created because all returns sum to zero.

Fourth, the sharp rise of virtual asset prices would promote the demand for real assets. Eventually, the real asset will be oversupplied, which cause the big waste of social resources.

## **7.6 Real Estate: A Special Asset**

### **7.6.1 Real Estate as a Real Asset and a Virtual Asset**

The category of real estate is, first and foremost, a consumer good, and one of the most fundamental of such goods. There is a common Chinese saying: clothing, food, housing, and transportation are indispensable!

Land, factory buildings, and real estate offices are important to production. Additionally, shops, apartments, hotels, entertainment properties, airports, stations, and gas stations are crucial elements in the provision of for-profit services. Conversely, government office buildings, school buildings, museums, hospitals, and churches, are vital for the delivery of non-profit services. Hence, real estate matters.

Every real asset contains a virtual asset. That is to say, possessing a real asset involves simultaneous right to claim returns from this assets. When an enterprise purchases a piece of land or a house and puts them into the production process, simultaneously, the purchaser obtained the right to claim the return from the real asset. In other words, the enterprise also acquired virtual assets, which are the claims on the future profits of the land or real estate. Similarly, when a family bought a piece of land or real estate, the family possessed the real assets. Meanwhile, they also had claims (namely,



virtual assets) on the future utility of the land or real estate.

The current selling price of the house is exactly the price of real assets. Furthermore, the total discounted value of the future utility brought by the housing is the price of the residential virtual asset. Investors do not wish to buy a house only until the price of virtual assets is higher than that of the real assets. As for society, the marginal price of virtual assets is equal to those of real assets.

Real assets can be disconnected with virtual assets. The real assets and virtual assets of real estate can also be disconnected. When real estate is exchanged for shares or leased to an enterprise for rent, the owner loses the real assets but gains virtual assets, namely, the claims for the residual of the enterprise or the claims for the rent and the principal. Similarly, when real estate were leased to a family, the owner also acquired the virtual assets, specifically, the claims on the rent.

When real estate is sold to an enterprise, the owner obtains another real asset (money) but does not acquire the virtual assets. Likewise, when lands or real estates were sold to a family, the owner gained another real asset (money) but did not secure the virtual assets.

When real assets and virtual assets of real estate are separated from each other, virtual assets of real estate are pure virtual assets.

### **7.6.2 Supply Elasticity of Real Estate**

When real assets and virtual assets of real estate are disconnected to one another, virtual assets of real estate are pure virtual assets. The supply of real estate is inelastic because of the limited supply of land.

1. Real estate with a special location or extensive historical and cultural value: supply is completely inelastic.

Many cities possess a single landmark. Buildings on that landmark are unique. They can neither be replaced nor reproduced. Real estate with special cultural value, in most cases, is unique. As a result, its supply is fully inelastic.

2. Real estate in developed areas: supply lacks elasticity.

Real estate in developed areas could be replaced by surrounding real estate. However, given that no two identical space positions exist, any location is essentially unique. The surrounding real estate could be approximately substituted for this kind of real estate but cannot completely replace it.

Therefore, the supply of real estate in developed area is less elastic. The more developed this area is, the more inelastic the supply is. Therefore, the closer to the city center the real estate is, the more inelastic the supply because the central area of a city is the most developed areas.

3. Real estate in developing areas: supply has elasticity

In developing areas (for example, in emerging cities), there is much space available for the real estate development. When real estate prices increase, supply will rise very rapidly. Real estate supply is more elastic in those areas.

### **7.6.3. The Elasticity of Supply and the Adjustment of Real Estate Prices**

1. Real estate with complete inelasticity

When real estate is completely inelastic, the overly high price is hard to come back to the normal level because the signals of market fundamentals can rarely appear.

If false good news appeared in real estate market (for example, a new subway will go through a place), the rent will rise. Real estate prices will also rise accordingly.

However, no new supply appears because the supply is completely inelastic. Hence, real estate rents have not fallen. Real estate rent-to-price ratio will be decreasing because of the rising housing prices and fixed rents. Even so, the real estate price will not necessarily fall if investors expect future price increases.

Therefore, when real estate prices rise because of false information, house prices will not fall for a considerable time. In fact, house prices will not fall but rise instead for an extended time because of the lack of signals.

## 2. Real estate with not complete inelasticity.

In this situation, given that the signal of market fundamentals provided by supply is unclear, once the price is overvalued, it would be difficult for the price to fall as well.

If false news appears on the market, then real estate prices will rise. Moreover, if the supply of the real estate increases heavily, then the rent of the real estate market will be reduced by the increased supply. As an important signal, dropping rent will break the market expectations about house prices rising continually, and then the high housing prices will return to normal.

Consequently, owing to the lack of supply elasticity, few supply increases shall occur despite the overvaluation of house prices. Thus, rent decline is not obvious and cannot provide investors with a strong signal that housing prices will drop significantly.

When the supply rises very little, the rents fall slightly. Falling rents will lead to the fall of the housing rent-to-price ratio. However, if investors expect future prices to rise,

then the decrease of the rents will be offset by the rise of capital gains. In conclusion, due to the inelasticity, the market does not provide the signals that are strong enough to pull the real estate's price down.

Therefore, even if real estate prices rise owing to false information, house prices will not fall for a considerable time. In fact, because of the unapparent signal about housing price decline and the expectations about housing price rising continually, house prices will not fall but rise for extended period. Of course, such time is shorter than when supply is completely inelastic.

3. Real estate with high elasticity: rapidly increased supply drives overvalued real estate prices back to normal level very quickly

In this case, once the real estate prices were overvalued, the supply would increase quickly. With such increase, real estate rents would decline very fast. As an important signal, rent decline could break the expectations that real estate prices will rise continually, and thus the real estate prices would begin to fall.

Therefore, real estate prices fluctuate more frequently in developing areas. Specifically, prices cannot remain overvalued when false good news appears.

## **7.7 Houses and their Uniqueness**

### **7.7.1 The Essential Difference between a House and a Commercial Property**

Purchasing commercial property is similar to purchasing stocks. Rents represent the holding period returns from commercial property. By the Discounted Flow Model, the theoretical value of a commercial property is equal to the sum of discounted value of all

future rents. In practice, the total returns of a commercial property consist of the rents before sales and purchase-resale differences (capital gains).

Is the theoretical value of a house also equal to the discounted value of the total future rents? If the answer is yes, then no essential difference would exist between a commercial property and a house. However, the answer is no. Given that most of houses are self-occupied, the theoretical value of a house should be the sum of discounted value of all returns that its owner receives from its self-occupied house. However, the total returns that the owner receives from his/her self-occupied house are not equal to the rents of the house. The utility that the owner obtains from his self-occupied house is much greater than the rents if this house is leased.

In fact, owners can obtain at least five types of utilities from their self-occupied houses. Residence is only one of those utilities. However, “residence” is all the utility that tenants can acquire from their rented houses, so the rent is actually the price of “residence”. The following are the five types of utilities the owner can obtain from their self-occupied houses.

1. Residence. It is one of the basic needs of people, because it is a vital condition for all kinds of human activities, such as sleep, leisure, diet, and party. The utility that tenants gain from their rented houses is residence.

2. The Right of Free Arrangement. People have personalized demands for their own living space, such as space design and decoration style. If the house is rented, the tenant is not allowed to freely rearrange and decorate the space according to his/her own needs. However, the owner has the free right to arrange and decorate his own space according to

his preference. In fact, the need fulfilled from the right of free arrangement also belongs to the needs of the living, which can be raised to the personalized level.

3. The Feeling of Settlement. This is a psychological need that is essentially equal to a sense of security plus a sense of belonging.

First, it is impossible for rented houses to provide tenants with an adequate sense of security because tenants cannot live in a rented house as long as they want. In China, lease agreement is an obligatory-right contract. The house owner can dissolve the contract at any time before termination date as long as the owner compensates the tenants. This means the tenants can be evicted out of the house at any time during the lease term. (In many western countries, tenant's right from the lease contract is not obligatory right but a property right. Under this condition, the owner cannot end the lease contract until the termination date, so the tenants could have more of a feeling of security and settlement during the lease term. Even if so, being evicted at the end of the lease remains possible.) By contrast, owning a house is a property right, people's ownership of houses completely eliminates the possibility of being evicted and thus ensure the feeling of security. In addition to the sense of security of not being evicted, ownership fosters the feeling of security at other aspects. A house can protect a family from the risk of rapidly-increasing rent, various emergency, accidents, economic pressure and family bankrupt. In this sense, owning a house is very similar to buying a insurance for the whole family.

Second, a house is an immovable property. When people acquire the sense of security from this immovable property, they would also acquire the sense of belonging to

its area. When people own a house, they will psychologically feel that they are residents of the area.

4. Proud Identity. It is a “higher level” of psychological need. For an upscale property, ownership of such a property can have a function of flaunting due to its unique location value, historic value or other cultural value. For an ordinary property, although it does not have the function of flaunting, ownership of such a property can improve the credit rating in banks and other financial intermediaries. This ownership can also upgrade the trust level from business partner and promote the trust level from the prospective spouse and his/her family. Hence, while ordinary property cannot provide the function of flaunting, it can offer a certain degree of “sense of identity.”

By Maslow's Hierarchy of Needs Theory, "physiological needs", "safety or security needs", "belonging" and "love" needs, "esteem" needs, "self-actualization" needs are the pattern that human motivations generally move through. Owning a house meets the needs of the first four.

5. Economic benefits. When house prices rise, the owners of self-occupied houses can potentially increase their wealth through. Such benefits are unavailable for tenants. In addition, when rents rise, self-occupied owners are not affected, but tenants have to pay more rent.

### **7.7.2 The Price-To-Rent Ratio of a House will be Higher than That of a commercial Property**

As shown by the above analysis, compared with renting, purchasing a house has the following advantages: free arrangement, the feeling of settlement and the feeling of proud

identity. When the economy is in a rising cycle, and therefore both house prices and rents rise, purchasing a house can represent a fourth advantage: economic benefits.

Thus, the profits that an owner receives from his self-occupied house extend far beyond those from renting out his house. Therefore, the profits that an owner obtains from his self-occupied house can be divided into two parts: rental income and non-rental income. The latter includes the feeling of settlement, the right of free arrangement, identity, and the possibility of gaining economic benefits.

As stated, the theoretical value of a house is based on the total gains that its owner receives from the self-occupied house. Given that the rent from this house is only a part of the total gains, the theoretical value based on total gains must be more than the value based only on rents.

Therefore, the price-to-rent ratio of a house is higher than that of the commercial property and higher than the Price/Earning Ratio (P/E Ratio)<sup>115</sup> of the stock.

A simple comparison can be made here. A large retail chain company intends to open a new branch in a commercial street. It has two ways to open this branch: buying a store or renting a store. Those two ways present no difference. Even if the owner bought the store, he could not obtain the feeling of settlement, which could be acquired from buying a house. Certainly, buying the store can generate the right of free arrangement. However, renting the store also involves this right due to the particularity of retail store. If the store is located in a well-known street (such as Shanghai's Nanjing Road and

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<sup>115</sup> The price-earnings ratio (P/E Ratio) is the ratio for valuing a company that measures its current share price relative to its per-share earnings. The price-earnings ratio can be calculated as: Market Value per Share / Earnings per Share.



Xujiahui and Beijing's Xidan, Wangfujing), buying it can bring popularity to the enterprise, but renting it can also have the same popularity.

Similarly, if an enterprise wishes to set up a new office in a city, the enterprise also has two means to acquire the office: buying or renting. No matter which means is chosen, the function remains indifferent. When the enterprise decides to buy an office, it could not obtain the feeling of settlement that could be acquired from buying a house. Buying an office involves acquiring the right of free arrangement. However, similar to the retail store, renting the office involves this right, too. If the office is located in a well-known area (such as Shanghai's Lujiazui, People's Square and Beijing's China World Trade Center, Dongdan), buying it can add popularity to the enterprise, but renting it can also achieve the same effect.

To sum up, the utilities acquired from renting and purchasing are the same for stores and office buildings. The same is true for hotels, storage properties, and tourism properties. As a result, the rent could reflect the total return from those commercial properties. Hence, the prices and rents of commercial properties are closely related.

However, in China, lease and residence are not interchangeable, because the total benefits of owning a house is very different from the benefits of renting a house. In fact, this difference is so big that the link between prices and rents of house is cut off. Thus, the prices can be separated from the rents, and they free rise or fall under the influence of other factors.

### **7.7.3 Why Are Housing Prices Increasing Faster than Commercial Property and Other Assets?**

The advantages noted above only suggest that house prices are overvalued but do not answer the following question: compared to commercial property and other assets, why do house prices rise so rapidly?

First, purchasing a house has the same characteristics as the investing in investment vehicles, because buying a house is also an act of investment. As an investment, the price of a house is not the same as that of a pure consumption good. The prices of consumption goods merely depend on their marginal utilities and their marginal production costs, but the housing prices depend on market fundamentals (the rents) and expectations for future price movements, which is affected by the trend of historical house prices.

Second, compared with investment in commercial property, stocks, bonds and funds, purchasing a house has a characteristic that these assets do not have: market fundamentals (rents) that have minimal influence on house prices, or the link between the price and its fundamentals is cut off. Hence, compared with other types of assets, house prices can go up more freely, quickly and longer. Besides the consumption attribute of residence, which can be acquired from renting, buying a house also presents three types of additional consumption attributes. The three attributes include the right of free arrangement, the feeling of settlement, and identity. These three consumption attributes, which cannot be received from renting, create the effect whereby house prices are minimally affected from rents and the link between house prices and rents is severed.

If house buyers are purchasing houses not for living in, will that affect the above conclusions? In other words, at this time, are houses similar to commercial properties wherein the prices and rents have a close relationship?

The answer is no. Even if the buyers are not purchasing houses for living in, it remains difficult for a connection between house prices and rents to exist. The fundamental reason is that most of the houses are self-occupied. Hence, the house price depends on the total benefits that the owner received from the self-occupied house, rather than on the returns (rents) that the house lessors obtained from lessees. Purchasing a house has the advantages which renting a house does not have, such that the total benefits that the owner received from the self-occupied house is higher those from rent. Thus, the price of a house based on the benefits from the self-occupied house is higher than that based on the rents.

Therefore, the price-to-rent ratio of a house is higher than that of commercial property and higher than the P/E ratio of other assets as well. Conversely, when buying a house to obtain rent, the investment return measured by rent/price is lower than from commercial property and other assets.

It is emphasized that the total benefits from self-occupied houses are bigger than those from rented houses. We cannot, however, conclude that the higher housing prices are always resulting from the bigger benefits. In fact, in many situations, the soaring-up housing prices cannot be explained by the bigger benefits at all. In other words, the reason why the investors buy a house at a very high price, is not because they can acquire the big benefits (residence, self-arrangement, security, settlement and identity) from

living in those houses, but because they expect that they get big capital gains from rapidly increasing prices. The existence of non-monetary benefits from houses cut off the relationship between housing prices and rents, then letting the housing prices can go up freely.

Overtime, house prices rose so rapidly that investors with many houses did not care about the trivial rental incomes, and left the house empty. Typical to speculative behavior, the wait until prices rise to an ideal level and then sell the houses. This is why there are so many vacant houses and ghost cities in China.

#### **7.7.4 Why Do There Exist House Rental Markets?**

The residential utility obtained from purchasing a house and renting a house are not interchangeable. This condition, therefore, leads to the relatively high price-to-rent ratio of a house. Conversely, that ratio means that the rate of return of a house is relatively low. Given this relatively rate of return of a house (due to the relatively high price-to-rent ratio), why is the house rental market still widespread? Or, why would some companies like to run houses renting business?

The answers can only be found in transaction and service costs.

1. The transaction costs of buying a house are far greater than that of renting one. When someone comes to a city, he can solve the problem of living only by two ways: renting and buying. If he chooses to rent, the costs of moving to another area include the search costs, contract negotiation costs, brokerage commissions, and the cost of termination of the lease (default) when renting a house. However, if he chooses to buy, the costs of moving to another area entail house searching costs, contract negotiation

costs, taxes, brokerage commission, as well as the buyer's search costs when the house is sold, the contract negotiation costs, taxes, and brokerage commission. Clearly, the transaction costs of buying a house are far greater than that of renting one. Consequently, house owners can charge higher rents. Higher rents indicate that the lessor of a house can obtain higher incomes, which makes house rental business profitable. Therefore, the house rental markets can exist.

If the time that a person lives somewhere is shorter (such as within 15 days), even the cost of renting a house is too high. Thus, staying in a hotel becomes a better choice. Therefore, the following market segmentation was formed: people who live for a very short term choose to stay in hotels, those for a short and medium term choose to rent a house, and those for the long term choose to buy a house. All these choices results from transaction costs.

2. Aside from the advantage of transaction costs, renting a house also presents another advantage: the low service costs brought about by scale economy. When a company specializing in house rental services operates numerous apartments, it needs only to hire a few people to provide many apartments with cleaning, maintenance, and other services (including emergency services). Thus, tenants can enjoy these services at a very low cost. However, if a person chooses to buy rather than to rent, the cost of obtaining these services will be extremely high. Therefore, lessors can further improve the rents. Higher rents make the house rental business more profitable, and therefore the house rental markets can exist.

## **7.8 Housing Bubbles can Last in the Long Run Because Housing Prices and Rents are Separated**

Previous analysis shows that when housing is overvalued, supply is the crucial factor in pulling back prices. The reason supply was able to play this role is that increasing supply will lower rents. The smaller the supply elasticity, the lesser the supply increases when housing prices are overvalued. Additionally, more supply cannot provide the signal of breaking the aforementioned expectation. Hence, there is minimal possibility of overvalued housing prices declining. The least possibility of overvalued prices declining occurs for the real estate with completely inelastic supply, followed by that with inelastic supply. However, for the real estate with elastic supply, the reduction space of overvalued real estate price is extremely large.

The above analysis is primarily used in commercial real estate and is unsuitable for housing. Given the difference between utilities provided by leased houses and those provided by self-occupied, housing rent cannot fully reflect the total benefits of self-occupied houses. Specifically, housing rent cannot indicate the housing market fundamentals. In this situation, capitalization of housing rent will be far less than the price of the house.

Such difference is crucial because it means that the relationship between housing price and housing rent is cut off. Given that rent is a core variable, the signal effects rent has on house prices disappear. Therefore, even for an emerging urban residential market with elastic supply, housing prices will hardly drop not only in the short and middle term but also in the long term. In conclusion, the particularity of houses likewise enables

overvalued prices to persist in the short, medium, and long term, whether the housing supply is completely inelastic, partially inelastic, or elastic.

1. When good news appears on the residential market, it is not necessarily manifested as the rise of rent, because when buying houses, investors aim not only at rent, but also at other non-rental utilities, such as right of freedom to decorate, sense of stability, and identity recognition. Even though the rent stays low in the long run, as long as investors find that other returns are on the rise, they do not consider that returns provided by the house are shrinking.

When good news appears on the commercial real estate market, the good news must be reflected in the rent very soon, because rents are the only return from commercial real estate investors. If the rent of commercial real estate remains extremely low, it will prove that the good news about commercial real estate is false. Hence, the price of commercial real estate cannot remain overvalued but must fall.

2. Related to the first point, if the housing investors focus not only on rent but also on the non-rent benefits, what they care is not the rental return, but the total return. Therefore, expectations of rising asset prices cannot be broken even if rental return is low in the long run. If the rent is extremely low but investors consider the total returns is very high, overvalued housing prices will be maintained. If investors think the total returns will be rising, then overvalued housing prices could be further overvalued.

For commercial real estate (or other kinds of financial assets such as stocks), because investors are concerned about the rent, the relative return measured by investors must be the rental return, that is, rent-to-price ratio. For commercial real estate with inelastic

supply, when prices are overvalued, supply will not increase and the rent will not drop. Expectations that the prices commercial real estate will be rising cannot be broken in the short and medium term. However, in the long run, the rental return will falls because the rent is the same but the price is overvalued. It will eventually break the expectation of rising prices and cause a decline in commercial real estate prices.



## **CHAPTER 8: EMPIRICAL STUDIES**

It is very clear that “Housing Prices” is the dependent variable and “Income Inequality” is one of independent variable. In addition to Income Inequality, independent variables also include Aggregate Products, Population, Housing Prices, Money Supply and Stock Market Index. The reasons why those variables were chosen and the measures for them will be illustrated one by one.

The data of Housing Prices, Aggregated Product, Population, Housing Prices and Income Inequality are quarterly data collected from the first Quarter of 2000 to the third Quarter of 2016, for China’s 70 different cities. The data of Money Supply and Stock Market are quarterly data collected from the first Quarter of 2000 to the third Quarter, 2016, at national level, not for different 70 cities.

### **8.1 Dependent Variables and Independent Variable**

#### **8.1.1 Dependent Variable: Housing Prices**

1. Measure: Quarterly Average Housing Prices (Y)
2. Data Source

Quarterly Housing Prices for 70 different cities from the first Quarter of 2000 to the third Quarter of 2016 are from 2005-2017 Report of Real Estate Market. E-House China R&D Institute (Authorized Access), 2000-2017 Statistical Yearbook, National Bureau of Statistics of Republic of China.

#### **8.1.2 Independent Variables**

##### **1. Aggregate Product of an Economy**

(1) Measure: Quarterly Gross Domestic Product ( $X_1$ )

GDP will certainly affect such prices. There are two ways in which GDP or GDI influences housing prices. One is by increasing demand in the capital market, and another is by increasing demand in the rental market.

The basic economic model tells us that asset prices are driven by rent, which is then driven by space demand. Thus, the first path in which GDP affects housing prices is “high GDP, high space demand, high rent, leading to high housing prices.”

However, in many situations, housing prices are separate from housing rents. They are directly driven by GDP. Thus, the second path in which GDP influences housing prices is “high GDP, high assets demand, resulting in high housing prices.”

When there is no speculation demand in a housing market, the housing prices are mainly driven by the first path. Conversely, when there is high speculation demand in a housing market, the housing prices are primarily driven by the second path. The demand in the first path is for consumption, while the demand in the second path is for assets.

(2) Data Source

Quarterly Gross Domestic Product for 70 different cities from the first Quarter of 2000 to the third Quarter of 2016 are from Wind Database, iFinD Database, CEInet Statistics Database and 2000-2017 Statistical Yearbook, National Bureau of Statistics of Republic of China.

## **2. Population**

(1) Measure: Quarterly Permanent Residential Population ( $X_2$ )

Population also influences housing prices. Population increase comes from two

sources: the self-increase of this city's population and immigrants from other cities. In the short and middle term, immigrants cause the population increase.

In China, there are two definitions of population. One is called "HUKOU" population, which is very similar to "citizens." Another one is called Permanent Resident Population, which includes the people with "HUKOU" and the people who work and live here but do not have "HUKOU."

"HUKOU" residents (citizens) and "Non-HUKOU" residents have very different "welfare profits." For example, in Beijing, Non-HUKOU residents are not eligible to buy houses unless they have worked and paid social insurance for five consecutive years. Non-HUKOU residents are ineligible to attend the Beijing vehicle-license-plate lottery. Moreover, children from Non-HUKOU families are disqualified from enrolling in all elementary, middle, and high schools in Beijing but are allowed in some assigned schools, which are usually very poor schools. Non-HUKOU residents are also ineligible for medical insurance, endowment insurance, unemployment insurance, home loans from housing accumulation fund, and affordable housing policies. Consequently, Non-HUKOU residents are seen as "second-class citizens." They have their own name, that is, "Beijing Drifters."

While governments always use HUKOU residents in statistical work, permanent residents population is used instead in this study. The Non-HUKOU residents work, live, and consume various kinds of goods in this city despite being overlooked and discriminated against by governments. They represent an important part of the total demand for homes. Hence, both Non-HUKOU residents and HUKOU residents are

participants in the home markets.

(2) Data Source

Quarterly Permanent Residential Population for 70 different cities from the first Quarter of 2000 to the third Quarter of 2016 are from 2000-2017 Statistical Yearbook, National Bureau of Statistics of Republic of China and Wind Database.

### 3. Housing Policy

(1) Measure: Quarterly Housing Policy Dummy Variable ( $X_3$ ). When there are housing policies,  $X_3=1$ ; when there are not housing policies,  $X_3=0$ .

In China, various types of housing policies have emerged since 2005. They include:

1) Home Loan Policies. These include:

A. Increasing the interest rate by 10% for the second home

B. Increasing the down payment rate from 30% to 70% for the second home

C. Prohibiting a loan for the third home

D. Changing the definition of “Second Home Loan.” Normally, the second home is defined as the second home a family buys when this family has already owned one.

2) Purchase Constraint Policies. These include:

A. One citizen family in this city can buy a maximum of two new houses after the policy came out. In other words, one citizen in one city cannot buy a third home.

B. An unmarried adult citizen (over 18 years) can only buy one new house after the policy came out. Thus, said adult citizen cannot buy a second home.

C. An adult (over 18 years) without “HUKOU”(citizenship) but who has worked and paid social insurance in a city for five consecutive years can buy only one new house

after the policy came out. Said adult cannot buy a second home.

### 3) Transaction Tax Policies

A. Adjusting contract tax

B. Adjusting income tax

C. Adjusting Value-added tax

### (2) Data Source

Quarterly Housing Policies for 70 cities from the first Quarter of 2000 through the third Quarter of 2016 are from 2000-2017 Statistical Yearbook, National Bureau of Statistics of Republic of China, 2005-2017 Report of Real Estate Market. E-House China R&D Institute, and Wind Database.

## 4. Money Supply

### (1) Measure: Quarterly M2 ( $X_4$ )

Why does money supply have influence on housing prices? First, more money supply means more home loans available for home buyers. Second, more money will lead to low interest rate, and then the home buyer would like to borrow more money to buy houses. Third, more money supply will lead to inflation, then the demand for houses will be strong because home purchase will become a good strategy to offset inflation.

People's Bank of China defined M0, M1 and M2 as follows:<sup>116</sup>

M0: currency in circulation

M1: M0 + Demand Deposits

M2: M1+ Quasi-Money (Time Deposits + Saving Deposits + Other Deposits).

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<sup>116</sup> <https://seekingalpha.com/article/4049854-interpreting-chinas-monetary-aggregates-relation-shadow-banking-business> April 4<sup>th</sup>, 2017

In monetary aggregates (M0,M1,M2,and M3), the most widely used in literature is M2. Hence, M2 was selected as the index for money supply.

## (2) Data Source

Quarterly M2 from the first Quarter of 2000 through the third Quarter of 2016 at national level are from Wind Database. All those data does not vary by city.

## **5. Stock Market**

### (1) Measure: Shanghai Stock Market Index ( $X_5$ )

Various types of assets exist in markets, including stocks, houses, funds, real estate investment trusts, exchanges, and gold. However, houses and stocks are often regarded as two of the most important assets. According to portfolio theory, these two important assets should be considered in the investment portfolio. They are often interchangeable with each other.

Consequently, housing prices and asset prices should have an extremely close relationship. For example, if the stock prices have been increasing and investors expect that it will keep going up, significantly more money will flow into the stock market from all other kinds of asset markets, such as housing markets. If the money comes out of the housing market, then the housing prices will decrease. That is called the replacement effect.

Therefore, the stock market should be taken into account. There are two stock market index in China. One is Shanghai Stock Market Index, the other is Shenzhen Stock Market Index. The first one is more widely used, so Shanghai Stock Market is selected as the measure for China stock market.

## (2) Data Source

Quarterly Shanghai Stock Market Index from the first Quarter of 2000 through the third Quarter of 2016 at national level is from Wind Database and iFinD Database. Those data do not vary by city.

## 6. Income Inequality

(1) Measure: Ration of Gross Domestic Income and Gross Domestic Product(RRG) ( $X_6$ ) . We frequently discuss this variable in the entire study because the relationship between income inequality and housing policies is the topic of this research.

## (2) Data Source

Quarterly RRG for 70 cities from the first Quarter of 2000 through the third Quarter of 2016 is calculated from GDP, Population and Per Capita Disposable Income, which are come from Wind Database, iFinD Database and CEInet Statistics Database(2000-2017), 2000-2017 Statistical Yearbook, National Bureau of Statistics of Republic of China and Income Research Report, China Income Institute for Income Distribution.

## 8.2 Panel Data Analysis Models

### 8.2.1 The Constant Coefficient Pooled Data Model

The simplest model for this analysis is Constant Coefficient Pooled Data Model. This model is also called the Pooled Regression Model because neither the time-series effects nor the cross-section effects are taken into account. In other words, all data is pooled into a simple regression model given where both the intercept and the coefficient are constant for the sample.

The model can be expressed by:

$$HP_{it} = \beta_0 + \beta_1 GDP_{it} + \beta_2 POP_{it} + \beta_3 HOP_{it} + \beta_4 M2_{it} + \beta_5 SSI_{it} + \beta_6 RGG_{it} + \varepsilon_{it} \quad (8.1)$$

Or,

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \varepsilon_{it} \quad (8.2)$$

where:

Y or HP: Housing Prices

X<sub>1</sub> or GDP: Gross Domestic Product

X<sub>2</sub> or POP: Population

X<sub>3</sub> or HOP: Housing Policy (Dummy Variable)

X<sub>4</sub> or M2: Money Supply

X<sub>5</sub> or SSI: Shanghai Stock Market Index

X<sub>6</sub> or RGG: Income Inequality

$$\varepsilon_{it} \sim i.i.d(0, \sigma^2)$$

### 8.2.2 The Fixed Effects Panel Data Model

Fixed Effects Panel Data Model or Fixed Effects Model is obtained when the assumption that the intercept is constant for all cities is removed. In other words, Fixed Effects Model has constant slopes and different intercepts by cross-sectional unit. In this model, temporal effects are not taken into account, but individual-specific features (intercept, denoted by  $u_i$ ) are emphasized. Different cities have different intercepts, but the intercepts remains constant during all periods. It is emphasized that  $u_i$  is correlated with some independent variables because  $u_i$  includes all the individual-specific features. The model can be expressed by:



$$HP_{it} = u_i + \beta_1 GDP_{it} + \beta_2 POP_{it} + \beta_3 HOP_{it} + \beta_4 M2_{it} + \beta_5 SSI_{it} + \beta_6 RGG_{it} + \varepsilon_{it} \quad (8.3)$$

Or

$$Y_{it} = u_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \varepsilon_{it} \quad (8.4)$$

Where

$\varepsilon_{it} \sim i.i.d(0, \sigma_\varepsilon^2)$  and it is independent of all  $X_{it}$

$u_i \sim N(0, \sigma_u^2)$  but it is correlated with some  $X_{it}$

Another way:

$$HP_{it} = \alpha_1 City_1 + \alpha_2 City_2 + \dots + \alpha_k City_k + \dots + \beta_1 GDP_{it} + \beta_2 POP_{it} + \beta_3 HOP_{it} + \beta_4 M2_{it} + \beta_5 SSI_{it} + \beta_6 RGG_{it} + \varepsilon_{it} \quad (8.5)$$

Or

$$Y_{it} = \alpha_1 C_1 + \alpha_2 C_2 + \dots + \alpha_k C_k + \dots + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \varepsilon_{it} \quad (8.6)$$

With the variables as previously describes.

### 8.2.3 Random Effects Panel Data Model

The Random Effects Panel Data Model is a regression model with random intercepts and constant coefficients. Precisely, the intercept is assumed to be a random variable in order to take errors into account. This cross-specific error term  $u_i$  should be uncorrelated with the independent variables because the intercepts are not individual-specific. In addition, the random error  $\varepsilon_i$  of the whole model is assumed to have temporal effects, that is, follow some auto regression (n) process.

The model can be expressed by:

$$HP_{it} = u_i + \beta_1 GDP_{it} + \beta_2 POP_{it} + \beta_3 HOP_{it} + \beta_4 M2_{it} + \beta_5 SSI_{it} + \beta_6 RGG_{it} + \varepsilon_{it}$$

Or

$$Y_{it} = u_i + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_6 X_{6it} + \varepsilon_{it}$$

Where  $u_i = \beta_0 + v_i$

So

$$Y_{it} = \beta_0 + \beta_1 X_{1it} + \beta_2 X_{2it} + \beta_3 X_{3it} + \beta_4 X_{4it} + \beta_5 X_{5it} + \beta_{it} IX_{6it} + v_i + \varepsilon_{it}$$

where,

$v_i \sim N(0, \sigma_i^2)$  but it is independent of all  $X_{it}$

$\varepsilon_{it} \sim AR(1)$  or  $\varepsilon_{it} = \rho\varepsilon_{i,t-1} + \eta_{it}$

with variables as described above.

## 8.3 Data

As a summary of 8.2, all data sources are listed here.

### 8.3.1 Main Sources

Wind Database (Authorized Access)

iFinD Database (Authorized Access)

CEInet Statistics Database (Authorized Access)

2000-2017 Income Research Report, China Income Institute for Income Distribution (Private Access )

2005-2017 Report of Real Estate Market. E-House China R&D Institute (Authorized Access)

2000-2017 Internal Reports of National Bureau of Statistics of Republic of

China(Private Access)

### 8.3.2 Reference Source

2000-2017 Statistical Yearbook, National Bureau of Statistics of Republic of China (Public)

## 8.4 Results and Discussion

### 8.4.1 Putting 70 Cities with 67 Quarters Together

In this section, 70 medium and large cities with 67 quarterly data from the first quarter of 2000 to the third quarter of 2016 are taken as a whole sample.

#### 1. Pooled Regression Model

As said above, neither time-series effects nor cross-section effects are taken into account in pooled regression. All data is run in a simple regression model. The results are shown in Table 8.1

**Table 8.1 Results of Pooled Regression Model**

Linear Regression	Number of Obs. = 4,690					
	F(6, 69)=42.78					
	Prob > F = 0.0000					
	R-squared = 0.6843					
	Root MSE = 2510.6					
	Std. Err. Adjusted for 70 Cluster in Cities					
Y	Coef.	Robust Std. Err.	T	P> t	[95% Conf. Interval]	
X <sub>1</sub>	3.552575	0.596295	5.96	0	2.362999	4.742151
X <sub>2</sub>	-1.971045	0.494902	-3.98	0	-2.958346	-0.9837429
X <sub>3</sub>	991.582	371.1852	2.67	0.009	251.0878	1732.076
X <sub>4</sub>	0.0256562	0.00524	4.9	0	0.015202	0.0361105
X <sub>5</sub>	0.0350784	0.063811	0.55	0.584	-0.0922218	0.1623785
X <sub>6</sub>	-7470.654	2221.687	-3.36	0.001	-11902.8	-3038.511
_cons	6652.292	1699.884	3.91	0	3261.116	10043.47

Without time-series effects and cross-section effects, the results show that housing prices(Y) is significantly affected by GDP( $X_1$ ), Population( $X_2$ ), Housing Policies( $X_3$ ), M2( $X_4$ ) and RGG( $X_6$ ) at 99% level. The fitting degree ( $R^2$ ) is also good, which is 0.6843.

The coefficients of GDP( $X_1$ ), Population( $X_2$ ) and M2( $X_4$ ) are all positive. This is consistent with economic fundamentals. When GDP, Population and Monetary supply increases, housing prices should also increase.

At first, it is a confusing that the coefficient of RGG ( $X_6$ ) is negative because what this study tries to show is the positive correlation between income inequality and housing prices, in other words, when income inequality is more severe, housing prices will be higher. The reason why the coefficient of RGG ( $X_6$ ) is negative is because the relationship between RGG and income inequality is negative, that is, a lower RGG means more severe income inequality. As a result, the coefficient of RGG ( $X_6$ ) should be negative, as showed by table 8.1.

It is also confusing that the coefficient of Housing Polies( $X_3$ ) is negative because the purpose of all housing policies is to suppress rapidly increasing housing prices. Therefore, the expectation for this coefficient is a negative sign. In other words, when housing policies came out(Dummy variable  $X_3=1$ ), the housing prices were supposed to decrease; when housing policies did not come out or were terminated(Dummy variable  $X_3=0$ ), the housing prices were supposed to increase.

However, the reason why housing Policies came out is because housing prices

increased too fast and the housing markets were too “hot” over past 16 years in China. Correspondingly, the reason why housing prices didn’t come out or were terminated is because housing prices were very stable or decreased slightly.<sup>117</sup> In details, the following facts can be observed in China:

When housing prices were stable, housing policies did not come out ( $X_3=0$ ) ;

When housing prices increased very quickly, housing policies came out ( $X_3=1$ );

After housing policies came out, housing prices still increased although they increased not as fast as before. When housing prices were stagnant or began to decrease slightly, housing policies were then terminated. That is the reason why the coefficient of Housing Policies( $X_3$ ) is positive.

## **2. Fixed Effects Panel Data Model**

As said before, then fixed Effects Panel Data Model has constant slope with different intercepts by cross-sectional unit. In this model, temporal effects are not taken into account, but individual-specific features (intercept) are emphasized.

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<sup>117</sup> Housing prices in all cities in China have never experienced quick decrease since 2000 except every few cities, like Ordos, Inner Mongolia.

Table 8.2a Results of Fixed Effects Model (Part)							
Fixed-effects (Within) Regression				Number of Obs. = 4,690			
R-sq:				Obs per group			
within = 0.7377				min =67			
between = 0.2979				avg =67.0			
overall = 0.3347				max =67			
				F(6,69) =48.70			
corr(u_i, Xb) = -0.8411				Prob>F =0.000			
Std. Err. Adjusted for 70 Cluster in Cities							
Y	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]		
X <sub>1</sub>	2.298844	0.528963	4.35	0	1.243592	3.354095	
X <sub>2</sub>	12.52721	2.775459	4.51	0	6.990318	18.0641	
X <sub>3</sub>	560.6446	245.4185	2.28	0.025	71.04815	1050.241	
X <sub>4</sub>	0.0232382	0.003308	7.03	0	0.0166396	0.0298369	
X <sub>5</sub>	0.1061664	0.041329	2.57	0.012	0.0237167	0.1886162	
X <sub>6</sub>	-6072.098	2549.337	-2.38	0.02	-11157.89	-986.3096	
_cons	-2651.217	2461.628	-1.08	0.285	-7562.031	2259.597	
sigma u	5977.1485						
sigma e	1735.5054						
rho	0.922248	(fraction of variance due to u_i)					

When individual effects (cross-section effects) are taken into account, the results show that housing prices(Y) are significantly affected by GDP(X<sub>1</sub>),Population(X<sub>2</sub>), M2(X<sub>4</sub>) at 99% level, and Housing Policies(X<sub>3</sub>) and RGG(X<sub>6</sub>) at the 95% level.

The overall degree of fit (R<sup>2</sup>) is 0.3347, which is not as good as that of pooled regression model because cross-sectional effects are taken into account. But the R-square within groups is 0.7377, which is very good.

The coefficient for GDP(X<sub>1</sub>), Population(X<sub>2</sub>) and M2(X<sub>4</sub>) are all positive. This is consistent with economic fundamentals. When GDP, Population and Monetary supply increases, housing prices will increase.

The coefficient for Housing Policies( $X_3$ ) is positive. As pointed out above, this result indicates housing policies have not stopped rapidly increasing housing prices in the past 16 years. The reason why housing policies were mandated was because housing prices increased very fast. Mandating housing policies is actually a reaction to rapidly rising housing prices. In a contrast, when housing prices were very stable or decrease slightly, housing policies were terminated or never came out. As a result, housing policies are positively correlated with increasing housing prices, and the positive coefficient on Housing Policies( $X_3$ ) makes better sense.

The coefficient of RGG ( $X_6$ ) is negative. As pointed out above, the reason is because the relationship between RGG and income inequality is negative, that is, a lower RGG means more severe income inequality. As a result, when the coefficient of RGG ( $X_6$ ) is negative as shown by the results, it indicates more severe income inequality, which will lead to higher housing prices.

The Fixed Effects Model takes individual features into accounts. So the model must produce the data about for different individuals. The results with individual intercepts are shown in table 8.2b.





_lcity_23	2347.714	439.0404	5.35	0	1487.211	3208.218
_lcity_24	-25.7882	189.7551	-0.14	0.892	-397.701	346.1249
_lcity_25	6250.709	1198.407	5.22	0	3901.874	8599.545
_lcity_26	8579.161	1453.989	5.9	0	5729.395	11428.93
_lcity_27	9555.047	1649.484	5.79	0	6322.118	12787.98
_lcity_28	6493.613	1294.702	5.02	0	3956.044	9031.183
_lcity_29	-811.335	159.6601	-5.08	0	-1124.26	-498.4073
_lcity_30	6582.845	1284.173	5.13	0	4065.913	9099.777
_lcity_31	7019.831	1358.077	5.17	0	4358.05	9681.613
_lcity_32	7477.457	1358.627	5.5	0	4814.597	10140.32
_lcity_33	-10456.5	3123.494	-3.35	0.001	-16578.5	-4334.582
_lcity_34	6699.721	1154.487	5.8	0	4436.967	8962.475
_lcity_35	4578.764	818.8213	5.59	0	2973.903	6183.624
_lcity_36	7748.982	1238.692	6.26	0	5321.191	10176.77
_lcity_37	1937.064	574.4802	3.37	0.001	811.1038	3063.025
_lcity_38	5015.829	838.8169	5.98	0	3371.778	6659.879
_lcity_39	-1469.09	319.7578	-4.59	0	-2095.8	-842.3745
_lcity_40	4220.691	292.217	14.44	0	3647.956	4793.426
_lcity_41	7001.899	661.1104	10.59	0	5706.146	8297.652
_lcity_42	6703.401	1150.463	5.83	0	4448.535	8958.267
_lcity_43	4112.546	547.7605	7.51	0	3038.955	5186.137
_lcity_44	-28005.5	5746.184	-4.87	0	-39267.8	-16743.18
_lcity_45	-64.0113	120.932	-0.53	0.597	-301.034	173.0111
_lcity_46	4371.058	755.56	5.79	0	2890.188	5851.929
_lcity_47	802.3604	320.3844	2.5	0.012	174.4185	1430.302
_lcity_48	376.1265	216.0455	1.74	0.082	-47.315	799.5679
_lcity_49	-567.983	205.876	-2.76	0.006	-971.493	-164.4739
_lcity_50	1940.324	309.7267	6.26	0	1333.271	2547.377
_lcity_51	4126.582	724.7792	5.69	0	2706.041	5547.124
_lcity_52	5322.184	925.1696	5.75	0	3508.885	7135.484
_lcity_53	4211.299	572.6927	7.35	0	3088.842	5333.757
_lcity_54	3819.372	603.572	6.33	0	2636.392	5002.351
_lcity_55	-2561.55	594.2437	-4.31	0	-3726.25	-1396.856
_lcity_56	3809.017	556.5121	6.84	0	2718.273	4899.76
_lcity_57	5762.778	922.1826	6.25	0	3955.333	7570.222
_lcity_58	2892.3	271.5237	10.65	0	2360.123	3424.476

_lcity_59	6875.104	1225.413	5.61	0	4473.338	9276.87
_lcity_60	4546.444	725.2232	6.27	0	3125.033	5967.855
_lcity_61	9594.029	1588.818	6.04	0	6480.004	12708.06
_lcity_62	17095.64	1901.657	8.99	0	13368.46	20822.82
_lcity_63	6594.082	865.489	7.62	0	4897.755	8290.41
_lcity_64	3354.896	351.1205	9.55	0	2666.712	4043.079
_lcity_65	2668.238	332.0981	8.03	0	2017.338	3319.138
_lcity_66	6203.781	1028.711	6.03	0	4187.544	8220.018
_lcity_67	8927.506	1975.752	4.52	0	5055.104	12799.91
_lcity_68	7373.742	1317.966	5.59	0	4790.577	9956.908
_lcity_69	-167.731	332.9335	-0.5	0.614	-820.268	484.8069
_lcity_70	3467.986	463.4558	7.48	0	2559.629	4376.342
sigma u	5977.149					
sigma e	1735.505					
rho	0.49874484 (fraction of variance due to u_i)					

As shown from table 8.2b, the intercepts for all cities are significant except city 11, 13, 24, 45 and 69. Therefore, cross section effects do exist for most cities.

### **3. Random Effects Panel Data Model**

As pointed out above, the Random Effects Panel Data Model is a regression model with random intercepts and constant coefficients. Precisely, the intercept  $u_i$  is assumed to be a random variable in order to take random errors  $v_i$  into account, that is,  $u_i = \beta_0 + v_i$ . This error term should be uncorrelated with the independent variables because the intercepts are not individual-specific. In addition, the residual  $\varepsilon_i$  of the model is assumed to have temporal effects, that is, it follows auto regression process.

Although  $cor(\varepsilon_i, \varepsilon_j) = 0$  for  $i \neq j$ , but  $cor(\varepsilon_i + v_i, \varepsilon_j + v_j) = \sigma_v^2 \neq 0$ , so Generalized Least Squares (GLS) Regression, not Ordinary Least Squares should be taken. Moreover, Maximum Likelihood Estimation is another widely used regression method that can be

used with Random Effects Models. So both Feasible Generalized Least Squares Random-effects Model (FGLS) and Maximum Likelihood Random-effects Model (MLE) are used to run the models.

(1) Feasible Generalized Least Squares Random-effects Model (FGLS)

Table 8.3 Results of Feasible Generalized Least Squares Random-effects Model (FGLS)

Random-effects GLS Regression	Number of Obs. = 4,690
Group Variable: city	Number of Groups = 70
R-sq:	Obs per group
within = 0.7274	min =67
between = 0.4357	avg =67.0
overall = 0.5100	max =67
Wald chi2(6) = 284.13	corr(u_i, X) = 0 (assumed)
	Prob > chi2 = 0.0000

Std. Err. Adjusted for 70 Cluster in Cities

Y	Coef.	Robust Std. Err.	t	P> t	[95% Conf. Interval]	
X <sub>1</sub>	3.018567	0.458382	6.59	0	2.120155 3.916979	
X <sub>2</sub>	4.948447	1.996788	2.48	0.013	1.034814 8.86208	
X <sub>3</sub>	714.3962	260.5309	2.74	0.006	203.765 1225.027	
X <sub>4</sub>	0.0249505	0.003351	7.45	0	0.0183824 0.0315186	
X <sub>5</sub>	0.0811522	0.041207	1.97	0.049	0.0003874 0.1619169	
X <sub>6</sub>	-6317.907	2504.919	2.52	0.012	-11227.46 -1408.356	
_cons	1858.576	2334.925	0.8	0.426	-2717.794 6434.946	
sigma u	1731.1542					
sigma e	1735.5054					
rho	0.49874484(fraction of variance due to u_i)					

The results from the Feasible Generalized Least Squares Random-effects Model show that housing prices(Y) is significantly affected by GDP(X<sub>1</sub>), Housing Policies(X<sub>3</sub>), M2(X<sub>4</sub>) at the 99% level and Population(X<sub>2</sub>) and RGG(X<sub>6</sub>) at the 95% level. Those results are similar to those of the Fixed Effects Model.

What is different from Fixed Effects Models is that the coefficient for the stock market index  $X_5$  is also significant at 95% level. The Fixed Effects Model emphasizes individual differences, but the Random Effects Model emphasizes the temporal correlation. On one hand, the stock market is not a “local” market but a “global” market because the whole country shares one stock market. As a result, the stock market variable will show the impact of global financial market effects on all cities. On the other hand, as many studies shows, China’s stock market does not follow a “random walk”, that is, the times series effect or “unit root” can be detected in China’s stock market. Because the Random Effects Model emphasizes the times series effects and “ignores” the cross section effects, the stock market variable produces a significant effect to housing markets.

The overall degree ( $R^2$ ) is 0.5100, again not as good as pooled regression models. But the R-square within groups is 0.7274, which is very good.

The coefficients of GDP( $X_1$ ), Population( $X_2$ ) and M2( $X_4$ ) are all positive. This is consistent with economic fundamentals. When GDP, Population and Monetary supply increases, housing prices will increases.

The coefficient of Housing Policies ( $X_3$ ) is positive and the coefficient of RGG ( $X_6$ ) is negative. The reason is the same as previously stated for the pooled regression model and fixed effects model.

(2) Maximum-likelihood Random-effects Model (MLE)



Three panel date models have been used to estimate the models. Which one is the best? Which one has best fit? To compare the models, a model selection test was done.

1) Choose Pooled Regression Model or Fixed Effects Model

$H_0$ : all  $u_i = 0$

$H_a$ : at least one  $u_i \neq 0$

Table 8.5 Selection between Pooled Regression Model and Fixed Effects Model

Fixed-effects (Within) Regression	Number of Obs.	=	4,690
Group Variable: city	Number of Groups	=	70
R-sq:	Obs per group:		
within = 0.7274	min =67		
between = 0.4357	avg =67.0		
overall = 0.5100	max =67		
F(6,4614)=2162.52	Prob > F	=	0.0000
corr( $u_i$ , Xb) = -0.8411			

Std. Err. Adjusted for 70 Cluster in Cities

Y	Coef.	Robust Std. Err.	T	P> t	[95% Conf. Interval]
X <sub>1</sub>	2.298844	0.078638	29.23	0	2.144676 2.453012
X <sub>2</sub>	12.52721	0.55952	22.39	0	11.43028 13.62413
X <sub>3</sub>	560.6446	69.68425	8.05	0	424.0301 697.259
X <sub>4</sub>	0.0232382	0.001941	11.97	0	0.0194335 0.027043
X <sub>5</sub>	0.1061664	0.03247	3.27	0.001	0.0425101 0.1698228
X <sub>6</sub>	-6072.098	415.3957	-14.62	0	-6886.473 -5257.724
_cons	-2651.217	446.7416	-5.93	0	-3527.045 -1775.39
sigma u	5977.1485				
sigma e	1735.5054				
rho	0.922248				
F test that all $u_i=0$ : F(69, 4614) = 75.16			Prob > F = 0.0000		

The test results show that the null hypothesis is refused and the fixed effects model is obvious better than pooled regression model. Thus, using a panel data approach is better than pooling the data.

2) Choose Pooled Regression Model or Random Effects Model

H<sub>0</sub>: There is no random effect

H<sub>a</sub>: There exists random effect

**Table 8.6 Selection between Pooled Regression Model and Random Effects Model**

Breusch and Pagan Lagrange Multiplier Test for Random Effects

$$Y[\text{city},t]=Xb+u[\text{city}]+e[\text{City},t]$$

Estimated Results

	Var	sd=sqrt(Var)	
Y	1.99E+07	4465.691	
e	3011979	1735.505	
u	2996895	1731.154	

test var(u)=0

chibar2(01)=31268.14

Prob > chibar2 = 0.0000

The Lagrangian multiplier test shows that the null hypothesis is rejected, and that the Random Effects Model is better than pooled regression model. Again, using a panel data approach is better than pooling the data.

### 3) Choose Fixed Effects Model or Random Effects Model

H<sub>0</sub>: Difference in coefficients is not systematic

H<sub>a</sub>: Difference in coefficients is systematic

**Table 8.7 Selection between Fixed Effects Model and Random Effects Model**

Y	—coefficient—			sqrt(Diag(v_b-v_B)) S.E.
	(b) FE	(B) RE	(b-B) Difference	
X <sub>1</sub>	2.298844	3.018567	-0.7197235	0.0396886
X <sub>2</sub>	12.52721	4.948447	7.57876	0.4130498
X <sub>3</sub>	560.6446	714.3962	-153.7516	8.540647
X <sub>4</sub>	0.0232382	0.024951	-0.0017123	0.0002218
X <sub>5</sub>	0.1061664	0.081152	0.0250143	0.002096
X <sub>6</sub>	-6072.098	-6317.907	245.809	78.75582
_cons	-2651.217	1858.576	-4509.793	129.3131

b = consistent under H<sub>0</sub> and H<sub>a</sub>; obtained from xtreg

B = inconsistent under H<sub>a</sub>, efficient under H<sub>0</sub>; obtained from xtreg

Test: H<sub>0</sub>: difference in coefficients not systematic

$$\text{chi2}(4) = (b-B)'[(V_b - V_B)^{-1}](b-B) \\ = 337.89$$

Prob>chi2 = 0.0000

( $v_b - v_B$  is not positive definite)

The test results show that the null hypothesis is refused, and that it is statistically better to use fixed effects model rather than random effects model.

#### **8.4.2 Grouped by Size of GDP**

The variable “Income inequality” is a “relative value”, but the variable “Housing Price” is an “absolute value”. So Income Inequality might have a different influence on Housing Price in different cities with different Characteristics. In order to test the correlation between Income Inequality and Housing Price, 70 cities are divided into 5 groups by GDP. Next, a model selection test is done between the Fixed Effects Model and the Random Effects Model. The result shows that it is better to use the Random Effects Model than the Fixed Effects Model for all 5 GDP-Ranked groups. Since the Random Effects Model does not emphasize individual-specific effects, this result confirms that the cities with similar GDP do not have statistically significant intercepts. Precisely, Income Inequality might have a similar influence on Housing Price in the cities with similar GDP.

##### 1. The Highest-GDP Group (Random Effects Model)



Table 8.8 Results of Random Effects Model on the Highest-GDP Group

**xtgls Y X1 X2 X3 X4 X5 X6 t panels(cor) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels : Heteroskedastic with Cross-sectional correlation

Correlation: Common AR(1) coefficient for all panels(0.7704)

Estimated Covariance= 21	Number of Obs. = 402
Estimated Autocorrelations= 1	Number of Groups = 6
Estimated Coefficient= 8	Time Period =67
	Wald Chi2(14) =443.94
	Prob > Chi2 =0

Y	Coef.	Std. Err.	Z	P> z	[95% Conf.	Interval]
X <sub>1</sub>	0.2885488	0.082079	3.52	0	0.1276779	0.4494197
X <sub>2</sub>	-1.107709	0.164165	-6.75	0	-1.429466	-0.7859513
X <sub>3</sub>	636.9573	160.1565	3.98	0	323.0564	950.8582
X <sub>4</sub>	-0.0035042	0.006129	-0.57	0.567	-0.0155165	0.008508
X <sub>5</sub>	-0.0377956	0.219047	-0.17	0.863	-0.4671192	0.3915281
X <sub>6</sub>	-1066.834	340.0649	-3.14	0.002	-1733.349	-400.3194
t	290.7348	19.4241	14.97	0	252.6643	328.8054
_cons	2477.769	824.4764	3.01	0.003	861.8253	4093.713

The results show that Housing Prices(Y) is significantly affected by GDP(X<sub>1</sub>), Population(X<sub>2</sub>), Housing Policies(X<sub>3</sub>), and RGG(X<sub>6</sub>) at the 99% level. The effect of M2(X<sub>4</sub>) and Stock Market(X<sub>5</sub>) are not significant.

It is very confusing here that the coefficient of Population(X<sub>2</sub>) is negative, which is opposite to our intuition. Although the high population is positively correlated with high housing prices for 70 cities as a whole sample, the correlation is negative for some of those 70 cities. For example, in the first group, although the population of Beijing was less than Shanghai, but the housing prices of Beijing are higher than those of Shanghai.

## 2. The Second-Highest Group (Random Effects Model)

Table 8.9 Results of Random Effects Model on the Second Group

**xtgls Y X1 X2 X3 X4 X5 X6 t panels(cor) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels :Heteroskedastic with Cross-sectional correlation

Correlation: Common AR(1) coefficient for all panels(0.9078)

Estimated covariance =36

Number of obs =536

Estimated autocorrelations =1

Number of groups =8

Estimated coefficients=8

Time periods=67

Wald chi2(7)=438.03

Prob > chi2 =0

Y	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]
X <sub>1</sub>	-0.0058556	0.011137	-0.53	0.599	-0.0276844 0.0159731
X <sub>2</sub>	-1.029399	0.141333	-7.28	0	-1.306406 -0.7523923
X <sub>3</sub>	51.20238	24.96223	2.05	0.04	2.277301 100.1275
X <sub>4</sub>	-0.0012469	0.001068	-1.17	0.243	-0.0033395 0.0008457
X <sub>5</sub>	0.0607393	0.040958	1.48	0.138	-0.0195375 0.141016
X <sub>6</sub>	-213.3064	104.4187	-2.04	0.041	-417.9634 -8.649514
t	124.8402	6.45917	19.33	0	112.1805 137.4999
_cons	1133.242	320.2413	3.54	0	505.5805 1760.903

The results show that Housing Prices(Y) is significantly affected by Population(X<sub>2</sub>), Housing Policies(X<sub>3</sub>), and RGG(X<sub>6</sub>) at the 99% level or 95% level. The effect of GDP(X<sub>1</sub>), M2(X<sub>4</sub>) and Stock Market(X<sub>5</sub>) are not significant.

Why is GDP insignificant? Although the correlation between GDP and housing prices is significant for all 70 cities as a whole sample, the correlation is not significant for some cities. For example, in group 2, although Wuhan's GDP was much higher than Zhengzhou in 2016, the housing prices in Wuhan was much lower than Zhengzhou.

### 3. The Middle-GDP Group (Random Effects Model)

Table 8.10 Results of Random Effects Model on the Third Group

**xtgls Y X1 X2 X3 X4 X5 X6 t panels(cor) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels :Heteroskedastic with Cross-sectional correlation

Correlation: Common AR(1) coefficient for all panels  
(0.9200)

Estimated covariance =105

Number of obs =936

Estimated autocorrelations =1

Number of groups =14

Estimated coefficients=8

Time periods=67

Wald chi2(7)=520.33

Prob > chi2 =0

Y	Coef.	Std. Err.	z	P> z	[95% Conf.	Interval]
X <sub>1</sub>	0.0069128	0.005091	1.36	0.174	-0.0030645	0.01689
X <sub>2</sub>	-1.568134	0.18426	-8.51	0	-1.929278	-1.206991
X <sub>3</sub>	39.32095	10.63348	3.7	0	18.47971	60.16218
X <sub>4</sub>	-0.0013157	0.00066	-1.99	0.046	-0.0026093	-0.000022
X <sub>5</sub>	0.0586522	0.025371	2.31	0.021	0.0089269	0.1083774
X <sub>6</sub>	56.12087	39.85236	1.41	0.089	-21.98832	134.2301
t	93.64965	4.411629	21.23	0	85.00301	102.2963
_cons	1539.668	244.4701	6.3	0	1060.515	2018.82

The results show that housing prices(Y) is significantly affected by Population(X<sub>2</sub>), Housing Policies(X<sub>3</sub>), and RGG(X<sub>6</sub>) at the 99% level or 90% level. The effect of GDP(X<sub>1</sub>), M2(X<sub>4</sub>) and Stock Market(X<sub>5</sub>) are not significant. The reason why the coefficient of GDP(X<sub>1</sub>) is not significant is the same to that for Group 2.

#### 4. The Fourth Group (Random Effects Model)

Table 8.11 Results of Random Effects Model on the Fourth Group

**xtgls Y X1 X2 X3 X4 X5 X6 t panels(corr) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels : Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels  
(0.8077)

Estimated covariance =190

Number of obs =1273

Estimated autocorrelations =1

Number of groups =19

Estimated coefficients=8

Time periods=67

Wald chi2(7)=1373.21

Prob > chi2 =0

Y	Coef.	Std. Err.	z	P> z	[95% Conf.	Interval]
X <sub>1</sub>	0.0402989	0.022324	1.81	0.071	-0.0034545	0.0840523
X <sub>2</sub>	0.9847672	0.068921	14.29	0	0.8496845	1.11985
X <sub>3</sub>	53.11829	19.93798	2.66	0.008	14.04057	92.19601
X <sub>4</sub>	-0.0008077	0.000817	-0.99	0.323	-0.0024098	0.0007943
X <sub>5</sub>	0.0372898	0.029861	1.25	0.212	-0.0212368	0.0958164
X <sub>6</sub>	-810.3798	82.06169	-9.88	0	-971.2177	-649.5418
t	88.24315	2.759474	31.98	0	82.83468	93.65162
_cons	619.2786	123.5382	5.01	0	377.1482	861.409

The results show that housing prices(Y) is significantly affected by GDP(X<sub>1</sub>), Population(X<sub>2</sub>), Housing Policies(X<sub>3</sub>), and RGG(X<sub>6</sub>) at the 99% or 90% level. The effect of M2(X<sub>4</sub>) and Stock Market(X<sub>5</sub>) are not significant.

### 5. The fifth group (Random effects model)

Table 8.12 Results of Random Effects Model on the Fifth Group

**xtgls Y X1 X2 X3 X4 X5 X6 t panels(corr) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels :Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels  
(0.8910)

Estimated covariance =276

Number of obs =1541

Estimated autocorrelations =1

Number of groups =23

Estimated coefficients=8

Time periods=67

Wald chi2(7)=999.79

Prob > chi2 =0

Y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
X <sub>1</sub>	-0.0368613	0.012919	-2.85	0.004	-0.0621814 -0.0115412
X <sub>2</sub>	-1.712392	0.101712	-16.84	0	-1.911743 -1.513041
X <sub>3</sub>	74.34254	9.903108	7.51	0	54.9328 93.75227
X <sub>4</sub>	-0.0001497	0.000534	-0.28	0.779	-0.001197 0.0008977
X <sub>5</sub>	0.0335428	0.020506	1.64	0.102	-0.0066482 0.0737339
X <sub>6</sub>	-275.5787	32.42964	-8.5	0	-339.1397 -212.0178
t	71.13436	2.873862	24.75	0	65.50169 76.76702
_cons	1340.761	130.6088	10.27	0	1084.773 1596.75

The results show that housing prices(Y) is significantly affected by GDP(X<sub>1</sub>), Population(X<sub>2</sub>), Housing Policies(X<sub>3</sub>), and RGG(X<sub>6</sub>) at the 99% level. The effect of M2(X<sub>4</sub>) and Stock Market(X<sub>5</sub>) are not significant.

### 8.4.3 Grouped by Regions

Theoretically, housing prices are spatially correlated, which means that the housing prices of neighboring cities might be closely related even though they have differences in GDP, Population and other economic characteristics. In order to prove this argument, 70 cities are divided into 9 groups according to their geographic location. Next, the model selection test is conducted. The results show that the Fixed Effects Model is statistically more supportive than the Random Effects Model for seven of the nine groups. Since the Fixed Effects Model emphasizes the individual-specific effects (different intercepts), the results confirm the arguments that individual-specific effects cannot be ignored within the same geographic group despite economic differences. Interestingly, it is better to use the Random Effects Model for two groups, Southwest Region and Northwest Region.

However, it is not hard to understand because the cities in those two group not only have the close location but also have the similar GDPs.

1. Northeast China Region (Fixed Effects Model)

**Table 8.13 Results of Fixed Effects Model on North-China Region**

**xtgls Y X1 X2 X3 X4 X5 X6 city2-city8 t panels(corr) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels :Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels  
(0.8627)

Estimated covariance =36

Number of obs =536

Estimated autocorrelations =1

Number of groups =8

Estimated coefficients=15

Time periods=67

Wald chi2(7)=889.43

Prob > chi2 =0

Y	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]
X <sub>1</sub>	0.0096496	0.0166	0.58	0.561	-0.0228851 0.0421843
X <sub>2</sub>	8.258907	0.743194	11.11	0	6.802274 9.71554
X <sub>3</sub>	23.23013	14.88306	1.56	0.119	-5.940119 52.40039
X <sub>4</sub>	-0.0006726	0.000639	-1.05	0.292	-0.0019244 0.0005792
X <sub>5</sub>	0.0366375	0.024187	1.51	0.13	-0.0107674 0.0840425
X <sub>6</sub>	-106.8699	114.8008	-0.93	0.042	-331.8753 118.1355
City2	-1712.943	190.5855	-8.99	0	-2086.483 -1339.402
City3	3687.2	388.042	9.5	0	2926.651 4447.748
City4	3340.777	335.2248	9.97	0	2683.748 3997.805
City5	2210.036	240.4507	9.19	0	1738.761 2681.311
City6	4011.578	366.2576	10.95	0	3293.726 4729.429
City7	104.9652	104.1366	1.01	0.313	-99.13875 309.0692
City8	3749.913	265.0876	14.15	0	3230.351 4269.475
t	63.77763	2.965946	21.5	0	57.96448 69.59078
_cons	-5520.148	613.885	-8.99	0	-6723.34 -4316.955

The results show that Housing Prices(Y) is significantly affected by Population(X<sub>2</sub>), and RGG(X<sub>6</sub>) at the 99% or 90% level. The effect of GDP(X<sub>1</sub>), Housing

Policies( $X_3$ ), M2( $X_4$ ) and Stock Market( $X_5$ ) are not significant.

Why is the coefficient of housing policies not significant? Northeast China Region has been experiencing recession since 2000. When the housing prices in other regions increased very quickly, the housing prices here increased very slowly. As a result, when housing policies came out, the local governments in this region often refuse those policies. As a result, many policies had no influence on housing prices.

Why is GDP insignificant? Although the correlation between GDP and housing prices is significant for all 70 cities as a whole sample, the correlation is not significant for the cities in this region.

## 2. Bohai Rim Region (Fixed Effects Model)

Table 8.14 Results of Fixed Effects Model on Bohai Rim Region

**xtgls Y X1 X2 X3 X4 X5 X6 city2-city9 t panels(cor) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels :Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels  
(0.8416)

Estimated covariance =45

Number of obs =603

Estimated autocorrelations =1

Number of groups =9

Estimated coefficients=16

Time periods=67

Wald chi2(7)=2498.73

Prob > chi2 =0

Y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
X <sub>1</sub>	0.0062424	0.009105	0.69	0.493	-0.0116039 0.0240887
X <sub>2</sub>	19.32339	0.677258	28.53	0	17.99599 20.65079
X <sub>3</sub>	53.94223	16.21	3.33	0.001	22.17121 85.71325
X <sub>4</sub>	0.0000228	0.000668	0.03	0.973	-0.0012856 0.0013313
X <sub>5</sub>	-0.0141827	0.025003	-0.57	0.571	-0.0631868 0.0348213
X <sub>6</sub>	41.40309	92.49603	0.45	0.084	-139.8858 222.692
City2	-6958.897	1259.905	-5.52	0	-9428.266 -4489.529
City3	-3067.813	153.5812	-19.98	0	-3368.826 -2766.799
City4	-8833.393	508.6521	-17.37	0	-9830.333 -7836.453
City5	-2863.58	129.4978	-22.11	0	-3117.391 -2609.769
City6	6130.576	254.6431	24.08	0	5631.485 6629.668
City7	-1553.838	57.40124	-27.07	0	-1666.342 -1441.334
City8	-4118.655	164.4756	-25.04	0	-4441.021 -3796.289
City9	-6936.951	275.8434	-25.15	0	-7477.595 -6396.308
T	52.03886	2.75288	18.9	0	46.64332 57.43441
_cons	-10601.95	489.8593	-21.64	0	-11562.06 -9641.843

The results show that Housing Prices(Y) is significantly affected by Population(X<sub>2</sub>), Housing Policies(X<sub>3</sub>), and RGG(X<sub>6</sub>) at the 99% level or 90% level. The effect of GDP(X<sub>1</sub>), M2(X<sub>4</sub>) and Stock Market(X<sub>5</sub>) are not significant.

Why is GDP insignificant? The reason is the same to Northeast China: although the correlation between GDP and housing prices is significant for all 70 cities as a whole



sample, the correlation is not significant for the cities in this region.

### 3. Central China Region (Fixed Effects Model)

**Table 8.15 Results of Fixed Effects Model on Central-China Region**

**xtgls Y X1 X2 X3 X4 X5 X6 city2-city5 t panels(corr) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels : Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels  
(0.9050)

Estimated covariance =15

Number of obs =335

Estimated autocorrelations =1

Number of groups =5

Estimated coefficients=12

Time periods=67

Wald chi2(7)=717.92

Prob > chi2 =0

Y	Coef.	Std. Err.	z	P> z	[95% Conf.	Interval]
X <sub>1</sub>	0.0403399	0.025822	1.56	0.118	-0.0102703	0.0909501
X <sub>2</sub>	8.740203	0.900536	9.71	0	6.975185	10.50522
X <sub>3</sub>	59.47196	21.16744	2.81	0.005	17.98454	100.9594
X <sub>4</sub>	-0.0001368	0.000525	-0.26	0.794	-0.001166	0.0008924
X <sub>5</sub>	0.0257744	0.020224	1.27	0.202	-0.0138631	0.0654119
X <sub>6</sub>	-141.0427	144.4678	-0.98	0.059	-424.1944	142.109
City2	-1011.843	152.7115	-6.63	0	-1311.152	-712.5343
City3	-519.9831	211.9454	-2.45	0.014	-935.3885	-104.5778
City4	777.4406	321.7971	2.42	0.016	146.73	1408.151
City5	2963.271	397.0344	7.46	0	2185.098	3741.445
t	55.12822	3.135208	17.58	0	48.98333	61.27312
_cons	-4475.581	730.2388	-6.13	0	-5906.823	-3044.34

The results show that Housing Prices(Y) is significantly affected by Population(X<sub>2</sub>), Housing Policies(X<sub>3</sub>), and RGG(X<sub>6</sub>) at the 99% level or 90% level. The effect of GDP(X<sub>1</sub>), M2(X<sub>4</sub>) and Stock Market(X<sub>5</sub>) are not significant.

Why is GDP insignificant? The reason is the same to Northeast China Region: although

the correlation between GDP and housing prices is significant for all 70 cities as a whole sample, the correlation is not significant for the cities in this region.

#### 4.South-central China Region (Fixed Effects Model)

**Table 8.16 Results of Fixed Effects Model on South-Central China Region**

**xtgls Y X1 X2 X3 X4 X5 X6 city2-city12 t panels(corr) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels : Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels (0.9050)

Estimated covariance =78

Number of obs =804

Estimated autocorrelations =1

Number of groups =12

Estimated coefficients=19

Time periods=67

Wald chi2(7)=1187.80

Prob > chi2 =0

Y	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]
X <sub>1</sub>	0.073261	0.011226	6.53	0	0.0512591 0.0952628
X <sub>2</sub>	4.090371	0.296835	13.78	0	3.508585 4.672157
X <sub>3</sub>	39.5198	15.35664	2.57	0.01	9.421336 69.61826
X <sub>4</sub>	-0.0002011	0.000432	-0.47	0.642	-0.0010484 0.0006462
X <sub>5</sub>	0.0131587	0.016611	0.79	0.428	-0.0193988 0.0457163
X <sub>6</sub>	-15.7822	46.12885	-0.34	0.01	-106.1931 74.62868
City2	759.3354	261.9904	2.9	0.004	245.8436 1272.827
City3	-1501.096	287.8496	-5.21	0	-2065.271 -936.9208
City4	-1538.112	335.8615	-4.58	0	-2196.389 -879.8358
City5	-496.83	361.9137	-1.37	0.17	-1206.168 212.5077
City6	-1550.883	337.0973	-4.6	0	-2211.581 -890.1841
City7	-1228.698	360.1125	-3.41	0.001	-1934.506 -522.8907
City8	-2041.198	320.8708	-6.36	0	-2670.093 -1412.303
City9	-800.4689	361.3635	-2.22	0.027	-1508.728 -92.2095
City10	-1156.2	334.2462	-3.46	0.001	-1811.31 -501.0895
City11	-1883.007	382.0034	-4.93	0	-2631.72 -1134.294
City12	-1814.633	370.6143	-4.9	0	-2541.024 -1088.243
t	60.85082	2.396773	25.39	0	56.15323 65.54841
_cons	-279.7389	405.8353	-0.69	0.491	-1075.162 515.6837

The results show that Housing Prices(Y) is significantly affected by GDP(X<sub>1</sub>),

Population( $X_2$ ), Housing Policies( $X_3$ ), and RGG( $X_6$ ) at the 99% level or 90% level. The effect of  $M2(X_4)$  and Stock Market( $X_5$ ) are not significant.

5. Yangtze River Delta Region (Fixed Effects Model)

**Table 8.17 Results of Fixed Effects Model on Yangtze River Delta Region**

**xtgls Y X1 X2 X3 X4 X5 X6 city2-city9 t panels(corr) corr(ar1)**  
 Cross-sectional time-series FGLS regression  
 Coefficients: Generalized least Squares  
 Panels :Heteroskedastic with Cross-sectional correlation  
 Correlation: common AR(1) coefficient for all panels (0.9414)  
 Estimated covariance =45  
 Estimated autocorrelations =1  
 Estimated coefficients=16  
 Number of obs =603  
 Number of groups =9  
 Time periods=67  
 Wald chi2(7)=432.90  
 Prob > chi2 =0

Y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
X <sub>1</sub>	-0.0059841	0.025813	-0.23	0.817	-0.0565771 0.044609
X <sub>2</sub>	9.370445	1.233205	7.6	0	6.953407 11.78748
X <sub>3</sub>	169.2337	26.76105	6.32	0	116.783 221.6844
X <sub>4</sub>	-0.0008751	0.001051	-0.83	0.405	-0.0029348 0.0011847
X <sub>5</sub>	0.0501175	0.040817	1.23	0.22	-0.0298827 0.1301178
X <sub>6</sub>	-46.38316	63.43359	-0.73	0.045	-170.7107 77.94439
City2	625.5107	258.0649	2.42	0.015	119.7127 1131.309
City3	-286.9426	384.9912	-0.75	0.456	-1041.512 467.6263
City4	-338.9069	2048.749	-0.17	0.869	-4354.381 3676.568
City5	-1921.951	452.7781	-4.24	0	-2809.38 -1034.522
City6	-857.5475	593.0024	-1.45	0.148	-2019.811 304.7158
City7	-5662.358	572.1185	-9.9	0	-6783.689 -4541.026
City8	131.9307	515.8666	0.26	0.798	-879.1493 1143.011
City9	524.8131	497.1092	1.06	0.291	-449.5031 1499.129
t	100.7989	8.335147	12.09	0	84.46236 117.1355
_cons	-3234.729	1063.741	-3.04	0.002	-5319.624 -1149.834

The results show that housing prices(Y) is significantly affected by Population( $X_2$ ), Housing Policies( $X_3$ ), and RGG( $X_6$ ) at the 99% level or 95% level. The effect of

GDP( $X_1$ ),  $M_2(X_4)$  and Stock Market( $X_5$ ) are not significant. Why is GDP insignificant?

The reason is the same to Northeast China Region.

### 6. Pearl River Delta Region (Fixed Effects Model)

Fixed effects model

**Table 8.18 Results of Fixed Effects Model on Pearl River Delta Region**  
**xtgls Y X1 X2 X3 X4 X5 X6 city2-city9 t panels(corr) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalized least Squares

Panels : Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels  
 (0.9189)

Estimated covariance =55

Number of obs =670

Estimated autocorrelations =1

Number of groups =10

Estimated coefficients=17

Time periods=67

Wald chi2(7)=696.77

Prob > chi2 =0

Y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
$X_1$	0.0422698	0.019314	2.19	0.029	0.0044149 0.0801248
$X_2$	16.17982	1.304728	12.4	0	13.6226 18.73704
$X_3$	24.95064	47.93793	0.52	0.603	-69.00597 118.9073
$X_4$	-0.0002828	0.000695	-0.41	0.684	-0.0016451 0.0010795
$X_5$	-0.0148077	0.026961	-0.55	0.583	-0.0676495 0.038034
$X_6$	-134.3716	71.4994	-1.88	0.06	-274.5078 5.764662
City2	9230.084	782.442	11.8	0	7696.525 10763.64
City3	-6751.855	857.2399	-7.88	0	-8432.015 -5071.696
City4	5880.967	1423.78	4.13	0	3090.41 8671.524
City5	5423.464	830.2201	6.53	0	3796.262 7050.665
City6	-5690.886	555.6391	-10.24	0	-6779.919 -4601.853
City7	163.2946	710.6658	0.23	0.818	-1229.585 1556.174
City8	-4335.688	560.029	-7.74	0	-5433.324 -3238.051
City9	1230.816	739.464	1.66	0.096	-218.5068 2680.139
City10	13289.38	1075.96	12.35	0	11180.53 15398.22
t	87.31964	5.172923	16.88	0	77.18089 97.45838
_cons	-6439.606	1080.928	-5.96	0	-8558.187 -4321.026

The results show that Housing Prices( $Y$ ) is significantly affected by GDP( $X_1$ ),

Population( $X_2$ ), and RGG( $X_6$ ) at 99% or 90% level. The effect of Housing Policies( $X_3$ ), M2( $X_4$ ) and Stock Market( $X_5$ ) are not significant.

Why is the coefficient of housing policies not significant? Pearl River Delta Region is a highly developed area China. Hence, the housing prices in many cities in this region are supported by the demand to live, not demand to invest. No matter if the housing policies came out, the demand to live can always support the housing prices. This is the reason why housing policies cannot affect housing prices significantly.

### 7. Sichuan-Chongqing Region (Fixed effects model)

**Table 8.20 Results of Random Effects Model on Sichuan-Chongqing Region**  
**xtgls Y X1 X2 X3 X4 X5 X6 city2-city4 t panels(corr) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels :Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels  
(0.8516)

Estimated covariance =10

Number of obs =268

Estimated autocorrelations =1

Number of groups =4

Estimated coefficients=11

Time periods=67

Wald chi2(7)=709.10

Prob > chi2 =0

Y	Coef.	Std. Err.	Z	P> z	[95% Conf. Interval]
X <sub>1</sub>	0.0145608	0.008702	1.67	0.094	-0.002495 0.0316166
X <sub>2</sub>	0.2523392	0.133047	1.9	0.058	-0.0084281 0.5131065
X <sub>3</sub>	9.390067	29.4467	0.32	0.75	-48.3244 67.10453
X <sub>4</sub>	-0.0004591	0.000778	-0.59	0.555	-0.0019843 0.0010661
X <sub>5</sub>	0.0637867	0.029297	2.18	0.029	0.0063663 0.1212072
X <sub>6</sub>	19.08068	72.38976	0.26	0.085	-122.8006 160.962
City2	-312.6817	214.1167	-1.46	0.144	-732.3427 106.9793
City3	305.9166	124.7611	2.45	0.014	61.38928 550.4439
City4	-255.5238	113.4953	-2.25	0.024	-477.9704 -33.07715
T	79.99652	3.370833	23.73	0	73.38981 86.60323
_cons	32.14095	254.2044	0.13	0.899	-466.0906 530.3725

The results show that Housing Prices( $Y$ ) is significantly affected by GDP( $X_1$ ), Population( $X_2$ ), Stock Market( $X_5$ ) and RGG( $X_6$ ) at 99% or 95% level. The effect of Housing Policies( $X_3$ ), M2( $X_4$ ) are not significant.

In all 9 group divided by regions, Sichuan-Chongqing Region is the only one where the coefficient of Stock Market is significant. Furthermore, the coefficient is positive. Chongqing and Sichuan is the most developed area in West China. The medium and big cities in this area are characteristic by a great number of list companies. And the economy of the cities in this area is driven mainly by those list companies. When the stock prices go up, the economy in this area will be very good, then the housing prices will go up. That is the reason why the correlation between stock market and housing market are positive.

#### 8. Southwest China Region (Random effects model)

Table 8.19 Results of Random Effects Model on Southwest-China Region

**xtgls Y X1 X2 X3 X4 X5 X6 t panels(cor) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels :Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels  
(0.8245)

Estimated covariance =28

Number of obs =469

Estimated autocorrelations =1

Number of groups =7

Estimated coefficients=8

Time periods=67

Wald chi2(7)=618.92

Prob > chi2 =0

Y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
X <sub>1</sub>	0.1527708	0.038357	3.98	0	0.0775924 0.2279493
X <sub>2</sub>	0.6451201	0.084733	7.61	0	0.4790458 0.8111945
X <sub>3</sub>	4.945682	21.73405	0.23	0.82	-37.65227 47.54363
X <sub>4</sub>	-0.0001595	0.000903	-0.18	0.86	-0.0019293 0.0016102
X <sub>5</sub>	0.0112436	0.033473	0.34	0.737	-0.054362 0.0768491
X <sub>6</sub>	-85.77822	59.87018	-1.43	0.019	-203.1216 31.56518
t	73.01279	3.368942	21.67	0	66.40978 79.61579
_cons	134.1225	148.3822	0.9	0.366	-156.7013 424.9462

The results show that housing prices(Y) is significantly affected by GDP(X<sub>1</sub>), Population(X<sub>2</sub>), and RGG(X<sub>6</sub>) at 99% or 95% level. The effect of Housing Policies(X<sub>3</sub>), M2(X<sub>4</sub>) and Stock Market(X<sub>5</sub>) are not significant.

Why is the coefficient of housing policies not significant? The reason is the same to Northeast China Region. Southwest China Region is an underdeveloped area in China. When the housing prices in other regions increased very quickly, the housing prices here increased very slowly. As a result, when some housing policies came out, the local governments in this area often refuse to take those policies. As a result, many policies had no influences on housing prices.

9. Northwest China Region (Random effects model)

**Table 8.21 Results of Fixed Effects Model on Northwest-China Region**

**xtgls Y X1 X2 X3 X4 X5 X6 t panels(cor) corr(ar1)**

Cross-sectional time-series FGLS regression

Coefficients: Generalize least Squares

Panels :Heteroskedastic with Cross-sectional correlation

Correlation: common AR(1) coefficient for all panels  
(0.9322)

Estimated covariance =21

Number of obs =402

Estimated autocorrelations =1

Number of groups =6

Estimated coefficients=8

Time periods=67

Wald chi2(7)=271.22

Prob > chi2 =0

Y	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
X <sub>1</sub>	0.0050757	0.026292	0.19	0.847	-0.046455 0.0566064
X <sub>2</sub>	0.8143479	0.264642	3.08	0.002	0.2956586 1.333037
X <sub>3</sub>	35.73762	15.47377	2.31	0.021	5.409577 66.06566
X <sub>4</sub>	-0.0001573	0.000566	-0.28	0.781	-0.0012657 0.0009511
X <sub>5</sub>	0.0229022	0.021836	1.05	0.294	-0.0198952 0.0656995
X <sub>6</sub>	-290.2001	109.6357	-2.65	0.008	-505.0821 -75.31808
t	62.49739	4.112732	15.2	0	54.43658 70.5582
_cons	472.9708	207.3314	2.28	0.023	66.60871 879.333

The results show that housing prices(Y) is significantly affected by Population(X<sub>2</sub>), and RGG(X<sub>6</sub>) at 99% or 95% level. The effect of GDP(X<sub>1</sub>), Housing Policies(X<sub>3</sub>), M2(X<sub>4</sub>) and Stock Market(X<sub>5</sub>) are not significant.

Why is the coefficient of housing policies not significant? The reason is the same to South China Region. Why is GDP insignificant? The reason is the same to Northeast China Region.

#### 8.4.4 R-Square Comparison

In order to show how important income inequality is to housing prices, the fitting degree (R<sup>2</sup>) is checked after the independent variable is removed one by one.

#### 1. Pooled Regression Analysis



**Table 8.24a R<sup>2</sup> Reduction When One Variable is Removed in Pooled Regression Model**

VARIABLES	(1) Y	(2) Y	(3) Y	(4) Y	(5) Y	(6) Y	(7) Y
X1		2.765***	3.706***	3.672***	3.554***	4.221***	3.553***
X2		(0.573)	(0.605)	(0.581)	(0.595)	(0.562)	(0.596)
	(1.168)		(0.525)	(0.521)	(0.493)	(0.544)	(0.495)
X3	2,047***	1,165***		995.7***	1,011***	1,051**	991.6***
	(508.1)	(414.7)		(374.1)	(345.5)	(422.6)	(371.2)
X4	0.0471***	0.0313***	0.0258***		0.0262***	0.0349***	0.0257***
	(0.00498)	(0.00481)	(0.00530)		(0.00582)	(0.00636)	(0.00524)
X5	0.0951	0.0653	0.155***	0.159*		0.101	0.0351
	(0.0737)	(0.0627)	(0.0404)	(0.0804)		(0.0635)	(0.0638)
X6	-15,339***	-8,182***	-7,573***	-8,079***	-7,488***		-7,471***
	(2,333)	(2,446)	(2,309)	(2,254)	(2,206)		(2,222)
Constant	10,325***	6,119***	6,636***	7,280***	6,731***	1,598***	6,652***
	(1,839)	(1,801)	(1,745)	(1,719)	(1,630)	(334.3)	(1,700)
Observations	4,690	4,690	4,690	4,690	4,690	4,690	4,690
R-squared	0.510	0.665	0.677	0.677	0.684	0.453	0.684

By the table above, we could draw another table.

**Table 8.24b R<sup>2</sup> Reduction When One Variable is Removed in Pooled Regression Model**

	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>
R <sup>2</sup> before this variable is removed	0.684	0.684	0.684	0.684	0.684	0.684
R <sup>2</sup> after this variable is removed	0.51	0.665	0.677	0.677	0.684	0.453
How much R <sup>2</sup> drops	0.174	0.019	0.007	0.007	0	0.231

Table 8.24b shows R<sup>2</sup> drops most when RGG is removed(X<sub>6</sub>).

## 2. Fixed Effect Panel Data Analysis

**Table 8.25a R<sup>2</sup> Reduction When One Variable is Removed in Fixed Effects Model**

VARIABLES	(1) Y	(2) Y	(3) Y	(4) Y	(5) Y	(6) Y	(7) Y
X1	2.299*** (0.529)		3.613*** (0.566)	2.317*** (0.537)	2.411*** (0.539)	2.321*** (0.530)	2.485*** (0.467)
X2	12.53*** (2.775)	24.74*** (3.194)		13.16*** (2.749)	12.69*** (2.752)	12.40*** (2.749)	12.93*** (2.638)
X3	560.6** (245.4)	620.5** (240.0)	779.0*** (248.9)		552.4** (246.2)	619.9*** (230.5)	577.0** (265.3)
X4	0.0232*** (0.00331)	0.0300*** (0.00423)	0.0243*** (0.00401)	0.0231*** (0.00334)		0.0241*** (0.00345)	0.0348*** (0.00536)
X5	0.106** (0.0413)	0.187*** (0.0494)	0.0546 (0.0436)	0.174*** (0.0308)	0.160*** (0.0451)		0.198*** (0.0412)
X6	-6,072** (2,549)	-8,040*** (2,311)	-6,525** (2,557)	-6,126** (2,603)	-8,093*** (2,577)	-6,334** (2,515)	
Constant	-2,651 (2,462)	-8,103** (3,121)	4,815*** (1,811)	-3,064 (2,426)	-1,271 (2,484)	-2,211 (2,372)	-7,098*** (1,600)
Observations	4,690	4,690	4,690	4,690	4,690	4,690	4,690
R-squared	0.3347	0.3024	0.6566	0.3215	0.3260	0.3278	0.1967
Number of city	70	70	70	70	70	70	70

By the table above, we could draw another table.

**Table 8.25b R<sup>2</sup> Reduction When One Variable is Removed in Fixed Effects Model**

	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>
R <sup>2</sup> before this variable is removed	0.3347	0.3347	0.3347	0.3347	0.3347	0.3347
R <sup>2</sup> after this variable is removed	0.3024	0.6566	0.3215	0.326	0.3278	0.1967
How much R <sup>2</sup> drops	0.0323	-0.322	0.0132	0.0087	0.0069	0.138

Table 8.25b shows R<sup>2</sup> drops most when RGG(X<sub>6</sub>) is removed.

### 3. Random Effect Panel Data Analysis

**Table 8.26a R<sup>2</sup> Reduction When One Variable is Removed in Random Effects Model**

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
VARIABLES	Y	Y	Y	Y	Y	Y	Y
X1	3.019*** (0.458)		3.584*** (0.565)	3.087*** (0.466)	3.173*** (0.466)	3.032*** (0.460)	3.209*** (0.385)
X2	4.948** (1.997)	16.42*** (3.867)		5.298*** (2.009)	4.765** (1.920)	4.881** (1.971)	5.477*** (2.098)
X3	714.4*** (260.5)	1,003*** (294.9)	788.3*** (252.3)		713.0*** (261.7)	759.2*** (245.2)	729.2*** (281.4)
X4	0.0250*** (0.00335)	0.0385*** (0.00503)	0.0247*** (0.00385)	0.0249*** (0.00343)		0.0256*** (0.00350)	0.0368*** (0.00559)
X5	0.0812** (0.0412)	0.188*** (0.0500)	0.0565 (0.0430)	0.167*** (0.0286)	0.141*** (0.0459)		0.176*** (0.0405)
X6	-6,318** (2,505)	-9,955*** (2,361)	-6,532*** (2,495)	-6,399** (2,574)	-8,433*** (2,559)	-6,510*** (2,468)	
Constant	1,859 (2,335)	-1,891 (3,526)	4,825*** (1,838)	1,599 (2,353)	3,508 (2,391)	2,171 (2,256)	-2,835** (1,241)
R <sup>2</sup>	0.5100	0.4588	0.6571	0.4921	0.4136	0.4125	0.2500
Observations	4,690	4,690	4,690	4,690	4,690	4,690	4,690
Number of city	70	70	70	70	70	70	70

By the table above, we could draw another table.

**Table 8.26b R<sup>2</sup> Reduction When One Variable is Removed in Random Effects Model**

	X <sub>1</sub>	X <sub>2</sub>	X <sub>3</sub>	X <sub>4</sub>	X <sub>5</sub>	X <sub>6</sub>
R <sup>2</sup> before this variable is removed	0.51	0.51	0.51	0.51	0.51	0.51
R <sup>2</sup> after this variable is removed	0.4588	0.6571	0.4921	0.4136	0.4125	0.25
How much R <sup>2</sup> drops	0.0512	-0.147	0.0179	0.0964	0.0975	0.26

Table 8.26b shows R<sup>2</sup> drops most when RGG(X<sub>6</sub>) is removed

In all three models, we find that the fitting degree drops the most when RGG is removed.

This shows that income inequality plays the most import role in housing prices.

## 8.5 Results Summary

To sum up, we have the following results.

No matter the model and no matter the grouping of the 70 cities, the coefficient of RGG, the measure for income inequality, is consistently negative. Since a high RGG

implies severe income inequality, the negative coefficient shows that the correlation between income inequality and housing prices is positive. Precisely, more severe income inequality leads to higher housing prices.

Furthermore, no matter the model and no matter the grouping of the 70 cities, housing prices are always significantly affected by RGG. The positive correlation between income inequality and housing prices is confirmed statistically, which is exactly what is intended to show in this study.

Also, in order to show how important income inequality is to the determination of housing prices, the degree of fit ( $R^2$ ) is checked after the independent variables are removed one by one. In all models, we find that the goodness of fit drops the most when RGG is removed. This again shows that income inequality plays the most important role in housing prices.

Next, when the 70 cities are grouped by their GDPs, model selection testing shows that it is better to use the Random Effects Model than the Fixed Effects Model. When the 70 cities are grouped by region, model selection testing shows that it is better to use the Fixed Effects Model than the Random Effects Model. Since the Fixed Effects Model emphasizes individual features but the Random Effects Model assumes that the individual features are important, the results imply that the individual features are insignificant when the cities with similar GDP are put together. That further implies that the GDP of one city is the unique feature of this city and income inequality might influence housing prices of this city through its GDP. Those results are consistent to our intuition that the same level of income inequality will cause much higher savings in a city

with high GDP than a city with low GDP, and then will lead to much higher housing prices in high-GDP cities compared to low-GDP cities.

Also, the coefficient of RGG is more significant when the 70 cities are grouped by GDP than when 70 cities are grouped by region. The influence of income inequality on housing prices will be similar, and is very evident within the group of cities with the similar GDPs. For the group of different GDPs, the influence will decline as GDPs decline. This is why the coefficient of RGG is more significant when 70 cities are grouped by GDP than that when 70 cities are grouped by region.

Finally, the coefficient of Housing Policies (X3) is positive, which means the enactment of housing policies is correlated with the high housing prices. This result is counterintuitive because the purpose of the housing policies is to suppress housing prices. But this result is reasonable. On one hand, it is the fact that all housing policies could rarely suppress housing prices in past 16 years in China. On the other hand, releasing housing policies was actually a reaction to the rapidly rising housing prices, and terminating housing Policies is a response the stagnant or slightly decreasing housing prices. In other words, when housing prices increased rapidly, the housing policies were enacted but rarely serve to stop the increasing housing prices; when housing prices were stagnant or decreasing slightly for some reason, the housing policies were not enacted or were terminated. As a result, the relationship between housing prices and housing policies is positive.

## **CHAPTER 9: CONCLUSION AND DISCUSSION**

### **9.1 Conclusion**

The conclusion is that all the hypotheses put forward in Chapter 3 are confirmed.

First, at a certain point, a high-income family spends a lower proportion of its income on consumption compared with a low-income family. In other words, the higher the level of a family's income in a society at a certain time point, the lower the proportion of its consumption accounted for in its income.

As a result, severe income inequality will lead to overly-high aggregate savings rate and over-low aggregate consumption rate.

Second, an overly-high aggregate savings rate and overly-low aggregate consumption rate caused by severe income inequality will induce high investment demand in the virtual sector and weak demand in the real sector. As a result, the virtual sector will progress, whereas the real sector will decline.

Third, in the context of a declining real sector, investors prefer houses to other types of assets in the virtual sector owing to unique the features of houses. Thus, housing prices will increase despite the high vacancy rate, the high new construction and the quick sale of houses. Those phenomena are “weird” but can be observed everywhere in current China.

### **9.2 Discussion**

In addition to the factors in the models in Chapter 7, there are also other reasons why do Chinese people prefer houses so much.

### 9.2.1 Cultural Factors

Several scholars attribute the rapidly rising housing prices to Chinese cultural tradition. It is believed that Chinese people love owning houses more deeply than any other nation in the world. Although there is no empirical evidence supporting this claim, some Chinese traditions do play important roles in the housing market.

1. Parents remain central in the marriage decision-making process of their children.

In China, there is a current saying, “Mothers-in-law boost housing markets.” When a boy wishes to marry a girl, the girl’s mother will tell the man, “No house, no marriage!” A house becomes a necessary condition for marriage. Therefore, this tradition will drive housing prices to speed up.

Before 1910, parents in China made the marriage decisions for their children. As the Chinese saying goes, “Marriage is arranged by the order of the parents and the matchmaker's word.” That situation has changed remarkably since 1910. Nowadays, many people independently choose their spouses. However, a considerable proportion of the youth still have marriages arranged by their parents. Furthermore, although many young people independently decide on their marriage, parental suggestions are highly vital to their decision.

As numerous studies have shown, factors that influence parents’ choice about their children’s marriage entirely differ from those that influence their children’s decision about their own marriage. When children make their own choices, they value the potential spouse’s physical appearance, whether the prospect is genuinely in love with them, and whether he/she has the unique capability, personality, potentials, or

achievements they consider attractive. When parents decide for their children, they care if the potential son-in-law or daughter-in-law is currently rich and if he/she has rich parents.

As housing prices are increasing, the number of houses owned becomes the signal whether this person is rich or not. Hence, parents often consider houses as the most important factor for their choice about their children's marriage. Consequently, a boy and his family have to try their utmost to buy a house in order to obtain a "wife" or a "daughter-in-law." Therefore, the cultural tradition of parents making marriage decisions for their children is pushing the housing prices up.

Why do Chinese parents often want to make decisions about their children's marriage? Chinese parents make not only such choices about their children's marriage, but also about which university their children should attend, which major they should study, what kinds of job they should pursue after graduation, when their children should produce a grandchild, and how many grandchildren they should have. This is Chinese culture, which rarely values independent will and personalities of children even when they have become adults.

## 2. Owning a house in a city means settling down in that city.

There is an old saying in China, "Only upon having a comfortable house can you start your enjoyable career!" Ancient China is an agricultural country. Therefore, land, as the most important productive and living factor, has been given foremost value for thousands of years. A family is deemed a settled family only if they own a piece of land and a house. Although China is now a modern country with manufacturing and service industries, Chinese continue to think that owning a house is the most important thing in



life. Hence, a person will likely spend all his/her current savings and future income (via loans) to acquire a house. It is highly popular for many families to spend over 80% of their monthly income on the monthly payment of home loans. That notion is incredible for many families in western countries.

### 3. Homeownership has become a symbol of social status and social class

Owing to the rapid ascent of housing prices, the value of one regular condominium is now equal to 60 years' worth of income of a regular family in most cities in China. This means that most regular families cannot afford a condominium in a city at all. Correspondingly, a family owning such unit will belong to the upper class. Conversely, a family without a condo unit will likely belong to the lower or middle class, no matter how much income this family earns. In order to be a member of upper class, an individual are always trying to buy houses as many as possible and as early as possible.

## **9.2.2 Non-cultural factors**

### 1. Immature Housing Rental Market

China's rental market is immature for the following two reasons.

First, Most condominiums are rented by individual owners. Very few companies own numerous condominiums and lease them to tenants. Given that the demand for rental services is sporadic, it is extremely difficult for an individual owner to provide good rental services to tenants. As the purpose of renting a condominium unit for a tenant is to enjoy satisfactory services from the owner, renting a house is not as good an option as buying a house.

B. The rental right of a tenant is an obligation right, not a property right, according to

current law in China. An obligation right is a relative right, whereas a property right is an absolute one. When tenants only have a relative right, the owner has the privilege to terminate the rental contract at any time before its expiration date. Consequently, it is very possible for a tenant to be evicted from the rental condominiums at any time. Such possibility will cause a tenant to feel extremely insecure. In this situation, tenants will not be allowed, also not motivated to redecorate and rearrange the space, and refurnish the condo. (On the contrary, they would have decorated the condo, arranged the space, and bought good furniture and equipment if they bought the condo.) Then the living quality from a rental condo will be not as good as that from a self-occupied condo.

## 2. Marriage Law

According to the marriage law of the United States and of most European countries, all properties of the husband and wife become common wealth after they get married. Unlike those laws, China's marriage law states that the pre-marriage property of the husband or wife still belongs to the husband and the wife after marriage. Thus, the husband will retain the pre-marriage property if they are divorced in the future. However, it is challenging for the husband or the wife to prove that his/her pre-marriage money belongs to him/her after marriage. Consequently, a reasonable way to prevent such difficulty is to change "cash money" to houses before marriage. Under this law, the parent will buy a house for their children before marriage even if their children already own one or two condominiums and do not need more.

## 3. Continuous inflation

China has been experiencing persistent inflation since 2000. Economists inform us

that real estate is the safest asset against inflation. Consequently, it is very reasonable for a family to invest their money on a house. The more severe the inflation is, the stronger the motivation of a family to buy houses.

#### 4. Long-term persistent quickly rising of housing prices

We know that the strong preference for houses boosts housing prices. However, housing prices also promote the preference for houses, thus continuing the increase in housing prices. When the housing prices are rapidly ascending, the return from investing in houses will be extremely high. Houses become the foremost assets among various kinds of assets. When the house prices have been increasing persistently in the long term, investors will deem houses as low-risk or risk-free assets. Consequently, they will continue to spend much more money on houses, which will further boost housing prices.

#### 5. Fake Divorce

As stated, the purchase constraint policy in Shanghai include the following.

1) One HUKOU family in Shanghai can buy a maximum of two new houses after the policy came out on January 31, 2011. Such family cannot buy a third house.

“HUKOU” is a unique demographical or political term in China. Although some scholars translate it to “registration” or “local citizenship,” it differs from both terms. An individual or family with HUKOU of a specific city enjoys many privileges in that city, which an individual or family without HUKOU does not. Those privileges include house purchase, vehicle registration, school enrollment, and medical and pension insurance. A family with HUKOU (HUKOU family) is the authentic resident family, while a family without HUKOU (Non-HUKOU family) is always considered the floating family in the

city.

According to the purchase constraint policy, “one family” is defined as “husband and wife” or “husband, wife, and their children under 18 years.” If one young couple still lives with the wife’s or husband’s parents in one condo, they will be seen as two families. An adult who is unmarried, or divorced, or a widow or widower, will be seen as an individual even if he/she lives with his/her children under 18 years. A couple living with their adult child will be considered as a family and one individual. An individual living with their adult child will be seen as two individuals.

2) A HUKOU individual can only buy one new house after the enactment of the policy. He/she cannot buy a second house.

3) One non-HUKOU individual or one family that has worked and paid social insurance in the city for five consecutive years or more can only buy one new house after the policy came out. They cannot buy a second home.

It is not hard to find out the big loophole in this policy. Given that one HUKOU individual can always buy a new house, one couple who already owns two houses can develop a “strategy” to buy a third house. The strategy has three steps.

Step 1: The husband gives his house to his wife (or his wife gives her house to the husband). According to the current law in China, this behavior is entirely tax free. Afterwards, they can get divorced. Thus, the wife owns all the properties, but the husband owns nothing.

Step 2: The man buys a new house because he eligible to do so.

Step 3: After the transaction is finished and the man acquires the property title, they

get remarried. Then, they own a new house (the third house).

Notice that the strategy could be repeated if this couple wants a fourth house. Furthermore, they could repeat the strategy to obtain a fifth house. In fact, we have the following formula: One-time Divorce = One More House.

In reality, even if one HUKOU family only owns one house and is eligible for buying a second one, the couple will still choose to divorce. The reason for that is because the house they buy will be seen as the first home by government if they divorce. Nevertheless, the house they buy will be the second one if they do not divorce. A major difference exists between “the first house” and “the second house.” Compared with the second houses, buyers will have the following advantages if the house he/she buys is the FIRST house.

First, the contract tax will be reduced to 1.5% (3% for the second house).

Second, the down payment is 30% (70% for the second house).

Third, the interest rate of the loan will be reduced to 90% of the benchmark lending rate (1.1 times the benchmark lending rate).

Fourth, no property tax will be charged. Thus, for the second house, annual property tax = the appraisal value $\times$ 70% $\times$ 0.6%.

Consequently, the couple will choose to divorce in order to ensure that the house they want to buy will be their first house. Then, they will save much from the contract tax, interest rate, and property tax. They can also borrow much more money to buy the house from the bank.

## 6. Fake marriage

What should an single person with HUKOU do when he owns one house and wants a second house? The only way that he could buy the second house is through a fake marriage. The strategy is as follows:

Step 1: Find a woman who would like to enter into a fake marriage with him. After they marry, their “family” owns one house, so this family is eligible to buy a second one.

Step 2: Buy the second house.

Step 3: Get divorced. Based on the marital settlement agreement, the man will keep both houses. To thank the woman, the man will pay her a fee.

## **9.3 Consequences of Housing Bubble Caused by Income Inequality**

### **9.3.1 Consequences for Built Environment**

1. Housing overdevelopment will cause loss and misallocation of resources, including land, construction material, building equipment, labor, and capital.

Products can provide individuals with the utility/satisfaction only if they are consumed by those individuals. Quickly rising housing prices result in housing overdevelopment, suggesting that a considerable number of buildings are constructed but never “consumed.” As a consequence, substantial resources such as land, construction material, building equipment, labor, and capital are wasted. Those resources could have been used to generate useful products or services that could have been used in other economic sectors.

2. Housing overdevelopment will lead to low quality of properties, including improper planning, unsound design in functions and arts, high energy consumption, and

low construction quality. Furthermore, those problems are shared by both high-level or expensive housing properties and low-level or cheap properties.

“The quality of buildings developed in [the] past 10 years is very worrying. Many housing projects are severely short of supporting facilities, the design is improper, the construction quality is very low, let alone the environment-friendly requirement. But it is very weird that the quality is very low while the price is quickly rising up.”<sup>118</sup> “Due to the erroneous planning and low quality, the average life of buildings in China is only 30 years,” claimed by Baoxing Qiu, the Vice Minister of the Ministry of Housing and Urban-Rural Development of the People's Republic of China, in 2011<sup>119</sup>.

It is a basic principle in economics that both low price and high-quality of products inherently come from intense competition between firms, especially in a buyer's market. Skyrocketing housing prices indicate a strong demand for buildings and a seller's market. When buyers are scrambling for condominiums and new condominiums can always be sold at a good price, whether the quality is good or bad, housing developers hardly have incentives to improve the quality of the property.

3. Housing overdevelopment will lead to high economic cost and significant harm to the environment. When low-quality buildings are removed, removing the buildings and recovering the land use also require enormous amounts of labor and money. Moreover, removing the buildings will generate considerable construction waste and dust, which are extremely harmful to the environment.

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<sup>118</sup> <http://house.ifeng.com/column/news/jianzhushouming/index.shtml>

<sup>119</sup> <http://house.ifeng.com/column/news/jianzhushouming/index.shtml>

### 9.3.2 Consequences for the Economy

1. Housing bubbles will lead to the instability of the financial system.

2. Housing bubbles will not only make the funds not to enter the real economy, but also stimulate the funds to escape from the weak economy. In the short run, weak real economy will result in high unemployment and low economic growth. In the long run, weak real economy will reduce the whole country's economic strength, innovation ability, and will drive the country into recession and depression.

3. Housing Bubbles will result in “**Income Distribution Trap**”.

The trouble that developing countries encounter owing to the polarization of income should be named “**Income Distribution Trap.**” It differs from “Middle Income Trap” and “Inequality Trap,” although some connections exist among them.

In the history of development economics, various scholars have emphasized the policy that upgrades capital accumulation on developing countries. However, when a country falls into the “Income Distribution Trap,” greater capital accelerates the recessed consumer market and further overheats the asset market. The same holds for foreign exchange, which has been emphasized by certain scholars because it can be used to purchase machinery and technology from foreign countries that developing countries urgently need.

Some scholars value the policies with the purpose of offering credit and technology support to enterprises in a substantial economy. However, these measurements not only fail to help enterprises rise above the predicament, but also further deteriorate the situation because only the productivity of the enterprises can be improved. The extreme



shortage in enterprises in substantial economy involves strong market demand rather than high productivity.

Certain scholars believed in the policy that cultivates human capital because such capital is of importance to the progress of developing countries aside from its physical capital. However, enterprises do not require high human capital and are unwilling to conduct human capital investment because of the lack of market demand in the “income distribution trap.” In this case, is it still useful to improve human capital?

Some scholars highlight policy that could accelerate the industrialization process in developing countries. Industrialization is certainly an inevitable path for most of these countries. However, if a country falls into the trap after stepping into industrialization, its industrialization process can no longer continue because its consumer market would be under persistent recession.

The policy of international trade advocated by other scholars is significant to countries caught in the trap, because international trade, especially export, can effectively support a consumer market in recession when domestic demand is insufficient. However, international trade fails to alleviate the recession of the consumer market if the consumption department lacks export competitiveness or the export competitiveness disappears due to lost comparative advantage in international trade.

4. Housing Bubble will deepen income inequality. Housing bubbles make the demand for consumption goods and production factors further decline. The declining real economy will reduce the income of the working class, and thus deepen income inequality.

In summary, only the policy that could decrease income inequality will be crucial to fix the problems faced by those countries. In other words, polarization of income and wealth over-concentration are not only the results of existing economic problems in developing countries, such as real estate overdevelopment and quickly rising real estate prices, but also the main, probably the most, crucial causes of a host of new, complicated, and dangerous economic problems. Therefore, the fair distribution of income is not only the goal for national welfare, but also the imperative condition that guarantees the development of a country.

## **9.4 Innovations**

1. Finding an economic relationship between income level and propensity to consume.
2. Establishing a new measure as a substitute for Gini Coefficient.
3. Revealing a unique feature of houses and explaining why this feature makes houses be a special asset preferred by high savings.

## **9.5 Contributions**

### **9.5.1 Theoretical Level**

1. Providing empirical evidences that soaring-up housing prices are positive related to income inequality.
2. Adding a new explanation for housing bubbles by uncovering the linkage from income inequality to the housing bubble

Three primary explanations for housing bubbles are extant in literature: rational expectation, irrational or psychological factors, and stimulating housing policies. Very few studies have connected housing bubbles with income inequality and examined the

relation between them. This dissertation would uncover the inherent linkage between income inequality and the housing bubble. As a result, a new reason for housing bubbles might be identified, namely, income inequality.

3. Showing a novel channel through which income inequality will damage the sustainability of economic growth in developing and developed countries, thus highlighting the importance of income inequality in developing economics and economic growth theories.

Apart from the overheated housing market, severe income inequality also results in a weak consumption market and recessive real sector in a country. The risk of the financial market accumulates while the productivity and the competitive capacity of such country decrease. Finally, the economy would become more unstable and unsustainable. In my opinion, the challenge that developing countries encounter because of the polarization of income should be called “Income Distribution Trap.”

Numerous scholars emphasize the importance of industrialization, capital accumulation, human capital, technological innovations, and international trade to the economic growth of countries. However, all those will be rendered ineffective when a country falls into the Income Distribution Trap. Therefore, this dissertation shows that the fair distribution of income is not only the national welfare goal but also the imperative condition that guarantees the healthy housing market, the stable finance market, and the sustainable economic growth of a country.

Those listed items are possible theoretical innovations in the field of economics, finance, and real estate development. Thus, this work has intellectual merit in those

fields.

### **9.5.2 Practical Level**

1. Highlighting the negative consequences for built environment and providing the professionals in this field with original thoughts to deal with the issues

In addition, my project would also reveal the consequences of housing bubbles for planning, design, and the built environment. In the field of economics and finance, the instability in the finance system, the risk to the entire national economy, and the unfair wealth redistribution are regarded as the entire aftermath caused by housing bubbles. According to my studies, such aftermath should also include (a) loss and misallocation of resources, including land, construction material, building equipment, labor, and capital; (b) low quality of properties, including improper planning, unsound design in functions and arts, high energy consumption, and low construction quality; and (c) substantial harm to the environment. This is also a possible innovation in the field of PDBE, and thus has intellectual merit in this field.

2. Offering developing countries the policy advice to avoid or emerge from the “Income Inequality Trap” and warning developed nations of this problem.

Therefore, if this research is completely successful, it will deepen the understanding in academic circles about income inequality and housing bubbles. It shall also add novel ideas about housing overdevelopment and other problems in planning, design, and the built environment to practitioners. Furthermore, it would remind the policy-makers to consider income distribution when they draft policies tackling problems such as low-quality housing buildings, housing overdevelopment, housing bubble, finance market

instability, and unsustainable economic growth in China. Given that numerous countries, including the US, have been experiencing increasing income inequality and the housing bubble, this research will also have a bearing on the policy-making process in other countries.

## **9.6 Limitations**

1. Correlation is not causation. I also faced this same problem encountered by economics studies.

2. After income inequality is proved to be a crucial determinant for quickly rising housing prices and housing overdevelopment, it remains unclear how important it is compared with rational expectation, psychological factors, and relevant policies.

3. Similar to severe income inequality, perfect income equality and the efforts to pursue the perfect income equality can also be very harmful to the entire economy. An optimal state between absolute income inequality and perfect income equality must exist. This research has not cast light on this optimal level.

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