Czech University of Life Sciences Prague

Faculty of Economics and Management

Department of Economics

The House Affordability Problem for Relatively Low-income Households in Shenzhen

© 2016 CULS Prague

CZECH UNIVERSITY OF LIFE SCIENCES PRAGUE

Faculty of Economics and Management

DIPLOMA THESIS ASSIGNMENT

Zihao Luo

Economics and Management

Thesis title

House affordability problem for relatively low income households in Shenzhen

---

Objectives of thesis

From a traditional culture view, house should be an essential part for normal Chinese. The property price in Shenzhen, China is great increasing these years. On the contrary, the wages' growth is not increase as same pace as property price. The low-income households, which have relatively low income, comparing to other groups, will face more financial pressures to afford a house. The reason why we focus on relatively low-income households is because they are more vulnerable in front of escalating house price. As constituted 40% of our population, the relatively low-income household should be carefully considered. Will they face unaffordable house prices? How unaffordable it is? Why it happens? How government solve it.

This study aims to use timely data to analyze the house affordability of relatively low-income household in Shenzhen and then compares the house affordability within different years to see the trend. Moreover, to make sure the results we get are scientific; this paper will choose four measurements to calculate the affordability. In the end of this study, author will try to explain the results and give some recommendations based on present policy.

Methodology

It is an empirical study aims to reveal the house affordability for relatively low-income household in Shenzhen.

To get the results, our study will mainly employed secondary resource tools to collect all the data. The sources are mainly from governmental document, such as Shenzhen statistic Yearbook, etc. As for the analysis process, this researcher uses four approaches to reach target groups' real affordability and then explain the results. The four approaches are income to price ration (IPR), the affordable size approach, the expenditure to income ratio (EIR) and the residual income measurement.

In term of our target group, we will focus on the relatively low-income household in Shenzhen. Specificity, they are lowest income group, low-income household, and medium low-income household, which constitute 10%, 10% and 20% respectively of population in Shenzhen. All the data we collected are arranged from 2005 to 2013.

The proposed extent of the thesis

60 pages

Keywords

House Affordability, Relatively low-income households, Real Industry Market.

Recommended information sources

Alain Bertaud, 2009, Housing Affordability in China; A Stock and Flow Approach, China Planning Network (CPN)

Eve Oleta Cary, 2011 Explaining Overheating in China through Institutional Analysis (1992–2010),Asian Survey, Vol. 51, No. 3 (May/June 2011), pp. 540-558

K.E.Hancock, 1993, Can Pay? Won't Pay? or Economic Principles of Affordability,Urban Studies, Vol, 30.No.1. 1993 127-145

Mark Duda, Xiulan Zhang, and Mingzhu Dong, 2005, China's Homeownership-Oriented Housing Policy: An Examination of Two Programs Using Survey Data from Beijing, Joint Center for Housing Studies Harvard University

Michael E. Stone, 2006, What Is Housing Affordability? The Case for the Residual Income Approach, University of Massachusetts–Boston

---

Expected date of thesis defence

2015/16 SS – FEM

The Diploma Thesis Supervisor

Ing. Petr Procházka, Ph.D., MSc

Supervising department

Department of Economics

Electronic approval: 9. 3. 2016

prof. Ing. Miroslav Svatoš, CSc.

Head of department

Electronic approval: 9. 3. 2016

Ing. Martin Pelikán, Ph.D.

Dean

Prague on 09. 03. 2016

DECLARATION

I declare that I have worked on my diploma thesis titled " The House Affordability Problem for Relatively Low-income Households in Shenzhen" by myself and I have used only the sources mentioned at the end of the thesis. As the author of the diploma thesis, I declare that the thesis does not break copyrights of any their person.

In Prague on 10 March, 2014

_____

Luo Zihao

ACKNOWLEDGEMENT

I would like to sincerely thank to my supervisor Ing. Petr Prochazka, for his valuable guidance, constructive criticism, hearted support and continuous encouragement during my study. Without his professional guidance and hearted support, my diploma thesis would not be completed.

Thanks to the teachers at the Faculty of Economics and Management: Ing. Boučková Bohuslava, Prof. Mansoor, Ph.D. Tomas Maier, and the teachers in summer school and blocks: Ph.D. Thomas Martin, Prof. Joan Harvey, Prof. Eamon Lenihan, who have instructed and helped me a lot in the past two years.

Special thanks to Ph.D. Vlastimil Černý，Ing. Oldrich Vylupek, Ing. Daniel Dědina. Professor Zuo Ting, and Dr. Tang Lixia. Without their favoring cooperation between Czech University of Life Science and China Agriculture University, it is impossible for me to study in Prague and gain such an amazing experience.

I also owe my sincere gratitude to my friends and my classmates I met in Prague for introducing me different lifestyles and thinking patterns. Thanks for Fangqi Ye, Nguyen Thuy Dung, Marika Schimonova who keep caring about me, listening to me and encouraging me to embrace a new life. Many thanks to Mr. Qin yupeng and Ms. Li Xialin’s accompany. Hope all of you keep positive attitudes and enjoy everyday of your life.

Deep thanks and warm heart are given to my family for their unconditional support, encourage and love.

Prague shows what a wonderful world we have. My studying life is clearly the most precious time in my life.

ABSTRACT

The escalating housing price in Shenzhen becomes a common problem for every household. The relatively low-income households, comparing to high-income households, are more vulnerable and under more financial pressures to afford their dwellings.

To quantify the housing affordable problems, this research employs four approaches, including revised “Housing Price to Income Ratio” approach (PIR), “Affordable House Sizes” approach, revised “Housing Expenditure to Income Ratio” approach (HEIR) and “Residual Income Measure”. The results of PIR ratios are arrange from 10 to 30, which means the house price is 10 to 30 times larger than relatively low-income households’ average annual incomes. The results of affordable house size approach shows our target, relatively low-income household, could only afford around 10 square meters. HEIR ratio said the monthly housing costs are higher than their monthly income. From the residual income measure’s view, the low-income households cannot afford a house; otherwise they will scarify their basic living quality. To explain housing affordable problems, the rapid urbanization, imbalance of demand and supply, speculative investment and culture influences might be the possible causes. The recommendations are differentiating the mortgage loans and developing more affordable house programs.

Keywords: House Affordability Problems, Relatively low-income households, Real Industry Market in Shenzhen.

ABSTRAKT

Stupňující se krize na shenzenském trhu s realitami se stává problémem pro běžné domácnosti. Domácnosti s relativně nízkým příjmem jsou v porovnání s domácnostmi s relativně vyšším příjmem více náchylné a finanční tlak způsobuje to, že si nemohou dovolit své bydlení. K výzkumu otázky finančně dostupného bydlení jsou v této práci použity čtyři koncepce: revidovaný poměr ceny bydlení/příjmu (housing price to income ratio, PIR), index velikosti dostupného bydlení (affordable house size approach), revidovaný poměr nákladů na bydlení/příjmů (housing expenditure to income ratio, HEIR) a metoda reziduálního příjmu (residual income measure). Výsledné hodnoty PIR se pohybovaly mezi 10 a 30, což ukázalo, že cena bydlení je desetkrát vyšší než průměrný roční příjem nízkopříjmových skupin. Výskedky míry velikosti dostupného bydlení potvrdily předpoklad, že domácnosti s nízkým příjmem si mohou dovolit jen 10 m2. Metoda HEIR ukázala, že měsíční náklady na bydlení jsou vyšší než měsíční příjmy nízkopříjmových domácností. Metoda reziduálního příjmu dokázala, že nízkopříjmové domácnosti si nemohou dovolit vlastní domov z důvodu ohrožení pokrytí svých bazálních potřeb. Tento výzkum vysvětluje problematiku dostupnosti bydlení v Shenzenu rychlou urbanizací, nerovnováha mezi nabídkou a poptávkou spekulativní investice a kulturní vlivy. Doporučení srovnává možnost řešení krize hypotečními úvěry a vytvořením více programů dostupného bydlení.

Klíčová slova: problematika dostupnosti bydlení, relativně nízkopříjmové domácnosti, trh s nemovitostmi v Shenzenu

TABLEB OF CONTENT

LIST OF FIGURES

LIST OF TABLES

1. Introduction

From a traditional culture's view, property is an essential part for every Chinese household. In China, real estate industry now is one of the most popular industries and hot-debate issue. Some voices believe that it is an important cause for over-heated economy. For instance, the average house price in Shenzhen has grown 7 times from 5000 RMB/m^2 to 38927RMB/m^2 from 2005 to 2015. To response, Chinese government used policy tools to cool down the market, but the results were not always satisfied.

On the contrary, the average wages' growth is not the same pace as the property, thus many households face affordable house problems. More specifically, the relatively low-income households will be more vulnerable in front of escalating house price. Because they are under more financial pressures to afford a house. Thus, this study will try to reveal the low-income households' house affordability status in Shenzhen.

2. Objectives and Methodology

2.1 Objectives

As constituted 40% of our population, the relatively low-income household should be carefully considered. Will they face affordable housing problems? How is it? Why it happens? And how government solve it?

This study aims to use timely data to analyse the house affordability of relatively low-income household in Shenzhen. In addition, author will compares the house affordability within different years to find the trend. Specifically, in this research, author will employ four approaches to quantify the affordable housing problems and analyze the possible causes. In the end of this research, author will give recommendations based on the research results and present policy.

2.2 Methodology

This is an empirical study aiming to reveal the house affordability for relatively low-income households in Shenzhen. To get the results, this study will mainly employed secondary sources as the main study and analysis tools to collect all the data we need. The sources are mainly from governmental document, such as Shenzhen Statistic Yearbook. All the data we collected are arranged from 2005 to 2013.

As for the analysis process, this research employ four approaches as another important methodological tools to quantify the real house affordability levels and explain them in a scientific way. More specifically, the four approaches are income to price ration approach (IPR), the affordable size approach, the expenditure to income ratio approach (EIR) and the residual income measurement (RIM).

In term of our target group, we will focus on the relatively low-income household in Shenzhen. Specificity, they are lowest income households, low-income households, and medium low-income households, which constitute 10%, 10% and 20% respectively of population in Shenzhen.

3. Theoretical Part

3.1 Real Estate Market in China

In This part, author will review the studies related with the escalating housing price and the real estate bubble. In addition, the basic information of the house market will also be introduced.

3.1.1 Escalating Housing Price and Real Estate Bubble in China

Case and Shiller (2004)[1] think that the more and more expectations of house price increases from homebuyers lead to the price temporarily elevated. Homebuyer will still possible to purchase for they think that, although the present price is high, the future value will increase which they will be compensated from that.

To shed light on whether "Bubble exist", as far as I know, all the scholars tested and verified their hypothesis by their own methods, and some of them think there do exist bubble in Chinese real estate market. Wang XiaoGuang (2004)[2] calculated Price to Income ration in metropolitans such as Beijing, Shanghai, he pointed out that all PI rations are over 8, which means residences can severely afford a house.

---

[1] Karle.E.Case, Robert.J.Shiller, (2004) Is There a Bubble in the Housing Market? , Cowles Foundation Paper No. 1089

[2] Wang xiaoguang, 2004, Real estate should no longer irrational exuberance, Outlook, Issued 2004.No.5 (in Chinese)

On the contrary, there is another voice said that the high demand is the real reason behind the escalating house price. Ren ZhiQiang (2004)3 criticized that the increasing demand lead to elevated prices, for that the empty house rate in China is decreasing. In addition, Hu JianYin (2006) agreed this statement. After verified through his econometric modeling, he found that the house price is determined by market, the bubble account no more than 10% of the present price.

Here comes a question that why do bubble or escalating price happens? Yang Fan (2005), and Lu Ping, Li HongMei (2004)[4] hold the idea that the increasing speculative capital flow into China, which invest into real estate market. In addition, Jiang ChunMing (2005)[5] said that the increasing price was mainly resulted from real estate suppliers. They hold loads of land but seldom sold the houses. In another words, they are supply less than demand on purpose in order to increase the price. The other interest group, such as local government and commercial bank admit these kinds of behaviors to protect their own profits.

As the high price is no-doubt reality, trying to find the solution is a task for every residence in China.

From the supply side, establishing related law to keep the normal supply of house, let it be a completed competitive market. In the same time, government should pay more attention to vulnerable groups such have

---

[3] Ren zhiqiang, (2004), “Central wanted to split the real estate risk", Beijing Morning Newspaper, October 20, 2004

[4] Li Ping, Li HongMei, (2004) "Speculative capital, local inflation and the real estate bubble", "China real estate" 2004, No.7

[5] Jiang Chunming, (2005), "An Empirical Analysis of China's real estate market speculative bubble", Management World, 2005, Issued. 12

relatively low-income, supply some affordable houses, to meet their basic needs.

From the demand side, government could consider take some measures, such as increase house purchase tax and transfer tax, increase down payment, etc. Those measures will increase the investment cost for speculative investor.

Another interest point is that Case and Shiller (2004) think that. The notion of real estate bubble is relied on how homebuyer's thoughts are. With more expectations, the future price will increase. With less expectation, the price will fall.

There are some non-economic contributors, there is an important factors named Hukou[6]. It is only exist in China, which is similar with green card in U.S.A. What kinds of Hukou you have determines which kind of medicine resource and education resource you acquire. In China, there is only metropolitans equip better education and health care.

Another non-economic contributes are grey income. According to economics Xie GuoZhong (2004)[7]'s study, there are huge scales of grey income in China, almost account 10% of GDP. And most of them are invested in Tier 1 and Tier 2 cities real estate market. The normalization of grey incomes in China feeds the property bubble in the long run.

---

[6] Note: A hukou is a record in the system of household registration required by law in China and Taiwan. The system itself is more properly called "huji", and has origins in ancient China.

[7] Xie Guo Zhong, Personal blog, http://xieguozhong.blog.sohu.com/

3.1.2 **Three category of Chinese real estate market**

There are three categories about Chinese real estate market.

1) Primary Market

The primary market also is known as primary land market, Land use right transfer market. Government exquisite the urban or rural collective-owned land, transferring them into state-owned land, then sell them to homebuyers. The primary real estate market is monopolized by state.

In the primary market, the state as the landowner is the core player in this market. The monopolization gives states rights to first requisition the land and compensates residence at the market level price. Moreover, state also monopolized demolition market. Government has ability to demolition. Demolition means for the goals of development, government renews some buildings or relocated them.

2) Real Estate Secondly Market

This market means in this market, the use right owner, also known as the home seller, sell or lease the property to homebuyers after construction.

For a real estate secondary market, once the investment transactions more than a particular level, the house price will increase. However, once they less than another level, lead the house markets go down. According to some surveys, there are many foreign capital flows into Chinese real estate market; there is more than 50 per cent of real estate agencies are from foreign direct investment[8].

[8] Source from Baidu baike. Baike.com

3) Tertiary Market

The players in this market are usually individuals and companies. In this market, they could sell their property again freely. In another word, the property will be sold again in this market.

Recent years it shows that secondary and tertiary markets are connected together. Both of them are the process of social resources integration. The major question for them is how to effectively integrate. Specifically, it requires a combination of carefully study and various social resources, including government policy, corporate capital investment, bank loans and other efforts to promote the stock of housing market.

For the real estate agency, work with the well-known construction companies, can ease the pressure caused by a bad market environment. At the same time, they have to improve the quality of personnel and normative level of the enterprise.

3.1.3 The Current situation of Real Estate industry

According to national statistics, the volume of selling stabilized fell and it estimated annual real estate transactions will over 7 trillion this year.

By the first half of 2014, without any new regulatory policies, the real estate industry showed sluggish trend. The national commercial housing transactions continued to decline, and the decline rates increasing from January to May.

In order to promote sales and reduce inventory, the housing prices began to loosen. The new commercial housing prices in 70 cities were decline by 0.2 per cent in May, which is first drop after 23 months June 2012. The developer

use not only lower prices but also take a variety of promotions to stimulate sales.

The accumulated demand of buyers from recent months started to release in June. National statistic bureau site shows that from January to June, the national real estate sales area reached 483.65 million square meters, 6.0% less than previous month. Residential house sales area fell 7.8 percent, decline 1.4% over the previous. Commercial housing sales 3.1133 trillion Yuan, goes down 6.7 percent[9].

3.2 **Study Area**

Before we start analysis, it is necessary to study the basic information of the real estate market in Shenzhen, and the background of low- income households there.

3.2.1 **Geographic and demographic background**

Shenzhen is the first special economic zone in China, which was established by the De Xiaoping in 1980. After no more than four decades, Shenzhen has grown into a modern metropolitan. It the typical city accomplish industrialization, urbanization and modernization[10]. As shown in the following map, Shenzhen located near the South China Sea is one of the most popular cities in the world.

[9] Source from: China National Statistic Bureau. http://www.stats.gov.cn/

[10] http://english.sz.gov.cn/gi/

Figure1: The Map of Shenzhen

Source from http://www.chinahighlights.com/shenzhen/map.htm

According to the Shenzhen government report for 2014, Shenzhen had a residence of 10,628,900, and 848,300 populations have HuKou[11]. Shenzhen is located in the Pearl River Delta, bordering Hong Kong to the south, Huizhou to the north and northeast, Dong Guan to the north and northwest. Lingding Yang and Pearl River to the west and Mirs Bay to the east. The municipality covers an area of 1,991.64 square kilometres, including urban and rural areas. It makes part of Pearl Delta River Mega City built-up area. The city is elongated measuring 81.4 kilometres from east to west while the shortest section from north to south is 10.8 kilometers[12].

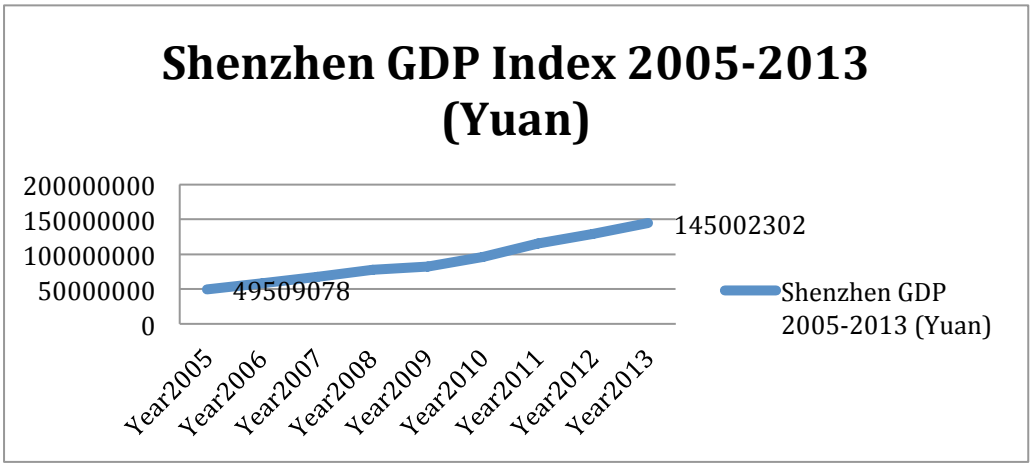
[11] A hukou is a record in the system of household registration required by law in China and Taiwan. The system itself is more properly called "huji", and has origins in ancient China.

[12] Source from: http://www.topchinatravel.com/shenzhen/shenzhen-facts.htm

3.2.2 Economical background and Inhabitant disposable income level

Shenzhen is known as China's Silicon Valley. According to the City Competitiveness Blue Book unveiled by the Chinese Academy of Social Sciences, Shenzhen ranked the most competitive cities in 2014[13]

Figure 2: Shenzhen GDP index from 2005 to 2013.



Source: Author's compilation based on information exacted from Shenzhen Statistics Yearbook

According to Graph 2, GDP was around 49 million in year of 2005, grows round 200% more, soaring to 145million in year of 2013, which ranks NO.4 among all the cities in China.

Such outstanding economic performances are results in all the hardworking inhabitants there. Accompanied with more employment opportunities and the relatively high-income level, Shenzhen attracts thousands of migrants to move there. Following graph is the disposable income level in Shenzhen.

[13] http://www.chinadaily.com.cn/regional/2015-06/03/content_20930739.htm

Table 1: Monthly disposable income index

Year	Average Persons per Household	Per Capita Monthly Disposable Income (Yuan)	Per Household Monthly Disposable Income (Yuan)
2005	3.35	1791	5999.85
2006	3.33	1880	6260.4
2007	3.29	2025	6662.25
2008	3.25	2227	7237.75
2009	3.24	2437	7895.88
2010	3.22	2698	8687.56
2011	3.15	3042	9582.3
2012	3.21	3395	10897.95
2013	3.19	3721	11869.99

Source: Author's compilation based on information exacted from Shenzhen Statistics Yearbook.

Shenzhen is a young city with the average age of its population at around 30 years old. The average Persons per Household in Shenzhen are amazingly small that are stable within 3.1-3.4 (persons) during recent 10 years. According to Shenzhen Statistics Yearbook, the average household monthly disposable income doubles during recent 10 years, from around 6,000 Yuan in the year of 2005, increase to around 12,000 Yuan in 2013.

Table 2. Minimum Living Guarantees per Year in Shenzhen（Yuan）

Year	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
X (Yuan)	4128	4332	4332	4980	4980	5400	6120	6720	6720	7440	9600

Note: X=Minimum Living Guarantees per year in Shenzhen (Yuan)

Figure 3: Minimum Living Guarantees per year in Shenzhen (Yuan).

Source: Author's compilation based on information exacted from http://www.szmz.sz.gov.cn/xxgk/ywxx/dbfw/bmxx/

As it shows in the graph and table above, the minimum living guarantee per year in Shenzhen was 4128 Yuan per capital per year, after 10 years growth, it reaches 9600 Yuan per year in the year of 2015. This study will employ these data in the later calculations.

3.2.3 Shenzhen Housing Provision and Characteristics

The commercialized building in Shenzhen composed by 5 categories, include Residential building, Office building, Houses for business Use and Others. The details are as following table

Table 3: Total Floor Space of Commercial Buildings for Sale, 2005-2013

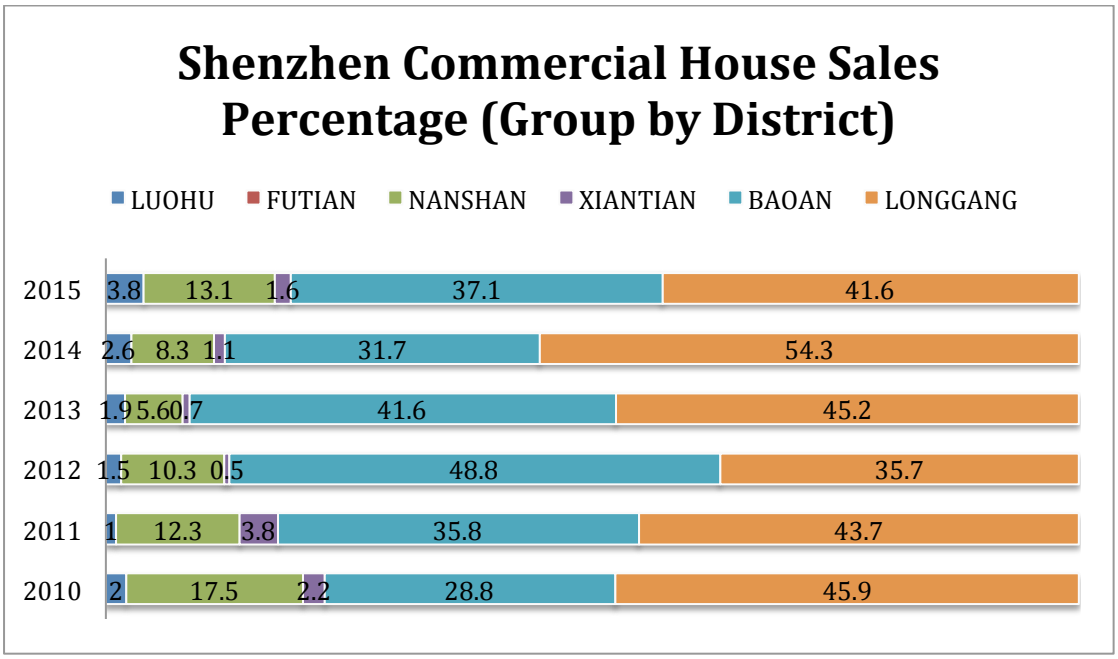
（Grouped by Usage） (10,000 Square meter)

Year	Residential Buildings	Office Buildings	Houses For Business Use	Other	Total Floor space of Commercial Buildings	The Percentage of Residential building
2005	90.24	14.38	63.44	23.45	191.51	47%
2006	69.63	23.98	66.41	25.39	185.41	38%
2007	58.92	15.81	55.30	22.33	152.36	39%
2008	121.17	15.02	69.22	26.17	231.58	52%
2009	63.60	15.41	49.56	13.07	141.64	45%
2010	53.15	9.00	51.82	20.39	134.36	40%
2011	148.13	5.15	84.49	19.92	257.69	57%
2012	188.94	16.89	80.14	24.09	310.06	61%
2013	203.06	14.08	103.06	31.47	351.67	58%

Source: Author's compilation based on information exacted from: Shenzhen Statistics Yearbook

As it shown in table above, the quantities of Residential building are fluctuated among these years, it declined from 902,400 square meters to 589,200 square meters in the year of 2005. Then it grew again from the year of 2011 from 1,481,300 square meters to 2,030,600 square meters. The quantities of residential buildings are influenced by restrict policy and global economic and real estate market. Nevertheless, despite the various quantities of selling residential space, the percentage of it accounts to total commercialized buildings stay around 40%-60% among these years. Plus, residential buildings always account the biggest proportions among other usage houses.

Figure 4: Shenzhen Commercial House Sales Percentage (Group by Districts)



Source: Author's compilation based on information exacted from: Shenzhen Statistics Yearbook

There are six districts in Shenzhen; they are BAO'AN district, NAN'SHAN district, FU'TIAN district, LUOHU district, YAN'TIAN district and LONGGANG district. The graph and map above vividly describes the Sales conditions in different Shenzhen districts from 2010 to 2015. LONGGANG and BAOAN are the main contributors, which account for 78.7% of real estate market. It's possibly because of their relatively huge geographic area and lower price.

Figure 5: Map of Shenzhen Districts

Source from: http://mapsof.net/china/shenzhen-districts

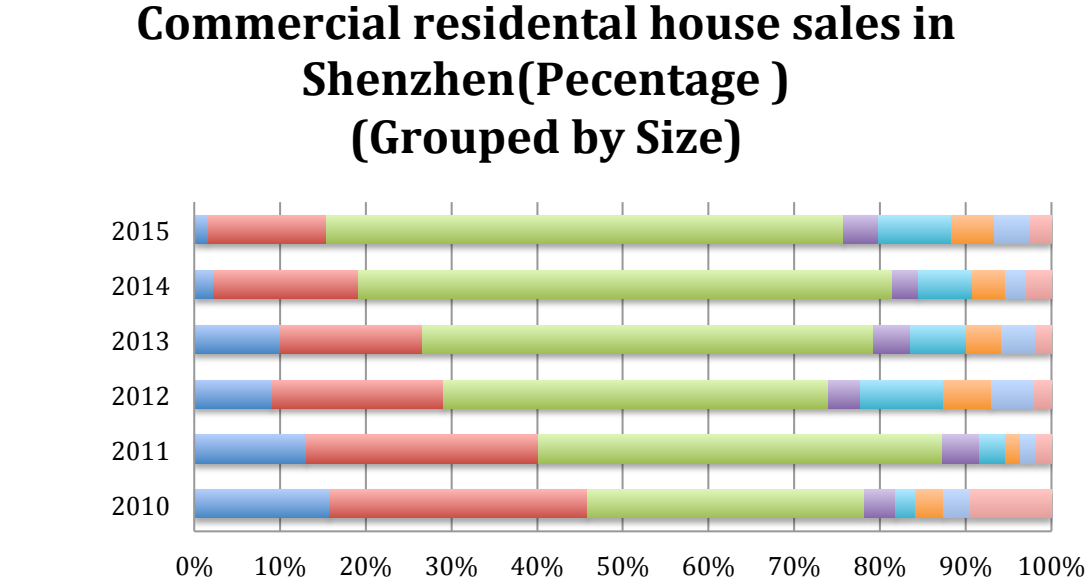
Another graph below expresses the different sizes of house sales conditions are in Shenzhen from the year of 2010 to the year of 2015.

According to CREIS collection, from the category of size, despite some declines, 80 to 100 square meters are always are the main contributor in commercial house market. Specifically, house of 80 to 100 square meters accounts 60.3 per cent of whole real estate market, declined around 1.9 per cent comparing to the year of 2014. Similarly, house of 60 to 80 square meters also decreased around 3.2 per cent, reaching 13.7 in the year of 2015.

Moreover, house size below 60 square meters is also declined 0.5 per cent. On the contrary, the houses sizes of 100 to 200 square meters, 120 to 140 square meters, 140 to 160 square meters and above 200 square meters was increasing a little from the year 2014 to 2015, the growths are 4%, 8.6%, 5%, 4.2% and 2.4% respectively.

In summary, some policies (i.e. second children policy) and increasing income level stimulates consumer to purchase larger size of house to satisfy the masses' need that they take the housing as their own living place or want to improve their living condition.

Figure 6: Commercial residential house sales in Shenzhen



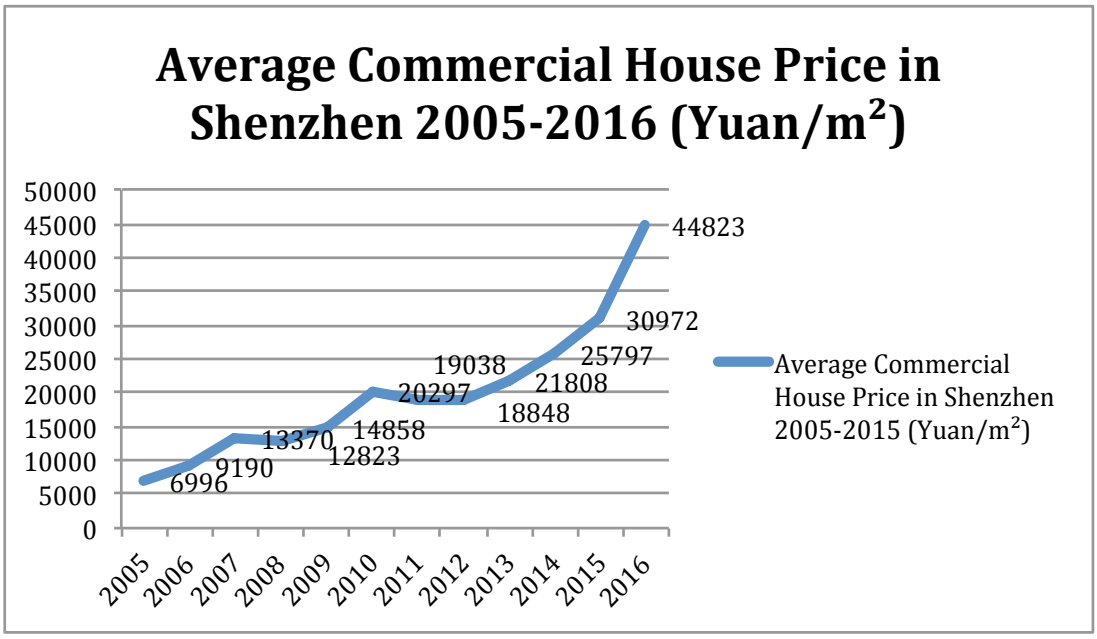
	2010	2011	2012	2013	2014	2015
[0,60)m²	15.8	13.1	9.1	10.1	2.2	1.7
[60,80)m²	30.1	27.1	20	16.5	16.9	13.7
[80,100)m²	32.3	47.1	44.9	52.6	62.2	60.3
[100,120)m²	3.6	4.3	3.7	4.3	3	4
[120,140)m²	2.3	3	9.7	6.6	6.3	8.6
[140,160)m²	3.3	1.8	5.6	4.1	3.9	5
[160,200)m²	3.2	1.8	5	3.9	2.4	4.2
[200,+oo)m²	9.4	1.8	2	1.9	2.9	2.4

Source: Author's compilation based on information exacted from: CREIS index.

Normally, Beijing and Shanghai seems like to be toppled from their top-of–the-pyramid status in real estate. However, if we look at the China real estate price report recent year, you will realize Shenzhen has stolen the crown as China's most expensive property city. To give you an example, the average new house prices in the city jumped to 44,823 Yuan per square meters (6853.25 US Dollar)

According a Chinese consulting company – SouFun.com. Its data indicates that Shenzhen technically overtook China's two largest cities from June, holding its position at the top of the tables for six straight months.

Figure 7. Average commercial House Price in Shenzhen 2005-2015



Source: Author's compilation based on information exacted from website: Shenzhen Statistics Yearbook

As shown in Figure, despite a little decrease in the year of 2012, the average commercial house price in Shenzhen almost increasing every year from 6,996 Yuan per square to 28,207 Yuan per square. The price grows 300% during these 10 years. For instance, if someone brought a commercial house of 90 squares in 2006, the total price we estimate is around 815,000 Yuan, which includes the 30% down payment (around 240,000 Yuan), 30-year mature mortgage (4000 Yuan per month). However, if you buy a same house in 2015, the overall payment will soar to 2,760,000 Yuan, including down payment around 830,000 Yuan and 30-year mature mortgage 11,169 Yuan per month.

4. Practical Part

4.1 Housing affordability definition and measurement

The main purpose of this study is to access the current status of housing affordability for low-income households in Shenzhen. In other words, this paper aims to examine how much money one low-income household will invest to afford to rent or purchase a house.

4.1.1 Housing affordability Definition

"Affordability" is concerned with securing some given standard of housing (or different standards) a price or a rent which does to impose, in the eyes of some third party (usually government) an unreasonable burden on household incomes (MacLennan and Williams. 1990.p.9)[14]. Bramley pointed out more specifically: that households should be able to occupy housing that meets well-established (social sector) norms of adequacy (given house hold type and size) at a net rent which leaves them enough income to live on without falling below some poverty standard (Bramley, 1990b,p.16)[15]

Stone (2006)[16] said that housing affordability is the relationship between households and housing. Affordability expresses the challenge each household faces in balancing the cost of its actual or potential housing and its non-housing expenditures, within the constraints of its income.

---

[14] Maclennan, D., & Williams, R. (1990). Affordable housing in Britain and the United States. York: Joseph Rowntree Foundation.

[15] (Bramley, G. (1990) .Access, Affordability and Housing Need. Paper Presented at ESRC Housing Studies conference, University of Surrey, mimeo (Bristol: SAUS, University of Bristol)

[16] Stone, M. E. (2006). What is Housing Affordability? The Case for the Residual Income Approach. Housing Policy Debate, 17(1), 151-184.

Generally speaking, affordable housing is defined as a house where less than 30% of monthly households' income is used to rent or when the overall price of a house is less than 3 years of household's income.

Nevertheless, there are some criticisms point out that, firstly, the standard approaches fail to catch the vital distinction between the judgments of society and the individual's own conception of what affordable housing is (Hancock, 1993; Bertaud, 2009). The estimated range of affordable housing is sensitive to the researcher's subjective definition of socially accepted minimum adequate housing but may not be consistent with the household's own assessment (Hancock, 1993)[17].

Secondly, the standard approaches ignore the argument that homeownership afford- ability for a household is decided according to its life-cycle economic capability rather than its current economic resources (Goodman and Kawai, 1982). The literature has argued that the role of income growth potential is a crucial factor towards understanding an owner's demand for housing in a fast-growing economy (Chen et al., 2010)[18].

Alain Bertaud's (2009) study[19] reveals that the "affordable" terminology is misleading as by definition every households in a city live in a house it can afford, with the exception of those who face immediate foreclosure or

---

[17] Hancock, K.E. (1993). 'Can Pay? Won't Pay?' or Economic Principles of 'Affordability', Urban Studies, 30(1), 127–145.

[18] Chen, J., Hao, Q. J. & Stephens, M. (2010). Assessing Housing Affordability in Post-reform China: A Case Study of Shanghai. Housing Studies, 1-25.

[19] (Alain Bertaud (2009) Housing Affordability in China; A Stock and Flow Approach, Paper presented at Peking University at the Symposium on Low- income Housing in China, Beijing, on July 10-11, 2009: Peking University .)

expulsion. The meaning of these indicators has very little to do with affordability but indicates mainly on average how much of their income households are allocating to housing.

4.1.2 **Measuring affordability**

Before empirical study, it's necessary to classify the measurement of house affordability. Generally speaking, house financing includes four ways:

- Buy a flat, household pay the overall payment themselves from their income or borrow from their friends.
- Buy a flat, household financing down payment and mortgage (they earned or they borrow them from friends or institutes) by themselves.
- Buy a flat, household financing down payment by their parents, and they pay the monthly mortgage themselves.

In terms of various purchasing approaches, this paper will employs three house affordability indicators to examine the real status of house affordability for young household in big cities. As far as I am concerned, despite the rapidly growing property prices, there is no affordability indicators be developed by the Chinese authority. Thus those three key indicators are be developed by other countries and they often be employed to evaluate the housing affordability.

1) Housing Price to Income Ratio Approach (PIR)

This approach means the ratio of median house prices to median familial disposable incomes in percentage or years of income. Individuals applied this ratio as a basic component of mortgage lending. PIR are a measure of the affordability of housing. Increasing in housing prices cannot deviate indefinitely from growth in the income of potential buyers. If housing princes

outpace income froth, at some point households will no longer be able to afford buying and demand will dry up, bringing prices down (C.Andre. 2014)[20]. PIR is a method that shows the ratio between current market value of housing unit that household plans to purchase to the total annual income of the household, which can summarize between Current Market Value of Housing Unit and The Total Annual Income of Household. For low-income group and middle-income group, a PIR method is the ratio between the mean free-market prices of dwelling Unit divided by the mean annual household income. This shows the different between different groups of income household. PIR provide a useful insight of the overall performance of the housing market for example, the total demand and supply of housing for a local market. PIR also provides information like the level of sustainability of human settlements with housing affordability such as the impact of market force and housing policies for example the new housing policy from China (Norazmawati, 2015)[21].

Formula of PIR

PIR = median house prices / median familial years incomes

Following table shows the four categories of affordability based on the values of PIR.

[20] C. Andre, A. G. Alana, and R. Gupta, "Testing for persistence in housing price-to-income and price-to-rent ratios in 16 OECD countries," Applied Economics, vol. 46, no. 18, pp. 2127-2138, 2014.

[21] Norazmawati (2015) Price to Income Ratio Approach in Housing Affordability, ournal of Economics: Business and Management, Vol. 3, No. 12, December 2015.

Table 4: PIR indicator and category of affordability

Rating	Median Multiple
Severely Unaffordable	5.1 & Over
Seriously Unaffordable	4.1 – 5.0
Moderately Unaffordable	3.1 – 4.0
Affordable	< 3.0

Sources: 7th Annual Demographic International Housing Affordability

2) Affordable House Size Approach

Use this method, we will find out that under present house price, how many size of house can be afford by a relatively low-income household in Shenzhen. The calculation is as follows.

Affordable house size:

$$\frac{\text{3 years disposable income per household}}{\text{Average house price per square meter in Shenzhen}}$$

3) Housing Expenditure To Income Ratio Approach (HEIR)

The expansion of the real estate speculative demand strongly links with the sufficient financial support, and sufficient financial support relies on the banks and the other financial sectors. Therefore, the expansion of residential speculative demand depends on the promotion of credit leverage. The index reflects the support degree of credits to the residential house needs and residential house consumption level also, on behalf of the degree of

development and realization of real estate bubble. The greater the index value, the higher support degree of credits to the residential house needs (Miao Liu, 2010)[22].

Thresholds of the price or expenditure-to-income ratio have been set at 25%, 30%, 40%, and 50 %; households that exceed these ratios are regarded as having housing affordability problem (Kutty, 2005) [23] . Since the U.S Department of Housing and Urban Development (HUD) define a housing cost burden exceed 30 percent of income as unaffordable, so it's widely acknowledged that a ratio up to 30 percent of income as affordable (Bogdon&Can, 1997)[24]

Formula of HEIR

HEIR = monthly owner cost / monthly household income

Monthly owner costs come from questions on the following subjects

- Mortgage
- Condo fee
- Utilities – Electricity, Gas, Water

[22] Miao Liu (2010) Housing Affordability Problem in Shanghai 1995-2009, 1 edn., Department of Real Estate and Construction Management: Masters Programme in Real Estate Management.

[23] Kutty, N. (2005). A New Measure of Housing Affordability: Estimates and Analytical Results. Housing Policy Debate, 16(1), 113-142.

[24] Bogdon, A. S. & A, Can. (1997). Indicators of Local Housing Affordability: Comparative and Spatial Approaches. Real Estate Economics 25(1), 43-80.

4) Residual Income Measure (RIM)

According to Stone, Burke and Ralstonl's (2011) study, the residual income approach recognizes that because of housing's distinctive physical attributes in comparison with other necessities, its cost makes the largest and least flexible claim on after-tax income for most households, i.e. that non-housing expenditures are limited by how much income is left after paying for housing. This means that a household has a housing affordability problem if it cannot meet its non-housing needs at some minimum level of adequacy after paying for housing. The appropriate indicator of the tension between housing costs and incomes is thus the difference between them—the residual income after paying for housing—rather than the ratio.

Compared to the ratio approach, the residual income approach has several merits. First, it takes the housing decisions of individuals and social acceptable level of consumption into account. The logic is that some rich families may spend 90% of their income on housings but still maintain superior living standards; this phenomenon could be viewed as a problem when using the established ratio approach. However, some extremely poor people may not survive or survive but suffer severe subsistence problem even spend 10% on housings (Chen et al, 2010).

Second, the residual income approach offers a more precise instrument to identify housing needs and problems, and it also promotes the allocation of housing subsidies in a more efficient and impartial way (Chen et al.,2010; Kutty, 2005, Stone, 2006).

Third, Stone (2006) argued that the residual income approach provides a way of refining residential mortgage underwriting that might perhaps yield a more

accurate assessment of risk[25].

Formula of RIM

RIM = monthly household income -monthly owner cost

[25]Chen Yao (2011) Measuring Housing Affordability in Beijing, 1 edn., Department of Real Estate and Construction: Track of Financial Service.

4.2 **The process of calculation**

4.2.1 **Revised Price to Income Ration**

As been defined in the above chapter, the “Price to Income” ratio should be:

PIR = median house prices / median familial years incomes

However, the method we use to calculate the PIR is not the same with the formula we mentioned above. Since we focus on relatively low-income group, the average index is not scientific enough for the results we get from general PIR method only explain the average affordability level in Shenzhen for ordinary family. Thus we employ a revised *PIR formula to target precisely on relatively low-income group.

The revised *PIR:

$$\frac{\text{Residence average living building area per household} * \text{Average house price}}{\text{Average disposable income for low-income household}}$$

Residence average living building area per household equals to “Residence average living building area per capita” multiplies “Average household size”.

In terms of Residence living building area per capita X, in our study, we define X is:

$$X_t = X_{t-1}(1-\alpha) + s_t$$

“ X_t ” - The total residence living building area this year;

“ X_{t-1}” - The total residence living building area last year;

α - Residence living building depreciation Rate;

S_t - The completed residence living building area this year.

According to new international accounting principle, the “α” is around 2.7%. Nevertheless, considering there are plenty of housing renew programs in China, we define the “α” equals to 3%.

Thus, we get the average living building area per capita are as following table.

Table 5: Average living building area per capita in Shenzhen. From 2005 to 2013 (Square meter)

Year	Total Floor Space of Commodity Housing (10,000 square meters)	Registered Population (10,000person)	Average living building area per capita
2005	2556.12	181.93	14.05
2006	3061.30	196.83	15.55
2007	3406.60	212.38	16.04
2008	3748.18	228.07	16.43
2009	3905.27	241.45	16.17
2010	4039.21	251.03	16.09
2011	4150.70	267.9	15.49
2012	4315.58	287.62	15.00
2013	4382.44	310.47	14.12

Source: Author’s compilation based on information exacted from Shenzhen Statistics Yearbook.

In this research, since our focus group is “low-income” household, we only study on the data based on relatively low-income households.

Grouped by income, we define the threshold in all the resisted households in Shenzhen are 10% population of lowest income group, 10% population of low-income group, 20% population of medium low-income household. In the later research, please do not be confused by the definition of relatively low-

income household, it means the sum of lowest, low and medium low-income household.

Table 6: Disposable annual income per capita and Household size conditions. (Grouped by income) (¥)

Year	Indicator	Average	Lowest Income	Low Income	Medium-low Income
	Proportion (%)	100%	10%	10%	20%
2009	Disposable Income	29244.52	9423.79	14352.25	19620.29
	Average Household Size (Person)	3.24	3.9	3.45	3.32
2010	Disposable Income	32380.86	11132.2	16043.3	22530.14
	Average Household Size (Person)	3.22	3.9	3.53	3.39
2011	Disposable Income	36505.04	12998.84	18896.31	25060.68
	Average Household Size (Person)	3.15	3.79	3.45	3.25
2012	Disposable Income	40741.88	15926.86	22705.76	28645.45
	Average Household Size (Person)	3.21	3.71	3.46	3.27

Source: Author's compilation based on information exacted from Shenzhen Statistics Yearbook

Following is the revised *PIR method calculation process, which includes 3 steps.

- **Step 1**

Average house price (Yuan) are as following table 8. They are calculated by the average living building area per capita multiply household size multiply the average house price per square meter.

Table 7: Average house price for relatively low-income households (Per person)(Yuan) (Square meter) in Shenzhen. 2009 - 2012.

Year		A	B	C	AS	P*
2009	House Size	3.9	3.45	3.32	16.17	14858
	Average living building area per household	63.1	55.8	53.7		
	Average house price	**936990**	**828875**	**797642**		
2010	House Size	3.9	3.53	3.39	16.09	20297
	Average living building area per household	62.8	56.8	54.5		
	Average house price	**1273657**	**1152822**	**1107101**		
2011	House Size	3.79	3.45	3.25	15.49	19038
	Average living building area per household	58.7	53.4	50.3		
	Average house price	**1117666**	**1017400**	**958421**		
2012	House Size	3.71	3.46	3.27	15.00	18848
	Average living building area per household	55.65	51.9	49.05		
	Average house price	**1048891**	**978211**	**924494**		

Notes: AS = Average living building area per capita.

P*= Average Commercial house price per square meter.

A= Lowest Income household

B= Low Income household

C= Medium-low household

Worth to mention that the average house prices of lowest income groups are always higher than other relatively low-income groups. The reasons are because the lowest income groups have higher household size, which causes results of the average prices are higher than other groups. However, the reality is that the lowest income household has higher population but the same, even smaller living space, which lead to a worse living condition.

- **Step 2**

After having the price data, the next step is to get the average disposable income in relatively low-income household. We need to multiply the household size and the disposable income in relatively low-income household per capita. The results are in the following table 8.

Table 8: Disposable annual income per Household in Shenzhen for relatively low-income households from 2009 to 2012. (Yuan)(Per Person)

		A	B	C
2009	IP	9423.79	14352.25	19620.29
	Household size	3.9	3.53	3.39
	IH	**36752**	**49515**	**65139**
2010	IP	11132.2	16043.3	22530.14
	Household size	3.9	3.53	3.39
	IH	**43415.58**	**56632.8**	**76377.17**
2011	IP	12998.84	18896.31	25060.68
	Household size	3.79	3.45	3.25
	IH	**49265.60**	**65192.26**	**81447.21**
2012	IP	15926.86	22705.76	28645.45
	Household size	3.71	3.46	3.27
	IH	**59088.65**	**78561.92**	**93670.62**

Notes: IP - Disposable annual income per capita (Yuan)

IH - Disposable annual income per Household (Yuan)

A= Lowest Income household

B= Low Income household

C= Medium-low household

It is shown the disposable income growth for the lowest group is the lowest compares to other two groups. One of the reasons might be the lowest income household lacking necessary working ability to make a living.

- **Step 3**

Finally, we can get revised *PIR by use Average house price (Yuan) divided by average household disposable income. The results are as following table 9.

Table 9: The revised *PIR for the relatively low-income households in Shenzhen from 2009 to 2012. (Yuan)

		A	B	C
2009	House price	936990.1	828875.8	797642.8
	IH	36752.8	49515.3	65139.4
	*PIR	**25.5**	**16.7**	**12.2**
2010	House price	1273657.0	1152822.9	1107101.9
	IH	43415.6	56632.8	76377.2
	*PIR	**29.3**	**20.4**	**14.5**
2011	House price	1117665.8	1017400.2	958420.5
	IH	49265.6	65192.3	81447.2
	*PIR	**22.7**	**15.6**	**11.8**
2012	House price	1048891.2	978211.2	924494.4
	IH	59088.7	78561.9	93670.6
	*PIR	**17.8**	**12.5**	**9.9**

Note: IH - Disposable annual income per Household (Yuan)

A - Lowest Income household

B - Low Income household

C - Medium-low household

According to the international standards for PIR, the normal PIR below 3, and if PIR bigger than 5,1, it will be considered severely unaffordable.

Considering international standards are developed by developed county, since China is still a developing country and there still thousands of people suffer from poverty line, this study define the unaffordable standards are around 10 ~ 11.

Nevertheless, even use this more loose standard, it is shown in table 9, that there is only have medium low-income household in the year of 2012 has the *PIR which is not inside the severely unaffordable scale. Others, no mater when or which group, are all should be considered severely unaffordable by revised PIR method.

Limitations

Even used revised PIR to precisely focus on relatively low-income household, there are still some limitations in this method.

Since we use the household size to calculate their living space, we overestimate the living space for relatively low-income household. Specifically, we take the household size multiply the living area per capita as their average living space per household. However, the true is usually that the more the households' size are, the same even smaller the living space they have, for the economical limitation.

Another limitation is for the data collection. Scientifically, the official data are not so represent the real situation, especial for disposable income, etc. For the reason that people will hide their income and there are a great proportion

of “grey incomes[26]” which will not included into the statistics yearbook. Still, the grey income normally exits in relatively high-income group. Since we research on relatively low-income household, we consider there is little chance to have grey income in our group, thus our data are reasonable in this extend.

Lastly, this method does not take different locations into consideration. However, there are huge price gaps among different districts. For recommendation, in the future studies, researchers could analyze PIR in within different districts.

[26] The term "grey income" was coined in China after 1978 when the country implemented its policy of reform and opening-up. It describes the significant portion of urban residents' income that is outside the scope of state supervision and control. While some of this income is derived from working additional jobs, some of it is obtained in a more questionable manner.

4.2.2 **Estimate affordable living space per household**

In this method, we assume that the affordable house for our target group is that household could afford the overall price by the sum of their 3 years disposable income. Based on that, we will calculate the affordable living space for the relatively low-income household. The formula is as follows.

Affordable living space per household for relatively low-income groups:

$$\frac{\text{Average disposable income per household * 3 years}}{\text{Average commercial house price per square meters}}$$

As we already collected the average disposable income per household in table 7, and the average commercial house price per square meters in table

Table10: Affordable living space per household (square meters)

		A	B	C
2009	IH	36752.8	49515.3	65139.4
	3IH	110258.3	148545.8	195418.1
	P*	14858.0	14858.0	14858.0
	S*	**7.4**	**10.0**	**13.2**
2010	IH	43415.6	56632.8	76377.2
	3IH	130246.7	169898.5	229131.5
	P*	20297.0	20297.0	20297.0
	S*	**6.4**	**8.4**	**11.3**
2011	IH	49265.6	65192.3	81447.2
	3IH	147796.8	195576.8	244341.6
	P*	19038.0	19038.0	19038.0
	S*	**7.8**	**10.3**	**12.8**
2012	IH	59088.7	78561.9	93670.6
	3IH	177266.0	235685.8	281011.9
	P*	18848.0	18848.0	18848.0
	S*	**9.4**	**12.5**	**14.9**

Notes: IH - Disposable annual income per Household (Yuan)

3IH- Disposable 3-year income per Household (Yuan)

P* - Average Commercial house price per square meter (m^2)

S* - Affordable living space per household (m^2)

A= Lowest Income household

B= Low Income household

C= Medium-low household

There is one saying that: Life is real and cruel. Unfortunately, the results show our target, relatively low-income household, could only afford around 10 square meters. Their affordability is great influenced by the house price. For instance, as the house price per square meters in the year 2010 is high, the relatively low-income household can afford only extremely small at 6.4, 8.4 and 11.3 square meters respectively for lowest-income, low-income household and the medium low-income household.

Obviously, no one will buy a house around 10 square meters, and also the real estate business man will not sell such a mini commercial house, either. It means that for relatively low-income group, it is hard to purchase a property in Shenzhen from the year of 2009 to the year of 2012. Generally speaking, it is acceptable for a normal size household to have around 70 square meters to live.

Limitations:

The same with the first method, this method does take location into consideration. Plus, 3 years are the standards developed by developing countries, for China's case, we think it should take more than 3 years to purchase a property in a big city like Shenzhen.

Moreover, it is not the whole picture, this researcher did not collect other years' data and other income groups' data, and thus we cannot analyze objectively and know the trends.

4.2.3 **Housing Expenditure To Income Ratio (HEIR) Approach**

As discussed before, the housing expenditure to income ration (HEIR) has calculation formula as follows.

Formula of HEIR

HEIR = monthly owner cost / monthly household disposable income

Monthly owner costs come from items on the following:

- Mortgage
- Condo fee
- Utilities – Electricity, Gas, Water and Sewer, and Other Utilities

As we mentioned in the pervious chapter, we defined that the acceptable house living space for a household size 3 ~ 4 is around 70 square meters.

- **Mortgage**

Generally speaking, Chinese banks offer local residents 2 types of mortgage repayment options.

1) Monthly Straight Line (Average capital plus interest)

Customers repay by equal monthly installments, which subject to interest rate fluctuations, so they can plan their budget. Details are as following:

Monthly repayment amount = (principal / repayment of months) + (principal - accumulated capital) * monthly interest rate
Monthly principal = total principal / repayment of months
Monthly Interest = (principal - accumulated capital) * monthly interest rates
Total interest repayment = (repayment months +1) * loans * monthly interest rate / 2

Total repayment = (repayment months +1) * loans monthly interest rate / 2 + loan

For instance, if Mr. Lee has a 70 square meters house, the average house price per $m^{2\ is}$ 5,000 RMB, and the down payment is 20%. He purchased a 20 years mature mortgage with 5.94 interest rate. In this case, the repayment for him is as following tables:

Table 11: Mr. Lee's mortgage repayment information (RMB)

The overall house price	350,000
Total loans	280,000
Total repayment	479,118
Total interest repayment	199,118
Down payment	70,000
Loan months	240 (months)
Monthly repayment amount	1996

2) **Monthly Reducing Balance (Average capital)**

The repayment amount is calculated and paid on a monthly basis. The interest is calculated based on the outstanding principal at the end of each month. This way, larger initial monthly repayments will help customers save overall loan interest.

Monthly repayment amount = [monthly interest rate * loan principal * (1+ monthly interest rate) ^ repayment months] ÷ [(1+ monthly interest rate) ^ repayment months -1]

Take a same example as above, we assume that if Mr. Lee has a 70 square meters house, the average house price per $m^{2\ is}$ 5,000 RMB, and the down payment is 20%. He purchased a 20 years mature mortgage with 5.94 interest rate. In this case, the first 12 months repayment for him is as following tables:

Table 12: Mr. Lee monthly repayments by Monthly Reducing Balance option.

Total repayment (RMB)	447,013
1st month	2252.67
2nd month	2546.89
3rd month	2541.12
4th month	2535.34
5th month	2529.57
6th month	2523.79
7th month	2518.02
8th month	2512.24
9th month	2506.47
10th month	2500.69
11th month	2494.92
12th month	2489.14
…	…

Source: Calculations using mortgage calculator from site: http://fang.com/house/tools.htm

Comparing to these two options, the Monthly Straight Line will have higher overall repayment, but less financial pressure for present. In the contrary, the second option will put more financial pressure on customers in the first repayment period, but the pressure will reduced gradually.

Our focus group is relatively low-income households. Therefore, be limited by the monthly amount of disposable income, they will face great financial pressure if they choose the “Monthly Reducing Balance” option. To this extend, the fixed amount of repayment is more suitable for them, for they will

face less pressure in the present. Plus, they will have ability to plan their own repayment schedule in their paces. So, we assume our target group will choose the fixed repayment (Monthly Straight Line).

We assume that a relatively low-income household bought a 70 square meters property in Shenzhen in January 2009, the house price per square meter is 14,858 Yuan, and the mortgage interest rate is 5.1%. The monthly repayment is as following table:

Table 13. Monthly and Annual Mortgage Payments for a relatively low-income household.

	30 years Loan	20 years Loan	10 years Loan
Price per square meter		14585	
Interest Rate		5.1%	
Total Price (¥)	1040060	1040060	1040060
Total Repayment	1626337	1328932	1063906
Amount Borrowed (¥)	832048	832048	832048
Monthly Payment (¥)	**4518**	**5537**	**8866**
Annual Payment (¥)	54211	66447	106391

Note: Based on 70 square meter unit and 20 percent down payment. Affordable and Commercial Housing average prices are for 2009, from the Shenzhen Statistic Yearbook

Source: Calculations using mortgage calculator from http://fang.com/house/tools.htm

As shown in table 13, the monthly payment in a relatively low-income household is at least 4518 RMB per month. Honestly, these price levels are quite high even for a normal household, rather than for a household has relatively low income.

- **Condo fee**

A condo fee is a maintenance fee charged by a condominium complex to cover the cost of repairs, landscaping, concierges, or amenities such as a gym or a pool. The condominium fee can be pegged to the size of the unit and what the development expects its expenses to be for the year[27].

The condo fee is not fixed, but the changes are small which will not influent our results. We assume that to begin with the year of 2009; the condo fee will maintain the same.

The condo fee in 10 big cities index in the year of 2015 is as following table 14:

Table 14: Condo fee in 10 big cities in December 2015. (Yuan per square meter per month)

10 big Cities	Condo Fee (¥)
Shenzhen	**3.12**
Beijing	2,81
Shanghai	2.36
Guangzhou	2.33
Tianjin	2.25
Hangzhou	2.11
Ningbo	2.11
Suzhou	2.02
Qingdao	1.96
Wuxi	1.93

[27] http://www.investopedia.com/terms/c/condominium-fee.asp

Source: CREIS, fdc.fang.com

Among all the big cities in China, Shenzhen has the highest condo fee. To explain this, the high human resource may be one of the possible answers.

As our focus group is relatively low-income household with 70 square meters house, here is the calculation of condo:

*3.12 RMB m^2 * 70 m^3 =* ***218.4*** *RMB (per month)*

- **Utilities – Water, Electricity, and Gas**

1) Water

The prices of usages of water in Shenzhen are three types based on the amounts a household used. According to the government official document, for normal household usage, below 22 cubic meters, the price is 2.3 RMB per cubic meter, between 23 to 30 cubic meters is 3.45 RMB, and it charges 4.6 RMB per cubic meter if usage more than 31 cubic meters.

Normally, ordinary households' water usages will around 23 meters. From a relatively low-income household view, as a rational economic man, they will try to reduce the cost as much as possible, thus they are highly possibility will change their water-usage habit to reduce the cost within 22 cubic meters. To this extend, we assume that a relatively low-income household will use 22 cubic meters per month, the water expenses will be:

*22 cubic meters *2.3 RMB =* ***50.6*** *RMB (per month)*

2) Electricity

With the time of use, Power Company will charge different price on for household off-peak and non-off-peak time. Moreover, the price will be a little difference in summer or in winter.

We assume that relatively low-income families are living normally. In another words, they will work in the day and sleep at night, thus they will be charged based on the non-off-peak price. The daily usage of electricity mainly goes to appliances such as Televisions, Washing machines, refrigerator and air conditioners. Some small appliances will also consume electricity a lot, such as hair dryers, laptops and bulbs. Generally, the amount of electricity usage In Shenzhen for a relatively low-income household with around 4 people will be around 200 kw/h.

For the usage amount below 260 kw/h, the price will be the same at 0.68 RMB per kw/h both in summer and winter period. Therefore, the expenses for a relatively low-income household on electricity will be:

*200 kw/h * 0.68 RMB per kw/h =* ***136*** *RMB (per month)*

3) Gas

Gas mainly is used in bathing and cooking. Usually, a relatively low-income household will use $50m^3$ gas per month. Shenzhen government gives the gas price at 3.5 RMB per m^3 for residence. Here is the calculation for gas use.

*$50m^3$ * 3.5 RMB per m^3 =* ***175*** *RMB (per month)*

The calculation results

Finally, we come to the Housing Expenditure to Income Ratio (HEIR). As we already have the information about disposable income per household, we choose the year of 2009 as our standard to calculate. The results are as following table.

Unfortunately, according to our calculation, none of the HEIR is below 30%, there even only one HEIR is below 100%, which means, there is only for medium low-income family can buy a 70 m^2 house and repay it every month by devoting 83% of their disposable income to repay 30 years! For other types

of families or maybe shorter option of repayment, they have no ability to buy the house and repay the mortgage.

Table 15: HEIR in Shenzhen for relatively low-income households

	30 years Loan	20 years Loan	10 years Loan
Monthly mortgage repayment	4518	5537	8866
Cando (¥)	218.4	218.4	218.4
Water (¥)	50.6	50.6	50.6
Electricity (¥)	136	136	136
Gas (¥)	175	175	175
IH for A (¥)	3062.7	3062.7	3062.7
HEIR for A	**148%**	**181%**	**289%**
IH for B (¥)	4126.3	4126.3	4126.3
HEIR for B	**109%**	**134%**	**215%**
IH for C (¥)	5428.3	5428.3	5428.3
HEIR for C	**83%**	**102%**	**163%**

Notes: IH - Disposable annual income per Household (Yuan)

A= Lowest Income household

B= Low Income household

C= Medium-low household

Limitations

Firstly, we do not take down payment into consideration, for we think the families already have some savings, which can afford them to pay the down payment. But it is a highly possibility that they have no money, and have to borrow from their friends. Which means that they have to give them back to their friends. If it is true, the households will face more financial pressures and they will lives more struggles.

Secondly, the same with the first two approaches, this method dose not considers the location and the environment.

Thirdly, the interest rate will not be the same during the whole repay period, for Chinese bank, the longest interest rate fixed period is 5 years, after that, the rate will adjusted by bank. Thus our result is not precise enough.

4.2.4 **Residual Income Measure (RIM)**

This section aims to appraise the housing affordability status in Shenzhen in the framework of residual income approach. Even we already know it is hard for the relatively low-income to afford a house with 70 square meters. It is still necessary to research based on residual income measure, which is most popular and widely accepted approach. Specially, this paper will employs a series of indicators to measure whether the deducted disposable income (after deducting the average expenditures for housing) is sufficient to satisfy basic households' needs.

Be begin with, in our analysis, we choose to use minimum acceptable non-housing budget (MNHB) indicator to defined as housing-reduced poverty.
This paper also names MNHB (Minimum Non-housing Budget) as the housing- induced poverty line.

This paper attempts to derive the MNHB from the monthly non-housing consumption of the bottom 40 per cent income group in Shenzhen in the year of 2009 to the year of 2012. The calculation of MNHB is the overall household consumption deducted the housing expenditures. We get data from Shenzhen statistic yearbook, and the results are as following table 16:

Table 16: The minimum acceptable non-housing budget (MNHB) in Shenzhen based on the relatively low-income group. (Yuan) 2010-2012

		A	B	C
2010	MNHB	8789.81	11220.18	16195.09
2011	MNHB	10187	12329	15195
2012	MNHB	10887.34	15821.45	16587.54

Notes: A= Lowest Income household

B= Low Income household

C= Medium-low household

The next step is to figure out the residual disposable income per household per month can satisfy the MNHB level or not. If no, we can say they are house-induced poverty.

The data of disposable income household and the house expenses per month already be collected and calculated in the previous sections. We still assume that the relatively low-income household will purchase a 70 square meters property in Shenzhen, the down payment is 20%, and they will choose 30 years mature mortgage. The interest rate is 5% from 2010. The deducted disposable income equals to the disposable income per household in relatively low- income household minus the monthly housing expenditure Thus, the difference between the deducted disposable income and the MNHB is as following table 17.

Table 17. Housing-induced poverty statuses in Shenzhen (RMB per month, 2010-2012)

		A	B	C
	Monthly housing expenditure		5097	
2010	IH	3617	4719	6364
	Deducted disposable income	-1480	-378	1267
	MNHB per month	732	935	1350
	Differences	**-2212**	**-1313**	**-83**
2011	IH	4105	5433	6787
	Deducted disposable income	-992	336	1690
	MNHB per month	849	1027	1266
	Differences	**-1840**	**-692**	**424**
2012	IH	4924	6547	7806
	Deducted disposable income	-173	1450	2709
	MNHB per month	907	1318	1382
	Differences	**-1080**	**131**	**1327**

Note: IH - Disposable annual income per Household (Yuan)

A= Lowest Income household

B= Low Income household

C= Medium-low household

Table 17 illustrates that the housing situation for relatively low-income households are quite terrible from the year 2010 to the year 2012. For the lowest income group, they cannot afford a house; otherwise they will scarify their basic living quality. As for relatively low-income household, the housing will also induce poverty for them in 2010 and 2011. They can afford a house in the year of 2012 without harming basic non-housing expenses. Lastly, for the medium low-income group, they will afford a house in the later 2 years,

but in the year of 2010, they cannot afford a house while satisfied the normal life in the same time.

Limitation:

This approach will be more correct to explain the affordability rather than other 3 methods, because we can measure the real living and purchasing power after deducting the housing cost. However, this approach still did not take the locations into account.

Another limitation is this study assumes the housing expenditure will be the same every year, however, it is flexible even time. If we want to research more precise results, we have to employ more detail index and more sample to analyze.

5. Results and Discussion

5.1 Possible Causes for house affordability problem

The direct reason for house affordability problem is the house price is so high and it is a must-to-buy thing for all the people, thus relatively low-income household will have problem to afford one house. The more deep reasons are as follows:

5.1.1 Imbalance between Supply and Demand

Normally, we said the supply and demand imbalance means in cities, the demand is highly bigger than supply. The question is why all the people want to live in big cities?

The reasons are that big city offers more opportunities, higher income, and more social chance to people. Living in the big city, residence is able to have better health care, better children education, convenient, colorful and Avant-grade urban life, enjoy the updating technology. Not to mention they can also enjoy food and drinks.

As a normal person, what we want is to become better and improving our life. Therefore, more and more people leave their hometown and chasing their dream in big cities. Purchasing a house is a important milestone for them on the way to their dreams.

However, there is only limited land and limited houses. Moreover, the numbers of house are far more less than the residences in big cities. Under market economy, only people who can pay more will purchase the property. This explains why the house price is crazily high in big cities.

5.1.2 **Rapid Urbanization**

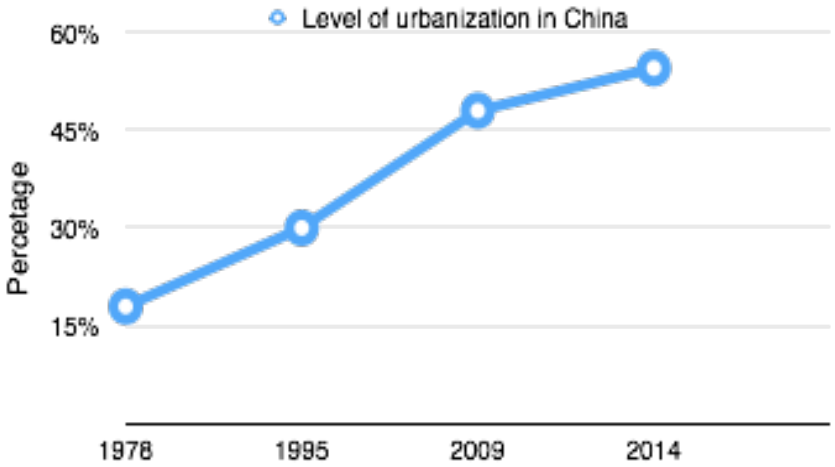
As we mentioned before, Shenzhen obviously has more job opportunities and more convenience environment that explains why Shenzhen attracts thousands of migrations every year. The scale and speed of the flow of migration is fast ever in modern times.

As shown in following graph, the urbanization level in China rose from 18 per cent in 1978, to 47.9 per cent in 2009, and soaring to 54.4 percentage in 2014. If you walk around any big city which even you never been there before, you will find that the urbanization homogenize almost every city in China. New skyscrapers, giant industrial factories, urban infrastructure projects and renewal developments projects are grows with fast ever pace and scale, significantly reshaping the urban area in China. China's urbanites by 2020 it will expand by 66%, or 7,000km, and every city with a population of 500,000 or more will be connected to it[28].

Migration will be the driving momentum of future urbanization. With the economic growth, new job opportunities are huge. According to MGI estimations, that urban China will have around 450 million and 500 million jobs in the year of 2025. We believe it will attract new migrants to fill this demand for employment. Those flow of migration will increase more than 40 % of population（MGI, 2009）. In many cities, etc. Beijing, the immigrants constitute more than 50% of total populations

[28] LANGFANG (2015) The great sprawl of China, 1 edn., http://www.economist.com/news/china/21640396-how-fix-chinese-cities-great-sprawl-china: The Economist.).

Figure 8: Level of Urbanization in China



Source: Author's compilation based on information exacted from WTO official website:
(http://data.worldbank.org/indicator/SP.URB.TOTL.IN.ZS/countries/CN?display=graph)

5.1.3 Speculative Investment in Housing

For the local governments' point of views, the land sales are a significant way to contribute to there financing to center government as well as province GDP targets.

As the GDP growth among the cities becomes a kind of vicious competitions. Local governments keep rely on land sales, massive constructions and renew programs to reach GDP growth goals, which are made every 5 years. Nevertheless, vicious competitions could cause overcapacity and create so-called ghost towns (which is commercial house groups which are purchased by investments that no one live or even cannot be sold or lease)

On the other hand, in ordinary Chinese households' eyes, purchasing property not only is efficient way to protect against their financial loss, but also a safe way to invest their money.

Worth to mention that the invest group are usually the relatively wealth households. The gap between wealth and poor families are widening recently. With more money in their hands, the problems they face are "How do I invest

my money". Generally speaking, there are two fast ways to gain huge fortune, energy and social resources. The former one normally are coal industry, and the later one means those people have different social background, which will help them to become wealthier. Both of those businesses need relatively low cash flow but will accumulate cash in a short time. For those rich people with short eyes, the luxury goods and real estate are the main way to use out their cash.

5.1.4 **Lose Sense of Safety under Materialistic Culture**

There is a survey to study the average age for people to purchase a property among all the countries in the world. In U.S.A, the average age are 42 years old, above 30 years old in EU, however, there is survey shows, in Beijing, the average age for first purchase is 27 years old.

As an agriculture country with over thousands years history, the China have crazy fantasy on land and possessions. From traditional cultures' view, when a Chinese man earns money or achieves some kinds of achievement, the first thing in his TO DO LIST is to buy house, land and have wives and babies. The materialistic already destroy the old merit, and residences rely on house to satisfy their sense of security.

Therefore, a man cannot marry a woman without a house and he will not be tagged as "successful man", either. These phenomenon constitute the theoretical basis of real estate bubble, also lead China become the country with youngest property purchase ages.

5.2 **Policy Recommendation**

5.2.1 **Refine the mortgage loans**

In terms of the solution of house affordability problem for relatively low-income households, the Shenzhen government need to develop refined the housing loans policy. The more specialized the policies are, the more effective the results are.

Government should pay more attention on the relatively low-income households. It is necessary to offer different housing loans for different income groups. More specifically, the house loans for the low-income group should decrease the interest rate, prolong the mature time and even financially support them. On the contrary, for the non-low-income households, who want to purchase the second or third houses for investment, government or bank should increase the mortgage interest rate and reduce the mature years, or increase the down payment.

5.2.2 **Develop more affordable houses**

In addition, Shenzhen government should develop the affordable house programs more, which targets on low-income households. Worth to mention that, the affordable house programs should not be located in remote, or far away from schools and hospitals. For the reason that the location will influence the basic expenses, if the affordable house is in a remote place, it will put financial pressure on the household for their expenses increase. Moreover, the infrastructure around the affordable house should be complete and convenient.

And from an anti-discrimination point of view, the affordable houses should mix with some other commercial houses, for to diminish the tags on relatively low-income household.

The affordable houses are not only comes from new constructions, the government can also renew the old properties, combined with some local capitals to “invest” the affordable housing. Corporates with companies, government will reduce the cost and increase the efficiency. Plus, this program also helps decrease the amount of empty houses in stock.

5.2.3 **Strictly enforce and precisely target.**

Even with government’s good policies, the market still has possibility do exist some rent-seeking to enjoy the low price through imitating low-income households. To this extend, some related law are required to keep the equity. Government should develop comprehensive audit system to check the income and property, ensuring every candidate is low-income household.

5.3 **Study limitations**

At present level, affordable house study only target on the residences that have relatively low-income, but neglected the large proportion of migrants, large part of which belong to low-income households.
As for the approaches, as mentioned before, even using revised approaches, which are focus on relatively low-income household, there are still some limitations in them.

In IPR approaches, since household size is used to calculate their living space, this study overestimates the living space for relatively low-income household. For relatively low-income household will have smaller living space even with more families.

As an empirical study, all the data we used are from official statistic yearbook. Honestly speaking, the official data are not so represent the reality, especial for disposable income. This is because people will hide their income and there are a great proportion of “grey incomes ” which will not included into the statistics yearbook. Nevertheless, the grey income normally exits in relatively

high-income group. Since this research is focus on relatively low-income household, there is little chance to have grey income in this group, thus the data are reasonable to this extend.

All the methods we used do not take different locations into consideration. The truth is that here are huge price gaps among different districts. For recommendation, in the future studies, researchers could analyze PIR in within different districts.

Down payment is neglected. This research does not take down payment into consideration, for author assumes that the families already have some savings that can afford the down payment. However, it is a highly possible that they have no money and borrow from their friends. After that they have to give money back, then the households will face more financial pressures and lead this unaffordable problem worse.

Another limitation is the interest rate. To calculate better, author assume that the interest rate still the same. However, it will not be the same during the whole repay period. For Chinese banks, the longest interest rate fixed period is 5 years. When it comes to the 6th year, banks will adjust the rate again. Thus the results are not practical enough.

6. Conclusion

As a special economic zone in China, Shenzhen is one of the well-known and typical metropolitans. The same with other cities, the escalating housing price in Shenzhen became a common problem from every residence, and this problem is getting more serious. The relatively low-income households, comparing to high-income households are more vulnerable and under more financial pressures to afford dwellings.

To quantify the housing affordable problems, this research employ four approaches, they are revised Housing Price to Income Ratio approach, Affordable House Size Approach, revised Housing Expenditure to Income Ration approach and Residual Income Measure. The findings are as follows.

To begin with, the results of PIR ratios are arrange from 10 to 30. According to the international standards for PIR, the normal PIR below 3, and if PIR bigger than 5,1, it will be considered severely unaffordable. Considering international standards are developed by developed county, since China is still a developing country and there still thousands of people suffer from poverty line, this study define the unaffordable standards are around 10 ~ 11. Nevertheless, even use this looser standard; the results shows that there is only have medium low-income household in the year of 2012 can severely affordable a house. Others, no mater when or which group, are all should be considered severely unaffordable by revised PIR method.

Similarly, the results of affordable house size approach shows our target, relatively low-income household, could only afford around 10 square meters. Their affordability is great influenced by the house price. Considering no one will buy a house around 10 square meters, and also the real estate businessman will not sell such a mini commercial house, relatively low-income group is hard to purchase a property in Shenzhen from the year of 2009 to the year of 2012.

Thirdly, it is the HEIR ratio which including mortgage, condo fee and utilities fee (Gas, water and electricity). According to this calculation, almost no types of relatively low-income households have the HEIR below 30%, there even only one HEIR is below 100%, which means, there is only for medium low-income family can buy a 70 m^2 house and repay it every month by devoting 83% of their disposable income to repay 30 years! For other types of families or maybe shorter option of repayment, they have no ability to buy the house and repay the mortgage.

From a residual income measure view, the housing affordable problem for relatively low-income households are quite terrible from the year 2010 to the year 2012. For the lowest income group, they cannot afford a house; otherwise they will scarify their basic living quality. As for relatively low-income household, the housing will also induce poverty for them in 2010 and 2011. They can afford a house in the year of 2012 without harming basic non-housing expenses. Lastly, for the medium low-income group, they will afford a house in the later 2 years, but in the year of 2010, they cannot afford a house while satisfied the normal life in the same time.

To shed the light on this problem, the more demand than the supply is one of the reason for high price. For more migrants and rapid urbanization, more and more people wants to living there while the restrictive policy limited the house supply. Furthermore, speculative investment in housing also explains the escalating price. Last but not the least, people also crazy about purchasing property to prove themselves.

To solve this problem, government could consider refine the mortgage loans, offer different types of loans depends on income level. In addition, developing more adorable house could also release this problem. However, these policies mentioned should be strictly enforce and precisely target to avoid some rent-seeking phenomenon.

References

(1) Karle.E.Case, Robert.J.Shiller, (2004) Is There a Bubble in the Housing Market? , Cowles Foundation Paper No. 1089

(2) Wang xiaoguang, 2004, Real estate should no longer irrational exuberance, Outlook, Issued 2004.No.5 (in Chinese)

(3) Ren zhiqiang, (2004), “Central wanted to split the real estate risk", Beijing Morning Newspaper, October 20, 2004

(4) Li Ping, Li HongMei, (2004) "Speculative capital, local inflation and the real estate bubble", "China real estate" 2004, No.7

(5) Jiang Chunming, (2005), "An Empirical Analysis of China's real estate market speculative bubble", Management World, 2005, Issued. 12

(6) Xie Guo Zhong, Personal blog, http://xieguozhong.blog.sohu.com/

(7) China National Statistic Bureau. http://www.stats.gov.cn/

(8) Maclennan, D., & Williams, R. (1990). Affordable housing in Britain and the United States. York: Joseph Rowntree Foundation.

(9) (Bramley, G. (1990). Access, Affordability and Housing Need. Paper Presented at ESRC Housing Studies conference, University of Surrey, mimeo (Bristol: SAUS, University of Bristol)

(10) Stone, M. E. (2006). What is Housing Affordability? The Case for the Residual Income Approach. Housing Policy Debate, 17(1), 151-184.

(11) Hancock, K.E. (1993). ‘Can Pay? Won’t Pay?’ or Economic Principles of ‘Affordability’, Urban Studies, 30(1), 127–145.

(12) Chen, J., Hao, Q. J. & Stephens, M. (2010). Assessing Housing Affordability in Post-reform China: A Case Study of Shanghai. Housing Studies, 1-25.

(13) (Alain Bertaud (2009) Housing Affordability in China; A Stock and Flow Approach, Paper presented at Peking University at the Symposium on Low- income Housing in China, Beijing, on July 10-11, 2009: Peking University .)

(14) C. Andre, A. G. Alana, and R. Gupta, “Testing for persistence in housing price-to-income and price-to-rent ratios in 16 OECD countries,” Applied Economics, vol. 46, no. 18, pp. 2127-2138, 2014.

(15) Norazmawati (2015) Price to Income Ratio Approach in Housing Affordability, ournal of Economics: Business and Management, Vol. 3, No. 12, December 2015.

(16) Miao Liu (2010) Housing Affordability Problem in Shanghai 1995-2009, 1 edn., Department of Real Estate and Construction Management: Masters Programme in Real Estate Management.

(17) Kutty, N. (2005). A New Measure of Housing Affordability: Estimates and Analytical Results. Housing Policy Debate, 16(1), 113-142.

(18) Bogdon, A. S. & A, Can. (1997). Indicators of Local Housing Affordability: Comparative and Spatial Approaches. Real Estate Economics 25(1), 43-80.

(19) Hulchanski, J. David. 1995. The Concept of Housing Affordability: Six Contemporary Uses of the Housing Expenditure-to-Income Ratio. Housing Studies 10(4):471–91.

(20) Michael E. Stone ， Terry Burke，Liss Ralston (2011) The Residual Income Approach to Housing Affordability: The Theory and the Practice, 1 edn., university of Massachusetts–Boston: Community Studies Faculty Publication Series.

(21) Chen Yao (2011) Measuring Housing Affordability in Beijing, 1 edn., Department of Real Estate and Construction: Track of Financial Service.

(22) Wang, Shengwei. "Hong Kong and Shenzhen Can Become China's Silicon Valley." Chinadaily. May 3, 2015. Accessed March 7, 2016. http://www.chinadaily.com.cn/regional/2015-06/03/content_20930739.htm.

(23) "The Minimum Living Standard over the Years in Shenzhen City." Shenzhen Government Website. February 6, 2015. Accessed March 7, 2016. http://www.szmz.sz.gov.cn/xxgk/ywxx/dbfw/bmxx/.

(24) Condominium Fee, Investopedia, Accessed March 7, 2016, http://www.investopedia.com/terms/c/condominium-fee.asp

(25) Lang, Fang. "The Great Sprawl of China." The Economist. January 24, 2015. Accessed March 7, 2016. http://www.economist.com/news/china/21640396-how-fix-chinese-cities-great-sprawl-china.