The Impact of Housing Market Fluctuation and Housing Supply on the Housing Opportunities of Moderate- and Low-Income Households in 21st- Century Urban China: A Case Study of Ordos City

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Source: *China Review*, Vol. 18, No. 1, SPECIAL ISSUE: Mobility and Life Chances in Urbanization and Migration in China (FEBRUARY 2018), pp. 107-136

Published by: Chinese University Press

Stable URL: https://www.jstor.org/stable/10.2307/26435636

The China Review, Vol. 18, No. 1 (Feburary 2018), 107–135

*The Impact of Housing Market Fluctuation and Housing Supply on the Housing Opportunities of Moderate- and Low-Income Households in 21st-Century Urban China: A Case Study of Ordos City**

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Abstract

Housing filtering is well documented in the West, but few empirical studies have applied this concept in China. Under the framework of housing filtering, this study investigates how the fluctuation of the commodity housing market affects the housing opportunities of moderate- and low-income households in Ordos City, China. The findings reveal that the excessive commodity housing supply is not helping moderate- and low-income groups during the housing boom period due to skyrocketing housing prices and low housing availability caused by multiple homeownerships of the rich. The burst of the housing market bubble in 2011 has favored moderate- and low-income groups, manifested by their increased purchases in the secondary housing market under decreasing housing prices. Nonetheless, the poorest households still face financial difficulties in purchasing commodity housing. Moreover, majority transactions in the secondary housing market involve medium-sized dwellings, suggesting that the

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*The authors gratefully acknowledge the financial support from a Mitacs Globalink Research Award (Reference Code: IT05828).

supply of medium-sized dwellings is critical in facilitating the filtering process in Ordos City. This research argues that government intervention is needed to ensure the housing opportunities of the lower income groups. However, it is beneficial to discuss how market mechanisms such as filtering can be made effective to promote housing opportunities for the poor.

Human beings always seek improved housing if their current houses fall below their expectations or better housing opportunities emerge. As buildings deteriorate over the passage of time, current house owners may move to newer or higher quality dwellings and pass their current houses to the comparatively lower income groups. Consequently, the housing market sees an ongoing dynamic flow of transactions. The notion of "housing filtering", which has long been discussed, depicts such a phenomenon. As the only market mechanism that increases the supply of dwellings that are more economical than newly constructed or modified houses, housing filtering is tightly related to the well-being of low-income groups.[1] In the West, housing filtering is often supported by market advocates as a part of neoliberal housing policies to improve housing affordability. Nevertheless, studies still question the efficacy of housing filtering for promoting housing affordability and opportunity for those on the lower end of the income spectrum.[2]

Compared to the West, the phenomenon of housing filtering is relatively new in China. Housing reform initiated in the 1980s has gradually introduced market mechanisms in both housing production and housing consumption in China.[3] On the demand side, marketization of housing stocks has allowed citizens' liberal housing choices,[4] and private-market housing transactions are normal for Chinese households nowadays.[5] On the supply side, commodity housing has become the dominant means of housing supply since the late 1990s when the state work units' housing allocation system was abolished in 1998.[6] Massive commodity housing development under the rapid urbanization process offers housing surplus for potential filtering in China. Meanwhile, the development of a secondary housing market has stimulated the exchange and circulation of housing stocks, resulting in an increased residential mobility.[7] Consequently, it is reasonable to postulate that the phenomenon of filtering will become increasingly notable in China.[8] Nonetheless, there is a limited progress on developing and applying the

housing filtering theory in the Chinese context, possibly due to the short history of the commodity housing market as well as data limitations. It is thus meaningful to discuss housing filtering with respect to urban China's housing market.

Housing affordability and housing supply are central issues under the housing filtering framework. The supply of different-sized dwellings can cast critical lights on housing affordability and the housing filtering process. The increasing supply of medium- and small-sized dwellings favors the moderate- and low-income households, as it facilitates the filtering process toward the lower levels of the housing ladder. In 21st-century urban China, skyrocketing housing prices severely threaten housing affordability for moderate- and low-income households.[9] Although issues of housing affordability[10] and housing supply[11] have been extensively discussed and the implications of housing supply on housing affordability have been studied in Anglophone countries,[12] few studies have linked them in the Chinese context. This study employs housing price as the linkage for housing supply and housing affordability. Housing price dynamics, as a primary reflection of housing market conditions, are crucial for analyzing the filtering process.[13] Consequently, besides analyzing the transactions of commodity housing, this study also explores the dynamics and determinants of commodity housing price, with special attention paid to the role of housing supply and income to shed light on the housing opportunities of moderate- and low-income households.

Under the framework of housing filtering, this article analyzes the transactions and price dynamics in the primary and secondary housing markets, the determinants of the average commodity housing price as well as secondary housing market price, and housing affordability of moderate- and low-income groups in order to shed light on the housing filtering process and the housing opportunities of moderate- and low-income groups in Ordos City (鄂爾多斯市). Ordos is a natural-resource-abundant frontier city located in China's Inner Mongolia Autonomous Region (內蒙古自治區), where its commodity housing market has experienced a dramatic rise and fall since 2000. Since entering into the 21st century, Ordos City has enjoyed an astonishing natural resource and property developmental boom. Consequently, a housing market bubble has been generated under the rapid urban expansion, and the city currently suffers from a collapsed housing market which occured in 2011.[14] Under severe housing market conditions in Ordos City, several questions remain unclear: how do fluctuations in the housing market

affect transactions in the primary and secondary housing markets? Has the burst of the housing bubble destroyed the secondary housing market? How does the commodity housing price, which is closely related to housing transactions and the filtering process, respond to the supply of different-sized dwellings and the incomes of moderate- and low-income households? Ordos City offers a valuable opportunity to explore these issues.

Apart from the empirical implications of this study, this article aims to discuss the prospect of applying the housing filtering theory under the rapid urban development process in contemporary China. One area of concerns deals with the effect of a marketized housing system induced by housing reform. For example, how does filtering take shape in China? What are the barriers to the filtering process in China? Another thread of thoughts focuses on the policy implications regarding housing affordability in China. Although the Chinese government has adopted a variety of affordable housing programs and policies to ensure low-income people's housing opportunities,[15] given the country's large population, many Chinese cities face severe challenges in affordable housing provision.[16] Under these circumstances, can housing filtering be introduced and utilized as an effective means to promote the housing opportunities for moderate- and low-income households? This question is particularly crucial given the fact that many Chinese cities have a high vacancy rate in their commodity housing stocks. For instance, around 22.4 percent of the newly constructed commodity housing in China's urban areas remained empty in 2013.[17]

This article is organized as follows. The next section reviews the mechanisms of housing filtering, with a particular focus on the impact of housing surplus on housing filtering. It also reviews the relationship between housing supply and housing affordability, and the development and application of the housing filtering theory in the Chinese context. The article then introduces the urban and commodity housing development in Ordos City, followed by the descriptive data analysis of housing prices and transactions in the primary and secondary housing markets, as well as the income and expenditure profiles of moderate- and low-income groups in Ordos City. Regression analysis is then employed to identify the determinants of the average commodity housing price and the secondary commodity housing market price in Ordos City, with particular emphasis on the role of income and housing supply. The last part of the article summarizes the findings and offers policy implications.

1. Theoretical Underpinning

Housing filtering is a framework that links excessive housing supply and the fluctuation of housing market to the housing opportunities of moderate- and low-income groups. The framework has been proven effective in connecting excessive new housing supply, such as urban sprawl, and housing opportunities of low-income groups.[18] Baer and Williamson state that "in its classic formulation, filtering is the process whereby the poor ultimately come to occupy what once were the homes of the rich."[19] The term "welfare filtering" refers to the fact that the housing quality of the poor has been improved over time through "natural" market processes or government intervention into the market.[20] Although controversies exist as to whether housing units or households should be the major focus of filtering, we argue that housing market transactions can serve as an effective lens into the exploration of housing filtering. Meanwhile, it would be beneficial to focus on the gist of the housing filtering discussion, which is whether moderate- and low-income households are able to upgrade their dwellings through market mechanisms.

Housing surplus and housing affordability are central issues of housing filtering. Housing surplus is a critical factor in the filtering process, since the volume of filtering hinges on the number of houses available for transaction.[21] Kristof argues that filtering can take place when new construction exceeds the rate necessary to house population growth, because excessive housing exerts a downward pressure on the rents and prices of existing housing, permitting lower income households to obtain better housing relative to their existing units.[22] Apart from new housing construction, excessive housing supply can also be introduced by functional conversion of structures,[23] population loss,[24] and changes in esthetical tastes and locational preferences.[25] However, the question as to whether new housing construction can reduce housing prices at lower quality levels depends on the quality level at which the new constructions take place, as well as the demand and supply elasticities.[26] The supply of new units at both upper and middle levels is thus critical to achieve welfare filtering.[27] Regardless, the notion that "excessive housing supply can induce filtering" should be taken with caution. There is always a possibility that, even under excessive housing supply, the filtering down of housing units toward lower income groups could be slow or even stagnated because high-income households may possess multiple houses and may be reluctant to sell them for the purpose of investment and wealth

accumulation.[28] Also, excessive new housing supply is often accompanied by skyrocketing housing prices during a housing boom period, which poses a tremendous financial burden on low-income groups. In sum, filtering may not necessarily take place under excessive housing supply.

The relationship between market housing supply and housing affordability has critical policy implications. The core arguments are centered on whether the increased new housing supply at higher level can expand housing opportunities for lower income groups by generating a greater quantity of affordable dwellings through the filtering process. Some scholars claim that an oversupply of housing in the form of urban sprawl may help the disadvantaged population with their housing opportunities through filtering.[29] However, opposite opinions have also been expressed. Fingleton argues that an increase of new housing supply does not necessarily lead to enhanced housing affordability in the case of the United Kingdom, as the increase in housing supply will also lead to the expansion of employment, and housing demand will rise accompanied by the enlarged housing supply as a result.[30] Aurand claims that there is no evidence that an increasing housing supply can expand the housing opportunities of low-income households.[31] Thus the belief of some market advocates that increasing housing supply can promote housing affordability needs to be taken with caution. What could be further argued is that the supply of dwellings of varying sizes will have different impacts on the housing opportunities of certain income groups, given the fact that the urban housing market features an interconnected system of submarkets.[32] For instance, the supply of large-sized dwellings may not benefit low-income groups as much as the supply of medium-sized or small-sized dwellings would.

The discussion of housing filtering may seem far-fetched in the Chinese context, as the theory originated in the West, where the market is the dominant principle in housing transactions, and filtering is often associated with neoliberal ideologies. Nonetheless, at least two theoretical positions can be justified as academically relevant to the application of the concept of filtering to China's housing market. First, a commodity housing market has gradually emerged in urban China since the housing reform, and the current housing market system and relevant institutions allow homeowners to sell and purchase houses freely. Theoretically, the housing filtering framework can be applied to a context where housing market transactions exist. In China, as the market transaction mechanism of commodity housing is unlikely to be abandoned in the near future, the discussion of filtering is

meaningful. Second, the implications of housing filtering can shed critical light on housing affordability issues in China. Although there are several affordable housing policies that promote low-income groups' housing opportunities in China, their implementations are not always effective.[33] On the other hand, given the fact that some Chinese cities witness a high vacancy rate of commodity housing,[34] it can be claimed that the logic of filtering can assist moderate- and low-income households to some extent. This article does not serve as a neoliberal housing policy advocate in urban China. Rather, it demonstrates the flaws of the market mechanisms in promoting low-income people's housing choices.

There has been limited progress in developing and applying the housing filtering theory in the Chinese context. Some studies employ theoretical filtering models to analyze the effectiveness of affordable housing policies in China.[35] In regards to the commodity housing market, Zhao and Shen not only stress the necessity of leveraging market power to solve the shortage of dwelling spaces for low-income people, but also emphasize the significance of establishing a legal system for real estate agencies to better circulate housing market information in order to facilitate the filtering process.[36] Huang and Wang suggest policy implications for well functioning filtering process in China, such as the implementation of transaction tax reform in the secondary housing market for a unified taxation policy, the encouragement of developing real estate agencies, and the opening up of public housing stock for transactions.[37] On the other hand, very few empirical studies on housing filtering have been conducted in the Chinese context. Liu and Tang analyze Hangzhou's housing market from the perspective of filtering, and discover that the active local secondary housing commodity market has accelerated the filtering process.[38] However, the robustness of Liu and Tang's study is questionable since their analysis is purely descriptive. In a more recent study of housing filtering in Hangzhou, Zhang et al. conduct surveys comprised of 270 households and employ the vacancy chain model based on the surveyed data.[39] Their findings suggest that the filtering process is moderate in Hangzhou. However, to date, how the fluctuation of the housing market affects the filtering process has received little attention. In general, the lack of empirical studies on housing filtering in China has hindered the development of market-oriented housing policies, which could be made more effective as the supplementary tools for affordable housing programs to promote housing opportunities of moderate- and low-income households in China.

While it is appropriate to discuss housing filtering in China, attention should also be paid to its barriers to promoting housing opportunities of the poor. Huang and Wang argue that the unsound development of the institutions regarding transactions in the secondary housing market in China has hindered the filtering process.[40] They also summarize the limitations in demand and supply aspects in China's housing market in relation to the filtering process. On the demand side, many moderate- and low-income households fail to purchase satisfactory houses due to their low income levels and skyrocketing housing prices. From the perspective of supply, many factors such as location advantages of old dwellings, higher-income groups' intentions of investment and wealth accumulation, and high transaction taxes in the secondary housing market have made some homeowners reluctant to sell their old dwellings, which are normally located within or close to city centers. Coupled with asymmetrical information among sellers and buyers, the supply of used housing stock is often limited. Thus, the housing filtering process in China can be regarded as "limited filtering."[41] It is also critical to acknowledge that the theoretical development and application of housing filtering should be tailored to the specific socioeconomic conditions in China.

2. Urban and Housing Development in Ordos City

Renowned for its abundant natural resources, Ordos is a frontier city located in the Inner Mongolia Autonomous Region of China (Figure 1). The city possesses approximately 16 percent of China's total coal reserve and many different kinds of mineral resources.[42] Because of the cold semiarid and desert climate as well as the scarce arable land, Ordos has historically featured a small population that live in poverty.[43] Upon entering into the 21st century, the Ordos local government targeted natural resource extraction as a means to reduce poverty and promote economic development under the auspicious national policy named the "Western Development Program," inaugurated in 2000. As a result, massive coal mining with skyrocketing national coal price brought immense fortune to the city. Ordos' per capita GDP in 2012 (equivalent to US$35,379) tops that of all Chinese cities, and far surpasses that of Shanghai and Beijing.[44] Unfortunately, Ordos's coal industry has been hit by declining national coal prices since 2012, which has adversely affected the local economy.

Figure 1: The Geographical Location of Inner Mongolia and Ordos City

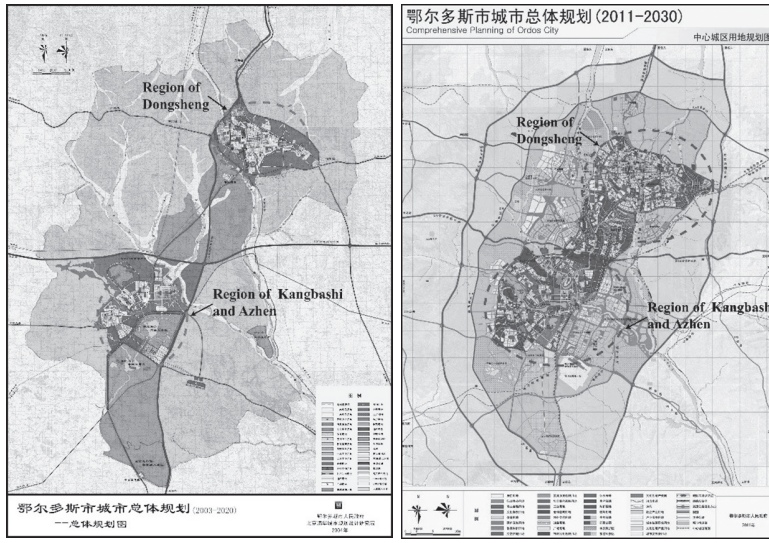
Source: Adapted from Wikipedia

Urban and housing development in Ordos City has also experienced vicissitudinous trajectories. In 2001, Ordos's administrative jurisdiction status was upgraded from the county level to the prefecture level by the Chinese central government. The new Ordos municipal government prioritized urban development and boosted urbanization as their core economic development strategies in the 21th century based on lucrative natural resource extraction and industrial production. Consequently, the 2003 to 2020 Ordos Comprehensive Plan (Figure 2) aimed at largely expanding the city's core area and adopted a "dual-core" metropolitan urban structure to house 650,000 residents by 2020. The dual-core metropolitan region comprises the old city center named Dongsheng (東勝) and the newly-designated city center named Kangbashi and Azhen Region (康巴什和阿鎮片區) (Figure 2). The new town of Kangbashi (康巴什新區) enjoys a strategic position in the city's ambitious long-term urbanization agenda, which is planned as the new center for all municipal agencies, and is expected to accommodate a great portion of future population growth. A later version of the plan, the 2011 to 2030 Ordos Comprehensive Plan (Figure 3), further expanded the planned core

metropolitan region with generous land supply, aiming to house two million people by 2030.

Under the ambitious urban planning scheme, Ordos City underwent an unprecedented urban expansion and housing development from 2000 to 2011. The Kangbashi New District has undergone remarkable urbanization and commodity housing development since its groundbreaking ceremony in 2004. During the approximately same period of time, Dongsheng District launched its Tiexi New Zone development (鐵西新區). The over-zealous attitude of the local government and developers toward housing development tolerated increasing speculative activities in Ordos City, and the housing bubble eventually burst in 2011, leading to plummeting housing prices and high vacancy rates in residential buildings. Today, the Kangbashi New District remains largely uninhabited, as most people still prefer to live in the old city center and commute to work. The new district's population was only 30,000 in 2014, with an estimated vacancy rate of 70 percent in its residential property market.[45] Meanwhile, Dongsheng District's urban expansion and regeneration which began in the early 2000s, was also followed by a collapse in the housing market in 2011.

Figure 2 (Left): The Comprehensive Plan of Ordos City, 2003–2020; Figure 3 (Right): The Comprehensive Plan of Ordos City, 2011–2030



Source: The Ordos Planning Bureau. Adapted by the authors.

3. Data and Analysis

The commodity housing profile data is drawn from the Ordos Housing Management Bureau (OHMB). The OHMB is a municipal-level unit responsible for housing management, market supervision, and housing policy making. The data covers all transactions in the Ordos Metropolitan Area. The OHMB garners annual information such as number of transactions, monetary amount, and housing floor areas involved in transactions of the primary and secondary housing markets. Specific information about individual housing transactions is not available. The average housing prices in the primary and secondary housing markets are calculated based on the total monetary amount and the total floor areas involved in all transactions in a given year.

a. Housing Market Profiles

It is helpful to have an understanding of Ordos's housing market to which the framework of housing filtering is applied. Ordos' commodity housing market has witnessed a boom and burst cycle from 2000 to date, with a housing development upsurge from 2000 to 2011, followed by the burst of the housing bubble beginning in 2011. Since the excessive housing development has generated a housing surplus, one of the possible prerequisites for filtering, the interaction between the primary and secondary housing markets can be intriguing. The data structure that separates the primary and secondary markets makes it possible to compare them, from which the inference of filtering may be strengthened. Table 1 lists the annual number of transactions and the average prices regarding the primary and secondary housing markets from 2000 to 2015. Due to the fluctuated resource economy and excessive housing supply, housing prices under both the primary and secondary markets have experienced tremendous rise and fall. The year 2010 witnessed the highest housing prices in both the primary and secondary markets with 6,744.68 yuan/m^2 and 4,986.89 yuan/m^2, respectively. The skyrocketing housing prices corresponded to the booming coal mining sector in Ordos from 2008 to 2010, with sharp price increases of 3,132.86 yuan/m^2 and 2,886.89 yuan/m^2 in the primary and secondary housing markets between 2008 and 2010, respectively. It is noteworthy that housing prices have dropped remarkably since 2011 following the burst of the housing bubble. In 2015, the

average housing prices in the primary and secondary markets hit a new low since 2009, reaching 4,192.88 yuan/m^2 and 1,926.43 yuan/m^2, respectively. The significant drop in housing prices in both the primary and secondary markets might promote the housing affordability for moderate- and low-income cohorts.

Apart from the housing price analysis, a scrutiny of the number of houses transferred reveals three significant phenomena in Ordos's housing market. First, from 2002 to 2014, the number of transactions in the primary housing market always exceeded that in the secondary market, which suggests a higher popularity of new commodity housing especially in the housing boom period. In 2015, due to the sluggish new commodity housing demand and the burgeoning secondary market, the number of transactions in the secondary housing market surpassed that in the primary housing market for the first time since 2002. Although the number of transactions in the secondary market was also higher than that of the primary market in 2001, it was a different story. When Ordos City ungraded its administrative jurisdiction status in 2001, the demand for housing in the metropolitan region was high. Nonetheless, few new houses were built to allow a high number of transactions in the primary housing market. Second, the trends of transactions in the primary and secondary housing markets are most likely opposite to each other in almost any two consecutive years except for 2007 and 2008. The dramatic decrease of transactions in the secondary housing market occurred between 2010 and 2011, which suggests little interest in used commodity housing among purchasers when transactions in the primary market reach their zenith. This is more apparent since the collapse of the housing market in 2011, when decreasing transactions in the primary market were accompanied by an increasing demand in the secondary housing market. Since the burst of the housing bubble, the differentiated transaction patterns in the primary and secondary housing markets suggest that housing prices in the secondary market have gained an advantage. The housing redevelopment programs in Ordos City have razed a large portion of shabby houses since the 2000s, and transactions in the secondary housing market are unlikely speculative activities as the economic recession has generated a high vacancy rate in new commodity housing. Thus, moderate- and/or low-income households are the main consumers in the secondary housing market.

Table 1: Number of Transactions and Average Housing Prices in the Primary and Secondary Housing Markets in Ordos City, 2000–2015.

Year	Primary Housing Market		Secondary Housing Market	
	Number of Transactions	Average Housing Price (Yuan/ m²)	Number of Transactions	Average Housing Price (Yuan/ m²)
2000	978	721.70	764	310.00
2001	760	965.25	777	385.00
2002	1669	1062.61	483	495.00
2003	2715	1067.64	415	684.62
2004	2342	1173.32	568	617.32
2005	5774	1545.79	587	616.91
2006	3387	2038.00	596	778.11
2007	6725	2238.01	490	1800.00
2008	7980	3611.82	580	2100.00
2009	7604	4475.39	1172	3350.34
2010	9460	6744.68	1160	4986.89
2011	9381	6703.91	753	4977.00
2012	4888	5376.58	1166	3685.33
2013	3526	4959.33	2183	2579.77
2014	3990	4538.42	2794	3017.25
2015	3609	4192.88	4162	1926.43

Source: The Ordos Housing Management Bureau

Third, housing prices in the secondary housing market experienced an increase from 2013 to 2014 with an upswing in the number of transactions, but witnessed a significant drop from 2014 to 2015, accompanied by an even more dramatic rise in the number of transactions. Such phenomena may be explained by the nuances of housing supply and can possibly serve as an evidence for effective filtering. A tentative explanation here is that there are more medium- and large-sized houses with relatively higher quality being transferred each year from 2011 to 2014 than in 2015 in the secondary housing market. The transactions in the secondary market in 2015 were likely the small- and medium-sized lower quality dwellings units with lower market values, which possibly explains the low average housing price of that year. Although this hypothesis cannot be robustly verified due to data limitations, the interviews with an official in the OHMB and the conversations with local citizens confirm this hypothesis to some extent. In the housing boom period, with skyrocketing housing prices, many households purchased multiple medium- or large- sized houses

as investments. When the housing bubble burst in 2011, along with the sluggish economy, some higher-income households sold their extra houses at a low price to overcome their financial difficulties. Meanwhile, moderate- and low-income households with sufficient funds for a down payment may have used the Housing Provident Fund to purchase small- or medium- sized units in the primary or secondary market. To conclude, increasing transactions along with decreasing prices in the secondary housing market since 2011 imply a great possibility of an effective filtering process whereby more moderate- and low-income households are acquiring better housing.

b. Income and Expenditure Profiles of the Moderate- and Low-Income Groups

Table 2 depicts the average income and expenditure profiles of the moderate- and low-income groups from 2002 to 2013 in Ordos City. The income groups are classified into five levels, and the boundaries are demarcated by the income level percentages within the entire income profile ladder, with 100 percent for the richest and 0 percent for the poorest. The groups are categorized as follows: high income group (80–100 percent), higher-moderate income group (60–80 percent), moderate income group (40–60 percent), lower-moderate income group (20–40 percent), and low income group (0–20 percent). For moderate, lower-moderate, and low income groups, average annual data on individuals' total income, total expenditure, and expenditure to income ratio are listed in Table 2. To facilitate the discussion on the filtering process, the ratio of average housing price in the secondary housing market to income is calculated for moderate, lower-moderate, and low income cohorts from 2002 to 2013 (Table 2). The data indicates that the ratio of expenditure to income has dropped for all moderate- and lower-income groups since 2011. Also, given the fact that the income levels of moderate- and low-income groups grew consistently, a conclusion can be drawn that the well-being of moderate- and low-income groups has been ameliorated. Meanwhile, the declining secondary market housing price to income ratio since 2011 can be inferred as resulting from an improvement in housing affordability for all moderate- and low-income groups. Not surprisingly, low-income group has the highest expenditure to income ratio since 2011. Overall, the secondary market housing price to income ratio has experienced two rounds of rise and drop from 2002 to 2013 with a striking record from

2005 to 2013. From 2005 to 2009, moderate- and low-income groups suffered from an increasing housing burden owing to housing prices increasing faster than incomes during the economic boom. Regarding the poorest households, the housing burden continued to rise until 2011. The situation has changed for moderate- and low-income cohorts since 2011, as the ratio has dropped significantly with the largest change for the low-income group. It can be inferred that the well-being and housing affordability of moderate- and low-income groups were ameliorated during the housing burst period, but not in the housing boom era.

Table 2: Income and Expenditure Profiles for Moderate- and Low-Income Groups in Ordos City, 2002–2013 (Unit: yuan/person).

Year	Item	Total Average	Low Income Group	Lower-moderate Income Group	Moderate Income Group
2002	Average Total Income	6606	3727	5436	6598
	Average Total Expenditure	5163	3641	4818	5104
	Expenditure to Income Ratio	0.782	0.977	0.935	0.774
	Secondary Housing Market Price to Income Ratio	0.075	0.133	0.091	0.075
2003	Average Total Income	7500	4031	6022	7204
	Average Total Expenditure	5507	3590	4767	5658
	Expenditure to Income Ratio	0.734	0.891	0.792	0.785
	Secondary Housing Market Price to Income Ratio	0.091	0.170	0.114	0.095
2004	Average Total Income	9104	5107	7571	9110
	Average Total Expenditure	7032	4174	5945	7850
	Expenditure to Income Ratio	0.772	0.817	0.785	0.862
	Secondary Housing Market Price to Income Ratio	0.068	0.121	0.082	0.068
2005	Average Total Income	11774	6663	9362	11619
	Average Total Expenditure	8879	5245	8131	9580
	Expenditure to Income Ratio	0.754	0.787	0.869	0.825
	Secondary Housing Market Price to Income Ratio	0.052	0.093	0.066	0.053
2006	Average Total Income	13665	7035	11049	13613
	Average Total Expenditure	10356	6015	8546	9423
	Expenditure to Income Ratio	0.758	0.855	0.773	0.692
	Secondary Housing Market Price to Income Ratio	0.057	0.111	0.070	0.057

Year	Item	Total Average	Low Income Group	Lower-moderate Income Group	Moderate Income Group
2007	Average Total Income	18186	11938	13924	16355
	Average Total Expenditure	12665	8434	10266	11868
	Expenditure to Income Ratio	0.696	0.706	0.737	0.726
	Secondary Housing Market Price to Income Ratio	0.099	0.151	0.129	0.110
2008	Average Total Income	20343	10910	16138	19360
	Average Total Expenditure	15541	8705	14870	13841
	Expenditure to Income Ratio	0.764	0.798	0.921	0.715
	Secondary Housing Market Price to Income Ratio	0.103	0.192	0.130	0.108
2009	Average Total Income	23031	13964	18401	21298
	Average Total Expenditure	18333	12011	15805	16003
	Expenditure to Income Ratio	0.796	0.860	0.859	0.751
	Secondary Housing Market Price to Income Ratio	0.198	0.240	0.247	0.214
2010	Average Total Income	27198	16791	21532	25805
	Average Total Expenditure	22566	16484	18753	21689
	Expenditure to Income Ratio	0.830	0.982	0.871	0.840
	Secondary Housing Market Price to Income Ratio	0.183	0.297	0.232	0.193
2011	Average Total Income	31441	15342	23433	28698
	Average Total Expenditure	25977	15261	20964	23697
	Expenditure to Income Ratio	0.826	0.995	0.895	0.826
	Secondary Housing Market Price to Income Ratio	0.158	0.324	0.212	0.173
2012	Average Total Income	35669	16612	26125	32328
	Average Total Expenditure	27488	16143	19637	23091
	Expenditure to Income Ratio	0.771	0.972	0.752	0.714
	Secondary Housing Market Price to Income Ratio	0.103	0.222	0.141	0.114
2013	Average Total Income	37564	17954	28972	35267
	Average Total Expenditure	27393	15378	18526	22196
	Expenditure to Income Ratio	0.729	0.857	0.639	0.629
	Secondary Housing Market Price to Income Ratio	0.069	0.144	0.089	0.073

Source: The Ordos Statistical Bureau. Complied by the authors.

4. The Models

a. Introduction

The determinants of average commodity housing price and the secondary market commodity housing price can better facilitate the discussion of housing filtering. The framework of housing filtering requires an understanding of housing submarkets and the fact that different submarkets are dominated by varying income groups. To date, majority models in studying housing prices have treated housing supply and income as general variables. This may lead to oversimplified conclusions, as the implications regarding housing submarket can be overlooked. We try to overcome this shortcoming by incorporating different levels of dwelling sizes and incomes of moderate- and low-income groups to shed light on the income levels of consumers as well as the sizes of dwellings in the secondary housing market. Such nuanced variables yield more subtle and robust results.

Given the small sample size of this study, ordinary least squares (OLS) regression has been adopted. This study employs two models for analyzing the determinants of average commodity housing price and secondary market housing price, respectively. Housing prices, like other commodity prices, are mainly affected by demand and supply dynamics. According to Abelson et al.,[46] changes in housing prices can be expressed as:

$$P_t - P_{t-1} = \alpha(D_t - S_t)$$

where P denotes commodity housing price, D stands for estimated housing demand, S represents housing supply, and the subscripts *t* and *t-1* signify a time period and its previous period, respectively. If demand exceeds supply, or $(D_t - S_t) > 0$, housing prices will rise during the period *t*. On the other hand, housing prices will drop if supply exceeds demand.

For an individual household, housing demand is determined by its consumption wills, which are closely associated with the household's financial budget and market conditions, such as incomes, interest rates, and housing prices.[47] In addition, population is another critical factor in shaping housing demand. Thus, the demand for commodity housing can be expressed by the following equation:

$$D_t = f\,(Y_t, IR_t, P_t, N_t)$$

where Y denotes average disposable income, IR signifies interest rate, P represents housing price, and N stands for population. Meanwhile, housing supply (S) refers to the stock of commodity housing. Based on the above two equations, the housing price model can be written as:

$$P_t = f(Y_t, IR_t, N_t, S_t, P_{t-1})$$

To explore the determinants of average housing price and secondary market housing price, two models will be run separately. The models can be expressed in a logarithmic form to consider the nonlinear relationship between dependent and independent variables. For the two models, the estimation analysis suggests that some variables such as interest rate are of low significance and cause ineffectiveness in the model. As a result, interest rate is removed from the two models to ensure effectiveness. Meanwhile, housing stocks that are less than 90 square meters are removed from the model for the average commodity housing price. Housing stocks between 140 and 300 square meters as well as average income of low-income groups are removed for the secondary market housing price model. The revised twomodels can be expressed as the following equations, where P stands for average commodity housing price and PS denotes housing price in the secondary market. All other variables are elaborated in the next section.

$$Ln(P_t) = \beta_0 + \beta_1 Ln(Pt\text{-}1) + \beta_2 Ln(90TO140t) + \beta_3 Ln(140TO300t) + \beta_4 Ln(Y_t) + \beta_5 Ln(N_t) + \varepsilon$$

$$Ln(PS_t) = \beta_0 + \beta_1 Ln(PS_{t-1}) + \beta_2 Ln(LESS90_t) + \beta_3 Ln(90TO140_t) + \beta_4 Ln(N_t) + \beta_5 Ln(LMIG_t) + \beta_6 Ln(MIG_t) + \varepsilon$$

b. Data and Variables

The data used in this study are collected from the Ordos Statistical Bureau and the OHMB. Housing supply information is obtained from the Ordos Housing Investigation Report of 2015, which covers information such as the construction completion time, number of units, and dwelling sizes of all 1,328 commodity housing complexes in Ordos City. Table 3 specifies the definitions of all the variables and their units. All nominal variables are converted into real values by using a consumer price index (year of 2000 = 100).

Table 3: Variables and Definitions.

Name	Definition	Unit	Format in this Study
Commodity Housing Price (P)	Average transaction price	yuan/m^2	Ln (P)
Commodity Housing Price in the Secondary Housing Market (Ps)	Average transaction price	yuan/m^2	Ln (Ps)
Population (N)	Total number of resident population	person	Ln (N)
Housing Stocks less than 90 m^2 (LESS90)	Total area of commodity houses that are less than 90 m^2	m^2	Ln (LESS90)
Housing Stocks between 90 m^2 and 140 m^2 (90TO140)	Total area of commodity houses that are between 90 m^2 and 140 m^2	m^2	Ln (90TO140)
Housing Stocks between 140 m^2 and 300 m^2 (140TO300)	Total area of commodity houses that are between 140 m^2 and 300 m^2	m^2	Ln (140TO300)
Average Disposable Income (Y)	Average annual disposable income of all households	yuan/person	Ln (Y)
Average Disposable Income of Low Income Groups (LIG)	Average annual disposable income of low income groups	yuan/person	Ln (LIG)
Average Disposable Income of Lower Moderate Income Groups (LMIG)	Average annual disposable income of lower moderate income groups	yuan/person	Ln (LMIG)
Average Disposable Income of Moderate Income Groups (MIG)	Average annual disposable income of Moderate Income Groups	yuan/person	Ln (MIG)

Source: The Ordos Statistical Bureau and The Ordos Housing Management Bureau.

c. Estimation Results

Table 4 reports the estimation results for the two models. The left column estimates the determinants of average commodity housing price in Ordos City. The results indicate that population, disposable income, one-year-lagged housing price, and the supply of dwellings between 90 m^2 and 140 m^2 have significant positive correlations with average commodity housing price in Ordos City. As expected, housing price is positively and significantly affected by one-year-lagged housing price, which highlights the role of expectations and inertia in fueling housing demand to boost housing prices even under the increasing vacancy and interest rates during the housing boom period. Field work informs that local residents in Ordos City favor purchasing extra houses primarily as a means of investment and wealth accumulation. Not surprisingly, population and

income have significant positive correlations with average commodity housing price. The positive correlation between the supply of houses between 90 m^2 and 140 m^2 (hereinafter medium-sized dwellings) and average commodity housing price suggest that medium-sized dwellings are the main target of housing consumers. On the other hand, the supply of houses between 140 m^2 and 300 m^2 (hereinafter large-sized dwellings) has a negative correlation with average commodity housing price, which implies that the oversupply of large-sized dwellings will have an adverse impact on the housing market.

Table 4: Estimated Results of OLS Regression Analysis.
Note: *$p < .1$. **$p < .05$. ***$p < .01$.

Independent Variable	Model I (Average commodity housing price as dependent variable)		Model II (Commodity housing price secondary market as dependent variable)	
	Coefficient	t-Statistic	Coefficient	t-Statistic
One-year Lagged Housing Price (P_{t-1})	0.511*	1.476	0.364**	3.407
Housing Stocks less than 90 m^2 ($LESS90_t$)	-	-	-0.451**	-2.538
Housing Stocks between 90 m^2 and 140 m^2 ($90TO140_t$)	2.654**	2.824	0.320***	1.990
Housing Stocks between 140 m^2 and 300 m^2 ($140TO300_t$)	-1.362**	-3.134	-	-
Income (Y_t)	0.657*	0.376	-	-
Population (N_t)	1.632**	3.276	1.744***	6.289
Average Income of Lower Moderate Income Groups ($LMIG_t$)	-	-	0.949***	5.231
Average Income of Moderate Income Groups (MIG_t)	-	-	1.673***	6.790
Adjusted R Square	0.964		0.982	
F-Value	69.929		277.647	

The analysis of the determinants for commodity housing prices in the secondary housing market reveals more subtle results. The right column of Table 4 lists the estimated results. Interest rate has no significant relationship with secondary market housing prices, which indicates that consumers in the secondary housing market may not largely rely on bank

mortgages. According to the interviews with an official in the OHMB, since the burst of the housing bubble many consumers in the secondary housing market have relied on the Housing Provident Fund rather than personal loans from banks to purchase housing units. Moreover, incomes of moderate- and lower-moderate income groups are significantly and positively correlated with secondary market housing prices, which possibly reveals that moderate- and lower-moderate income groups are the main buyers in the secondary housing market. On the other hand, the insignificant relationship between low-income groups and secondary market housing price suggests that the majority of low-income households have not purchased commodity houses, even under decreasing housing prices. The interviews with the official in charge of the documentation of housing transactions in the OHMB confirm that since the burst of the housing bubble the main consumers in the secondary housing market have been moderate and lower-moderate households, while most low-income households still face financial difficulties in acquiring better housing.

In addition, the supply of medium-sized dwellings demonstrates a significant and positive correlation with secondary market housing price, while a negative correlation is discovered between the supply of small-sized dwellings (houses that are less than 90 m^2) and secondary market housing price. Such relationships can be interpreted as the increase in the number of medium-sized dwellings could boost housing availability within this range, which would enable expanded housing transactions of medium-sized dwellings and later small-sized dwellings through the filtering process. Interviews again confirm that medium-sized dwellings share a large portion in secondary market transactions, while the transactions of used small-sized dwellings have risen gradually. Taken together with the aforementioned finding that the supply of medium-sized dwellings has a significant positive correlation with average commodity housing price, a conclusion can be drawn that the supply of medium-sized dwellings plays a vital role in Ordos' commodity housing market and the filtering process, and the oversupply of large- and/or small-sized commodity housing is ineffective in facilitating filtering.

5. Conclusions and Discussions

Under the framework of housing filtering, this article analyzes the transactions and housing price dynamics in the primary and secondary housing markets. It investigates how the fluctuation of the commodity

housing market affects the housing choices and affordability of moderate- and low-income households, and examines the determinants of commodity housing prices in Ordos City. Two notable conclusions can be reached. First, the housing boom and burst cycle in Ordos City from 2000 to date has had a tremendous influence on housing transactions as well as moderate- and low-income households' housing consumption behaviors and opportunities. Although the new housing supply has increased rapidly in Ordos since 2001, the rising secondary market housing price to income ratio for moderate- and low-income groups during the housing boom period has shown little evidence for the improvement of housing affordability. This challenges the belief among market advocates that more housing supply means greater housing opportunities for all. Multiple homeownerships of the rich have impeded the filtering of many old dwellings toward the poor. A pilot survey conducted by the authors in 2015 suggests that nearly 40 percent of all extra houses of the 90 respondents are claimed to be unoccupied in Ordos City. Interviews with officials in the OHMB also confirm that a great number of households hold multiple houses without renting or selling the extras to others. Meanwhile, urban expansion and regeneration eliminate a great portion of old dwellings in Ordos City. Consequently, the skyrocketing prices in both the primary and secondary housing markets and the limited well-conditioned old commodity housing stocks jeopardize the housing opportunities of moderate- and low-income households. Ironically, the burst of the housing bubble and the economic downturn in the city help some moderate- and low-income people. The housing market has encouraged the transactions in the secondary housing market with decreasing housing price since 2011. Interviews and quantitative data analysis reveal a great possibility that moderate- and low-income people have grasped this opportunity to upgrade their houses. These arguments are supported by the decreasing secondary market housing price to income ratio and the expenditure to income ratio regarding moderate- and low-income households. The burst of the housing bubble and the economic downturn have led to a process of wealth redistribution to some extent between the rich and the poor. Second, various socioeconomic forces define the commodity housing prices and the filtering process in Ordos City. One notable factor is the supply of medium-sized commodity housing, which has a significant positive correlation with both average commodity housing price and secondary market housing price. It is most likely that transactions in the

secondary housing market are concentrated on medium-sized dwelling units, whose purchasers are usually moderate and lower-moderate income groups. In other words, the lower income groups are getting better housing. Nonetheless, the poorest households are still facing financial difficulties in purchasing commodity housing.

The framework of housing filtering is closely connected with housing policies, particularly the tax and mortgage policies for housing transactions. On the one hand, China's sales tax policy in the secondary housing market becomes stricter with the required property ownership tenure time for market transaction eligibility. For instance, in 2005, a purchased housing unit has to be resided in for more than two years before its sales tax can be exempted in market transaction. But this tenure time requirement has been extended to five years since 2010.[48] On the other hand, the fact that property tax reduction and exemption encourages property transactions in China through tax reduction and exemption facilitates the housing filtering process. For instance, the policy states that if a property seller purchases a new housing unit within one year after selling his or her existing housing unit, the new housing unit's property taxes can be deducted or exempted depending on the price difference between the two.[49] Using taxes to leverage secondary market transactions in Ordos City is still debatable, though it has not been a barrier to transactions during the past 15 years.

The Housing Provident Fund mortgage policies of Ordos City have encouraged transactions in the secondary housing market. While the national policy has continuously increased the rate of the Housing Provident Fund mortgage,[50] Ordos City has lifted the Housing Provident Fund mortgage limit for transactions in the secondary housing market from 150,000 yuan in 2009 to 200,000 yuan in 2010, and then further to 300,000 yuan in 2012.[51] Considering the conclusion drawn from the regression analysis that mortgage rate is not closely associated with commodity housing prices, one may expect that there is a great possibility that the mortgage limit and the Housing Provident Fund play a significant role in secondary market transactions in Ordos City. This hypothesis has been confirmed by a recent interview with a high level official in the OHMB. However, the Housing Provident Fund is available only to those who are employed, and many of the poor who are not employed or self-employed do not have access to this fund.

Largely due to the decrease in housing price caused by the market decline and economic downturn, the secondary housing market has helped moderate- and low-income households to some extent. However,

the housing filtering in Ordos City should not be encouraged at the expense of the economic downturn. Ideal welfare filtering should be the outcome of the healthy operation of the economy and the amelioration of the welfare system. Under the current excessive housing supply, Ordos City has recently adopted a policy of "eliminating excess commodity housing stock" (去庫存 qu kucun) with the support of the Chinese central government. The policy enables designated households to exchange their shabby houses for new high-rise apartments located in undesired and disadvantageous locations. This can be seen as a housing upgrading process led by the government to be expeditious in the short term, but not a result of the invisible hand of the market. Thus, ameliorated housing policies for long-term property prosperity is encouraged to make the filtering process more effective in improving the living conditions of moderate- and low-income groups. There is an imminent need for strengthened housing development management pursuing a more inclusive property market. Some policy recommendations are made here. To begin with, financial institutions could lower mortgage interest rates specifically for consumers in the secondary housing market in Ordos City, and the upper limit of the Housing Provident Fund mortgage should be kept or increased as one of the welfare filtering tools for moderate- and low-income groups. The restrictions on new housing development, especially projects comprising large-sized dwelling units, may assist the recuperation of the housing market. The supply of medium-sized dwelling units should be a critical component for housing development in the long term. Moreover, efforts should be made to consolidate housing-related financial systems. The overall goal is to encourage transactions in the secondary housing market and provide a robust credit system with enhanced investment safety in order to protect the benefits and welfares of the general public and property investors.

This study verifies the applicability of the housing filtering framework in the Chinese context. However, the theoretical development and application of housing filtering should be tailored as per the specific socioeconomic conditions in China. Meanwhile, it is crucial to acknowledge that the market itself is not sufficient to ensure housing opportunities for moderate- and low-income households. Nonetheless, it is beneficial to discuss how market mechanisms such as filtering can be made to promote housing opportunities for the poor, together with the help of affordable housing programs and policies.

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