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The Unintended Consequences of Curbing Household Speculative Housing Demand on Bank Channel Operations

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Abstract: As omnichannel operations continue to evolve, the layout and adjustment of offline channels remain an essential component of the overall system. This study examines the spillover effects of changes in household speculative housing demand on bank channel operations. Using the implementation of housing purchase restrictions (HPR) in 46 Chinese cities as a quasi-natural experiment, we compile monthly data on newly approved retail branches of 19 systemically important banks across 282 cities from 2008 to 2014. Employing a staggered difference-in-differences approach, we find that curbing household speculative housing demand led to a 1.88% increase in the number of bank retail branches in affected cities, which is driven primarily by customer diversified financial demand. Moreover, the effect is more pronounced for large and medium-sized banks and in economically developed, high-income regions. Overall, this study provides micro-level evidence on how real estate policy interventions can reshape banks' channel strategies and operational decisions.

Key words: speculative housing demand, channel operations, housing purchase restrictions, difference-in-differences

1 Introduction

In recent years, although online financial services have expanded rapidly, traditional offline channels have not been fully replaced. On the contrary, through functional innovation and integration with online platforms, they have taken on new strategic importance (Lee et al., 2019; Patel, 2014). Banks increasingly recognize the complementary role of physical channels in their omnichannel strategies. For instance, physical branches not only provide essential services such as account opening and loan approval but also offer non-digital functions like customer education and personalized advisory support. These functions are critical for improving online service conversion rates, strengthening customer loyalty, and building trust (Gallino and

Moreno, 2014; Rapp et al., 2015). Moreover, physical channels help reduce information asymmetry in financial services, which is particularly important when handling complex transactions such as large loans and wealth management (Kumar et al., 2019; Ye and Shankar, 2025). In addition, physical branches can optimize local service coverage, lower delivery costs, and enhance customer satisfaction and service flexibility by supporting functions such as product returns, complaints handling, and risk disclosure (Fuster et al., 2019; Hossain et al., 2020).

Existing research has shown that the layout or adjustment of banks' offline channels is shaped by a range of factors, including socioeconomic conditions such as population density, regional income, and employment structure (Sengupta and Dice, 2019); technological advancement driven by information technology and digital transformation (Jagtiani and Lemieux, 2018; Nguyen, 2019; Teller et al., 2016); regulatory frameworks including financial access regulations, licensing systems, and branch approval mechanisms (Claessens and Laeven, 2004; Yaprak, 2012); and market competition reflected in market concentration and product differentiation (Fuentelsaz et al., 2002; Kozhikode and Li, 2012). In addition to these external factors, prior studies have also examined internal drivers of branch adjustment, such as bank size, capital adequacy, years of operation, risk preferences, governance structure, and experience in geographic diversification (Berger et al., 2017; Skrastins and Vig, 2019). However, among these determinants, the impact of housing demand shocks, which are closely linked to banks' credit activities, on branch network configuration remains insufficiently explored. For example, in China, housing purchases rely heavily on mortgage financing, with personal housing loans issued by banks accounting for roughly 70 percent of total housing transactions. In 2021, personal housing loans at major state-owned banks represented about 32.5 percent of their total loan portfolios, approaching the regulatory ceiling[①]. In a banking system where interest spreads remain a key source of profitability, real estate policies that influence housing demand are likely to exert significant spillover effects on banks' branch networks through the mortgage lending channel (Glancy, 2021; Bayoumi and Zhao, 2025).

[①] According to the disclosed annual reports of listed Chinese banks, by the end of 2021, Industrial and Commercial Bank of China (ICBC), China Construction Bank (CCB), Bank of China (BOC), and Postal Savings Bank individually exceeded the 32.5% threshold for the proportion of individual housing loans to total loans. The collective ratio for the five major state-owned banks surpassed 33%, with China Construction Bank notably reaching as high as 35.7%.

Nevertheless, most existing studies focus on the general determinants of branch adjustments and pay little attention to how fluctuations in housing demand caused by real estate regulatory policies shape banks' channel strategies. To fill this gap, we adopt a contingency theory framework to investigate how changes in household speculative housing demand, as an external environmental shock, drive banks' strategic adjustments in their channel structures.

From the perspective of contingency theory, bank channel adjustments reflect how organizations rationally adapt to changes in their environment, aiming to optimize performance by aligning channel structures with external conditions (Child, 1972; Donaldson, 2001). Within this framework, configuring and adjusting bank channels is a key organizational strategy for responding to environmental shifts (Donaldson, 2001; Fredericks, 2005). Regulations aimed at curbing speculative housing demand, such as housing purchase restrictions (HPRs), impose external shocks on the housing market, eroding banks' traditional mortgage-driven revenue streams and compelling them to adapt their retail channel strategies with greater flexibility (Järvensivu and Möller, 2009). In this context, bank branches, as vital organizational resources, can enhance market coverage and customer engagement by restructuring channels and expanding offline service reach (Gölgeci et al., 2021; Hossain et al., 2020). This reallocation of channels illustrates banks' ability to adapt and manage risk effectively under adverse conditions.

We leverage the housing purchase restriction (HPR) policy implemented in 46 cities across China to examine how shifts in speculative housing demand in the real estate market influence the adjustment of bank channels. The main goal of the HPR policy is to curb rapid housing price increases driven by speculative homebuying. By restricting households' eligibility to purchase additional homes through the household registration system, the policy effectively reduces the number of house buyers in the market, providing a valuable exogenous shock for observing changes in residential speculative housing demand. We focus on 19 systematically important banks identified by the People's Bank of China and the China Banking and Insurance Regulatory Commission[②], and construct detailed monthly data on newly established retail branches of these banks across 282 cities nationwide, including the 46 cities with HPR,

[②] According to the "Method for the Assessment of Systemically Important Banks," in 2022, the People's Bank of China (PBOC) and the China Banking and Insurance Regulatory Commission (CBIRC) assessed systemically important banks (SIBs) in China.19 domestic banks were identified as systemically important, including 6 commercial banks, 9 joint-stock commercial banks, and 4 city commercial banks. These 19 systemically important banks occupy a significant majority of the credit market share in China's banking industry and can represent the development of the entire banking sector in China.

spanning from January 2008 to December 2014. Using the staggered difference-in-differences (DID) method, we find that banks are more likely to expand their retail branches following the implementation of the HPR policy. Compared to unrestricted cities, the monthly number of bank retail branches in restricted cities increased by 1.88% after the HPR. To further identify the mediating mechanism of customer diversified financial demand, this study draws on multiple data sources, including the growth rate of total retail sales of consumer goods and the consumer price index (CPI) from the China City Statistical Yearbook, as well as micro-level household consumption data from the 2009–2015 waves of China Family Panel Studies (CFPS). The findings show that at the macroeconomic level, housing purchase restrictions lead to an increase in the growth rate of total retail sales and a rise in CPI. At the micro level, housing purchase restrictions increase household spending on consumer goods and services, thereby pushing banks to expand their branch networks to enhance service coverage and develop new sources of non-mortgage business. Further heterogeneity analyses reveal significant differences in the impact of housing purchase restrictions on bank branch expansion across bank types and regions. First, large banks are more likely to expand their channels, while small banks are less responsive and less willing to expand. Second, compared with low-income regions, banks in high-income areas are more likely to expand their networks in response to housing purchase restrictions. Finally, banks in economically developed regions are more likely to expand their branch networks under housing purchase restrictions than those in less developed regions.

The key challenge in our identification strategy is that HPR implementation may be correlated with both observable and unobservable determinants of bank retail branches expansion. We address this concern in several ways. First, we apply an event-study design with staggered treatment adoption to demonstrate a parallel trend in bank retail branch expansion between restricted and unrestricted cities prior to HPR implementation. Second, we add interaction terms between potential restricted city selection criteria (mainly housing prices and their growth rates from 2004 to 2008). Third, we show that our results are robust across placebo analyses and a variety of robustness checks, including the Heckman two-stage estimation, spatial DID models, and multilevel linear regression models; falsifying the policy timing and treatment cities; excluding potential confounding policies; analyzing bank channel expansion

on both a quarterly and annual basis; relaxing bank selection criteria to increase the number of banks; and conducting a policy reversal analysis.

Our research makes several contributions to the existing literature. First, our study contributes to understanding how factors related to real estate industry incentivize banks to expand their retail branches. Recent research has found that bank institutional size, years in operation, experience with geographical diversity (Berger et al., 2017; Skrastins and Vig, 2019), risk preferences (Koetter, 2008), competitive brand and reputation (Berger and Dick, 2007; Cohen and Mazzeo, 2010), market competition (Fuentelsaz et al., 2002; 2006) and credit costs (Jappelli and Pagano, 2002; Brown et al., 2009), play a pivotal role in influencing banks' decision to extend retail branches in new regions. Our study contributes to this body of literature by identifying that curbing speculative housing demand can lead to operational pressure on bank housing loans, which incentivizes banks to expand their retail branches. This effect is especially significant for large- and medium-sized banks in cities with developed economies and high-income levels.

Second, our study contributes to the strand of literature that relates to the impactions of homebuying demand restrictions. Previous research has examined the economic effects of homebuying demand restrictions in various contexts, such as mitigating rapid house price increases (Deng et al., 2022; Du and Zhang, 2015; Huang and Hong, 2023; Jia et al., 2018), discouraging students from accepting job offers (Sun et al., 2021), increasing fake divorces (Alm et al., 2022; Chen et al., 2024), decreasing auction entrants in the auction market (Shi et al., 2022), and changing government and enterprise investment (Zhao and Zhang, 2022). Our study contributes to the literature by identifying that speculative housing demand regulations not only directly affect housing purchases but also indirectly impact bank retail operations, which is crucial for a better understanding of the implications of speculative housing demand interventions in the housing market.

Finally, our study also helps to clarify the mechanism through which speculative housing demand restrictions incentivize banks to expand their retail branches. Existing research has found that household income effects (Carroll et al., 2011; Chen et al., 2020; Muellbauer and Murphy, 1997) and house price crowding-out effects (Hu et al., 2025) are the main reasons that incentivize city households to increase their commodity consumption, thereby making banks

more likely to expand their retail branches. Unlike previous studies, we find that curbing speculative housing demand can stimulate bank channel expansion by driving more diversified customer financial demand. When curbing speculative housing demand increase households' disposable income, their demand for financial services tends to shift from housing-related products to areas such as consumer credit, wealth management, and financial products for education and healthcare, thereby creating a broader set of financial needs (Attanasio and Weber, 1995). This diversification in customer demand creates new opportunities for banks to grow their retail business, encouraging them to expand their branch networks and offer more convenient services to customers.

2 Literature review

2.1 Speculative housing demand regulations

Speculative housing demand regulations refers to a set of government interventions aimed at cooling overheated housing markets and containing rapid price increases. These policies seek to limit speculative and investment-driven demand by tightening home purchase eligibility, capping the number of properties households may own, and restricting access to mortgage financing, thereby helping to stabilize market conditions (Banti and Phylaktis, 2025). In pursuit of the policy principle that "housing is for living in, not for speculation," governments employ several instruments, including purchase restrictions, mortgage restrictions, resale constraints, and transaction taxes. Prior research suggests that without such intervention, speculative demand can dominate the housing market, pushing prices upward and contributing to housing financialization (Huang and Hong, 2023; Xiang et al., 2022). By regulating demand, policymakers can more effectively distinguish between fundamental homebuying motives and speculative motives, thus promoting a more balanced and stable market (Fu and Qian, 2014). Among these tools, purchase restrictions and mortgage restrictions are the most prevalent. Purchase restrictions narrow eligibility and limit ownership, which curbs speculative behavior while exerting relatively modest influence on genuine housing needs (Yan and Hongbing, 2018). Empirical studies show that these policies reduce speculative homebuying and influence the market valuations of listed real estate firms (Deng et al., 2022; Fang et al., 2016). Transaction taxes and resale restrictions also play a meaningful role by raising the cost of short-term trading

and dampening incentives for speculative turnover (Best and Kleven, 2018; Lan et al., 2023). From a demand-side perspective, these regulatory measures reshape both household expectations and homebuying decisions. First, stricter purchase and financing conditions directly compress speculative demand, especially among multi-property investors, resulting in a noticeable decline in investment-oriented home purchases (Deng et al., 2022; Fang et al., 2016; Yan and Hongbing, 2018). Second, because these policies are persistent and often uncertain in their future trajectory, they influence buyers' perceptions of market risk. Many households adopt a more cautious stance, and heightened wait-and-see behavior can further suppress investment-driven demand (Wu et al., 2016).

Existing research on speculative housing demand regulations mainly centers on several areas. The first stream examines how specific policy instruments shape real estate market outcomes. Studies investigate the effects of purchase restrictions, mortgage restrictions, resale restrictions, and transaction taxes on speculative housing demand, housing price dynamics, and overall market stability (Deng et al., 2022; Fang et al., 2016; Wu et al., 2016). This work generally shows that demand-side regulation can effectively curb speculative buying and moderate price growth in the short run, although its longer-term impact depends heavily on policy continuity and shifts in market expectations (Lia et al., 2020). A second stream focuses on the underlying mechanisms that drive investment-oriented housing demand. Drawing on household portfolio theory and research on speculative motives, these studies highlight the roles of wealth effects, expected returns, inflation hedging, and diversification benefits in shaping households' incentives to purchase homes as investment assets (Chen, 2017). This literature helps explain the prominent investment function of housing in households' wealth portfolios and provides a theoretical foundation for regulating investment-driven demand. A third stream explores how different regulatory tools operate through distinct behavioral channels and produce heterogeneous effects. Mortgage restrictions, for example, constrain leveraged demand by raising down payment requirements and borrowing costs. Resale restrictions and various forms of transaction taxes increase holding or trading costs, making short-term speculative activity less attractive (Best and Kleven, 2018; Wang et al., 2024). This line of work sheds light on the micro-level decision mechanisms through which policy interventions alter buyer behavior and underscore the importance of nuanced and multi-layered policy design. A fourth

stream extends the discussion to broader economic and financial externalities. This research documents how speculative housing demand regulations can influence corporate investment, local government fiscal capacity, labor mobility, household decisions, and financial system stability (Chen et al., 2018; Su et al., 2021). For example, such regulation may shape households' employment and migration choices (Sun et al., 2017), trigger strategic divorce behaviors (Alm et al., 2022), or reduce land-based fiscal revenues, thereby affecting firms' investment activities (Zhao and Zhang, 2022). More recent work also highlights regional differences, policy interaction effects, and the ways in which these regulations intersect with institutional settings such as the rental market and land finance (Zhao and Liu, 2023).

Overall, prior research has highlighted the wide-ranging effects of speculative housing demand regulations on real estate markets, household decisions, and macroeconomic outcomes. However, much less attention has been given to how these policies affect financial institutions, particularly banks. Banks play a central role in the housing ecosystem: they are the primary providers of mortgage financing and real estate–related financial services, and they are also the actors most immediately exposed to shifts in housing market conditions (Kara and Vojtech, 2024). Regulations that target investment-driven housing demand can reshape banks' mortgage demand, alter their credit allocation portfolios, and influence the configuration of their retail operations, thereby creating pressure for banks to adjust their offline channels and operating models. Studying housing investment demand regulation through the lens of bank channel adjustments therefore not only fills a meaningful gap in the literature but also provides valuable managerial insight into how real estate policies diffuse through the financial system and shape firms' strategic responses.

2.2 Factors Influence Bank Channel Adjustment

As a key component of banks' channel systems, the spatial layout of bank branches determines the geographic coverage and service reach of the financial network (Berger et al., 2017; Skrastins and Vig, 2019). Decisions to open or adjust branches in specific areas essentially reflect banks' strategic assessments of local market potential, shifts in customer demand, and the efficiency of resource allocation. Hirtle and Stiroh (2007) argue that banks need to strike a dynamic balance between long-term profitability and service coverage, with channel expansion

representing the outcome of this trade-off. Existing research on the determinants of bank branch network layout mainly focuses on three categories of factors: external environmental factors, bank organizational characteristics, and market competition structure. First, from the perspective of the external environment, prior studies show that factors such as national and regional economic development (Bernini and Brighi, 2018), population density and structure (Cohen and Mazzeo, 2010), and technological change (Jagtiani and Lemieux, 2018; Keil and Ongena, 2024) all influence banks' channel strategies. Second, banks' organizational characteristics, including size, history, experience in geographic diversification, and risk preferences, also influence their willingness and capacity to expand branch networks (Kozhikode and Li, 2012; Shiers, 2002). Barros (1995) finds that banks that have undergone mergers and acquisitions are more likely to reallocate branch resources to achieve market synergies. In addition, banks tend to establish branches closer to potential customers to reduce information acquisition costs and mitigate default risks (Jappelli and Pagano, 2002). Third, the market competition structure is another important external driver of channel adjustment. For example, Fuentelsaz et al. (2002) show that the intensity of competition in both target and core markets significantly affects the timing and density of bank market entry. Moreover, the scale and density of branch networks directly influence service efficiency and marginal costs (Carlson et al., 2022; Coccorese and Santucci, 2020).

Although existing studies have systematically examined the factors influencing bank branch network layout from multiple dimensions, including technological evolution, demographic structure, regulatory frameworks, and interbank competition (Berger et al., 2017; Fuentelsaz et al., 2002; Jagtiani and Lemieux, 2018), an important gap remains in understanding how changes in speculative housing demand shape banks' channel structures through their effects on household credit demand. This issue is especially salient in China, where local commercial banks provide most personal housing loan services. Under the shock of speculative housing demand regulations, the sharp contraction in housing demand is likely to exert significant influence on banks' channel configuration and strategic decision-making (Kara and Vojtech, 2024). However, conventional perspectives on channel layout often regard bank branches as the outcome of resource allocation in a relatively static environment, emphasizing their roles in geographic coverage, scale efficiency, and cost control, while

neglecting how channel strategies should respond to sudden demand shocks from real estate. In this context, when personal housing loan business is hit by speculative housing demand regulations, banks seeking to respond proactively to such external shocks must quickly assess the impact and adjust their channel structure to align with the changing demand environment. Therefore, as a core strategic resource for banks, bank channels not only serve as the foundation for personal housing credit services but also constitute a critical mechanism through which banks dynamically reallocate and optimize resources in response to external disruptions.

3 Hypotheses development

3.1 Impacts of speculative housing demand regulations on bank channel expansion

Previous studies have shown that speculative housing demand regulation, as a common real estate regulatory instrument, limit households' home-buying eligibility through mechanisms such as household registration, thereby significantly curbing non-rigid and speculative housing demand (Yan and Hongbing, 2018). In the short run, these restrictions lead to a sharp decline in housing transactions and a contraction in personal mortgage demand (Li et al., 2020; Lu et al., 2021). This reduction in housing demand not only affects the real estate sector itself but also transmits to the banking industry by undermining revenue streams and operational stability associated with personal housing credit services (Flannery et al.,2022; Kara and Vojtech, 2024; Wan, 2018). Because the profitability of commercial banks remains heavily dependent on the traditional interest rate spread between deposits and loans, which is strongly shaped by macroeconomic conditions and real estate credit policies, any change in housing credit, a core component of banks' loan portfolios, directly affects their channel operations (García-Herrero et al.,2009; Su et al., 2021). Confronted with these pressures, banks need to identify new sources of business growth and customer acquisition in the context of a weakening housing credit market. As a strategic response, physical bank branches, an important means of increasing market penetration and strengthening customer relationships, are likely to play a key role in driving banks to expand their offline channel networks.

This logic reflects banks' adaptive strategic responses to the contraction in housing investment demand, which can be understood through the lens of contingency theory (Donaldson, 2001; Teece et al., 1997). First, bank channel structures are expected to adjust

flexibly in response to housing demand changes (Donaldson, 2001; Fredericks, 2005). The external demand shock triggered by speculative housing demand regulations undermines banks' traditional mortgage business, which has long been a key source of revenue. In this context, bank branches, as a core strategic resource, enable banks to reconfigure their channel structures and extend the reach of offline services, thereby enhancing local market coverage and strengthening customer engagement (Järvensivu and Möller, 2009). Such channel reallocation demonstrates banks' flexibility and capacity to mitigate risks in unfavorable environments. Second, banks often pursue a more diversified channel layout by expanding coverage of consumer credit, wealth management, and financial services for small and micro enterprises, thereby reducing their dependence on mortgage lending. Channel expansion into other high value-added businesses such as wealth management, corporate credit, and consumer finance allows banks to redeploy resources, redesign their service delivery models, and ultimately improve business resilience and risk resistance (Dick, 2006; Dick, 2007; Evanoff, 1988). Finally, from the customer experience perspective, banking channels are not only conduits for product delivery but also platforms for value co-creation and trust building (Gölgeci et al., 2021; Vargo and Lusch, 2004). In a contracting mortgage market, face-to-face interactions, personalized consultation, and rapid response become crucial for maintaining customer relationships (Cetorelli and Strahan, 2006; Silva et al., 2023). The continuous expansion of banking channels helps banks sustain customer loyalty, strengthen brand identity, and deepen the penetration of non-mortgage services, thereby mitigating operational risks associated with a concentrated product structure (Dick, 2006; Evanoff, 1988; Neuberger and Zimmerman, 1990). Therefore, the sharp decline in housing demand induced by speculative housing demand regulations not only erodes bank revenues and increases the risk of customer attrition but also encourages banks to expand their offline channels as a strategic response to these challenges. Based on this reasoning, we propose the following hypothesis:

H1. Curbing speculative housing demand can promote the expansion of bank channels.

3.2 The mediating role of customer diversified financial demand

we further propose that speculative housing demand regulations can promote the diversification of customer financial demand, which in turn drives the expansion of bank channels. As previously discussed, these regulations curb speculative and non-rigid housing demand by imposing measures such as household registration requirements and higher purchase thresholds (Li et al., 2020; Lu et al., 2021). As a result, funds that households would have otherwise allocated to home purchases are temporarily retained. Whether earmarked for full payments or mortgage down payments, these retained funds increase households' disposable income (Chen et al., 2020; Tai, 2025). Because housing represents a major household expenditure, a decline in housing demand can substantially ease debt burdens and expand the amount of assets available for discretionary use (Kinghan et al., 2022; Tai, 2025). Prior research also shows that when households have greater disposable income, they are more inclined to allocate part of it to other forms of investment and consumption, thereby increasing the demand for financial services (Campbell and Cocco, 2007; Carroll et al., 2011; Muellbauer and Murphy, 1997). In this sense, the shock of speculative housing demand regulations reshapes household balance sheets, reduces leverage and debt burdens, and makes funds more likely to flow into non-housing sectors such as consumption, investment, and other financial products (Anderes, 2023). For example, Albouy et al. (2016) find that a decline in housing expenditures generates a significant income effect, stimulating non-housing consumption and financial asset allocation. This provides a macro-level explanation for the reallocation of funds from housing to other forms of consumption and financial services.

Therefore, the increase in disposable income resulting from speculative housing demand regulations s is likely to shift households' demand for financial services toward other areas, such as consumer credit, wealth management, and financial products related to education and healthcare, thereby fostering more diversified financial service needs (Attanasio and Weber, 1995). This diversification creates new opportunities for the expansion of banks' retail business. As customers increasingly demand consumer credit, wealth management, and other high value-added financial products, banks need to restructure their channels and innovate their services to effectively respond to these changing needs. Bank channels serve as a critical platform for providing consumer loans, delivering wealth management services, and maintaining customer relationships. They play a central role in building trust and promoting financial products

(Evanoff, 1988; Dick, 2006; Neuberger and Zimmerman, 1990). In this context, banks must actively adapt to evolving patterns of customer financial demand by optimizing channel resource allocation and expanding their networks to strengthen market penetration and service quality (Gölgeci et al., 2021; Hossain et al., 2020). In sum, speculative housing demand regulations stimulate the diversification of customer financial service demand, which serves as an important mediating mechanism driving the expansion of bank channels. Based on this reasoning, this study proposes the following hypothesis:

H2. Curbing speculative housing demand promote the expansion of bank channels by stimulating customer diversified financial demand.

4 Empirical Strategy

To test the above hypotheses, we use the implementation of housing purchase restrictions (HPR) in 46 Chinese cities as a quasi-natural experiment. By combining this policy shock with bank branch data, we examine how banks adjust their offline channel strategies in response to changing market demand, seeking to mitigate the negative impact of declining speculative housing demand on their mortgage business.

4.1 Policy Background

To curb speculative housing demand in the real estate market and contain the rapid rise in housing prices, on April 17, 2010, China's State Council issued the "Several Opinions on Promoting the Stable and Healthy Development of the Real Estate Market" (commonly referred to as the "New Ten Measures"). The document explicitly called for the implementation of a differentiated housing credit policy, aiming to suppress speculative home purchases from the demand side by tightening eligibility criteria based on household registration. Subsequently, major cities across China introduced their own local regulations to implement housing purchase restrictions. On April 30, 2010, the Beijing Municipal Government announced its detailed implementation measures for the "New Ten Measures," stipulating that each Beijing household could purchase only one additional home. This made Beijing the first city in the country to impose a "purchase restriction order" limiting the number of homes per household. These measures primarily targeted cities with excessively high housing prices, rapid price increases,

and tight supply. They limited the number of housing unit households could purchase within a specified period and held local governments accountable if they failed to enforce the policy effectively. Following Beijing's lead, between October 1 and October 19, 2010, thirteen cities, including Shenzhen, Xiamen, Shanghai, Hangzhou, and Guangzhou, successively introduced housing purchase restriction policies. By the end of 2011, under this policy momentum, a total of forty-six cities nationwide had implemented housing purchase restrictions, which imposed limits on factors such as the number of homes purchased, buyers' household registration, and mortgage ratios. As the real estate market gradually cooled, these policies were progressively lifted starting in July 2014. By the end of that year, only Beijing, Shanghai, Guangzhou, Shenzhen, and Sanya continued to enforce the restrictions. Because purchase restriction policies limit households' eligibility to buy homes, cap the number of properties they may own, and tighten the conditions for obtaining mortgage loans, they significantly reduce speculative housing demand. Accordingly, we use housing purchase restrictions as a proxy for shocks related to speculative housing demand regulation.

4.2 Data Sources

In this study, we collected the exact implementation dates of the first round of housing purchase restriction (HPR) policies in 46 cities between April 30, 2010, and November 1, 2011, and used them to construct a policy shock timing variable. Information on these policies was obtained from official announcements published on local government websites (see Appendix Table 1). Data on bank branches were sourced from the China Banking and Insurance Regulatory Commission (CBIRC). Importantly, we focus on physical bank branches that rely on human services and operations, rather than self-service facilities such as ATMs. Staffed branches can provide comprehensive financial services, including credit, deposits, and withdrawals, whereas ATMs and similar terminals cannot support complex credit transactions. Moreover, due to regulatory restrictions on the establishment of new branches in China, most outlets, especially those of smaller, non-national banks, are highly localized and typically operate within the same city or a few nearby cities. Consequently, compared with large and medium-sized banks, smaller banks face greater constraints on expanding their networks and have less flexibility to adjust their branch layout in response to policy shocks. To ensure the representativeness and

validity of our sample, we focus on 19 banks included in the list of Domestic Systemically Important Banks released by the People's Bank of China and the CBIRC in 2022. These banks are all large or medium-sized institutions with a relatively high share of personal housing loans and possess greater autonomy and resources to adjust their branch networks in response to the HPR shock. Using data from 282 cities nationwide, we constructed a monthly panel dataset of newly established bank branches covering the period from January 2008 to December 2014. In addition, we obtained data on basic city-level characteristics for these 282 cities over the same period from the National Bureau of Statistics of China.

4.3 Variables Description

To examine the impact of speculative housing demand regulations on bank channel adjustments, we use the monthly number of newly established bank branches in each city as the dependent variable. The key explanatory variable is the housing purchase restriction shock, measured by a dummy variable indicating whether a city implemented the housing purchase restriction policy. We also include a set of control variables to account for heterogeneity across cities and banks. At the regional level, the control variables capture differences in local economic environments and include per capita GDP, annual average population, average employee wage, residential investment, household savings balance, deposit balance of financial institutions, loan balance of financial institutions, commercial housing sales area, and total commercial housing sales. These data are obtained from the China City Statistical Yearbook. At the bank level, we control for bank income, operating expenses, deposits, and total loans, with data drawn from the China Commercial Banking Statistical Yearbook. Detailed definitions and measurement methods for all variables are provided in Table 1.

Table 1. Variables Measurement

Variable Type	Variable Name	Variable Symbol	Variable Measurement	Data Source
Dependent Variable	Bank Channel Expansion	$BankApproval$	Number of newly established bank branches by each bank in each city per month (log-transformed)	China Banking Regulatory Commission (CBRC)
Independent Variable	Housing Purchase Restrictions	HPR	Dummy variable indicating whether a city implemented the housing purchase	Official documents issued by local governments

			restriction policy (1 = yes, 0 = no)	
Control Variables	Average Wage of Urban Employees	$StaffWage$	Average annual wage of urban employees in each city (standardized)	China City Statistical Yearbook
	Per Capita GDP	$AvgGdp$	Annual GDP of the city divided by its total population (standardized)	China City Statistical Yearbook
	Average Annual Population	Pop	Annual average permanent population of the city (standardized)	China City Statistical Yearbook
	Residential Investment	$HouseInvest$	Total annual residential investment of the city (standardized)	China City Statistical Yearbook
	Household Savings Balance	$ResidentSave$	Annual savings balance of urban and rural residents in the city (standardized)	China City Statistical Yearbook
	City Deposit Balance	$CityDep$	Annual deposit balance of financial institutions in the city (standardized)	China City Statistical Yearbook
	City Loan Balance	$CityLoan$	Annual loan balance of financial institutions in the city (standardized)	China City Statistical Yearbook
	Commercial Housing Sales Area	$HouseSaleArea$	Annual total commercial housing sales area of the city (standardized)	China City Statistical Yearbook
	Commercial Housing Sales	$HouseSale$	Annual total commercial housing sales of the city (standardized)	China City Statistical Yearbook
	Bank Revenue	$BankRevenue$	Annual operating revenue of each bank (standardized)	China City Statistical Yearbook
	Bank Operating Expenses	$BankExpense$	Annual operating expenses of each bank (standardized)	China City Statistical Yearbook
	Bank Deposit Balance	$BankDeposit$	Annual deposit balance of each bank (standardized)	China City Statistical Yearbook
	Bank Total Loans	$BankLoan$	Annual total loan balance of each bank (standardized)	China City Statistical Yearbook

4.4 Basic Specification

In this study, we employ a difference-in-differences (DID) regression model (Angrist and Pischke, 2009) using data on newly established bank branches from January 2008 to December 2014. The analysis compares 46 treatment cities that implemented the Housing Purchase

Restriction (HPR) policy with 236 control cities that did not. The baseline specification of the continuous time DID model is as follows:

$$Y_{i,b,t}=\beta HPR_{i,t} +\alpha X_{i,t}+S_i * f(t)+\mu_i+\delta_b+\lambda_t+\varepsilon_{i,b,t} \quad (1)$$

In this equation, $Y_{i,b,t}$ is the outcome variable for the number of new bank retail branches established by bank b in city i during month t. The binary variable $Limit_i$ represents whether the city belongs to the treatment group or control group. If city i implemented HPR policy between January 2008 and December 2014, it takes the value 1; otherwise, it is 0. The binary variable $After_t$ represents whether HPR were implemented in city i during month t. If city i implemented HPR in month t, it takes the value 1 for the period from month t to December 2014; otherwise, it is 0. $X_{i,t}$ comprises a series of control variables about city characteristics from Chinese Urban Statistical Yearbook and bank characteristics from Chinese Commercial Banks Statistical Yearbook. μ_i represents city fixed effects, δ_b represents bank fixed effects, λ_t represents time fixed effects, and $\varepsilon_{i,b,t}$ is the error term in the DID model. The standard errors of all regression results are adjusted for clustering at the city and bank levels to mitigate potential issues related to serial correlation. In this estimation equation, we are interested in coefficient β. If the estimated value $\hat{\beta}>0$, it indicates that the implementation of HPR policy has led to the expansion of bank branch networks in restricted cities compared to the unrestricted cities.

4.5 Identification

A key concern for the identification strategy in the above model is the potential correlation between the factors determining the implementation of the housing purchase restriction policy and bank channel expansion decisions within cities. Although the difference-in-differences (DID) approach mitigates some of the endogeneity concerns by using city fixed effects to control for time-invariant unobserved factors, there are some policy-related factors may still influence the outcome variable at the city level. As discussed in the institutional background, the HPR policy was primarily introduced to curb excessively high housing prices resulting from rapid price growth. Therefore, cities with higher housing prices and faster price increases were more likely to be selected for policy implementation. Housing price levels and growth rates are likely key determinants of HPR adoption, and they may also affect banks' decisions to open

new branches. To address this issue, we include an interaction term between the average housing price and its average monthly growth rate during 2004–2008 (denoted as S_i) and a cubic polynomial function of time $f(t)$ in regression equation (1). This approach flexibly controls for potential time-trend effects that may result from the criteria used to select cities for HPR implementation. Furthermore, given the staggered timing of HPR adoption across treatment and control cities, using a conventional two-way fixed effects model could produce biased estimates, as the treatment effects may vary over time and across units (Callaway and Sant'Anna, 2021; De Chaisemartin and D'Haultfoeuille, 2020; Goodman-Bacon, 2021). To obtain more reliable estimates, we apply the improved DID estimator proposed by Sun and Abraham (2021).

5 Results

5.1 Descriptive Statistics

Table 2 presents the descriptive statistics of the original variables. The table summarizes the establishment of branches by 19 domestic systemically important banks in Chinese cities from January 2008 to December 2014, as well as the basic characteristics of 282 cities and 19 banks, covering a total of 450,072 observations.

Table 2. Descriptive Statistics of Original Variables

Variable	Observations	Mean	SD	Min	Max
$BankApproval$	450072	0.07	1.64	0.00	457.00
$StaffWage$	450072	36172.52	11754.06	11707.47	103400.41
$AvgGdp$	450072	38014.18	29397.87	99.00	467749.00
Pop	450072	4383313.07	3071356.70	376000.00	33668000.00
$HouseInvest$	450072	14499262603.85	24337786920.47	110000.00	245136600000.00
$ResidentSave$	450072	269335650162.21	638616674516.71	8328660000.00	9054587560000.00
$CityDep$	450072	118312931413.32	197647391041.32	4594690000.00	2397221630000.00
$CityLoan$	450072	184791162948.52	403191173953.70	3508960000.00	4791581000000.00
$HouseSaleArea$	450072	35331711.20	45243405.01	90000.00	510039000.00
$HouseSale$	450072	195560263.69	386445631.56	130000.00	4330224000.00
$BankRevenue$	450072	125040029551.71	151727071429.35	3403794331.49	658892000000.00
$BankExpense$	450072	64752121202.61	73954136077.08	1852896560.51	299280000000.00
$BankDeposit$	450072	3231879711432.22	3842886871570.54	76221739664.41	15556601000000.00
$BankLoan$	450072	2130521485656.42	2543007422494.18	49155965919.21	11026331000000.00

5.2 The Impact of Housing Purchase Restrictions on Bank Channel Expansion

Figure 1 presents the time trend of newly established bank branches in cities that implemented housing purchase restriction (HPR) policies and those that did not between January 2008 and December 2014. As the figure shows, on average, cities that adopted HPR policies had a higher number of newly opened bank branches compared to cities without such policies. The figure also indicates that, prior to the introduction of the policy, the trends in bank branch expansion were broadly similar between HPR and non-HPR cities, which provides further support for the parallel trends assumption. Notably, after May 2010, when Beijing first implemented the HPR policy (indicated by the gray dashed line), the number of newly established bank branches began to rise steadily. As more cities subsequently adopted the policy, the number of new branches continued to grow, offering preliminary evidence that housing purchase restrictions encouraged the expansion of bank channels.

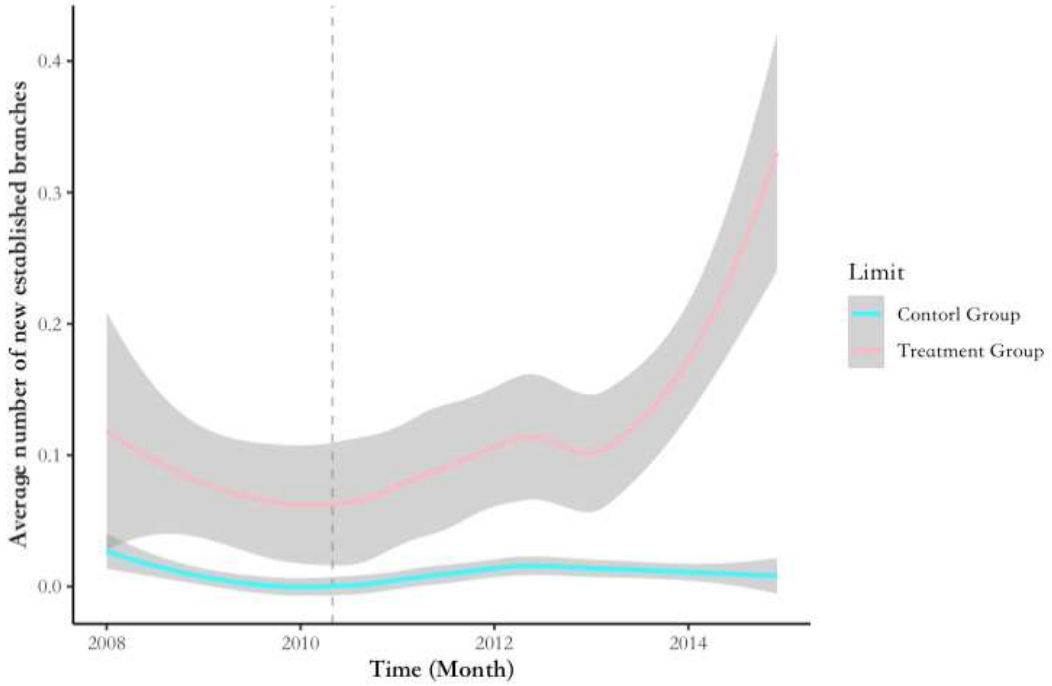


Figure 1. Monthly Growth Trend of Bank Branches

We further apply a difference-in-differences (DID) model to examine the impact of housing purchase restriction policies on the number of new increased bank branches. Table 3 first reports the regression results without including any fixed effects or control variables (Column 1). The estimated coefficient for the housing purchase restriction policy is positive and statistically significant at the 1% level ($\beta = 0.03217;\ p < 0.01$). We then add city, bank, and time fixed effects (Column 2). The effect of the housing purchase restriction policy on bank

channel expansion remains positive. Although the coefficient decreases slightly, it remains statistically significant at 1% level ($\beta = 0.02747; p < 0.01$). Finally, we include an interaction term between the selection criteria of HPR cities (S_i) and a third-degree polynomial of time ($f(t)$) to control for potential unobserved time trend factors during policy implementation (Column 3). The results indicate that banks in HPR cities open approximately 1.88% more new branches per month ($p < 0.01$). This finding suggests that the contraction of speculative housing demand induced by the housing purchase restriction policy encourages banks to expand their channel networks. Overall, these results provide strong support for Hypothesis 1.

Table 3. Impact of Housing Purchase Restrictions on Bank Channel Expansion

Variable	Number of new established bank branches		
	(1)	(2)	(3)
HPR	0.03217***	0.02747***	0.01883***
	(0.00734)	(0.00690)	(0.00648)
Controls	No	Yes	Yes
Time fixed effects	No	Yes	Yes
City fixed effects	No	Yes	Yes
Bank fixed effects	No	Yes	Yes
$S_i \times f(t)$	No	No	Yes
N	450,072	450,072	450,072
R^2	0.02025	0.07431	0.07994
Adjusted R^2	0.02024	0.07352	0.07912

Note: Robust standard errors clustered at the city–bank level is reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

5.3 Parallel Trend Test

The identification of the coefficient β in Equation (1) rests on a key assumption: prior to the implementation of the housing purchase restriction policy, the number of newly established bank branches in cities that adopted the policy and those that did not followed a parallel trend (Angrist and Pischke, 2009). To verify this identifying assumption, we adopt the event study approach proposed by Jacobson et al. (1993) to test for parallel trends. The full model specification is as follows:

$$Y_{i,b,t} = \sum_{k=-36, k\neq -1}^{44} \beta_k HPR_{i,t} + \alpha X_{i,t} + S_i * f(t) + \mu_i + \delta_b + \lambda_t + \varepsilon_{i,b,t} \quad (2)$$

In this equation, k represents the relative time interval between month t for city i and the month in which the housing purchase restriction policy was implemented. Because the implementation dates vary across cities, the time intervals between the policy implementation month and the current month also differ accordingly. Specifically, the relative month is defined as follows: the implementation month is coded as 0; the first (second) month after implementation is coded as +1 (+2); the first (second) month before implementation is coded as −1 (−2); and so on. The observation period spans from January 2008 to December 2014, covering seven years before and after policy implementation. As a result, the value of the variable Month t ranges from −36 to +44. Following Fajgelbaum et al. (2020), all months less than or equal to −36 are coded as −36, and all months greater than or equal to +44 are coded as +44. In the regression estimation, we omit the time category $k = -1$ as the reference period, while the other control variables and parameter settings remain consistent with those in Model (1). The coefficient β_k, captures the difference in the number of newly established bank branches between HPR and non-HPR cities in month k relative to the implementation of the policy. If β_k remains stable for $k < 0$, it suggests that the parallel trends assumption holds. In contrast, if β_k shows a significant upward or downward trend in the pre-treatment period ($k < 0$), this indicates systematic differences between the treatment and control groups before the policy implementation, thus violating the parallel trends assumption.

Figure 2 presents the results of the parallel trend test examining the impact of housing purchase restrictions on bank channel expansion. Before the implementation of the HPR policy, the dynamic effects β_k fluctuate around zero within the 95% confidence interval, suggesting that the estimates from Equation (2) are unlikely to be driven by divergent pre-treatment trends between treated and control cities. In addition, Figure 2 shows that the significant effect of housing purchase restrictions on bank channel expansion begins to emerge roughly 12 months after the policy is introduced. This indicates that the impact of the HPR policy on bank channel expansion takes about a year to materialize. One plausible explanation is that banks typically require a preparation period before opening new branches, involving proposal evaluation, site

selection, and branch establishment procedures. Taken together, these results provide additional support for the validity of the identification assumption underlying our empirical strategy.

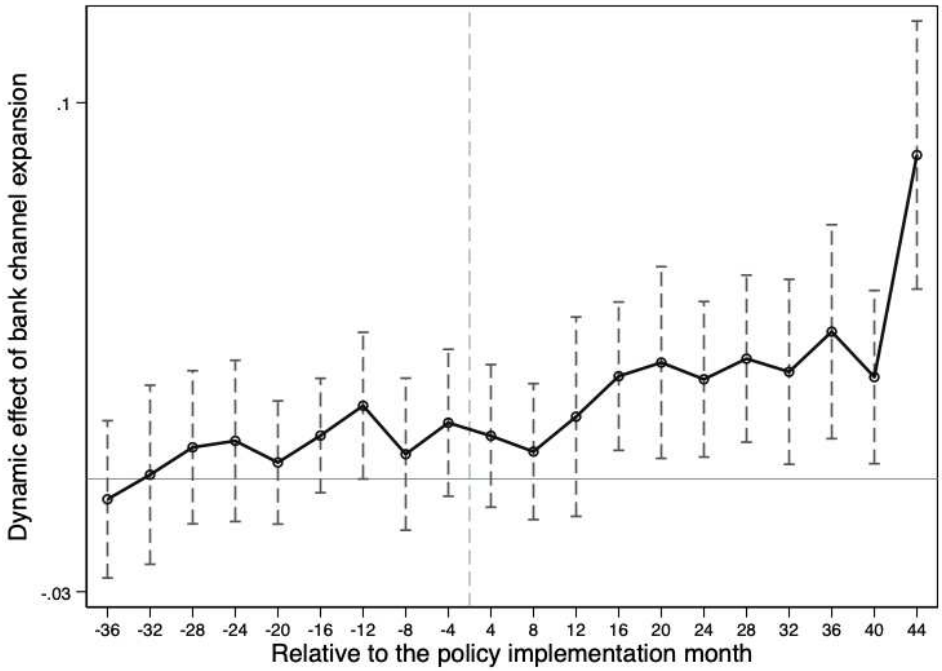


Figure 2. Parallel Trend for Bank Channel Expansion

5.4 Mediating Role of Customer Diversified Financial Demand

As outlined in Hypothesis 2, speculative housing demand regulations may lead households to increase their demand for alternative financial products, which in turn incentivizes banks to expand their branch networks to provide more convenient financial services (Anderes, 2023; Attanasio and Weber, 1995). To empirically test this mediating mechanism, we use two macro-level indicators from the China City Statistical Yearbook as proxies for non-housing financial service demand. The first is the growth rate of total retail sales of consumer goods, which reflects the volume and intensity of household spending on goods and services. This measure is closely linked to retail financial services such as payment clearing, card usage, and consumer credit. The second is the Consumer Price Index (CPI), which captures price pressures and nominal demand intensity in consumption scenarios. CPI serves as a macro-level indicator of the substitution effect from housing toward other types of consumption and related financial services when housing demand is constrained. Consistent with Hypothesis 2, Table 4 shows that the implementation of housing purchase restrictions has a positive and statistically

significant impact on both the growth rate of total retail sales of consumer goods (Column 1) and CPI (Column 2). This indicates that once housing demand is suppressed, household spending and settlement activities shift toward non-housing goods and services. This shift increases transactional activity and price levels at the city level, thereby stimulating demand for consumption-related retail financial services, such as payment clearing, card transactions, and consumer credit, which heightens financial service demand and ultimately drives the expansion of bank channels. This provides robust macro-level evidence in support of Hypothesis 2.

Second, using household-level microdata, we further examine the mediating role of customer diversified financial demand in the relationship between speculative housing demand regulations and bank channel expansion. Following the shock of speculative housing demand regulations, home purchases and related expenditures (such as down payments and additional mortgage costs) decline, leading households to reallocate their budgets from housing toward non-housing items, including durable goods, services, and daily consumption. This reallocation of spending intensifies the use of retail financial services such as payment transactions and consumer credit, which in turn indirectly encourages banks to expand their offline channels to meet rising retail financial service demand and strengthen customer reach. Based on this logic, we expect to observe an increase in non-housing consumption among households in cities subject to speculative housing demand regulations, which, through higher financial service usage, translates into bank channel expansion. To test this mechanism, we draw on micro-level household consumption data from the China Family Panel Studies (CFPS) collected by Peking University between 2009 and 2015. We use total household consumption, non-housing expenditure, total housing expenditure, and housing purchase expenditure as dependent variables to estimate the impact of HPR on household spending patterns. Consistent with our expectations, Table 4 shows that housing purchase restrictions have a significantly positive effect on total household consumption (Column 3) and non-housing expenditure (Column 4), while exerting a significantly negative effect on total housing expenditure (Column 5) and housing purchase expenditure (Column 6). These results provide micro-level evidence for the mediating role of household diversified financial demand, thereby lending further support to Hypothesis 2.

Table 4. Estimation Results of Housing Purchase Restrictions on Customer Diversified Financial Demand

Variable	Retail Sales Growth	CPI	Total Household Expenditure	Non-Housing Expenditure	Total Housing-Related Expenditure	Housing Purchase Expenditure
	(1)	(2)	(3)	(4)	(5)	(6)
HPR	0.06717***	0.00193*	0.10055**	0.94286***	-0.77080*	-0.09668*
	(0.01674)	(0.00102)	(0.04314)	(0.24351)	(0.45102)	(0.05256)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
City fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Family fixed effexts	-	-	Yes	Yes	Yes	Yes
N	1,963	1,882	24,409	24,441	24,442	24,441
R^2	0.23670	0.81662	0.64981	0.50174	0.60300	0.46419
Adjusted R^2	0.09946	0.78320	0.53259	0.33525	0.47036	0.28515

Note: Robust standard errors clustered at the city or household level is reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

6 Robustness Check

6.1 Heckman Two-Stage Estimation

To address the potential endogeneity issue in whether a city decides to implement the Housing Purchase Restriction (HPR) policy, we adopt an alternative estimation approach, the Heckman two-stage model, to re-estimate the treatment effect. The annual average commercial housing price is a key factor influencing a city's likelihood of being selected for the HPR policy, yet it does not directly affect bank channel expansion. Therefore, it serves as an exclusion restriction variable in the first-stage selection equation (Probit regression). In the second stage, the estimated correction term (the inverse Mills ratio) is incorporated into the outcome equation to control for potential selection bias. Table 5 reports the results of the two-stage estimation. The exclusion restriction variable in the first stage (column (1)) and the estimated coefficient of the HPR policy in the second stage (column (2)) are both significant at the 1% level, while the inverse Mills ratio in the second stage is not statistically significant. These results suggest that,

after accounting for all covariates and fixed effects, the baseline regression estimates are not materially affected by self-selection bias, supporting the robustness of the above main findings.

Table 5. Heckman Two-Stage Estimation Results of Housing Purchase Restrictions on Bank Channel Expansion

Variable	First-stage	Second-stage
	(3)	(4)
HPR		0.09501***
		(0.03171)
Average housing price	0.60661***	
	(0.03219)	
Inv mills ratio		-0.00306
		(0.00192)
Controls	Yes	Yes
Time fixed effects	Yes	Yes
City fixed effects	Yes	Yes
Bank fixed effects	Yes	Yes
$S_i \times f(t)$	Yes	Yes
N	450,072	450,072
R^2		0.08109
Adjusted R^2		0.08027

Note: Robust standard errors clustered at the city-bank level is reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

6.2 Addressing Spatial Correlation in Policy Implementation

While the basic DID model helps mitigate bias from omitted variables, it cannot fully eliminate the issue of spatial dependence among treated cities (Anselin and Arribas-Bel, 2013). If the implementation of the Housing Purchase Restriction (HPR) policy is spatially correlated across cities, the fact that the treatment group adopts the policy earlier while the control group has not yet done so does not necessarily imply that the policy only affects the treated cities. The HPR policy may also influence control cities through housing demand spillovers or other unobservable spatially correlated factors. In such circumstances, relying solely on the traditional Difference-in-Differences (DID) approach may lead to biased estimates, as the DID framework assumes no interference between treatment and control groups. This violates the assumption of group independence, potentially resulting in biased and inconsistent estimators

(Anselin, 1988; Páez and Scott, 2004). Specifically, spatial dependence related to the HPR policy may arise from two sources: (1) spatial dependence in independent variables (e.g., spillovers in housing demand), and (2) spatial dependence in the error term (i.e., unobservable factors that exhibit spatial correlation). To account for these potential dependencies and avoid bias in estimating the policy's impact on bank channel expansion, we incorporate spatial lags of both the independent variables and the error term into Model (1), applying the Spatial Durbin Error Model (SDEM) (Anselin, 1988; Elhorst, 2013; LeSage and Pace, 2009):

$$\begin{cases} Y_{i,b,t} = (\beta + \rho W)HPR_{i,t} + \alpha X_{i,t} + S_i * f(t) + +\mu_i + \delta_b + \lambda_t + \varepsilon_{i,b,t} \\ \varepsilon_{i,b,t} = \eta W \varepsilon_{i,b,t} + \upsilon_{i,b,t} \end{cases} \quad (3)$$

In Equation (3), $\rho WHPR_{i,t}$ represents the spatially lagged term of the Housing Purchase Restriction (HPR) policy, while $\eta W \varepsilon_{i,b,t}$ denotes the spatially lagged error term. The parameter ρ measures the spillover effect of the HPR policy, and η captures the spatial spillover effect of the error term. When $\rho = 0$, the Spatial Durbin Error Model (SDEM) reduces to the Spatial Error Model (SEM). Since the diffusion of the HPR policy is affected by the policies and housing prices of neighboring cities, this study adopts an inverse distance weight matrix. Specifically, W is a positive $N \times N$ spatial weight matrix that characterizes the spatial correlation structure among the sample cities. The matrix is row-standardized, and its diagonal elements are set to zero. Thus, the inverse distance spatial weight matrix W, which reflects the spatial proximity between cities, can be expressed as:

$$W = \begin{bmatrix} 0 & \frac{1}{d_{1,2}} & \cdots & \frac{1}{d_{1,n}} \\ \frac{1}{d_{2,1}} & 0 & \cdots & \frac{1}{d_{2,n}} \\ \vdots & \vdots & \ddots & \vdots \\ \frac{1}{d_{n,1}} & \frac{1}{d_{n,2}} & \cdots & 0 \end{bmatrix} \quad (4)$$

In Equation (4), $d_{i,j}$ represents the geographic Euclidean distance between the geometric centers of two cities. The results are shown in Table 6. Column (1) reports the estimates from the two-way fixed effects DID model; column (2) presents the results after including the spatial lag of the independent variable; column (3) shows the results after including the spatially lagged error term; and column (4) reports the estimates when both the spatial lag of the independent variable and the error term are included. The results shows that the independent variable does not exhibit significant spatial autocorrelation (the coefficient of $W * HPR_{i,t}$ is not significant),

while a significant negative spatial spillover effect is detected in the error term ($\rho = -0.26307, p < 0.01$). Furthermore, after accounting for spatial autocorrelation in the error term, the Housing Purchase Restriction still has a significant positive effect on bank channel expansion ($\beta = 0.02049, p < 0.01$), providing further support for the robustness of the main regression results.

Table 6. Spatial DID Regression Results of Housing Purchase Restrictions on Bank Channel Expansion

Variable	Number of new established bank branches			
	TWFE	SLX	SEM	SDEM
	(1)	(2)	(3)	(4)
HPR	0.01580***	0.01691***	0.02019***	0.02049***
	(0.00155)	(0.00158)	(0.00154)	(0.00157)
$W \cdot HPR$	-	-0.00647	-	-0.01830
	-	(0.01196)	-	(0.01200)
Controls	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes
City fixed effects	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes
$S_i \times f(t)$	Yes	Yes	Yes	Yes
rho	-	-	-0.26307***	-0.26356***
	-	-	(0.01261)	(0.012615)
N	450,072	450,072	450,072	450,072

Note: Robust standard errors clustered at the city-bank level is reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

6.3 Placebo Test

To rule out the possibility that unobserved factors could bias the identification, we conduct a placebo test using the pre-treatment sample from January 2008 to December 2009. The implementation month of the Housing Purchase Restriction (HPR) policy in treated cities is artificially set to January 2009. Using only pre-treatment period data, the DID model is re-estimated with the same specification as the baseline regression, including identical fixed effects, control variables, and clustered robust standard errors. If changes in the monthly number of newly opened bank branches were mainly driven by common trends, seasonality, or other non-policy shocks, the placebo policy would yield a significant coefficient even though

the policy did not actually occur. Conversely, an insignificant coefficient indicates that the model does not falsely detect an effect before the policy is implemented, thereby strengthening the causal relationship of the main results. Column (1) of Table 7 shows that the coefficient for the placebo treatment is not significant, suggesting no systematic anticipatory response or spurious effect from unobserved factors. This further alleviates concerns about omitted confounders and provides additional support for the robustness of the main results.

Additionally, since cities that implemented the HPR policy may systematically differ from those that did not, some unobserved city characteristics could still have time-varying effects beyond what is controlled for in Equation (1), even after including city-level control variables and fixed effects. To address this, following Chetty et al. (2009), we randomly assign cities a fictitious HPR treatment status and estimate the corresponding coefficient $\hat{\beta}^{random}$. This procedure is repeated 500 times, generating 500 $\hat{\beta}^{random}$ estimates, and their distribution is plotted in Figure 3. The results show that $\hat{\beta}^{random}$ is centered around zero and approximately normally distributed, consistent with expectations for a placebo test. This further confirms the robustness of the main findings. In the figure, the dashed line represents the estimated main effect, which lies outside the 95% confidence interval of the placebo distribution.

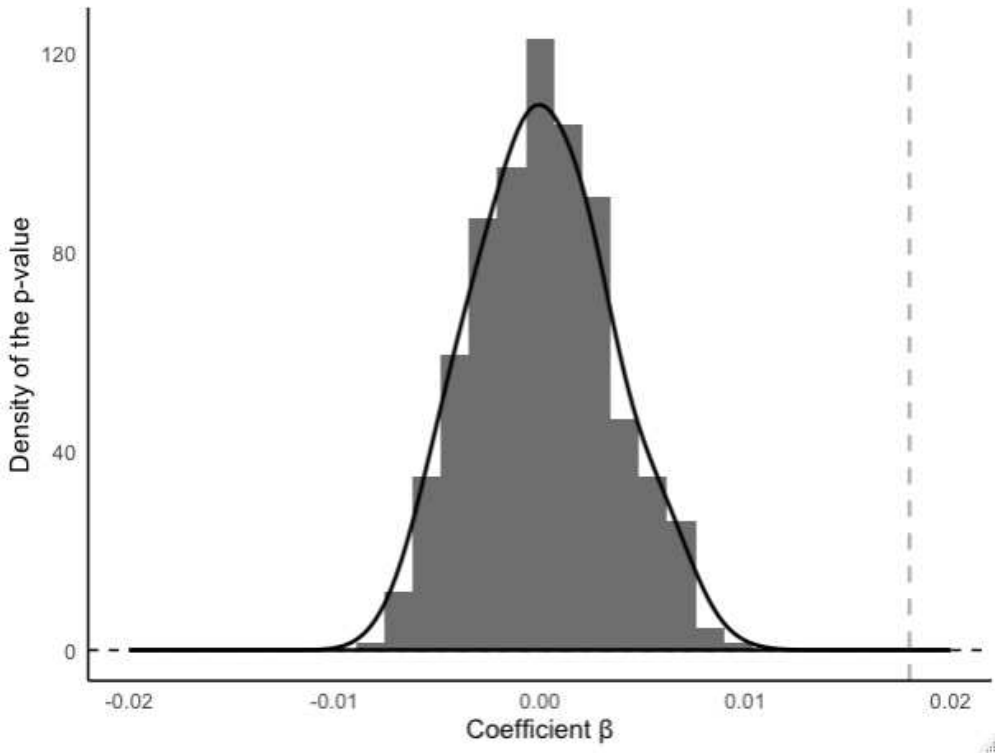


Figure 3. Density Distribution of 500 Random Assigned Placebo Treatments

6.4 Other Robustness Checks

6.4.1 Multilevel Linear Regression Model

First, the data used to examine the impact of the Housing Purchase Restriction (HPR) policy on bank channel expansion include both bank-level and city-level observations, with banks nested within cities. Most previous studies do not distinguish between city and bank differences, instead running regressions directly at the bank level. However, traditional linear regression models rely on two key assumptions: independence of observations and homoscedasticity. In a nested data structure, these assumptions are often violated. First, within the same city, all banks are affected by the HPR policy, which influences the housing loan revenue of all banks in that city. This violates the independence assumption across banks. Second, differences in economic development, housing prices, and other factors across cities lead to substantial variation in bank channel expansion, violating the homoscedasticity assumption. To address these issues, we employ a Hierarchical Linear Model (HLM), introducing random intercepts and random slopes at the city level to capture city-level heterogeneity and the differential effects of the HPR policy on new branch openings. Column (2) of Table 7 shows that the direction and significance of the independent variable remain consistent with the baseline model, indicating that the main conclusions hold even after controlling for city-level heterogeneity.

6.4.2 Quarterly and Annual Estimation Results

Second, the opening of bank branches typically follows a relatively long cycle. In addition to analyzing monthly effects, we also examine the HPR policy's impact from a longer-term perspective by aggregating branch openings at the quarterly and annual levels. The monthly number of new branches is summed into quarterly and annual counts, and the effect of the HPR policy is estimated separately for each. As shown in Table 7, the coefficients and significance of the HPR policy at the quarterly (column (3)) and annual (column (4)) levels are consistent with the baseline monthly results. This indicates that the findings are not driven by short-term fluctuations or random shocks. These results suggest that the HPR policy's effect on bank channel expansion is likely sustained over the medium to long term, while mitigating concerns about timing mismatches or seasonality caused by delays in branch construction and long approval cycles, further supporting the robustness and external validity of the baseline results.

3. Relaxing Bank Sample Selection Criteria

As noted earlier, to ensure the representativeness and validity of the bank sample, this study initially relied on the list of 19 systemically important banks published by the People's Bank of China and the China Banking and Insurance Regulatory Commission in 2022. To further strengthen the reliability of the estimates, the bank selection criteria were moderately relaxed, substantially increasing the number of banks included in the analysis. The expanded criteria are as follows: (1) banks operating in five or more provinces with over 200 branches, and (2) banks with more than 200 branches. Using criterion (1), the estimation sample comprises 31 banks, including the original 19 systemically important banks. Using criterion (2), the sample includes 75 banks, again covering the original 19 banks. As reported in Table 7, the coefficients for the HPR policy remain significantly positive under both criterion (1) (column (5)) and criterion (2) (column (6)), indicating that the positive effect of housing purchase restrictions on bank branch expansion also holds for a broader set of large and medium-sized banks. This provides additional support for the robustness of our findings.

4. Controlling for Potential Confounding Policies

Between 2010 and 2014, Chinese cities also implemented the Smart City policy and the Broadband China pilot policy, both starting in 2013. The Smart City policy promoted the widespread adoption of technologies such as big data, cloud computing, the Internet of Things, and mobile payment systems, which could influence the spatial distribution of bank branches. Meanwhile, the Broadband China policy improved access to online financial services for businesses and residents, potentially supporting bank channel expansion. To account for the potential influence of these policies, dummy variables for the Smart City and Broadband China policy were added to the baseline model as additional controls. As shown in column (7) of Table 7, after controlling for these policies, the effect of the HPR policy on retail bank channel expansion remains consistent in both direction and significance with the previous results, further confirming the robustness of the main findings.

Table 7. Robustness Checks of Housing Purchase Restrictions on Bank Channel Expansion

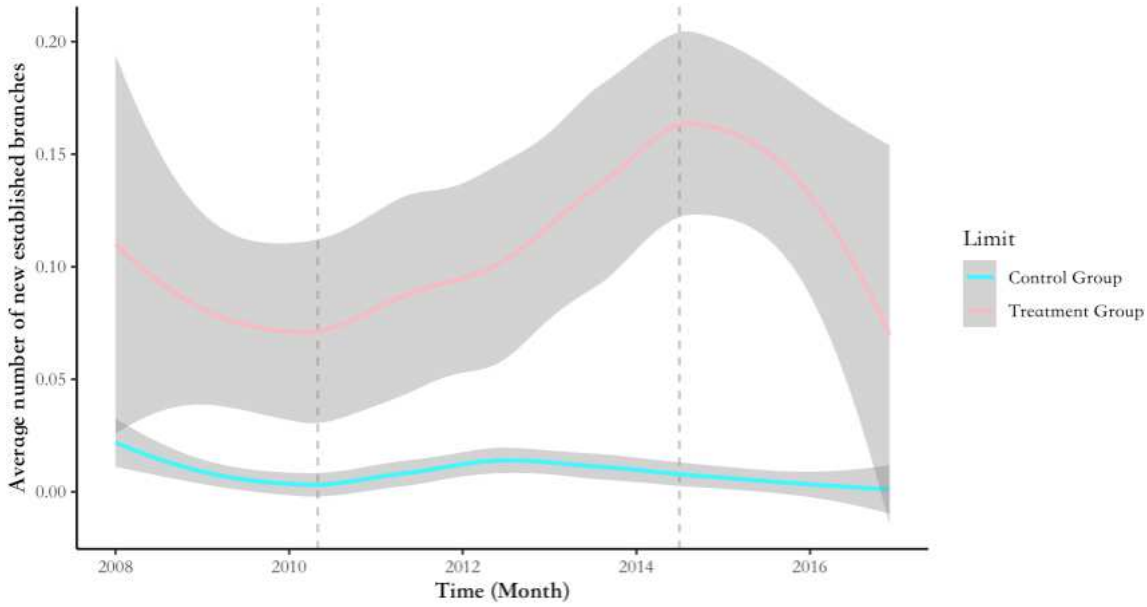
Variable	Number of new established bank branches						
	Placebo Policy Time	HLM Model	Quarterly-Level Estimates	Annual-Level Estimates	31-Bank Sample	75-Bank Sample	Control Confounding Policies
	(1)	（2）	(3)	(4)	（5）	(6)	(7)
HPR	-0.00284	0.09464***	0.22152***	0.30866***	0.01242***	0.00669***	0.13836***
	（0.00641）	(0.01576)	(0.06884)	(0.10253)	(0.00432)	(0.00189)	(0.03701)
Smart City							0.00346
							(0.00299)
Broadband China							0.02691*
							(0.01495)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$S_i \times f(t)$	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	128,592	450,072	150,024	37,506	734,328	1,776,600	450,072
R^2	0.0984	-	0.17226	0.37564	0.06838	0.04860	0.07652
Adjusted R^2	0.09601	-	0.17036	0.37023	0.06786	0.04836	0.07570

Note: Robust standard errors clustered at the city-bank level is reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

6.5 Analysis of Housing Purchase Restriction Policy Withdrawal

As discussed in the earlier policy background, many cities began lifting the Housing Purchase Restriction (HPR) policy in the latter half of 2014 to address a weakening local real estate market. If the observed increase in bank branch openings was truly driven by the HPR policy, we would expect the number of new bank branches in previously restricted cities to decline following the policy's withdrawal. This provides an additional opportunity to validate the effectiveness of the identification strategy used in this study. To examine this, we analyze bank branch establishment data from January 2008 to December 2016, focusing on the policy

withdrawal period. The sample includes only two types of cities: (1) cities that never implemented the HPR policy during the sample period (control group), and (2) cities that implemented the HPR policy in May 2010 or 2011 but lifted it after June 2014 (treatment group). As shown in Figure 4, the number of new bank branches increases sharply in the year the HPR policy is first implemented (marked by the first vertical dashed line). After the policy is lifted in June 2014 (second vertical dashed line), the number of new branches gradually declines. These patterns further strengthen the conclusion that the HPR policy actively promoted bank



channel expansion; otherwise, the pronounced rise and fall in branch openings around the implementation and withdrawal periods would be difficult to explain.

Figure 4. Trend of Bank Branch Growth Before and After Implementation and Withdrawal of the HPR

7. Heterogeneity Analysis

To identify the boundary conditions of the impact of speculative housing demand regulations on bank channel expansion and to better understand the mechanism through customer diversified financial demand, we conduct a heterogeneity analysis along three dimensions: bank size, city economic development level, and household income. Building on the results of H1 and H2 and drawing on contingency theory, we expect that banks with greater resources and organizational capabilities, as well as cities with higher household incomes and more advanced

economic development, are better able to translate the reallocation of non-housing consumption induced by speculative housing demand regulations into demand for diversified retail financial services, thereby exhibiting stronger channel expansion effects.

7.1 Bank Size

Bank size plays a key role in shaping how speculative housing demand regulations affects channel expansion. According to the Resource-Based View, large banks generally have more abundant tangible and intangible resources, including capital, extensive branch networks, technology investments, and professional human resources, which provide a solid foundation for channel expansion strategies (Barney, 1991; Peteraf, 1993). Large banks also tend to have stronger dynamic capabilities, allowing them to optimize branch networks and manage risks to adapt to shifts in customer financial service demand driven by changes in housing demand. In contrast, smaller banks, limited by resources and capabilities, may struggle to adjust their branch networks effectively in response to the pressures created by speculative housing demand regulations. This results in weaker willingness and capacity to expand. Furthermore, banking regulations impose stricter limits on branch operations for smaller institutions. Except for large national banks, most smaller banks operate highly localized networks, typically confined to their home city or nearby areas, which further restricts their ability to alleviate operational pressure through branch expansion. Therefore, bank size not only determines resource endowment and capability but also significantly affects how banks respond to speculative housing demand regulations and the flexibility of their branch adjustment strategies. To test this, we categorize the 19 systemically important banks based on branch count: large banks with 10,000 branches or more, medium banks with 1,000 to 10,000 branches, and small banks with fewer than 1,000 branches, and run separate regressions for each group. As shown in Table 8, HPR significantly increases channel expansion for large banks (column (1)) and medium banks (column (2)) but has no significant effect on small banks (column (3)). These results suggest that bank size actively shapes the response to speculative housing demand regulations. Large banks leverage their resource advantages to expand branches and alleviate business pressure, whereas small banks, limited by organizational capacity, tend to maintain their existing branch networks.

7.2 Household Income Level

Household income is another important factor shaping how speculative housing demand regulations influence bank channel expansion. Higher-income households not only possess stronger consumption capacity but also tend to exhibit higher financial literacy and more diversified financial service needs (Dynan and Kohn, 2007). When speculative housing demand regulations take effect, residents in high-income areas are more likely to reallocate their disposable income toward other financial products, including consumer loans, wealth management services, investment products, and insurance (Campbell and Cocco, 2007). This shift creates new revenue opportunities and expands the scope for banks to grow their retail channels. In contrast, households in low-income areas generally have limited disposable income, simpler financial needs, and greater sensitivity to housing market fluctuations, which reduces banks' incentives to expand branch networks in these regions. Accordingly, household income shapes banks' channel expansion decisions under speculative housing demand regulations by influencing the breadth and depth of financial service demand.

To test this, we divide cities into high-income and low-income groups based on whether the average wage of urban employees is above or below the median and run separate regressions for each group. As shown in Table 8, HPR significantly increases channel expansion in high-income cities (column 4), while it reduces channel expansion in low-income cities (column 5). This indicates that household income actively shapes the impact of speculative housing demand regulations on bank channel expansion. In high-income cities, households spend more on non-housing goods and services, which stimulates retail financial demand such as payment, settlement, and consumer credit. Banks capture this demand and actively expand their channels. In low-income cities, although speculative housing demand regulations reduces mortgage-related business, insufficient non-housing financial demand limits banks' incentives to expand their branch networks.

7.3 Economic Development Level

Finally, similar to household income, the level of economic development condition plays a key role in shaping bank channel expansion. Cities with higher economic development typically

have more advanced infrastructure, richer financial resources, and a more dynamic market environment, providing favorable external conditions for banks to expand their channels (Glaeser et al., 2001). Residents in these cities usually have stronger consumption capacity and higher demand for financial services. When housing demand declines, banks can actively expand their channels to diversify business and increase market penetration, helping offset the impact of reduced lending (Rajan and Zingales, 2003). In contrast, less developed areas often have underdeveloped financial markets and limited, more homogeneous financial demand, which reduces banks' incentives to expand. Banks in these regions are more likely to maintain existing networks or even scale back operations (Aghion et al., 2004). Economic development also affects the cost-effectiveness of channel expansion. In more developed areas, higher population density and greater economic activity make channel expansion more economically viable, encouraging banks to pursue growth strategies. Thus, economic development shapes banks' external environment and strongly influences their willingness to expand channels in response to speculative housing demand regulation shocks.

To test this, we divide cities into high-development and low-development groups based on whether their per capita GDP growth exceeds the median and run separate regressions for each group. As shown in Table 8, HPR significantly increases channel expansion in highly developed cities (column 6) but does not significantly affect less developed cities (column 7). This indicates that regional economic development actively shapes speculative housing demand regulations impact on bank branch expansion. In highly developed cities, higher industrial and commercial density, better digital infrastructure, and a more complete financial ecosystem enable banks to capture the funds released from reduced housing demand and convert them into diversified retail financial service demand, prompting channel expansion. In less developed cities, weaker demand for non-housing financial services leads banks to maintain or even shrink branch networks, producing no significant expansion effect.

Table 8. Heterogeneity Analysis of Housing Purchase Restrictions on Bank Channel Expansion

Variable	Number of new established bank branches						
	Bank Size			Household Income		Economic Development	
	Large	Medium	Small	High	Low	High	Low
	(1)	(2)	(3)	(4)	(5)	(6)	(7)

HPR	0.03859*	0.01441**	0.00518	0.01600**	-0.00572*	0.03057***	0.00675
	(0.01699)	(0.00614)	(0.00445)	(0.00627)	(0.00301)	(0.00852)	(0.00881)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bank fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
$S_i \times f(t)$	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	118440	236880	94752	225036	225036	225036	225036
R^2	0.11243	0.10353	0.11716	0.08661	0.05671	0.07129	0.08763
Adjusted R^2	0.10953	0.10205	0.11356	0.08556	0.05563	0.07022	0.08658

Note: Robust standard errors clustered at the city-bank level is reported in parentheses. ***, **, and * indicate significance at the 1%, 5%, and 10% levels (two-tailed), respectively.

8. Conclusion and Discussion

8.1 Research Conclusions

In recent years, despite the rapid growth of online financial services, traditional physical channels have not been fully replaced. Instead, they have gained new strategic importance through functional innovation and integration with online channels (Patel, 2014). Banks have also recognized the complementary value of physical channels within an omnichannel strategy. While prior studies have systematically examined factors influencing bank branch networks, including technological evolution, demographic changes, regulatory frameworks, and interbank competition (Berger et al., 2017; Fuentelsaz et al., 2002; Jagtiani and Lemieux, 2018), research on how shifts in real estate financial demand, particularly changes in speculative housing demand, affect bank channel structures via household credit demand remains limited. Drawing on contingency theory, we explore how banks use channel adjustment strategies to respond to the external shock of declining housing demand under the speculative housing demand regulation shocks.

To test our hypotheses, we use the Housing Purchase Restriction (HPR) policy, implemented since 2010 in 46 cities, as a quasi-natural experiment to construct the empirical indicators and estimate the models. The results show that speculative housing demand regulations significantly promote bank channel expansion. Compared with cities that were not

subject to these regulations, treated cities experienced faster growth in newly established bank branches, indicating that banks actively adjust their channel networks in response to shifts in speculative housing demand. To examine the mediating role of customers diversified financial needs, we draw on city-level data from the China City Statistical Yearbook, including total retail sales growth and the Consumer Price Index (CPI), as well as micro-level household consumption data from the 2009 to 2015 waves of the China Family Panel Studies (CFPS). The findings reveal that, at the macro level, speculative housing demand regulations increase total retail sales and CPI, and at the micro level, they raise household spending on consumer goods and services. These shifts stimulate banks to broaden their channel presence and offer a wider range of non-mortgage retail financial services, thereby expanding service reach and creating new revenue opportunities. The heterogeneity analysis indicates substantial variation across bank types and regional contexts. Large banks, equipped with stronger organizational structures and resource allocation capabilities, respond more proactively by expanding their channel networks. In contrast, small banks, constrained by limited resources and operational flexibility, exhibit weaker responses. Household income also exerts a significant moderating effect, as banks expand channels more aggressively in high-income areas than in low-income ones. Furthermore, regional economic development shapes banks' strategic responses, with institutions in economically advanced regions being more likely to pursue channel expansion. We conduct several robustness checks to validate these findings. These include using the Heckman two-stage method to address the potential endogeneity of city selection into policy treatment, accounting for spatial correlations during policy implementation, applying a hierarchical linear model (HLM) to capture the nested structure of banks within cities, running placebo tests with fictitious policy timings, and examining patterns during the policy withdrawal period. Across all specifications, the results consistently show that shocks from speculative housing demand regulations prompt banks to adjust their channel strategies, and the core findings remain highly robust.

8.2 Implications for Practice

Our findings also offer several practical implications. First, bank channels serve not only as points of customer access and service delivery but also as crucial tools for managing business

pressures and allocating resources in complex environments. When facing demand pressures in the real estate market, banks can use channel expansion to offset business contraction caused by declining housing credit demand. Second, since diversified customer financial demand mediates the effect of speculative housing demand regulations on bank channel expansion, a decline in housing demand does not equate to a reduction in overall financial demand. Instead, customers' financial needs shift from housing to a broader range of products and services, requiring banks to allocate channel resources more flexibly and improve overall performance. Finally, banks should adopt a differentiated strategy when expanding channels under speculative housing demand regulations, taking into account bank size, regional household income, and local economic development, with particular focus on economically advanced areas with higher-income residents.

8.3 Limitations and Future Research

This study has several limitations that future research could address. First, our analysis focuses on a period when online channels were not fully developed and therefore emphasizes the impact of speculative housing demand regulations on offline channels. Given the rise of omnichannel banking, future studies could examine how online channel expansion interacts with policy shocks. Second, our sample is largely based on the Chinese banking system, which may limit the applicability of our findings in other contexts. Future research could extend the analysis to other countries or regions to provide a more comprehensive understanding. Third, due to limited availability of city-level bank lending data, we could not directly measure the impact of speculative housing demand regulations on household demand for other financial services. Future studies might introduce alternative instruments to capture demand for different banking services across cities, enabling a more precise assessment of speculative housing demand regulations effect on diversified financial demand. Finally, future research could investigate the spillover effects of varying speculative housing demand regulations intensity on bank channels, providing policymakers with more nuanced guidance for regulating housing demand.

This study has several limitations that point to promising directions for future research. First, our analysis focuses on a period in which online banking channels were still developing, which leads us to emphasize the effects of speculative housing demand regulations on offline channel

expansion. As omnichannel banking continues to grow, future research could explore how online and offline channels jointly respond to policy shocks. Second, our empirical setting is primarily rooted in the Chinese banking system, which may limit the generalizability of our findings. Extending the analysis to other countries or institutional environments would help build a more comprehensive understanding of the phenomenon. Third, due to limited access to city-level bank lending data, we were unable to directly measure how speculative housing demand regulations influence households' demand for other financial services. Future studies could incorporate alternative measures of service demand across cities, allowing for a more precise assessment of how these regulations reshape financial consumption patterns. Finally, examining the spillover effects of differences in the intensity of speculative housing demand regulations across regions could provide policymakers with more nuanced insights into how speculative housing demand regulations propagate through the banking channel system.

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Ethics Approval

Not applicable.

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