From Renting to Owning: Anticipatory Behavior of First-Time Homebuyers

Research Proposal

Nimrod Cohen*
Tel Aviv University and The Bank of Israel

2025-07-16

Abstract

The purchase of a first home is a major milestone in most households' life cycle. This study examines how first-time homebuyers adjust their spendings around the event of taking their first mortgage, using a novel household-level panel constructed from Israel's consumer credit and mortgage register data. Employing an event-study framework I document a sharp, temporary rise in spending post-purchase, consistent with prior findings (Benmelech et al. (2023)), and a long (5 years at least) low stable spending beforehand—suggesting systematic saving for a down payment. This behavior is most pronounced among highly leveraged households. Alternative explanations, such as changes in family structure, salary increases, or deferred purchases of home durables, are less plausible, as evidenced by heterogeneous analyses based on leverage and income.

A simple dynamic model where homeownership provides utility but required minimal wealth, reproduces saving behavior toward down payment. The gap between initial wealth and the required downpayment primarily affects the duration of the saving period—not the spending levels which drops to a stable level largely independent of the gap—aligning with the empirical results. This implies that tighter credit conditions or rising house prices extend the period households remain renters, potentially increasing rental demand, while consumption stays flat. These dynamics may help explain the low elasticity of renters' consumption to house prices found in the literature (e.g., Berger et al. (2018)).

1 Introduction

The purchase of a first home is one of the most significant economic decisions a household makes. It is typically the largest—and most highly leveraged—investment a household undertakes, with profound consequences for its con-

*nimrod.cohen@boi.org.il

sumption, saving, and borrowing trajectories. So, securing a mortgage demands extensive long-term planning and financial commitment, shaping the household's lifetime welfare.

Focusing on first-time homebuyers, this study explores several central questions:

- How do households adjust consumption around their first home purchase?
- Focusing on the pre-purchase period:
  - How do households anticipate and prepare for home purchase? Do they deliberately save for a down payment?
  - What is their reaction to house price increases? Do they reduce consumption (like "negative wealth effect" as non-owners)?
  - How do macroprudential tools[1] (e.g., LTV and PTI limits) transmit through first-time buyers to influence broader economy?

Using comprehensive administrative data, this study applies an event study regression to analyze household spending patterns around the time of first home purchase in order to address the research question. The empirics indicate several significant trends in household behavior associated with first-time home purchases. Average monthly credit card expenditure increases from 8.8 k NIS prior to purchase to 14.7 k NIS following the acquisition.

After adjusting for common shocks and fix effects, a distinct spending pattern emerges five years before the purchase: households progressively cut back on spending during this pre-purchase phase. In credit cards terms, spending deviates by up to –1,500 NIS per month for five-year before purchase (–72,000 NIS cumulatively). Following the home purchase, households substantially increase their consumption for up to two years, likely reflecting the realization of durable goods needs associated with homeownership (in line with Benmelech et al. (2023)). Increases credit card spending by approximately +17,000 NIS cumulatively in the subsequent two years.

Moreover, households with low loan-to-value (LTV) ratios or higher incomes tend to show minimal decreases in spending prior to a purchase but experience significant increases in expenditure post-purchase. In contrast, highly leveraged households with high LTV ratios exhibits pronounced reductions in pre-purchase spending, primarily due to the necessity of accumulating savings for a down payment. Alternative explanations, such as changes in family structure, salary increases, or deferred purchases of home durables, appear to have a lesser impact or that are less plausible, as evidenced by heterogeneous analyses based on leverage and income.

To rationalize these empirical patterns, I develop a parsimonious model in which households accumulate wealth to meet a down-payment threshold for having

[1] These regulations mainly affect first-time buyers, who often struggle to meet requirements because they generally have less wealth and lower incomes.

homeownership. The model's central insight is that the "net wealth shortage"—the gap between current households' wealth and required down-payment — primarily drives the duration of the saving period, whereas consumption stabilizes at a level largely independent of shortage magnitude. In other words, during the savings period, expenditure decreases to a fixed level largely independent of the magnitude of the net wealth shortage, and remains at this point over time.

The pattern aligns with the empirical evidence presented above and has important implications. For example, when housing prices increase and households' wealth gaps widen, the result is a longer timeframe to reach the necessary down payment and achieve ownership, thereby increasing demand for rental properties—potentially fueling rental inflation. Additionally, this behavior helps explain renters' relatively low sensitivity in spending response to rising house prices (i.e., the low elasticity reported in existing literature, e.g., Berger et al., 2018).

To summarize, this research shell makes the following **contributions**. To begin with, I construct a unique, anonymized household panel that links comprehensive mortgage origination data with monthly credit spending, enabling precise identification of first-time home purchases. This panel facilitates event-study regressions to analyze spending behavior up to five years prior to home acquisition. Second, I present robust evidence of significant long-term saving patterns among prospective homebuyers—distinct from the 'home-durables delay' effect—and provide micro-level estimates of down-payment saving behavior. Finally, the formulation of a dynamic model provides analytic solutions for optimal saving horizons based on a specified wealth threshold, enhancing our understanding of how financial constraints—such as those imposed by macroprudential—affect behavior. This approach also offers analytical insight into why consumption among renters exhibits limited sensitivity to increasing house prices.

Together, these findings deepen our understanding of the consumption-saving trade-off facing first-time homebuyers and can inform the design of relevant policies.

2 Literature

2.1 Consumption Response to Innovations in Housing and Mortgages Markets

In general, there is no consensus on the link between house prices and consumption (Jappelli and Pistaferri (2017)), with MPC for housing wealth range from 0.04 to 0.01. Partial literature limitations are: co-movements in consumption and house prices which reflect not a causal link but the action of common factors such as economic events that move income expectations (Attanasio et al. (2009)), unobserved house price idiosyncratic risk, non-distinguish between transitory and permanent wealth shocks which should affect consumption differently.

Most of the literature on the relationship between housing market and consumption has focused on *housing wealth effects* (Carroll et al. (2011); Mian et al. (2013); Aladangady (2017); Kaplan et al. (2020); Guren et al. (2021) and the *collateral effect*—the role of housing as collateral for credit (Mian and Sufi (2011); Cooper (2013); Cloyne et al. (2019); Greenwald and Guren (2024)). Notably, these effects stem from the behavior of **homeowners**, who typically make up about two-thirds of the population in most advanced economies and account for a significant share of aggregate consumption.

There has been comparatively less research focused on **renters**, and when their behavior is addressed, it is frequently considered a secondary topic. Although renters represent a minority and do not drive overall economic trends and dynamics, they are still an important part of the economy. They are typically younger cohorts at the beginning of their financial lives—a critical stage for economic mobility and long-term wealth accumulation. Renters are also highly sensitive to house prices and credit conditions, making them particularly relevant in discussions on monetary policy and macroprudential regulation. Finally, their role in the rental market directly influences rent prices and broader inflation dynamics.

Only a few studies explicitly analyze non-homeowners, and their results are mixed, often lacking statistical significance, see Table 1. Graham and Makridis (2023) report a positive elasticity among renters, which is rather distinctive, and can be due to a demand shock, or miss identification of renters (the identification is in group level; thus, it is not clean reaction of renters). My research may contribute to this by making an analysis with more attention to renter state based on detailed data.

Table 1: Consumption Elasticity in the Literature

	Homeowners	**Renters**	**Main data source**
Aladangady (2017)	.051 (.026)	-.017 (.020)	Consumer Expenditure Survey
Stroebel and Vavra (2019)	.024***	**-.024 to -.012** (.016) (0.16) not statistically significant	7,200 grocery stores in over 2,400 zip codes + Nielsen Consumer Survey Identification of renters by condominium residences
Berger, Guerrieri , Lorenzoni and Vavra(2018)		no consumption response, just renting smaller houses.	

	Homeowners	Renters	Main data source
Graham and Makridis (2023)	.100 (.031)	.034 (.059)	Nielsen Consumer Survey (~50K HH each year)
Attanasio et al. (2009)		(+) significant	microdata from the UK
Campbell and Cocco (2007)		Old: (+) significant Young: insignificant	

2.2 Consumption around the event of house purchasing

The present study examines behaviour related to house purchasing events and shares similarities with the work of Benmelech et al. (2023), However, this research is focused on the pre-purchase period, whereas Benmelech et al. primarily investigate post-purchase effects. More specifically, Benmelech et al. (2023) show a sharp increase in home durable spending[2] following home purchase (No spending increase on nondurables and durables unrelated to the home), but find no significant reduction in the same category beforehand (minimal, if any, intertemporal substitution from the delay of prepurchase spending). This study focuses on prospective first-time homebuyers, particularly in the years preceding the purchase, and examines whether observed consumption patterns reflect saving for a down payment.

2.3 Macroeconomic models with credit-constrained households

A broad class of macroeconomic models, such as Iacoviello (2005); Greenwald (2018); Justiniano et al. (2019), dominates the analysis of policy interventions, including macroprudential policy. These models typically rely on a representative-agent framework, distinguishing between two household types: *savers* and *borrowers* (sometimes referred to as *credit-constrained households*). In such models, prospective homebuyers are usually embedded (imperfectly) within the group of financially constrained households. Utility from housing is modeled as a continuous function of owner-occupied housing, implying that households always own some positive level of housing. In this setting, there are no explicit barriers to homeownership; each representative household is always a homeowner

[2]From an economic point of view, expenditure on durable consumption goods, such as cars and washing machines, represent an investment in household physical capital (Uribe and Schmitt-Grohé (2017)). Moreover, spending to purchase and improve houses and other housing units is treated as investment and not consumption in the CPI (https://www.bls.gov/cpi/factsheets/owners-equivalent-rent-and-rent.htm).

to some degree, and given their income, net worth, and constraints (such as LTV or PTI), they choose the *quantity* of housing to own—an intensive margin decision.

In contrast, the current study focuses on a group that falls outside this conventional classification: *prospective first-time homebuyers* who are neither traditional savers nor current borrowers. These households are only indirectly affected by borrowing constraints, primarily through the required duration of saving, but are not themselves indebted and therefore not directly constrained. Moreover, by definition, they are renters and hold no ownership. As such, they are not adequately captured in standard models, and it may be important to generalize these models correspondingly.

The framework I propose emphasizes the extensive margin of housing—transitioning from renting to owning. Given house prices, housing needs (given ownership is preferred), and financial constraints (e.g., LTV and PTI), a minimum wealth is required for ownership. The central question becomes how and over what horizon the household chooses to accumulate this wealth. In summary, while standard models ask: *Given current wealth, what house size can the household purchase?* My framework reverses the question: *Given a target house, what wealth must the household accumulate, and how does it plan to do so?*

Several large-scale general equilibrium models, including Berger et al. (2018); Chen et al. (2020); Kaplan et al. (2020), incorporate household decisions between renting and owning. In these frameworks, renters typically make a dynamic choice each period between continuing to rent or purchasing a home. However, due to the complexity of these models, the analysis relies exclusively on numerical methods, offering limited analytical insight into the behavior of renters—particularly with respect to long-term saving for a down payment and its implications.

By contrast, my research adopts a simplified but analytically tractable approach, in which the renter is assumed to have already decided to purchase a home in the future. In my model, renters choose in advance to remain in the rental market for a number of periods in order to accumulate the minimum wealth required for homeownership. This narrower scope enables an (almost) closed-form analytical solution and yields deeper insight into the decision-making process of prospective homeowners.

For example, the model implies that tighter credit conditions or higher house prices tend to prolong the saving phase—effectively extending the time spent in renting—while leaving consumption relatively flat. This behavior may help explain the low elasticity of renters' consumption to house prices observed in empirical studies. In particular, my mechanism offers a complementary explanation to that of Berger et al. (2018), who argue that the low elasticity arises because income and substitution effects cancel out under Cobb–Douglas preferences, such that renters respond to rising house prices by reducing the size (or quality) of housing rather than non-housing consumption.

3 Data

This research focuses on household behavior around the event of first-time home purchase. While the decision to become a homeowner is largely endogenous and unobserved, the actual timing of the purchase is observable—specifically, the date on which the first mortgage is taken. Home purchases without a mortgage are outside the scope of this study, as they likely do not involve the same process of long-term capital accumulation.

Accordingly, the analysis requires several key features in the data. First, the dataset must allow for precise **identification of households** (rather than customers) and the timing of their first home purchase, defined by the **origination date of their initial mortgage**. This timestamp anchors the event we aim to investigate. Second, the dataset should include variables that capture **consumption dynamics** around the event, which serve as the primary dependent variables. Additional **control variables**—primarily time-invariant—are needed to characterize household income, leverage, and broader financial conditions. Lastly, detailed information on housing characteristics, mortgage terms, and related contextual factors is also essential for the empirical analysis.

In this section, I describe the datasets used in this research, outline the key assumptions and steps taken to construct a suitable panel for econometric analysis, and present the main descriptive statistics of the resulting sample.

3.1 Israeli Consumer Credit Register

The primary data source for this study is a sanitized and anonymized version reproduction of the Israeli Consumer Credit Register.[3] The register is an administrative dataset contains detailed, loan-level information covering the full spectrum of consumer credit for nearly the entire population of borrowers in Israel (fewer than 0.1% of eligible individuals opted out of the registry). It includes both new and outstanding credit—such as consumer loans, credit card balances, credit lines, and mortgages—updated at a monthly frequency.

3.2 Mortgages database

In addition, I use a partial dataset derived from loan-level data provided by the Bank of Israel, which covers all mortgages issued by the seven commercial banks operating in Israel. These banks collectively account for approximately 95% of all mortgage lending in the country.

The underlying dataset contains detailed information on **loan characteristics** at the time of origination, including: the date of mortgage issuance, the date

[3]This database was established under the “Credit Data Law”. The Bank of Israel serves as the sole collector and repository of all raw credit data. https://www.creditdata.org.il/en

of housing asset purchase, the approved loan amount and maturity, the stated purpose of the mortgage (e.g., first-time purchase, upgrading, or investment), interest rate plans[4] and rates, loan-to-value (LTV) ratio, and the payment-to-income (PTI) ratio. It also includes the value and geographical location of the acquired property. Mortgage balances are reported on a quarterly basis. The dataset further includes selected **borrower characteristics**: post-tax monthly household income, reported recurring monthly expenses (such as repayments on other loans), number of borrowers (individual or couple), age of each borrower, and whether a guarantor was involved in the mortgage agreement.

3.3 Panel construction

To align the data with the research objectives, I construct a household-level monthly panel dataset. The raw data is originally structured at the level of individual contracts and customers. My focus is on households that took out a mortgage, which comprise approximately 30% of all households in Israel.

First, I define a household (HH) as either a single customer with a solo mortgage or a pair of customers with a joint mortgage—provided that neither member has a mortgage with any other customer. If a customer appears in multiple mortgage pairings, they and all their associated partners (recursively) are excluded (nearly 5% of the sample) to avoid ambiguous household definitions. Additionally, I exclude borrowers identified as business-related (e.g., those with more than two co-borrowers, authorized dealers) and those listed as guarantors. This filtering results in a sample of roughly one million households.

Next, I matched each household to all relevant financial contract (IDs)—including credit cards, mortgages plans, consumer loans, and other financial instruments—while excluding guarantees and business-related customers or contracts. I then dropped any household with contracts that involve more than one HH (i.e., multi-household contracts). Thus, only contract (such as credit cards) uniquely and exclusively linked to a single household are included in my final dataset. This step removed approximately 4.7% of the original sample (around 47,000 HHs). The remaining 95.3%—roughly 957,000 households—each hold only internal contracts, meaning all contracts are confined within the household. In total, this results in approximately 20.9 million contracts, averaging about 20 contracts per household.

For each household, I use the earliest mortgage origination date, τ_i – interpreted as the first home purchase date – to assign household characteristics, mortgage and property details, and other debt and credit information. I use this information to refine my dataset; for most analyses, I exclude households that bought homes with government discounts, such as "MEHIR LAMISTAKEN", as they may skew the economic relationships I'm studying. I exclude households lacking LTV and

[4]Type of interest rate (fixed or variable, adjustable or not adjustable), and type of the benchmark for adjustable rates.

income data to maintain consistency across graphs for comparability of effects. The appendix presents event studies using all samples without filtering.

Next, I aggregate credit card spending at the household level on a monthly basis. While cash transactions and withdrawals are not observed, credit cards represent the most common method of payment in Israel.[5] Thus, this spending serves as a proxy for household consumption (see Caspi et al. (2024)), but since it is only a proxy for overall consumption, the analysis focuses primarily on **changes in spending** rather than absolute levels. The resulting longitudinal panel allows for tracking household financial behavior and consumption dynamics over time. Unfortunately, the dataset does not include detailed spending categories—such as durables versus non-durables—which limits the ability to assess compositional changes in consumption behavior around the time of home purchase.

3.4 Sample description and summary statistics

Table 1 shows that mortgages average YYY years, with a mean loan of YYY thousand (SD YYY) and an average home value of YYYY thousand, yielding an LTV of YY%. Sampled households have a mean annual income of YYY thousand NIS; YY% receive government price discounts, and YYY% are couples, mostly in their mid-thirties.

Table 2: Summary statistics for first time homeowners, 7/2017 to 4/2025

	Mean	SD	N (of households in millions)
Mortgage maturity	*Omitted because of communication constraints.*		0.96
Mortgage (credit line at origination)	*Will be completed*		0.3
Households' income (annually)			0.3
Home value			0.3
LTV (for first mortgage)			0.3

[5] Most credit cards issued in Israel are deferred debit cards: the full monthly balance is automatically withdrawn from the consumer's checking account, with no interest charged (except for designated installment purchases). Interest-accruing (revolving) credit cards, as common in the U.S., are relatively rare. For each household, I separately aggregate interest-bearing and non-interest-bearing CC balances. The latter—i.e., deferred debit balances—serves as the primary measure of consumption used in the empirical analysis. This is utilization amount from a customer's renewable line of credit which does not bear interest.

	Mean	SD	N (of households in millions)
Government price discount programs			0.3
Share of couples within the above			0.96
Age			0.96

4 Estimating Spending Patterns Around First Time Home Purchases

The analysis is limited to first-time homebuyers, with purchases by existing homeowners excluded. These households generally lack pre-existing housing wealth and, as a result, must often accumulate substantial savings to attain the necessary net wealth for a property purchase.

I begin the analysis with a descriptive exploration of raw data patterns in household spending around the time of home purchase. This initial step provides a sense of the magnitude and direction of spending changes, though it may primarily capture selection effects or compositional differences among households that choose to purchase a home, rather than causal impacts of the purchase itself.

To move beyond descriptive patterns, I then implement an event-study regression using panel data, which allows me to trace the dynamic evolution of spending before and after the home purchase event, while controlling for time and household fixed effects and more.

4.1 Average consumption relative to time of purchase

Observing credit card expenses during the period from July 2017 to April 2025, we find that the average monthly spending is 13.8 thousand NIS, with a large standard deviation (especially cross-sectional). Spending rises substantially following home purchases, increasing from 8.8 to 14.7 thousand NIS, with a corresponding rise in standard deviation. This pattern is also visible at the monthly level, where spending gradually increases in the months before purchase and continues to rise afterward.

Table 3: Household spending around first home purchase (Average monthly spending New Shekels)

	Mean (thousands NIS)	SD (thousands NIS)	N of observations (millions)
Total	13.8	15.1	83
Before	8.8	10.5	12.8
After	14.7	15.6	70.2
Monthe relative to home purchase			
-12	9.4	10.9	0.3
-6	9.7	10.5	0.3
0	11.0	12.8	0.3
6	12.5	14.1	0.3
12	12.5	14.0	0.3

4.2 A Statistical View

The objective of this section is to present statistical results derived from two primary methodological steps, both of which are technical in nature and **do not rely on any economic assumptions or subjective judgments.**

Given my focus on household behavior, I standardize each household's spending by dividing their expenditure by its standard deviation. Subsequently, I aggregate these values by **treatment cohort** (time of first home purchasing), establishing the cohort as the fundamental unit of analysis.

The first step involves removing common factors by subtracting the **first principal component** from each series, which accounts for 96.2% of the total variance. This procedure removes the primary dynamic shared throughout the series, which may reflect macro trends, business cycles, seasonality, COVID-19, and geopolitical conflicts. Principal Component Analysis (PCA) is preferred in this context due to its ability to accommodate varying joint variation structures, especially where different series exhibit distinct volatilities or correlations.

In the second step, I align all treatment cohorts such that time zero corresponds to the point of treatment. The results are presented in Fig 1, which illustrates a distinct spending pattern surrounding the first home purchase: spending decreases prior to the purchase, spikes sharply during the purchase month, and then converge toward a long-term trend (with the series already de-trended).

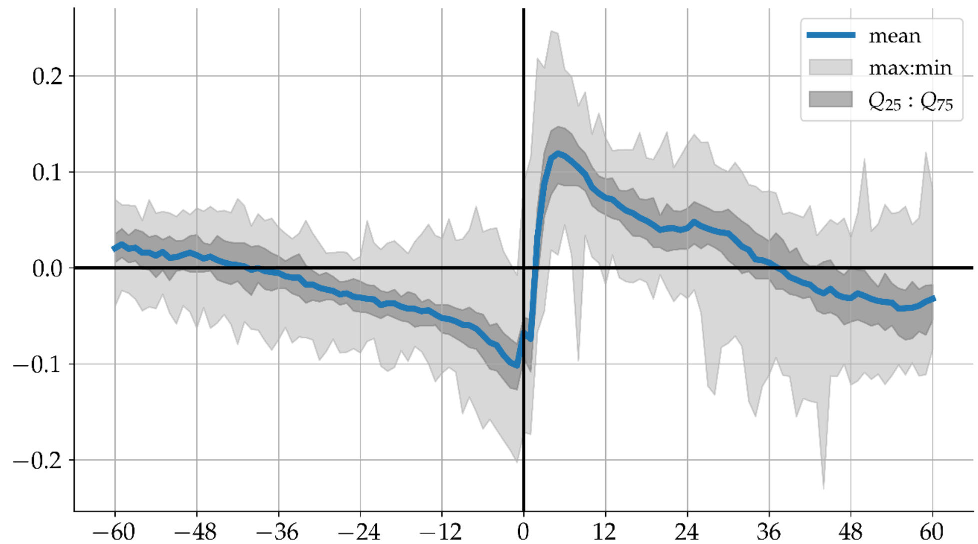

Figure 1: Spending (Y-axis, in standard deviations) deviation from trend (PCA wise), plotted against months relative to first home purchase (X-axis).

4.3 An Empirical Model of Spending Patterns Around Home Purchases

The objective of this section is to examine whether households engage in substantial pre-emptive saving behavior in anticipation of making a mortgage down payment. A more modest but still informative goal is to estimate household consumption patterns around the time of a first-time home purchase.

However, this inquiry faces two key empirical challenges. First, the timing of the household's decision to purchase a home is unobserved; the data only records the date of mortgage origination. This limitation obscures the actual point of decision-making, which is crucial for identifying anticipatory saving behavior. Usually, the mortgage origination occurs well after the household has made the decision (explicitly or implicitly) to enter the housing market. Second, the counterfactual scenario – what similar households would have done in the absence of a home purchase or down payment requirements – is inherently unobservable.

To address these issues, I assume that buying a home has only a temporary impact on household spending, which fades after two years as spending returns to its usual trend (as if the purchase had not occurred). This aligns with Benmelech et al. (2023) and is partially supported by my statistical analysis above. Based on this benchmark, the event study regression allows for analysis of the dynamics both following and preceding the purchase.

Additionally, I will later assess how households with different characteristics respond to the event, which will strengthen the analysis. For instance, households with low leverage (LTV)—potentially indicating external support from parents—may have less need for prolonged saving extensively (face minimal financial frictions, thus are able to better smooth consumption). In contrast, highly leveraged households plausibly are used to be actively saved for a down payment.

Using individual-level panel data, presented above, I analyze household expenditures around the timing of first-time home purchases. Specifically, I employ an event study framework to estimate the dynamic path of spending before and after the purchase. The following baseline event study regression is estimated:

$$S_{it} = \beta_m + \delta_t + \theta_i + \gamma' X_{it} + \varepsilon_{it} \qquad (1)$$

Where the outcome, S_{it}, is household spending approximated by credit card expenditures (*consider moving to real terms*). Time fixed effects, δ_t, represent coefficients on time dummies (dummy variable for each time period), absorb common macroeconomic trends and business-cycle fluctuations in spending. Household fixed effects, θ_i, represent coefficients on dummies for each household, accounting for time-invariant unobserved heterogeneity (e.g., preferences, income, baseline consumption levels). Next, X_{it}, are household-level control variables.

The coefficients of interest, β_m, pertain to indicators representing relative time (RT) with respect to the event occurrence: $m = RT(i,t) = t - \tau_i$. Formally:

$$\beta_m \quad is: \quad \sum_{m=a}^{b} \beta_m \, \mathbf{1}_{m,t-\tau_i}$$

For each household, the event of interest is the date of first mortgage origination, denoted by τ_i. The event dummies coefficients, β_m, quantify the deviation in a household's spending from its established trend, based on the aforementioned assumption. Technically, these dummy variables are **referenced to** the omitted category—the spending level of households with **two or more years since purchase**. This allows for a straightforward interpretation of the dynamics of household spending around the home purchase event, relative to the longer-run consumption behavior of homeowners.

4.4 Model estimation and adjustments

Estimation of regression (1)[6] without control variables is shown in the appendix. The event study coefficients display a distinct positive slope, even though the regression accounts for common trends. This finding holds across all tested specifications, including changes to reference time and outcome measures (log spending or standardized spendings).

[6] I mainly use the "fixest" R package for panel data and fixed effects analysis.

The issue arises, to my understanding, from differences between treatment cohorts. Heterogeneity in spending trend slopes undermine the parallel trends assumption crucial for identifying the event's impact. The cohort with later mortgage acquisition starts with lower spending but shows a faster growth rate (see Figure in the appendix). Specifically, earlier relative times coefficients are mainly influenced by later cohorts, which typically represent younger groups characterized by lower spending and steeper trend slopes. As a result, these values fall below the overall trend and exhibit larger slopes. Once the common slope is removed, the event study dummy variables continue to indicate lower spending levels and a positive slope.

When the parallel trends assumption is questionable—for instance, due to observed differences in pre-treatment trends across cohorts—standard time fixed effects may misattribute variation to the treatment effect, leading to biased inference (see Freyaldenhoven et al. (2021); Roth (2022); Borusyak et al. (2024)). In such cases, the econometric literature recommends the use of **interactive fixed effects** to accommodate long anticipation windows and heterogeneous responses to aggregate shocks. Specifically, Chudik and Pesaran (2015) and Xu (2017), develop panel models that allow unobserved common factors to enter with cohort-specific loadings, addressing violations of the parallel trends assumption. Bai (2009) provides the foundational framework, using principal component analysis to estimate latent factors that capture time-varying unobserved heterogeneity across units.

Accordingly, I absorb common shocks without imposing identical effects across all treatment cohorts. This is achieved by interacting the panel's first principal component[7], which captures the dominant aggregate factor, with cohort-specific indicators. This interaction allows each treatment cohort to load differently on the common component, accommodating heterogeneous exposure to systematic shocks (i.e., differential sensitivity). This strategy helps to mitigate potential bias arising from non-parallel trends and cohort-specific macroeconomic environments. Formally, I specify the time effect as:

$$\delta_t = \varphi_\tau \cdot PC_t^0$$

Which provides the following specification:

$$S_{it} = \beta_m + \varphi_\tau \cdot PC_t^0 + \theta_i + \gamma' X_{it} + \varepsilon_{it} \qquad (2)$$

Lastly, for consistency with subsequent analyses, the sample will be restricted to households possessing LTV information at origination—primarily those who

[7]Specifically, the principal component analysis (PCA) was conducted on the treatment-cohorts-level average spending trajectories (approximately 93 groups). This approach improves upon using a simple time-series average because, by construction, the first principal component maximizes the explained variance across groups. In this case, the first component captures 96.2% of the total variability, indicating that it serves as an effective proxy for the dominant common factor influencing household spending dynamics over time.

obtained mortgages after July 2017 (denoted as subsample [2]). No substantial differences were identified relative to the event study conducted on the full sample, as detailed in the appendix. Furthermore, I will concentrate on specification (2) without incorporating controls, in order to maintain consistency with subsequent analyses. The currently available control variable is time-invariant and introduces substantial **collinearity** (with households fix effects) when the sample is partitioned for certain analyses. For reference, the results for specification (2) including controls are presented only in the appendix.

Fig. 2 displays the estimation results of the main specification event study (2). During the **pre-purchase period**, there is a significantly **lower spending level** (deviation ranging from 1000 to 1500 NIS, summing up to **72,000 NIS** over five years)[8], which may be explained by two primary factors. First, this decrease in spending compared to typical levels may reflect a savings strategy aimed at accumulating wealth for a mortgage down payment. It is suggested that households, by leveraging mortgages to facilitate earlier apartment purchases, benefit from the advantage of enjoying homeownership sooner. This behavior will be further examined using a theoretical model that represents intentional intertemporal optimization decision-making. Second, reduced spending can be linked to postponed purchases of home-durable goods, aligning with a saving motive and reflecting the need for such expenditures to be tailored to a future residence that has not yet been acquired.

After buying a first house, expenditures typically increase temporarily, and cumulatively spending is **17,000 NIS** over the first two years. This is probably mainly reflecting adjustments for home durables related to the new residence, as Benmelech et al. (2023) refer to this as the "home purchase channel". Their quantitative analysis suggests that cumulative spending on home durables increases by $2,500 in the two years following a purchase, while expenditures on home improvements and maintenance rise by $4,300. No significant change was observed in spending on non-home durables, nondurables, or services. The total additional expenditure thus amounts to $6,800. Using an approximate exchange rate of 3.6, this equates to roughly 24,000 NIS. It should be noted, however, that typical spending patterns in Israel may differ substantially from those in the United States. Additionally, not all expenses are paid by credit card, as observed in Israel, although the figures are within a similar magnitude.

This expenditure can be considered part of the investment in the new property (analogous to adjustment and installation costs encountered when firms invest in capital), rather than routine or non-durable consumption.

[8]According to a Ministry of Finance review of residential real estate through the end of 2021, the average first home purchase price was approximately 1.6 million NIS. A minimum downpayment of **400 thousand NIS was required**. This amount is comparable to estimated reductions in consumption observed during the prepurchase period, which were 72 thousand NIS over five years for the general group, and 118 thousand NIS over five years for buyers with a loan-to-value ratio of 75%.

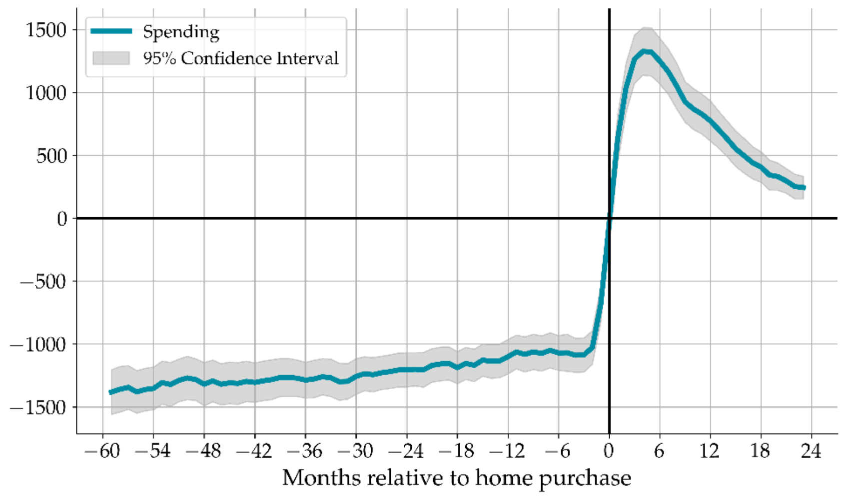

Figure 2: The Y-axis displays coefficients β_m from specification (2); here, the first principal component interacted by cohort replaces time fixed effects, with no control variables. The X-axis shows months relative to home purchase. Using subsample [2], clustered by treatment cohort (home purchase month). $\left[\int_{m<0} \sim -72 \text{ , } \int_{m>0} \sim 17\right]$

4.5 Interpretation Issues

Unobserved household-level heterogeneity or unobserved shocks that coincide with, and potentially prompt, home purchases may lead to increased expenditures,[9] particularly during the initial months following acquisition. For example, households might buy their first home during major **family changes** that require more spending. Likewise, events such as **job promotions** may simultaneously incentivize both the purchase of a home and greater consumption. As previously indicated, decreased spending may also be associated with **deferred purchases of home-durable goods**, reflecting the need for such expenditures to be tailored to a future residence that has not yet been acquired ("the home purchasing channel").

These scenarios suggest that reduced spending prior to purchase may not be solely attributable to saving for a down payment, but rather to relatively low expenditure associated with factors such as family changes, income variations, or shifts in credit availability at the time of purchase.

First, these effects are likely pre-existing, as they are inherent to the household life cycle and therefore confounded with the narrative of saving for down payment. To effectively distinguish between these various channels, additional data and

[9]Securing a **mortgage** can enhance borrowing capacity, thereby facilitating additional expenditure. However, the prospect of obtaining a mortgage is precisely what drives households to save for a down payment, making it fully consistent with my propositions.

comprehensive econometric analysis would be required. One approach could involve interacting control variables with relative time dummies to capture dynamic interactions. In the next section, however, I will implement select sample partitions to provide qualitative insights into the existence of these channels.

4.6 Treatment Heterogeneity

As noted above, the control covariates are time-invariant and were found to induce collinearity with individual fixed effects in the regressions. The objective is to estimate separate treatment effects (event-study coefficients) for distinct subgroups (e.g., low-LTV vs. high-LTV households). These results should be interpreted with caution, as observed differences across subgroups may reflect underlying heterogeneity beyond the covariate of interest.

I will provide an analysis of partial samples with respect to two key variables relevant to understanding the effects associated with the event of first-time home purchase. First, I will present subsamples of households classified by identical leverage levels (LTV). Second, I will examine samples differentiated by both low and high relative income (I attempted a similar analysis for the house price-to-income ratio, but the results were inconclusive).

Another interesting comparison group would be that of "home improvers"—households upgrading or renovating their existing homes. This group could serve as a useful benchmark for spending patterns, as they are likely to face much less pressure to accumulate wealth for down payments and are typically subject to looser financial constraints. At this stage, however, they are not included in the dataset constructed for the current analysis.

4.6.1 Estimation of Sample Partition by LTV

At the time households make their first home purchase, the actual loan-to-value (LTV) ratio, virtually no households possess an LTV exceeding 75%. In Figure 3, I present the estimation results for specification (2), considering only households with the maximum permitted loan-to-value (LTV) ratio of 75%. The observed pattern closely resembles that of the baseline scenario (Figure 2); however, pre-purchase spending in this group is lower by approximately 2,500 to 2,000 NIS per month relative to the normal level, whereas in the baseline case, the deviation ranges from 1,500 to 1,000 below the normal level. This finding is consistent with the anticipated behavior of more financially constrained households.

Figure 4 shows an estimate for households with an LTV of 65%. Although this is under the regulatory limit, these households are also highly leveraged. This scenario closely resembles the baseline case.

Finally, Figure 5 shows the estimation of the loan-to-value (LTV) ratios range between 20% and 38%, indicating a relatively low level of leverage. Unlike the previously described patterns, households in this group do not demonstrate

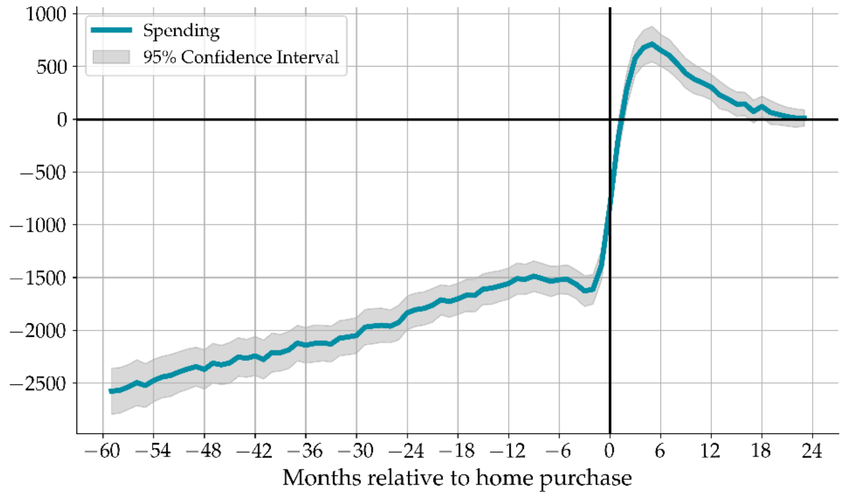

Figure 3: The Y-axis shows β_m coefficients from specification (2), without control variables; the X-axis shows months relative to home purchase. Subsample [LTV=75%], Cluster by treatment (home purchase date) cohort $\left[\int_{m<0} \sim -118 \;, \int_{m>0} \sim 6\right]$

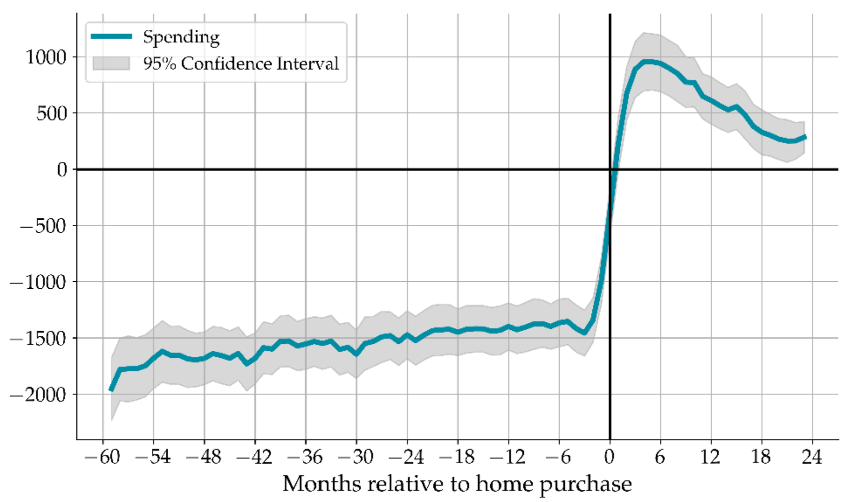

Figure 4: The Y-axis shows β_m coefficients from specification (2), without control variables; the X-axis shows months relative to home purchase. **Subsample [LTV=60%]**, Cluster by treatment (home purchase date) cohort $\left[\int_{m<0} \sim -91 \;, \int_{m>0} \sim 13\right]$

reduced spending before purchasing a home. This indicates that they may not accumulate savings for a down payment themselves, but instead obtain external funding, potentially from family members. After purchasing, there is a notable but temporary rise in spendings.

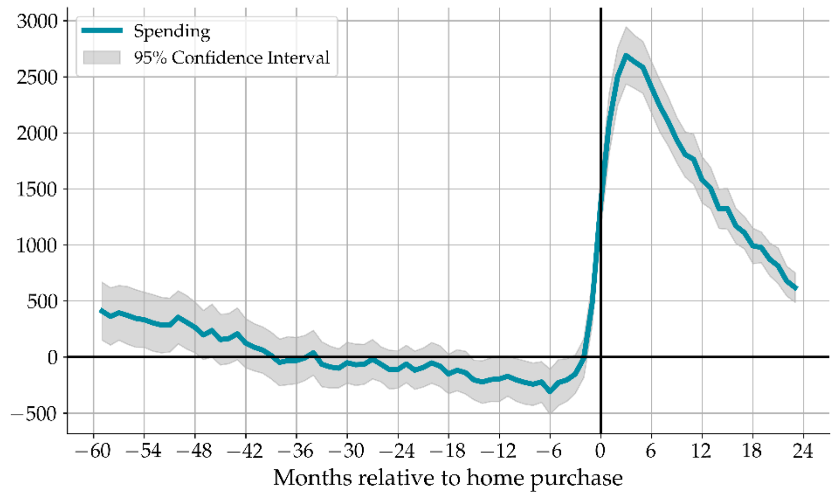

Figure 5: The Y-axis shows β_m coefficients from specification (2), without control variables; the X-axis shows months relative to home purchase. **Subsample [20%<LTV<38%]**, Cluster by treatment (home purchase date) cohort $\left[\int_{m<0} \sim 1 \text{ , } \int_{m>0} \sim 38\right]$

4.6.2 Estimation of Sample Partition by Household Income

This section presents the event study regression estimates for subsamples stratified by income levels (considering specification with conditional on house prices, q). The appendix demonstrates that the sample with monthly incomes ranging from 10,000 NIS to 20,000 NIS exhibits a pattern closely resembling the baseline case depicted in Figure 2.

Figure 6 presents the estimation for low-income households (those earning less than 10,000 NIS per month). While the pre-purchase period is characterized by a low level of spending, the deviation amounts to only 1,000 NIS, compared to 1,500 NIS in the baseline. It is important to note that this represents a significant proportion of total income—exceeding 10%—due to the lower income level. Following the purchase, no increase in spending is observed, unlike the patterns seen in other cases. This may be attributed to the very limited financial resources available to these households.

Figure 7 illustrates the corresponding scenario for households with comparatively high incomes. In this case, consumption levels were largely maintained throughout the pre-purchase phase, with little reduction observed (very low in income

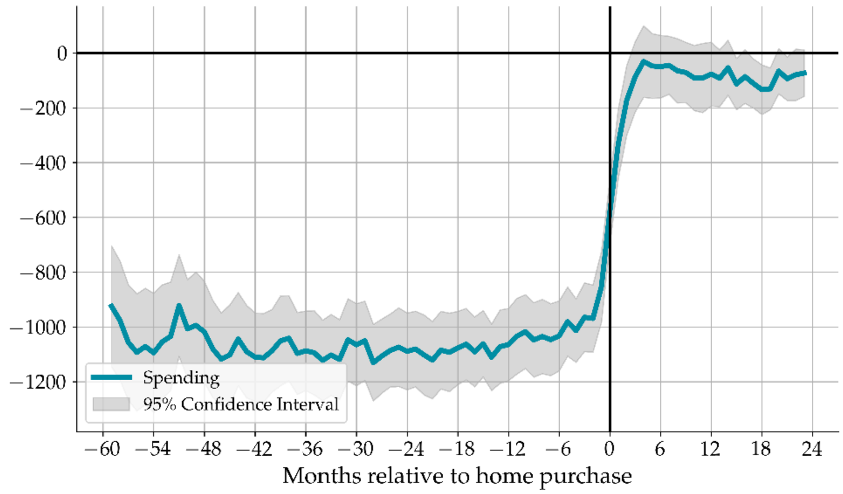

Figure 6: The Y-axis shows β_m coefficients from specification (2), without control variables; the X-axis shows months relative to home purchase. Subsample [income<10K], Cluster by treatment (home purchase date) cohort $\left[\int_{m<0} \sim -62 \ , \int_{m>0} \sim -2\right]$

terms). However, there was a noticeable temporary increase in consumption following the purchase.

4.7 Insights

From the above analysis, several insights emerge regarding the interpretation challenges discussed earlier. First, regarding the possibility that households might buy their first home during major **family changes** that require more spending. Consider Figure 3, which examines households at the regulatory limit (LTV=75%). It is unlikely that most family expansion occurs precisely in the same month as a home purchase; rather, it is more likely that much of the family expansion takes place before households have accumulated sufficient wealth to buy a home. In such cases, one might expect that a lot of household spending to increase in the periods RT<0 (before house purchase). The slight upward slope in spending may reflect this narrative, but its magnitude appears modest. Furthermore, Figure 5 indicates that low-leverage households experience only a temporary rise in consumption, rather than the sustained increase typically anticipated in instances of family changes.

Regarding, events such as **job promotions** may simultaneously incentivize both the purchase of a home and greater consumption. For this point, let's consider

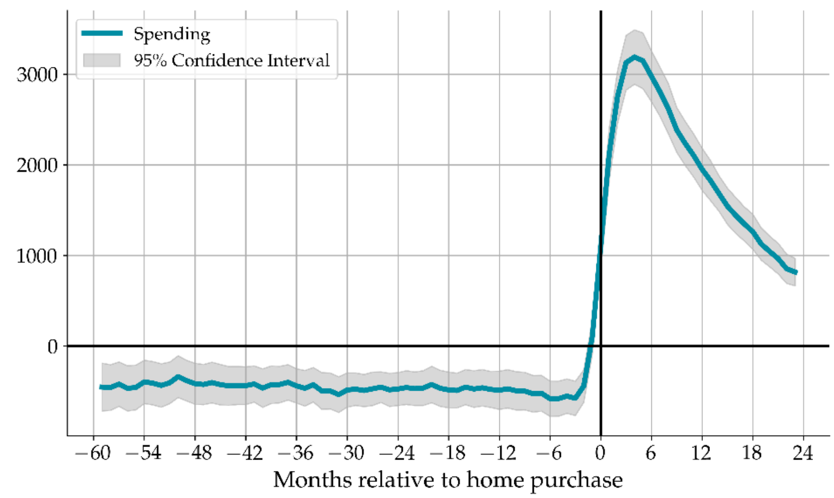

Figure 7: The Y-axis shows β_m coefficients from specification (2), without control variables; the X-axis shows months relative to home purchase. **Subsample [income>20K]**, Cluster by treatment (home purchase date) cohort $\left[\int_{m<0} \sim -23\ , \int_{m>0} \sim 45\right]$

a scenario in which a household initially earns a low income, insufficient to support savings toward a down payment. Following an improvement in earnings, the household may begin allocating a substantial portion of income to savings. However, the accumulation of sufficient wealth to meet the down payment requirement is a gradual process and does not occur instantaneously—unlike constraints such as the payment-to-income (PTI) ratio, which can be satisfied immediately upon income increase. Consequently, income growth typically precedes home purchase, with a necessary interim period dedicated to wealth accumulation before the household can enter the housing market. Additionally, as illustrated in Figure 5, low-leverage households exhibit only a short-term increase in consumption, rather than the prolonged growth typically anticipated with substantial income gains. This is also illustrated in Figure 7, in relation to high-income households.

Another potential alternative explanation to the down payment saving mechanism is the deferral of home-durable purchases—that is, households may postpone buying major durable goods (e.g., furniture, appliances) until after acquiring a new home, as these purchases are often tailored to the specific future residence. However, the empirical patterns suggest that this is not the primary driver. In the baseline case, the cumulative reduction in spending prior to the home purchase is substantially greater than the post-purchase increase, even though many durable purchases may not be captured fully through credit card transactions. Furthermore, the duration of the pre-purchase low-spending period exceeds what would typically be needed to delay home-durable expenditures.

When disaggregating by loan-to-value (LTV) ratio, the pattern becomes even more pronounced. For highly leveraged households, the gap between pre-purchase spending reduction and post-purchase spending increase is particularly large—consistent with a strong savings motive to meet the down payment requirement. In contrast, households with low LTV ratios (see Fig. 5) exhibit little to no decline in pre-purchase spending, but do display a noticeable increase afterward.

Furthermore, analysis of low-income groups (see Fig. 6) indicates that they do not exhibit an increase in consumption following purchases—likely related to household durables—yet they experience a significant reduction in spending during the post-purchase period. Among high-income households (Fig. 7), although there is a significant increase in expenditure following a home purchase, there is no evidence of further spending reductions in the two to three years prior to the transaction.

This suggests that while some durables may indeed be postponed until after the home purchase, this effect is not significant enough to explain the broader consumption dynamics observed in the data.

To summarize, this differential behavior between more liquid households—those with initial loan-to-value (LTV) ratios of 20% to 38%—and less liquid households—with initial LTVs around 75%—suggests that saving for a down payment is the dominant driver of pre-purchase consumption dynamics. In contrast, the deferral of home-durable expenditures to the post-purchase period appears to play a secondary role.

4.8 Spending Heterogeneous Response to House Price (planed only)

In this section, I plan to examine the spending response to changes in house prices across cohorts, specifically by relative time (RT) from the purchase of a first home. For $RT < 0$, households are classified as renters—those who are RT periods away from becoming homeowners. For $RT \geq 0$, the household has already transitioned to ownership. This framework allows to trace consumption responses across the renter-to-owner transition.

The focus here is on **renters**, particularly because—as discussed in Table 1 and the literature review—there is **no consensus** on the relationship between house prices and consumption among this group. Table 1 summarizes recent elasticity estimates from the literature. The typically small and statistically insignificant responses observed for renters may reflect their ability to adjust behavior through channels other than immediate consumption changes—such as delaying the timing of a home purchase or choosing smaller, more affordable housing. These substitution mechanisms suggest that wealth effects from housing may operate differently, or weaker, for renters compared to homeowners.

Another goal of this assessment is to verify the results presented above as well as those obtained from the theoretical model described below.

In order to assess the effects of changes in house price on household consumption, I will estimate the elasticity of household-level spending (measure by credit cards) to local house price movements. The benchmark regression specification takes the form (e.g. Graham and Makridis ,2023, Campbell and Cocco (2007); Guren et al. (2021) and Aladangady (2017)):

$$\Delta c_{i,g,t} = \beta_1 \Delta q_{g,t} + \beta_2 x_{i,t} + \beta_3 y_{g,t} + \alpha_g + \alpha_t + u_{i,g,t}$$

where i denotes an individual household, g denotes the geography of that household (e.g., city)[10] and t denotes the year of observation. $\Delta c_{i,g,t}$ is the annual log change in real household consumption expenditure; $\Delta q_{g,t}$ is the annual log change in real local house prices in geography g. The coefficient of interest is β_1, the elasticity of consumption with respect to local house prices.

5 *Chapter 2*

6 Theoretical Model of Household Decision-Making Toward Achieving Homeownership

To illustrate the barrier to homeownership and the trade-offs faced by first-time homebuyers, in this section I will analyze a simplified household decision problem, grounded in the **assumption that the household has a stable preference for homeownership over renting**.[11] This core assumption does not necessarily reflect the preferences of all households, but as discussed in the introduction, it is a plausible and empirically relevant characterization for a large segment of the population. While formally treated here as a preference, this assumption can also be interpreted as a reduced-form representation of a range of underlying motivations: the perception of housing as a sound investment, a form of long-term (pension-related) saving, a vehicle for bequest, or a hedge against expected increases in housing prices. These considerations are inherently subjective and may evolve over time, but for the purposes of this model, they are captured through a stable preference for homeownership.

I assume that the transition from rent to homeownership, and homeownership *per se*, is not expected to generate financial profit for the household (A formal discussion provided in the appendix). If households do anticipate financial gains from owning a home, such as from capital appreciation or rental income potential, these expectations are incorporated into the perceived utility of ownership, u^o, as part of the household's subjective valuation. This assumption allows for a clean separation between the utility benefits of ownership and its financial consequences.

[10] Supply-Demand analysis (Siaz): Area with a lot of lands for living, where supply is elastic (dq/qH is low), the response to demand increases shock couse a small price increase in respect to area with inelastic supply (dq/qH high, as lands are limited).

[11] See, for example, Kaplan et al. (2020).

Moreover, homeownership *per se* is assumed to not alter the household's net worth or its flow budget constraint, at least not in the period immediately surrounding the transition, as formalized in the appendix.

Achieving homeownership, however, requires a minimum level of net worth, denoted by $\overline{w}$. This threshold may reflect intrinsic household considerations (e.g., living standards, which resemble the PTI constraints below, or desired liquidity buffers), but in most cases, it is primarily shaped by two key external **financial constraints**.

1. Loan-to-Value (LTV) Constraint. The minimum down payment must satisfy the regulatory LTV requirement, θ_{ltv}, such as:

$$\overline{w} \geq \quad qH \cdot (1 - \theta_{ltv}) \qquad (*)$$

where qH is the price of the target home.

2. Payment-to-Income (PTI) Constraint. Additionally, the household must ensure that mortgage payments are consistent with the PTI regulation. Using the standard annuity formula for equated monthly payments over m periods with interest rate r, the PTI constraint implies:

$$\psi_{pti} \geq \frac{payment}{y} = \frac{\frac{rD}{1-R^{-m}}}{y} = \frac{\frac{r(qH-\overline{w})}{1-R^{-m}}}{y}$$

Rearranged, this yields the following bound on required wealth:

$$\overline{w} \geq \; qH - \psi_{pti} \cdot y \cdot \; \frac{1 - R^{-m}}{r}$$

These two constraints—LTV and PTI—are distinct in their dependence on household resources. The LTV constraint is primarily related to the household's current financial (liquid) wealth, while the PTI constraint reflects the expected future income stream, or human capital ($\sim y/r$). Together, they highlight the dual nature of the financial requirement: the household must possess both sufficient accumulated assets and credible future earning potential. In this way, the bank is partially insured: if house prices decline, the household's income supports the mortgage payments; conversely, if household income deteriorates, the value of the house serves as collateral to secure the loan[12].

[12]The necessity of accumulating a down payment prior to purchasing a home can be interpreted as a result of **financial frictions**, which introduce a temporal disconnect between the household's decision to acquire a home and the actual execution of the purchase. Another friction arises in the context of home-related durable goods, as discussed in Benmelech, whereby households face constraints in furnishing or upgrading their homes post-purchase. In a hypothetical environment with frictionless credit markets—households would be able to immediately act upon their housing decisions. Such conditions would facilitate optimal

The constraints can be expressed in terms of income:

$$\overline{\overline{w}} = \frac{\overline{w}}{y} \geq \frac{qH}{y} \cdot (1 - \theta_{ltv})$$

$$\overline{\overline{w}} \geq \frac{qH}{y} - \psi_{pti} \frac{1 - R^{-m}}{r}$$

Or

$$\overline{\overline{w}} \geq \max \left[\frac{qH}{y} \cdot (1 - \theta_{ltv}) \ , \quad \frac{qH}{y} - \psi_{pti} \ \frac{1-R^{-m}}{r} \ \right]$$

$$\overline{\overline{w}} \geq \frac{qH}{y} \left(1 - \min \left[\theta_{ltv} \ , \quad \psi_{pti} \frac{y}{qH} \frac{1-R^{-m}}{r} \ \right] \right)$$

In general, the wealth threshold can be expressed as a function of several variables:

$$\overline{\overline{w}} \left(\frac{qH}{y}, \theta_{ltv}, \psi_{pti}, \ R, \ m, \ldots \right)$$

This formulation captures the key economic parameters that define the affordability and feasibility of homeownership in a regulated mortgage market.

The value function – the households' present cumulative expected utility – is defined through the recursively bellman equation:

$$V \left(w_t, \overline{w} \right) = \max_{c_t} \left\{ u \left(c_t \right) + o_t \left(w_t, \overline{w} \right) + \beta V \left(w_{t+1}, \overline{w} \right) \right\}$$

Where,

$$o_t = \begin{cases} \ \ 0 & , w_t < \overline{w} \\ u^o & , w_t \geq \overline{w} \end{cases}$$

The budget constraint

$$w_{t+1} = R \left(w_t + y - c_t \right)$$

Where c_t denotes total consumption in period t, which includes housing (dwelling) services regardless of whether they are obtained through renting or owning (for

intertemporal consumption smoothing, allowing households to allocate resources efficiently across time without delay or constraint.

a detailed discussion of this treatment, see the appendix).[13] y is labor income, w_t is current net worth, w_{t+1} is next period's wealth, R is the **gross interest rate** (i.e., $R = 1 + r$).

$o_t(w_t, \overline{w})$ is the ownership utility, which equals u^o if $w_t \geq \overline{w}$, and 0 otherwise. I assume that in the period where the household's net worth w_t exceeds a threshold $\overline{w}$,[14] the household purchases house and becomes a homeowner[15] and receives an additional utility flow from ownership, denoted u^o.

This formulation introduces a distinctive utility component—an additional term that depends on the household's wealth level[16]. This utility term captures the **intrinsic utility derived from ownership per se**, over and above the utility gained from the flow of housing services, which can be obtained through either renting or owning. In other words, it reflects the non-monetary or psychological benefits of homeownership—such as autonomy, long-term stability, control over the dwelling, and perceived social status—that are distinct from the consumption utility of housing services.

In the current framework, renters derive utility solely from consumption (including housing services via rent), whereas homeowners receive an additional utility benefit, denoted by u^o, associated with the ownership status itself. Most literature treats ownership and renting similarly, considering both as forms of dwelling in the consumption basket—typically modeled with a Cobb-Douglas utility function.

Typically, o_t, appear at the start of the agent life cycle to represent a consistency model. However, this can be generalized by allowing, o_t, to arise at moments when household conditions change, such as during marriage, the birth of children,

[13] I ignore the effects of home durables (analysis in Benmelech et al. (2023)) which are typically involve substantial adjustment costs, making it optimal for households to delay such purchases until after acquiring a specific home. Additionally, they and home improvements can be treated as part of the broader housing investment.

[14] This threshold, of the net-worth, as it appears within the optimization framework, is relatively unique and necessitates a more intricate solution approach. In many standard optimization problems involving thresholds, even endogenous one, the process governing the variable crossing of the threshold remains exogenous, such as idiosyncratic shocks to returns as seen in the Merton model or in Bernanke et al. (1999), or stochastic salary as in the McCall job search model. Another related example is the life-cycle model with retirement, where a time-based threshold marks the cessation of labor income. Another point of comparison is with models that incorporate inequality constraints or binding conditions, such as Iacoviello (2005), where constraint affect directly current consumption, while the above constrains are less restrictive, and only act on future utility.

W.L.G can generalize to $\overline{w}_t \sim \overline{w}_0 R^t$, which will result in better interpretations.

[15] I assume that once the household becomes a homeowner, the transition is irreversible—i.e., the household remains a homeowner even if its net worth subsequently falls below the initial threshold.

[16] This structure may also be useful in other economic models where a minimum resource threshold is required—for example, models of entrepreneurial entry requiring startup capital, or models involving credit access conditioned on minimal collateral or net worth.

In the above model, wealth itself enables access to the utility benefits of ownership—beyond its role in supporting future consumption or serving as a buffer against income risk (i.e., precautionary savings).

or other circumstances.

A natural extension of this framework is to allow the ownership utility to depend on the value of the home being purchased. Specifically, one can model this as a function of the required wealth threshold: $u^o = f(\overline{w})$. This generalization captures the idea that more expensive homes (with higher $\overline{w}$) may deliver greater perceived or psychological utility. For each given value of $\overline{w}$, the model can be solved using the same techniques outlined below, and the household's optimal choice can then be obtained by maximizing utility over the space of feasible $\overline{w}$ values.

Another way to interpret or generalize u^o is to think of it as the realization of a **preference shock** – a sudden change in the household's valuation of ownership. This could represent a shift in personal priorities, life-stage changes (e.g., marriage, having children), or external events that elevate the perceived value of homeownership and trigger a reassessment of housing goals.

It is convenient to express the household's period-by-period **budget constraint** as:

$$c_t = y + w_t - \frac{w_{t+1}}{R}$$

The dynamic problem – the household's **Bellman equation**:

$$V(w_t, \overline{w}) = \max_{w_{t+1}} \{u(c_t) + o_t(w_t, \overline{w}) + \beta V(w_{t+1}, \overline{w})\}$$

Broadly speaking, the model captures a key **intertemporal trade-off**. Higher consumption today raises current utility, but reduces future wealth w_{t+1}, which in turn lowers future utility. Conversely, greater saving today (i.e., lower c_t) improves future utility by increasing future wealth.

The solution to the model involves characterizing the optimal policy functions:

- $w_{t+1}(w_t)$: the **wealth transition function**,
- $c_t(w_t)$: the **consumption policy function**.

These mappings describe how an optimizing household adjusts consumption and savings in response to current net worth.

The **solution** of the model proceeds in several steps. It begins with the analysis of households already in the state of homeownership and then turns to those with wealth levels near the threshold required for entering homeownership. Building on these cases, the framework extends recursively to construct the general case. This step-by-step approach enables the derivation of an analytical value function and the corresponding optimal consumption path. The full derivation is provided in detail in the appendix.

Below, we proceed directly to the simulation of the model, focusing on the consumption dynamics implied by the household's optimal behavior over time.

6.1 Model Simulation: Consumption Dynamics

Fig. 8 illustrates the consumption dynamics conditional on each value of w_t. (*I need to better calibrate the model*) Suppose that there are no other considerations beyond consumption and ownership utility. Prior to entering the ownership process, consumption is at a "steady-state" level, defined by, $\overline{C}_- = y + rw_t/R$, which maintains a constant level of net wealth. After purchasing the house, consumption adjusts to a new steady-state, $\overline{C}_+ = y + r\overline{w}/R$, where $\overline{w}$ represents the threshold wealth needed for homeownership.

Once the household commits to purchasing a home, it reduces its consumption to $c^{np}(w_t)$ and maintains that level for np periods (consistent with the value function, see figure 24). This allows the household to accumulate sufficient wealth to meet the financial constraints required for ownership. While this reduction imposes a utility cost (consumption reduction) during the saving period, it enables future utility gains from homeownership (e.g., through u^o, collateral value, housing services, or stability benefits).

This dynamic may be expressed as follows:

$$\overline{C}_-(green\ line) \rightarrow\ c^{np}\,(w_t)\,(red\ line) \rightarrow \overline{C}_+(blue\ line)$$

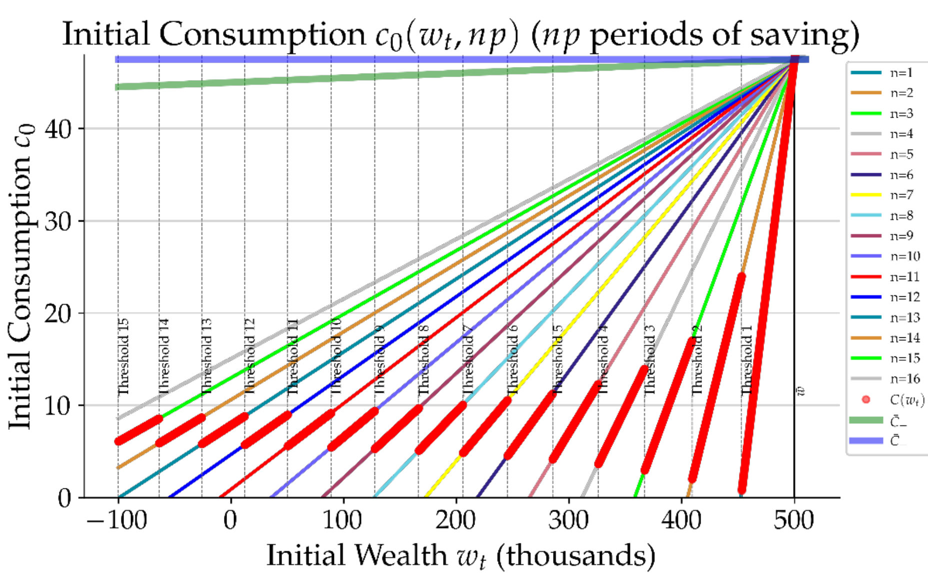

Figure 8: Consumption level for... - to explain ($\overline{w} = 500,\quad \Delta t = quarter,\quad y = 15 * 3, R = 2\%\ ann.,\ \beta = \frac{1}{R},\ \sigma = 1.4,\ \theta = 1$)

Number of consumption paths are illustrated in Fig. 9, which shows trajectories for various initial wealth levels. These trajectories follow a general structure (as seen also in Fig. 8): an initial steady consumption level, a phase of reduced and smoothed consumption over np periods, followed by a post-purchase adjustment toward a new steady-state level under ownership.

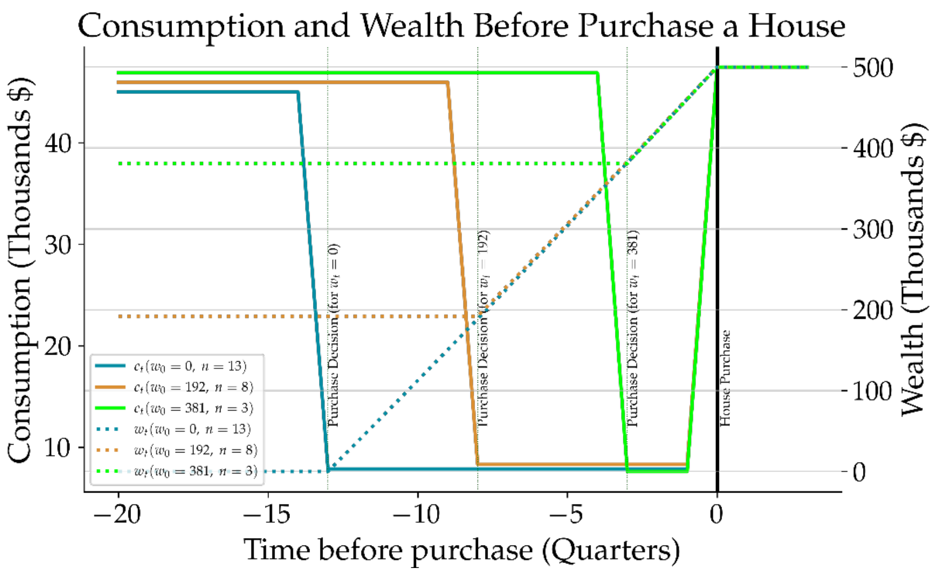

Figure 9: Consumption path around the event of home purchases

For example, with an initial wealth of 192 thousand dollars (indicated by the orange lines), the optimal saving duration is eight quarters. Selecting a saving period of seven or nine quarters remains a viable option, as shown in Fig. 10, but yields a lower level of utility.

Prior to purchasing a home, a household must accumulate sufficient wealth to cover the down payment. This requirement introduces a fundamental intertemporal trade-off. If the household does not reduce consumption (or delay with this), it will take longer to accumulate the necessary savings, thereby postponing the transition to homeownership and forgoing the associated utility benefits during the interim. Conversely, if the household reducing consumption too aggressively it incurs a prolonged period of reduced consumption leading to a substantial loss in utility. The household's decision, therefore, involves optimizing between these two opposing forces—minimizing the utility cost of reduced consumption while maximizing the benefits of earlier homeownership. This trade-off is shaped by household-specific characteristics and prevailing economic conditions.

It is important to connect the model’s results with the empirical evidence presented in the earlier part of the study. Consider Figures 2 and 3. If the primary driver of the observed pre-purchase decline in spending is the need to accumulate

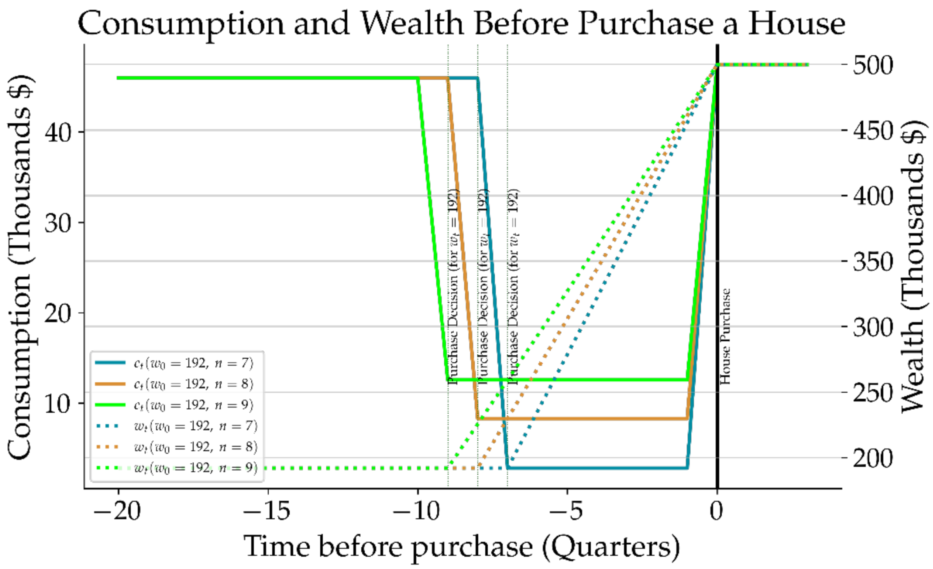

Figure 10: Consumption path around the event of home purchases. The optimal path and deviation from it

wealth for a down payment, then—over time—households' net wealth increases as they approach the point of purchase. In this interpretation, the x-axis of these figures can be viewed as a proxy for net wealth. However, the figures reveal that, despite increasing wealth, consumption remains nearly flat throughout the pre-purchase period. Formally, for periods before the purchase ($m < 0$), consumption $C(m)$ is approximately a function of the net wealth gap, $C\left(\overline{w} - w_t\right)$, which appears to remain stable—consistent with the model's simulation results. This suggests that shocks to current wealth or to the required threshold $\overline{w}$ (e.g., through changes in housing prices or credit conditions) have a minimal immediate impact on prospective homebuyers' consumption behavior. For example, in Figure 3, a one-year loss in savings for highly leveraged households results in a consumption loss of only about 200 NIS over the entire year (approximately 17 NIS per month), highlighting the low sensitivity of consumption to their net wealth.

6.2 Discussion and Implications

The above model has two main core assumptions: First, homeownership provides utility, and second, homeownership requires a minimal wealth level. Several key insights arise from the proposed model, given its assumptions, derivations, and analysis:

1. A key insight derived from the graphical analysis (Figures 8, 9). Define the "net-worth gap" as the gap between initial wealth and the required

threshold wealth (for downpayment). **The net-worth gap determines the length of the saving period, while consumption drops to a stable level largely independent of the gap.** Or rephrase it – given two otherwise similar households, the one with lower initial wealth will engage in a longer period of saving to reach the ownership threshold. Interestingly, both households reduce consumption to approximately the same level during the saving phase. In summary, a larger net-worth gap – whether due to a higher required wealth threshold ($\overline{w}$) or a lower initial net worth (w_t) – results in a longer saving period, while **the level of consumption** (and thus the saving rate) **remains stable over time**.

One might expect the lower-wealth household to reduce consumption more aggressively in an attempt to "catch up" to the higher-wealth household in terms of ownership timing. However, the model reveals that this is not the case. Instead, the adjustment occurs primarily along the time dimension—the lower-wealth household simply extends its saving horizon, rather than intensifying its consumption reduction.

The key **intuition** (partial) behind this behavior lies in the trade-off between present consumption utility and the timing of homeownership. Prospective homebuyers reduce their consumption to a level that already imposes a substantial utility cost. Further reductions in consumption—especially **over many periods**—entail steep marginal utility losses. In contrast, postponing the home purchase by **a single period** imposes a relatively small utility cost, especially given the discounted future utility. Therefore, when the required wealth threshold increases slightly (e.g., due to higher house prices or tighter credit), households prefer to extend the saving horizon rather than deepen consumption cuts. This mechanism explains why consumption remains relatively flat even in the face of worsening affordability: the marginal cost of further consumption reduction is simply too high compared to the marginal cost of delay.

2. **From Micro to Macro – Aggregation Mechanism.** The preceding analysis focuses on individual households and their specific characteristics. However, the underlying behavioral mechanisms can be meaningfully aggregated to the macro level. For example, an economy-wide increase in house prices or a tightening of credit conditions raises the minimum wealth threshold required for homeownership across the board. While the impact may vary in magnitude depending on household-specific factors (e.g., income, initial wealth), the direction of the effect is uniform: all prospective buyers will need more time to accumulate sufficient savings.

   Consequently, one significant implication of this "delay" is the raise in the age of first home-ownership. Chiuri and Jappelli (2003) provide empirical evidence (see Fig. 3 there) indicating that an increase in the required down payment from 20 percent to 40 percent is associated with a substantial decline—approximately 20 percentage points—in the homeownership rate among individuals aged 26 to 35 across OECD countries. Therefore, the saving-delay mechanism identified at the micro level becomes relevant in aggregate, potentially influencing broader housing market dynamics, rental demand, and even macroeconomic policy transmission.

3. **Implication 1: Renters' Consumption Elasticity**. The model shows that prospective homebuyers exhibit **low sensitivity** of consumption to changes in the required wealth, $\overline{w}$, which often reflects housing prices. This implies a low elasticity of renters' consumption with respect to house prices—consistent with empirical findings (e.g., Berger et al., 2018; see also Table 3). Importantly, the model offers a complementary explanation: the muted consumption response does not indicate an absence of impact, but rather reflects the long-horizon nature of the adjustment.

4. **Implication 2: Increased Rental Demand and Inflationary Pressures.** An increase in $\overline{w}$, whether from rising house prices or tighter credit conditions, delays households' transition to homeownership. As a result, more households remain in the rental market for longer, increasing demand for rental units. Although renters comprise only about 30% of the population, they are the sole source of demand in the rental market—and thus play a central role in determining rent prices, which, in turn, affect the overall consumption basket of the entire population. This shift can elevate rent prices and may contribute to broader inflationary pressures. Rising rent prices further burden renters and slow the accumulation of savings needed for a down payment, thereby prolonging the path to homeownership. Moreover, because the underlying mechanism—the gradual accumulation of savings—is inherently slow-moving, the macroeconomic consequences may persist over an extended period, amplifying the policy relevance of this dynamic.

   This channel—from rising house prices to higher rent prices—can generate **a reinforcing dynamic**: as rent prices increase, they raise the implicit asset value of rental housing, which further elevates house prices. This, in turn, increases demand for rentals, creating a feedback loop ($q^h \circlearrowleft p^h$). The **implications for monetary policy** are non-trivial. On one hand, raising interest rates may help cool house prices[17]. On the other hand, it can exacerbate affordability constraints for prospective homebuyers by increasing mortgage costs and tightening PTI constraints, further increases demand for rentals. Conversely, lowering interest rates may ease borrowing conditions but risk fueling further increases in house prices.

5. **Motive for Saving.** While seemingly straightforward, the model high-

[17] Even this mechanism is uncertain. Higher market interest rates may lead existing mortgage holders—who benefit from previously locked-in low rates—to be reluctant to sell their homes. This reduction in housing supply can, paradoxically, put upward pressure on house prices, despite the general expectation that higher interest rates should dampen demand.

lights an important yet often under-discussed motive for household saving, as the model reproduces down payment saving behavior. Specifically, it analytically demonstrates that typical households with a positive preference for homeownership will, over the life cycle, enter a **prolonged** saving phase in order to accumulate the necessary wealth for a mortgage-backed home purchase. During this period, consumption levels decline and remain relatively stable—adjusting only with the general pace of economic growth. This mechanism provides an important complement (and maybe substitution) to existing explanations for household saving behavior, such as precautionary motives, heterogeneous discount factors.

6. **Borrowing Constraints: Reinterpreting**. As elaborated in the literature review, in large class of macroeconomic models, prospective first-time homebuyers are typically modeled as part of a representative group of "*borrowers*" which are financially constrained.[18] In that models' households always own some positive level of housing. So, given their income, net worth, and constraints (such as LTV or PTI), they choose the quantity of housing to own (*intensive margin*). In such frameworks, the financial constraint acts directly, limiting current and future consumption and investment decisions.

   In the current model the focus is on a group that falls outside this conventional classification: prospective first-time homebuyers. They do not hold debt and therefore are not immediately subject to borrowing constraints. The key behavioral mechanism here is forward-looking planning: the household anticipates the constraint and responds by adjusting consumption and savings over time in order to accumulate enough wealth. These constraints influence decisions indirectly, primarily by extending the duration required to reach the ownership threshold.

7 Conclusion

Utilizing extensive administrative data, I conduct an event study regression to examine household spending patterns surrounding the first home purchase. The analysis reveals two distinct phases. In the post-purchase phase, consistent with findings in the literature, there is a significant but temporary increase in spending—seemingly primarily on home durables and improvements—as demonstrated by Benmelech et al. (2023), typically lasting about two years. Conversely, in the pre-purchase phase, households display a marked, stable and

[18] Greenwald (2018) describe it precisely: "*This [financial] constraint is applied at origination of the loan only, so that borrowers are not forced to delever if they violate these constraints later on. ... However, households usually wait years between prepayments in the model, during which time they are typically away from their borrowing constraints and accumulating home equity*". **But practically** in his model "*the borrower's problem conveniently aggregates to that of a single representative borrower*" (and "*assume that saver demand is fixed ..., so that a borrower is always the marginal buyer of housing*").

sustained reduction in expenditures (for at least 5 years). This behavior is mainly attributable to efforts to save for a down payment. Alternative explanations, such as changes in family structure, salary increases, or deferred purchases of home durables, appear to have a lesser impact or that are less plausible, as evidenced by heterogeneous analyses based on leverage and income.

A related theoretical model addressing wealth accumulation for down payment and homeownership has been developed, yielding several insights. The disparity between a household's net wealth and the required down payment—referred to as the "net wealth shortage"—primarily influences the **length of time needed for saving** toward a down payment, while having only a minimal impact on **spending levels**. Specifically, during the savings period, expenditure decreases to a fixed level largely independent of the magnitude of the net wealth shortage, and remains at this point over time. The pattern aligns with the empirical evidence presented above and has important implications. For example, when housing prices increase and households' wealth gaps widen, the result is a longer timeframe to reach the necessary down payment and achieve ownership, thereby increasing demand for rental properties—potentially fueling rental inflation. Additionally, this behavior helps explain renters' relatively low sensitivity in spending response to rising house prices (i.e., the low elasticity reported in existing literature, e.g., Berger et al., 2018).

The next stages of this research involve several key extensions. First, the empirical analysis will be refined by incorporating additional control variables and interaction terms—particularly interactions with the event-time indicator (e.g., relative month) and variables such as LTV group. Further heterogeneity analysis, including partitioning by demographic characteristics such as age, will help uncover more nuanced behavioral patterns, as well as extension the sample to home improvers. Second, the consumption elasticity with respect to house prices has yet to be estimated. To do so, each household will be matched with housing price data based on location, possibly utilizing the appraised property values provided by the bank. Lastly, the theoretical model can be extended into a more complete life-cycle framework, or embedded within a broader macroeconomic model. This will enable a more empirically grounded estimation of the down-payment savings effect and allow for comparison with other structural models in the literature.

Reference

Aladangady, Aditya, "Housing Wealth and Consumption: Evidence from Geographically Linked Microdata," *American Economic Review*, 107 ((2017)), 3415–3446.

Bai, Jushan, "Panel Data Models With Interactive Fixed Effects," *Econometrica*, 77 ((2009)), 1229–1279.

Benmelech, Efraim, Adam Guren, and Brian T Melzer, "Making the House a Home: The Stimulative Effect of Home Purchases on Consumption and Investment," *The Review of Financial Studies*, 36 ((2023)), 122–154.

Berger, David, Veronica Guerrieri, Guido Lorenzoni, and Joseph Vavra, "House Prices and Consumer Spending," *The Review of Economic Studies*, 85 ((2018)), 1502–1542 (Oxford Academic).

Bernanke, Ben S., Mark Gertler, and Simon Gilchrist, "The financial accelerator in a quantitative business cycle framework," in *Handbook of Macroeconomics* (Elsevier, (1999)).

Borusyak, Kirill, Xavier Jaravel, and Jann Spiess, "Revisiting Event-Study Designs: Robust and Efficient Estimation," *Review of Economic Studies*, 91 ((2024)), 3253–3285.

Campbell, John Y., and João F. Cocco, "How do house prices affect consumption? Evidence from micro data," *Journal of Monetary Economics*, 54 ((2007)), 591–621.

Carroll, Christopher D., Misuzu Otsuka, and Jiri Slacalek, "How Large Are Housing and Financial Wealth Effects? A New Approach," *Journal of Money, Credit and Banking*, 43 ((2011)), 55–79.

Caspi, Itamar, Nadav Eshel, and Nimrod Segev, "The Mortgage Cash-Flow Channel: How Rising Interest Rates Impact Household Consumption," (2024) (SSRN).

Chen, Hui, Michael Michaux, and Nikolai Roussanov, "Houses as ATMs: Mortgage Refinancing and Macroeconomic Uncertainty," *The Journal of Finance*, 75 ((2020)), 323–375.

Chiuri, Maria Concetta, and Tullio Jappelli, "Financial market imperfections and home ownership: A comparative study," *European Economic Review*, 47 ((2003)), 857–875.

Chudik, Alexander, and M. Hashem Pesaran, "Common correlated effects estimation of heterogeneous dynamic panel data models with weakly exogenous regressors," *Journal of Econometrics*, 188 ((2015)), 393–420.

Cloyne, James, Kilian Huber, Ethan Ilzetzki, and Henrik Kleven, "The Effect of House Prices on Household Borrowing: A New Approach," *American Economic Review*, 109 ((2019)), 2104–2136.

Cooper, Daniel, "House Price Fluctuations: The Role of Housing Wealth as Borrowing Collateral," *Review of Economics & Statistics*, 95 ((2013)), 1183–1197 (MIT Press).

Freyaldenhoven, Simon, Christian Hansen, Jorge Pérez Pérez, and Jesse M. Shapiro, "Visualization, Identification, and Estimation in the Linear Panel Event-Study Design," Working Paper Series, Working Paper, (2021) (National Bureau of Economic Research).

Graham, James, and Christos A. Makridis, "House Prices and Consumption: A New Instrumental Variables Approach," *American Economic Journal: Macroeconomics*, 15 ((2023)), 411–443.

Greenwald, Daniel L., "The Mortgage Credit Channel of Macroeconomic Transmission," (2018).

Greenwald, Daniel L, and Adam Guren, "Do Credit Conditions Move House Prices?," ((2024)).

Guren, Adam M, Alisdair McKay, Emi Nakamura, and Jón Steinsson, "Housing Wealth Effects: The Long View," *The Review of Economic Studies*, 88 ((2021)), 669–707.

Iacoviello, Matteo, "House Prices, Borrowing Constraints, and Monetary Policy in the Business Cycle," *American Economic Review*, 95 ((2005)), 739–764.

Jappelli, Tullio, and Luigi Pistaferri, "The Economics of Consumption: Theory and Evidence," (Oxford, UNITED STATES, Oxford University Press, (2017)).

Justiniano, Alejandro, Giorgio E. Primiceri, and Andrea Tambalotti, "Credit Supply and the Housing Boom," *Journal of Political Economy*, 127 ((2019)), 1317–1350.

Kaplan, Greg, Kurt Mitman, and Giovanni L. Violante, "The Housing Boom and Bust: Model Meets Evidence," *Journal of Political Economy*, 128 ((2020)), 3285–3345.

Mian, Atif, Kamalesh Rao, and Amir Sufi, "Household Balance Sheets, Consumption, and the Economic Slump," *The Quarterly Journal of Economics*, 128 ((2013)), 1687–1726.

Mian, Atif, and Amir Sufi, "House Prices, Home Equity–Based Borrowing, and the US Household Leverage Crisis," *American Economic Review*, 101 ((2011)), 2132–2156.

Roth, Jonathan, "Pretest with Caution: Event-Study Estimates after Testing for Parallel Trends," *American Economic Review: Insights*, 4 ((2022)), 305–322.

Uribe, Martín, and Stephanie Schmitt-Grohé, "Open Economy Macroeconomics," (Princeton University Press, (2017)).

Xu, Yiqing, "Generalized Synthetic Control Method: Causal Inference with Interactive Fixed Effects Models," *Political Analysis*, 25 ((2017)), 57–76.

8 Appendix

8.1 Consumption heterogeneity

8.2 Additional event-study specifications

Fig. 13 shows the results of specification (1). The behavior retains a trend, even after removing the economic trend, indicating that the time fixed effect did not fully capture the common trend as discussed in the text.

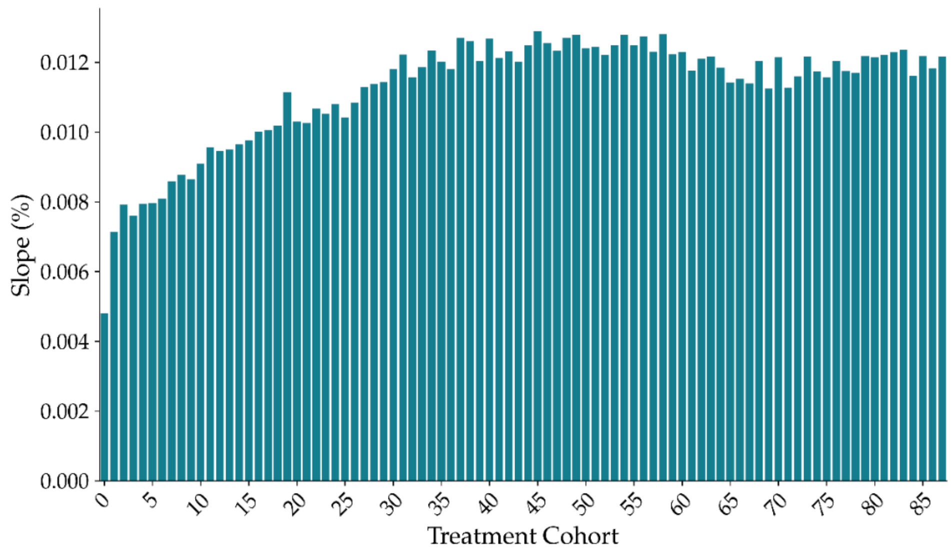

Figure 11: Slope of Spending Linear Trend (by Cohort), monthly frequency

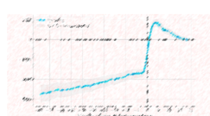

Figure 12: * to be add**Spending Levels by Cohort [The graph illustrates a clear downward trend in spending across the cohorts].

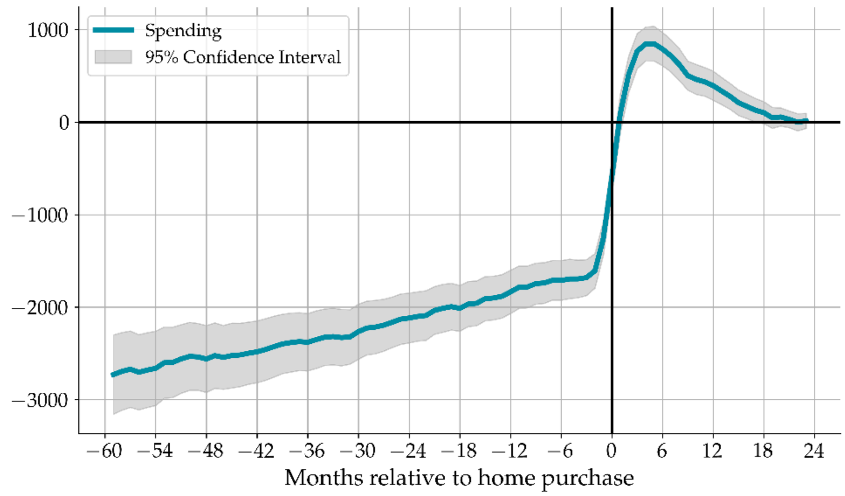

Figure 13: The Y-axis shows β_m coefficients from **specification (1)**, with **time fixed effects**; the X-axis represents the time relative to home purchase, measured in months. Cluster by treatment (home purchase date) cohort $\left[\int_{m<0} \sim -130\ , \int_{m>0} \sim 8\right]$

Fig. 14 shows an event study on a random subsample without the filtering used in the main analysis. The results are very similar and suggest no significant effects were missed.

Figure 15 presents specifications with time-invariant controls, where the coefficient on LTV is positive and the coefficient on q/y is negative. However, this analysis only includes fixed effects and does not account for dynamic relationships of the controls.

Figure 16 uses a common transformation, $\log 1 + S_{it}$, as the regression outcome. However, in my experience with the current dataset, this specification performs poorly. This may be due to the smoothing effect of the log transformation, which dampens sharp transitions in spending around the time of home purchase (RT = 0), thereby obscuring relevant dynamics. Additionally, this transformation may introduce complications when detrending using the common factor approach, as discussed in the main text.

8.3 Theoretical Model: Solution Stages

We will present here, the solution of the model of household decision-making toward achieving homeownership, which described above. This proceeds in several steps. It begins with the analysis of households already in the state of homeownership and then turns to those with wealth levels near the threshold required for entering homeownership. Building on these cases, the framework

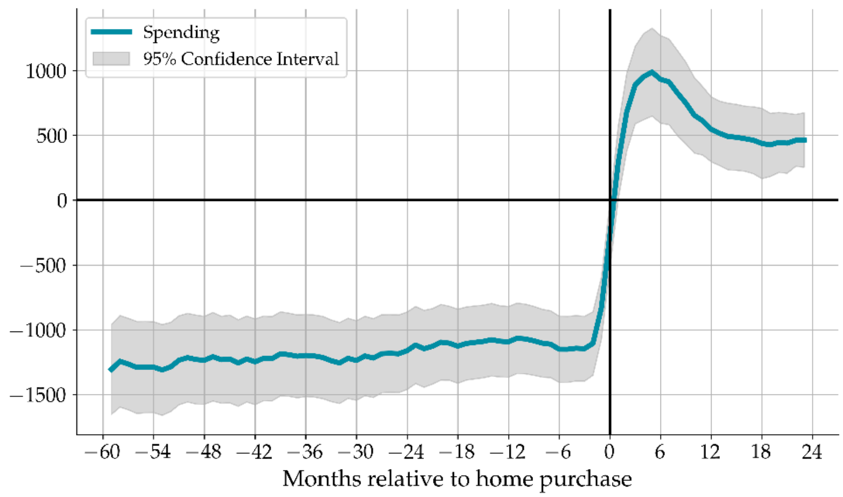

Figure 14: The Y-axis shows β_m coefficients from **specification (2)**, without control variables; the X-axis represents the time relative to home purchase, measured in months. **Full sample**, Cluster by treatment (home purchase date) cohort. $\left[\int_{m<0} \sim 70\ , \int_{m>0} \sim 14\right]$

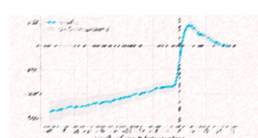

Figure 15: *to be add* The Y-axis displays coefficients β_m from specification (2) with control: LTV and house price to income ratio ($\frac{q}{y}$) at time of mortgage origination. The X-axis shows months relative to home purchase. Using subsample [2], clustered by treatment cohort (home purchase date).

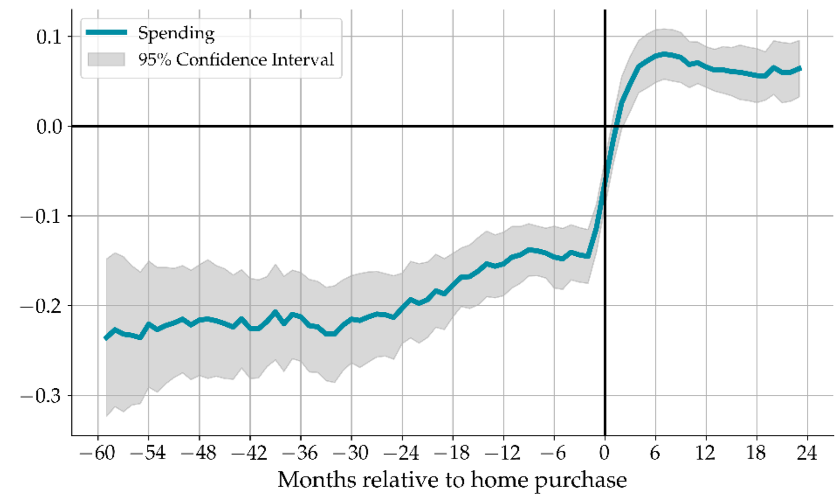

Figure 16: The Y-axis shows β_m coefficients from specification (2), for **outcome** log$\mathbf{S_{it}}$; the X-axis represents the time relative to home purchase, measured in months. Cluster by treatment (home purchase date) cohort

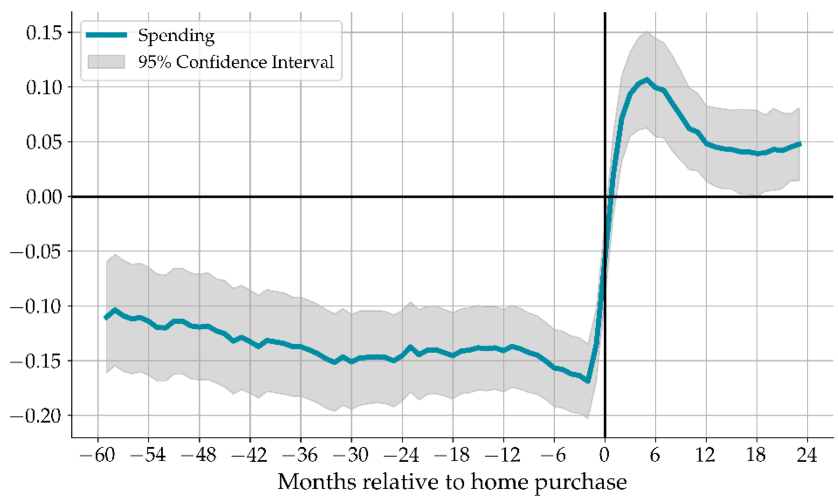

Figure 17: The Y-axis shows β_m coefficients from specification (2), outcome scaled spending (standardized by each household standard deviation), without control variables; the X-axis represents the time relative to home purchase, measured in months. Cluster by treatment (home purchase date) cohort

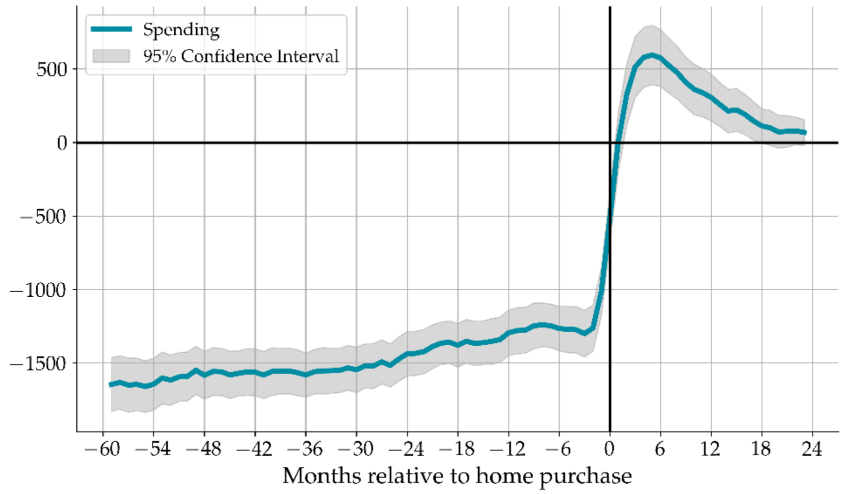

Figure 18: The Y-axis shows β_m coefficients from specification (2), without control variables; the X-axis represents the time relative to home purchase, measured in months. Subsample [10K<income<20K], Cluster by treatment (home purchase date) cohort $\left[\int_{m<0} \sim -87 \,, \int_{m>0} \sim 7\right]$

extends recursively to construct the general case. This step-by-step approach enables the derivation of a fully analytical value function and the corresponding optimal consumption path.

8.3.1 Stage 1: Homeowners

We begin by solving the household's problem in the case where the net worth satisfies $w_t \geq \overline{w}$, so the household qualifies as a **homeowner**.

The Bellman equation in this case becomes:

$$V(w_t) = \max_{w_{t+1}} \{u(c_t) + u^o + \beta V(w_{t+1})\}$$

subject to the **budget constraint**:

$$c_t = y + w_t - \frac{w_{t+1}}{R}$$

Taking the First-Order Condition (FOC) with respect to w_{t+1}:

$$u'(c_t^*) = R\beta V'\left(w_{t+1}^*\right)$$

Where c_t^* and $w_{t+1}^*$are the optimal choices of consumption and savings. We can write the Bellman equation explicitly at the optimum:

$$V\left(w_t\right)=u\left(c_t^*\right)+u^o+\beta V\left(R\left(w_t+y-c_t^*\right)\right)$$

This enables us to analyze the effect of a marginal change in current wealth w_t on the value function by taking the total derivative of both sides of the Bellman equation ($\frac{\partial f}{\partial w_t}\ dw_t+\frac{\partial f}{\partial c_t^*}dc_t^*$):

$$V'\left(w_t\right)dw_t=u'\left(c_t^*\right)dc_t^*+\left(\beta V'\left(R\left(w_t+y-c_t^*\right)\right)\right)R\left(dw_t-dc_t^*\right)$$

$$V'\left(w_t\right)dw_t=\left(u'\left(c_t^*\right)-\beta RV'\left(w_{t+1}^*\right)\right)dc_t^*+\left(\beta RV'\left(w_{t+1}^*\right)\right)dw_t$$

The first term cancels due to the first-order condition established above. As a result, we find that the marginal value of wealth satisfies the following condition:

$$V'\left(w_t\right)=\beta RV'\left(w_{t+1}^*\right)$$

This is a straightforward application of the *Envelope Theorem*. Combining the first order condition and the Envelope theorem, we conclude that

$$u'\left(c_t^*\right)=V'\left(w_t\right)=\beta RV'\left(w_{t+1}^*\right)$$

Substituting back into the first order condition, we obtain:

$$u'\left(c_t^*\right)=\beta RV'\left(w_{t+1}^*\right)=\beta Ru'\left(c_{t+1}^*\right)$$

In summary, at the optimum, the household's consumption path satisfies the well-known Euler Equation:

$$u'\left(c_t\right)=\beta Ru'\left(c_{t+1}\right)\qquad(*)$$

This condition characterizes intertemporal consumption smoothing: the marginal utility of consumption today is equated to the discounted marginal utility of consumption tomorrow, adjusted by the gross interest rate.

Since we assume **irreversible homeownership** (i.e., once the household becomes a homeowner, it remains so regardless of subsequent wealth), the threshold condition drops out in future periods, and the Euler equation applies unconditionally from this point on.

Steady State Consumption. Assume the CRRA utility function $u(c)=\frac{c^{1-\sigma}-1}{1-\sigma}$, and suppose consumption grows at rate G^c.

$$c_t^{-\sigma}=R\beta c_{t+1}^{-\sigma}$$

$$\frac{c_{t+1}}{c_t} = (R\beta)^{1/\sigma} = G^c$$

For analytical simplicity, I assume that the household is on a permanently sustainable consumption path—expressed in income terms—and requiring that wealth remains constant over time[19], $\Delta w_t = 0$ or $w_t = w_{t+1}$. Under this condition, the sustainable level of consumption is given by:

$$c_t = y + \frac{r}{R} w_t = \overline{c}$$

This expression reflects the balance between income, consumption, and the return on savings necessary to maintain a constant wealth level.

Implying **constant consumption** over time, I use the fact that $c_t = \overline{c}$, and iterate the Bellman equation forward:

$$V\left(w_t\right) = u\left(\overline{c}\right) + u^o + \beta V\left(w_{t+1}\right) = u\left(\overline{c}\right) + u^o + \beta\left[u\left(\overline{c}\right) + u^o + \beta V\left(w_{t+2}\right)\right]$$

$$= \left(u\left(\overline{c}\right) + u^o\right)\sum_{t=0}^{\infty}\beta^t = \frac{u\left(\overline{c}\right) + u^o}{1-\beta} = V^{Owner}$$

That is, the **value function for homeowners is constant** and independent of w_t, under the assumption of constant consumption and no growth. This could be generalized to allow for income or consumption growth, but the qualitative result remains: **once a household becomes a homeowner, the utility benefit of ownership is permanently incorporated.**

8.3.2 Stage 2: Near Ownerships

This stage captures the transitional decision of a household that is not yet a homeowner but is on the edge of becoming one. Specifically, this occurs when:

$$w_t < \overline{w} \quad \textit{and} \quad w_{t+1} \geq \overline{w}$$

In this case, the household chooses next period's $(1p)$ wealth such that it meets the ownership threshold. The value function is:

$$V^{1p}\left(w_t\right) = \max_{w_{t+1}\geq\overline{w}}\left\{u\left(c_t\right) + \beta V^{Owner}\right\}$$

[19] A more realistic assumption of fixed mortgage payments is presented in the appendix. However, this formulation also leads to constant consumption over time and therefore does not alter the qualitative conclusions of the discussion.

Where, V^{Owner} , is the constant value function once the household becomes a homeowner, as established in Stage 1.

Since V^{Owner} is constant and does not depend on the specific level of w_{t+1}, the optimal choice is: $w_{t+1} = \overline{w}$, since any choice of $w_{t+1} > \overline{w}$ would unnecessarily reduce current consumption (and hence current utility) without increasing future value. Thus, the value function becomes:

$$V^{1p}(w_t) = \max_{w_{t+1} \geq \overline{w}} \left\{ u\left(y + w_t - \frac{w_{t+1}}{R} \right) + \beta V^{Owner} \right\}$$

$$= u\left(y + w_t - \frac{\overline{w}}{R} \right) + \beta V^{Owner}$$

This expression captures the cost (in terms of reduced current consumption) that the household must incur to achieve the ownership threshold by next period (we will elaborate on this below). The closer w_t is to zero, the more severe the consumption cut must be to accumulate sufficient wealth.

8.3.3 Stage 3: Far From Ownerships

In this final region, the household is too far from the ownership threshold to feasibly reach it in the next period. Formally, this corresponds to: $w_t < \overline{w}$ and $w_{t+1} < \overline{w}$.

The household remains a renter, and the Bellman equation becomes:

$$V^{-}(w_t) = \max_{w_{t+1} < \overline{w}} \left\{ u(c_t) + \beta V(w_{t+1}) \right\}$$

Here, $V(w_{t+1})$ denotes the general continuation value for a non-homeowner, which may itself depend on the region the household reaches next. Unfortunately, the standard approach of solving via first-order conditions and the Envelope Theorem is not applicable directly, since the continuation value $V(\cdot)$ is piecewise and may jump between regions (i.e., from renter to near-ownership to ownership).

To make progress analytically, consider an **approximate solution** under the assumption that the household is **close enough to ownership** so that they might plan to become a homeowner in **two periods** ($2p$). That is, suppose:

$$V^{2p}(w_t) = \max_{w_{t+1} < \overline{w}} \left\{ u(c_t) + \beta V^{1p}(w_{t+1}) \right\}$$

Substituting the earlier expression for $V^{1p}(w_{t+1})$, which assumes ownership is achieved one period later (at $t+2$), gives:

$$V^{2p}\left(w_t\right) = \max_{w_{t+1}<\overline{w}} \left\{ u\left(y + w_t - \frac{w_{t+1}}{R}\right) + \beta u\left(y + w_{t+1} - \frac{\overline{w}}{R}\right) + \beta^2 V^{Owner} \right\}$$

Taking the derivative with respect to w_{t+1}, the first-order condition is:

$$u'\left(y + w_t - \frac{w_{t+1}^*}{R}\right) = R\beta u'\left(y + w_{t+1}^* - \frac{\overline{w}}{R}\right)$$

Assuming $R\beta = 1$, this simplifies to:

$$u'\left(y + w_t - \frac{w_{t+1}^*}{R}\right) = u'\left(y + w_{t+1}^* - \frac{\overline{w}}{R}\right)$$

This gives

$$w_t - \frac{w_{t+1}^*}{R} = w_{t+1}^* - \frac{\overline{w}}{R}$$

Solving for w_{t+1}^*:

$$w_t + \frac{\overline{w}}{R} = w_{t+1}^*\left(1 + \frac{1}{R}\right) = w_{t+1}^*\frac{1+R}{R}$$

$$w_{t+1}^* = \frac{w_t R + \overline{w}}{1+R}$$

Plugging w_{t+1}^* back into the value function yields:

$$V^{2p}\left(w_t\right) = u\left(y + w_t - \frac{w_t R + \overline{w}}{1+R}\frac{1}{R}\right) + \beta u\left(y + \frac{w_t R + \overline{w}}{1+R} - \frac{\overline{w}}{R}\right) + \beta^2 V^{Owner}$$

$$= u\left(y + w_t\frac{R}{1+R} - \frac{\overline{w}}{R(1+R)}\right) + \beta u\left(y + w_t\frac{R}{1+R} - \frac{\overline{w}}{R(1+R)}\right) + \beta^2 V^{Owner}$$

$$= (1+\beta)u\left(y + w_t\frac{R}{1+R} - \frac{\overline{w}}{R(1+R)}\right) + \beta^2 V^{Owner}$$

This approximation highlights the **forward-looking behavior** of households who are still far from the ownership threshold but are beginning to plan their path toward it, anticipating homeownership two periods ahead. It shows how future ownership affects today's savings and consumption decisions—even when ownership is not immediately attainable.

Importantly, in such cases, if a household decides to begin saving for a down payment and reduces consumption over two periods, the optimal strategy is to spread the adjustment evenly (or nearly evenly if $\beta R \neq 1$), balancing the utility loss today against the future gain from ownership.

Proposition 1. As household net worth increases, the number of periods required to reach the ownership threshold decreases.

Proposition 2. Once a household decides to pursue homeownership, it is optimal to allocate savings evenly across periods, minimizing total utility loss while ensuring the required wealth accumulation.

8.3.4 Stage 4: Integrating the Non-Homeowner Value Function

Here is the proposed full non-homeowner value function for $w_t < \overline{w}$, formulated for a given w_t under maximization with respect to the choice of w_{t+1}, and expressed as a maximum over two regimes:

$$V(w_t) = \max_{w_{t+1}} \left[\; V^{1p}(w_t) \; , \; V^{-}(w_t) \; \right]$$

Where, $V^{+}(w_t)$, captures the **transition into ownership** (near ownership regime), in which the household accumulates enough savings in the current period to cross the ownership threshold $\overline{w}$ in the next period, i.e., $w_{t+1} \geq \overline{w}$. And $V^{-}(w_t)$ describes the **gradual savings path** (far-from-ownership regime), in which the household does not yet reach the threshold in the next period, i.e., $w_{t+1} < \overline{w}$, and continues saving over multiple periods.

This structure nests the "near ownership" and "far from ownership" regimes inside a single Bellman equation, ensuring global consistency in the decision process. These can be more concretely written as:

$$V(w_t) = \max_{w_{t+1}} \left[u\left(w_t + y - \frac{\overline{w}}{R} \right) + \beta V^{Owner} \; , \quad \max_{w_{t+1} < \overline{w}} \{ u(c_t) + \beta V(w_{t+1}) \} \right]$$

Note that the outer maximization operator eliminates the need for imposing the constraint $w_{t+1} < \overline{w}$ explicitly in the "far" regime, since the household would otherwise switch to ownership, which certainty have higher utility.

Using the approximation for w_{t+1} near $\overline{w}$, the expression simplifies as shown above,

$$V(w_t) = \max_{w_{t+1}} \left[u\left(y + w_t - \frac{\overline{w}}{R} \right) + \beta V^{Owner} \; , \quad \max_{w_{t+1} < \overline{w}} \left\{ u(c_t) + \beta \mathbf{V^{1p}}(w_{t+1}) \right\} \right]$$

This formulation highlights the discrete nature of the transition to homeownership and presents an endogenous threshold $\underline{w}$ below which households find it optimal to delay ownership and accumulate wealth gradually. The critical threshold wealth level $\underline{w}$, where the household is indifferent between these two options ($w_{t+1} < \overline{w}$ and $w_{t+1} \geq \overline{w}$), satisfies:

$$u\left(y + w_t - \frac{\overline{w}}{R}\right) + \beta V^{Owner} = \max_{w_{t+1} < \overline{w}} \left\{u\left(c_t\right) + \beta V^{1p}\left(w_{t+1}\right)\right\}$$

Using the above development and some algebra (and define the solution as $w_t = \underline{w}$):

$$u\left(y + \underline{w} - \frac{\overline{w}}{R}\right) + \beta V^{Owner} = (1+\beta)u\left(y + \frac{\underline{w}R}{1+R} - \frac{\overline{w}}{R(1+R)}\right) + \beta^2 V^{Owner}$$

$$\beta(1-\beta)V^{Owner} = (1+\beta)u\left(y + \frac{\underline{w}}{1+R} - \frac{\overline{w}}{R(1+R)}\right) - u\left(y + \underline{w} - \frac{\overline{w}}{R}\right)$$

$$\beta\left(u\left(\overline{c}\right) + u^o\right) = (1+\beta)u\left(y + \frac{\underline{w}R}{1+R} - \frac{\overline{w}}{R(1+R)}\right) - u\left(y + \underline{w} - \frac{\overline{w}}{R}\right)$$

The consumption which maintains fix wealth is presented above: $\overline{c} = \ y + \frac{r}{R}w_t$. Define $u^o = \theta \cdot u\left(\overline{c}\right)$

$$\beta\left(1+\theta\right)u\left(\overline{c}\right) = (1+\beta)u\left(y + \frac{\underline{\mathbf{w}}R}{1+R} - \frac{\overline{w}}{R(1+R)}\right) - u\left(y + \underline{\mathbf{w}} - \frac{\overline{w}}{R}\right)$$

A simplified equation, for illustration, for $R = 1$:

$$\beta\left(1+\theta\right)u\left(\overline{c}\right) = (1+\beta)u\left(y + \frac{\underline{\mathbf{w}} - \overline{w}}{2}\right) - u\left(y + \underline{\mathbf{w}} - \overline{w}\right)$$

This formulation illustrates how the marginal gain from deferring homeownership (and smoothing consumption over time) compares against the immediate gain from acquiring ownership utility.

For $w_t < \underline{w}$, it is strictly optimal to reduce consumption such that in the following period the household achieves $w_{t+1} = \overline{w}$, thereby becoming a homeowner. Below this threshold, however, it becomes optimal to spread the required savings over two or more periods. To determine how many periods the household must save before reaching homeownership, the calculation can be extended along the same lines as the preceding derivation.

Figure 6 illustrates the threshold between the two savings regimes as a function of θ, which captures the relative utility value of ownership compared to standard consumption utility. For instance, when $\theta = 2$, a household with a wealth of 225.1 thousand shekels or more will optimally choose to save nearly 23.8 thousand shekels—almost their entire income of 24 thousand shekels (consume almost zero). This substantial sacrifice in current consumption is justified by the anticipated gain in utility from becoming a homeowner in the next period, which is equivalent to receiving utility worth two times their standard consumption utility.

A higher value of θ reflects greater utility derived from ownership. Consequently, it becomes worthwhile for households to reduce consumption more aggressively. This, in turn, lowers the threshold of pre-purchase wealth above which the household optimally chooses to make a single, substantial savings effort—enabling homeownership in the immediate next period through a sharp reduction in current spending.

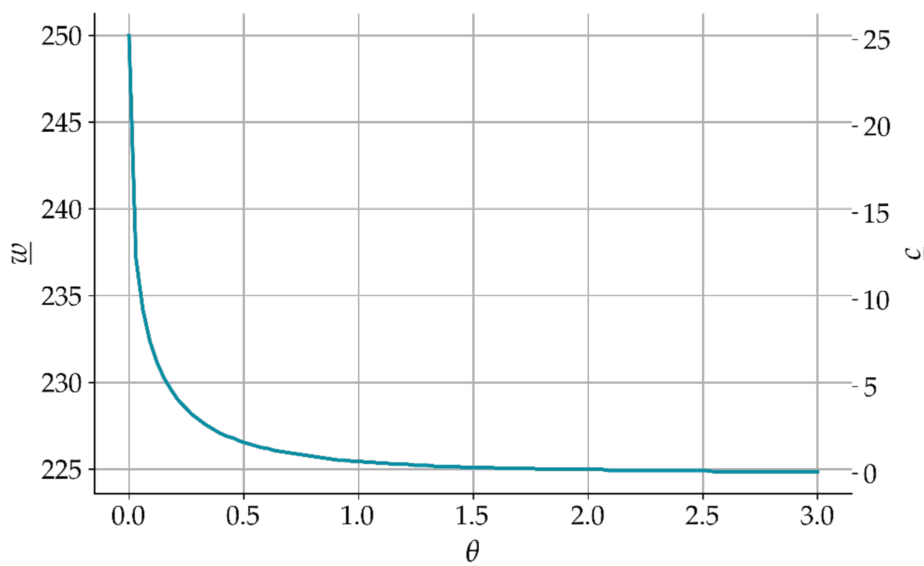

Figure 19: Threshold wealth $\underline{w}$ and corresponding consumption c_t at the decision point between becoming a homeowner in the next period versus delaying ownership. The figure shows how the optimal savings decision varies with the utility value of ownership θ. Parameters: $\overline{w} = 250,\ y = 24\ (quarterly),\ r = 2\%(annualy),\ \beta = \frac{1}{R},\quad \sigma = 1.4$.

Figure 7 presents the values of the components in the ownership decision equation for a given value of θ. This decomposition helps clarify the household's trade-off: whether to defer homeownership and continue saving gradually, or to sharply reduce current consumption in order to accumulate sufficient wealth to purchase a home in the next period and access its associated utility gains. As θ increases, the left-hand side (representing the utility value of ownership) rises, reflecting the greater benefit. However, achieving this requires a substantial drop in current consumption, which imposes a significant utility cost today.

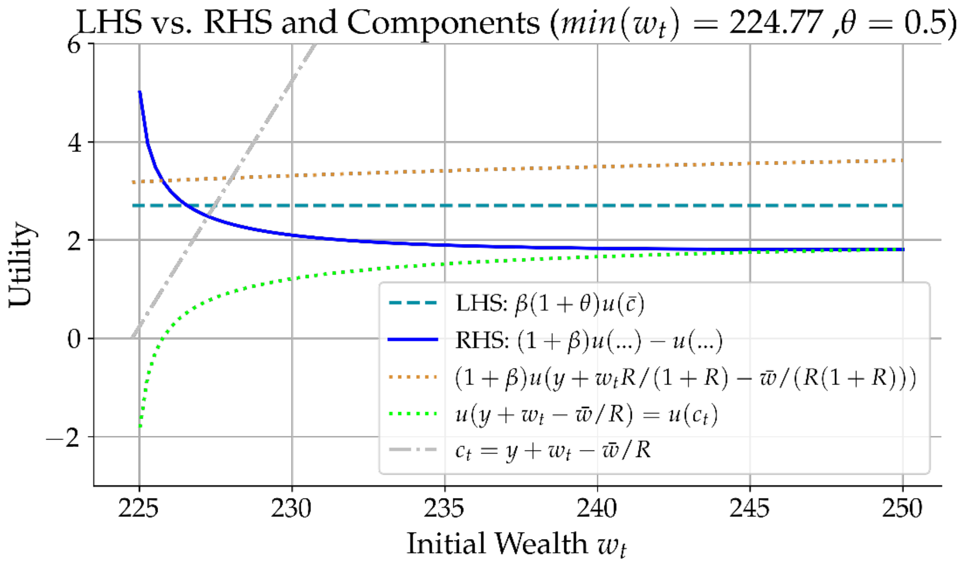

Figure 20: Components of the ownership decision equation evaluated at a given value of θ.

In connection with the empirical findings, the model focuses on the choice between a single, substantial reduction in consumption versus spreading the effort across two or more periods with smaller consumption cuts. Households with relatively high net worth are more likely to opt for a one-time, drastic reduction in spending to achieve the ownership threshold. In contrast, households with lower net worth tend to distribute the required savings effort over multiple periods.

This multi-period strategy can be analyzed further by extending the calculation, considering whether the household prefers to save intensively over two periods or to distribute the effort across three or more. As net worth increases, it becomes more plausible that the household will choose the two-period path of stronger savings. Conversely, households with more limited wealth will likely adopt a longer horizon, with savings spread over additional periods. In either case, the savings and consumption reductions are approximately evenly allocated between periods, consistent with the optimality condition discussed earlier.

8.3.5 Stage 5: Far From Ownerships – Extension

Above, we analyzed an approximate solution under the assumption that the household is sufficiently close to the ownership threshold such that it may optimally plan to become a homeowner within two periods.

We now turn to the case in which the household considers a longer trajectory—specifically, a plan to transition into homeownership in three periods. That is, suppose:

$$V^{3p}(w_t) = \max_{w_{t+1}<\underline{w}} \left\{ u(c_t) + \beta V^{2p}(w_{t+1}) \right\}$$

Substituting the earlier expression for $V^{2p}(w_{t+1})$, gives:

$$V^{3p}(w_t) = \max_{w_{t+1}<\underline{w}} \left\{ u(c_t) + \beta \max_{w_{t+2}<\overline{w}} \left\{ u\left(y + w_{t+1} - \frac{w_{t+2}}{R}\right) + \beta u\left(y + w_{t+2} - \frac{\overline{w}}{R}\right) + \beta^2 V^{Owner} \right\} \right\}$$

$$= \max_{w_{t+1}<\underline{w}} \max_{w_{t+2}<\overline{w}} \left\{ u(c_t) + \beta u\left(y + w_{t+1} - \frac{w_{t+2}}{R}\right) + \beta^2 u\left(y + w_{t+2} - \frac{\overline{w}}{R}\right) + \beta^3 V^{Owner} \right\}$$

In this setting, there are two stages of optimization. The first-order condition with respect to w_{t+2} yields:

$$u'\left(c^*_{t+1}\right) = \beta R u'\left(c^*_{t+2}\right)$$

Similarly, the first-order condition with respect to w_{t+1}:

$$u'\left(c^*_t\right) = \beta R u'\left(c^*_{t+1}\right)$$

for any values of βR,

$$G^c_{t+1} = \frac{c_{t+1}}{c_t} = (\beta R_t)^{\frac{1}{\sigma}}$$

The key insight is that the household allocates consumption and savings in a manner that is nearly uniform throughout the pre-purchase periods. This behavior reflects **intertemporal consumption smoothing**, where the household seeks to minimize utility losses by distributing the sacrifice in consumption evenly while accumulating the required wealth for homeownership.

$$V^{3p}(w_t) = u(c_t) + \beta u(c_{t+1}) + \beta^2 u(c_{t+1}) + \beta^3 V^{Owner}$$

$$V^{3p}\left(w_t\right)=\frac{{c_t}^{1-\sigma}-1}{1-\sigma}+\beta G^{1-\sigma}\frac{{c_t}^{1-\sigma}}{1-\sigma}-\beta\frac{1}{1-\sigma}+\left(\beta G^{1-\sigma}\right)^2\frac{{c_t}^{1-\sigma}}{1-\sigma}-\beta^2\frac{1}{1-\sigma}$$

$$+\beta^3 V^{Owner}$$

$$V^{3p}\left(w_t\right)=\left(1+\beta G^{1-\sigma}+\left(\beta G^{1-\sigma}\right)^2\right)\frac{{c_t}^{1-\sigma}}{1-\sigma}-\frac{1+\beta+\beta^2}{1-\sigma}+\beta^3 V^{Owner}\ (**)$$

Were

$$c_{t+2}=G^2c_t=y+w_{t+2}-\frac{\overline{w}}{R}$$

$$c_{t+1}=Gc_t=y+w_{t+1}-\frac{w_{t+2}}{R}$$

$$c_t=y+w_t-\frac{w_{t+1}}{R}$$

These are three equations with three unknowns: c_t, w_{t+1}, w_{t+2}. And we can find $c_t(w_t)$. Recursively assignment give:

$$c_t=y+w_t-\frac{1}{R}\left(Gc_t-y+\frac{1}{R}\left(G^2c_t-y+\frac{\overline{w}}{R}\right)\right)$$

$$\mathbf{c_t^{3p}}\left(1+\frac{G}{R}+\left(\frac{G}{R}\right)^2\right)=y\left(1+\frac{1}{R}+\frac{1}{R^2}\right)-\left(\frac{\overline{w}}{R^3}-\mathbf{w_t}\right)\qquad(***)$$

As above, for $w_t<\underline{w}$ we are indifferent between $V^{--}\left(w_t\right)$ and $V^{-}\left(w_t\right)$ for some new threshold: $\underline{\underline{w}}$, which holds:

$$V^{--}\left(w_t\right)=V^{-}\left(w_t\right)$$

$$\left(1+\beta G^{1-\sigma}+\left(\beta G^{1-\sigma}\right)^2\right)\frac{c_t\left(\mathbf{w_t}\right)^{1-\sigma}}{1-\sigma}-\frac{1+\beta+\beta^2}{1-\sigma}+\beta^3V^{Owner}=V^{-}\left(\mathbf{w_t}\right)$$

Which is solvable. Here for $\beta R=1$:

$$\left(1+\beta+\beta^2\right) u\left(y-\frac{\frac{\overline{w}}{R}-R^2\mathbf{w_t}}{1+R+R^2}\right)+\beta^3 V^{Owner}$$

$$=(1+\beta)u\left(y-\frac{\frac{\overline{w}}{R}-R\mathbf{w_t}}{1+R}\right)+\beta^2 V^{Owner}$$

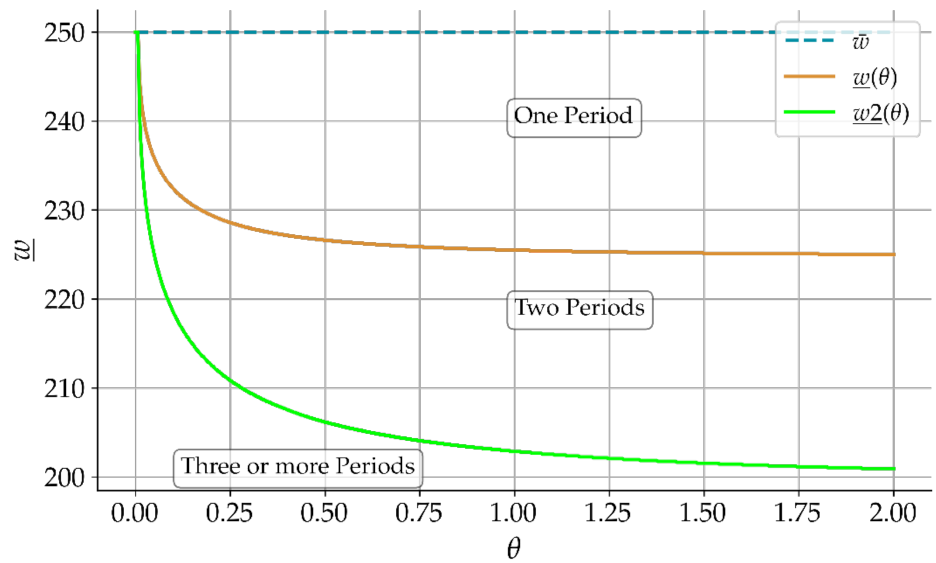

Figure 21: Threshold wealth $\underline{w}$ and $\underline{w2}$ at the decision point between becoming a homeowner in the next period versus delaying ownership one period, or tow periods. The figure shows how the optimal savings decision varies with the utility value of ownership θ. Parameters: $\overline{w}=250,\ y=24\ (quarterly),\ r=2\%(annualy),\ \beta=\frac{1}{R},\ \sigma=1.4.$

8.3.6 Generalization

We can generalize the above framework to the case where the household plans to transition into homeownership over np periods. This follows the same logic and structure as in the two- and three-period examples previously presented.

Specifically, this generalization extends equation (***) to:

$$\mathbf{c_t^{np}}\sum_{m=0}^{n-1}\left(\frac{G}{R}\right)^m=y\sum_{m=0}^{n-1}R^{-m}-\left(\frac{\overline{w}}{R^n}-\mathbf{w_t}\right)$$

$$\mathbf{c_t^{np}}\frac{1-\left(\frac{G}{R}\right)^n}{1-\frac{G}{R}}=y\frac{1-\left(\frac{1}{R}\right)^n}{1-\frac{1}{R}}-\left(\frac{\overline{w}}{R^n}-\mathbf{w_t}\right)$$

$$\boxed{\mathbf{c_t^{np}}\left(w_t\right)=\frac{1-\frac{G}{R}}{1-\left(\frac{G}{R}\right)^n}\left(\frac{1-\left(\frac{1}{R}\right)^n}{1-\frac{1}{R}}\mathbf{y}-\left(\frac{\overline{w}}{R^n}-\mathbf{w_t}\right)\right)}$$

This condition ensures intertemporal optimization across all pre-purchase periods, reflecting consistent consumption smoothing behavior.

Similarly, the generalized value function—extending the structure of equation (**)—can be written as:

$$V^{np}\left(w_t\right)=\left(1+\beta G^{1-\sigma}+\ldots+\left(\beta G^{1-\sigma}\right)^{n-1}\right)\frac{\left(\mathbf{c_t^{np}}\right)^{1-\sigma}}{1-\sigma}-\frac{1+\beta+\ldots+\beta^{n-1}}{1-\sigma}+\beta^n V^{Owner}$$

$$V^{np}\left(w_t\right)=\sum_{m=0}^{n-1}\left(\beta G^{1-\sigma}\right)^m\frac{\left(\mathbf{c_t^{np}}\right)^{1-\sigma}}{1-\sigma}-\frac{\sum_{m=0}^{n-1}\beta^m}{1-\sigma}+\beta^n\frac{u\left(\overline{c}\right)+u^o}{1-\beta}$$

Define $u^o=\theta u\left(\overline{c}\right)$, so $V^{Owner}=\frac{1+\theta}{1-\beta}u\left(\overline{c}\right)$, and

$$V^{np}\left(w_t\right)=\frac{1}{1-\sigma}\left(\frac{1-\left(\beta G^{1-\sigma}\right)^n}{1-\beta G^{1-\sigma}}\left(\mathbf{c_t^{np}}\right)^{1-\sigma}-\frac{1-\beta^n}{1-\beta}\right)+\beta^n\frac{1+\theta}{1-\beta}u\left(\overline{c}\right)$$

$$\boxed{V^{np}\left(w_t\right)=\frac{1}{1-\sigma}\left(\frac{1-\left(\beta G^{1-\sigma}\right)^n}{1-\beta G^{1-\sigma}}\left(\mathbf{c_t^{np}}\right)^{1-\sigma}-\frac{1-\beta^n}{1-\beta}\right)+\beta^n\frac{1+\theta}{1-\beta}u\left(\overline{c}\right)}$$

In summary, for $G=1$

$$\mathbf{c_t^{np}}=\mathbf{y}-\frac{1-\frac{1}{R}}{1-\left(\frac{1}{R}\right)^n}\left(\frac{\overline{w}}{R^n}-\mathbf{w_t}\right)\qquad(\#\#)$$

$$V^{np}\left(w_t\right)=\frac{1-\beta^n}{1-\beta}\frac{\left(\mathbf{c_t^{np}}\right)^{1-\sigma}-1}{1-\sigma}+\beta^n\frac{1+\theta}{1-\beta}u\left(\overline{c}\right)$$

The equation illustrates the key factors that shape the behavior and decision-making of prospective homebuyers. These fall into two broad categories:
(i) External conditions—including the interest rate, housing prices, and financial regulations (all of which are embedded in the wealth threshold $\overline{w}$), and
(ii) Household-specific characteristics—such as income, initial wealth, and preference parameters: the time discount factor β, risk aversion σ, ownership preference θ, and the minimum housing standard reflected in $\overline{w}$.

To characterize the household's decision, define $\underline{w}^{np}$ as the threshold level of net worth that separates two optimal choices regarding the number of saving periods required before purchasing a home. This threshold can be determined "graphically" by the crossing point of the following condition:

$$V^{np}\left(\ \underline{w}^{np}\right) = V^{n+1\ p}\left(\underline{w}^{np}\right)$$

This approach highlights a useful transformation in the modeling framework. Instead of solving the original recursive problem with a discontinuity (requiring a "max" operator between two w_{t+1} intervals), the problem is recast into the **n-space**—that is, optimizing over the number of saving periods n. This yields a more intuitive and tractable global solution.

Once the household decides to pursue homeownership and identifies the wealth gap to be filled (given current wealth w_t), they evaluate all feasible saving schedules over different lengths n, and choose the one that maximizes total discounted utility – global solution – balancing current consumption against the future utility gain from ownership (see figure 10).

8.3.7 Simulation

Figure 22 presents the initial consumption level, c_t^{np}, that the household chooses at the point where it decides to begin the homeownership process. This consumption level is shown as a function of the household's initial wealth, w_t, for each possible planning horizon np (i.e., number of periods until purchase). After this decision point, the consumption path evolves according to the standard Euler equation derived above. For simplicity, I assume zero consumption growth, which simplifies the analysis without sacrificing essential insights (It is straightforward to incorporate consumption growth within the model).

Fig. 23 presents the value function as a function of initial wealth w_t and the number of periods np required to accumulate sufficient wealth to reach the homeownership threshold $\overline{w}$. As expected, households with higher initial wealth can reach the threshold over a shorter horizon. This is the key insight from the figure: lower net worth implies a longer saving period, during which the household remains in the rental market.

The figure also shows that, in general, shorter saving horizons are associated with higher utility. However, this relationship is not strictly monotonic. For example, a household starting with zero wealth could, in principle, reach the ownership threshold in 11 quarters. Yet doing so would require an extremely sharp reduction in consumption, resulting in substantial utility loss. By contrast, extending the saving horizon to 12 quarters allows for smoother consumption, which leads to a higher value function. This illustrates the trade-off between the speed of wealth accumulation and the utility cost of consumption reduction.

A particularly interesting feature arises near the threshold $\overline{w}$. Consider the case

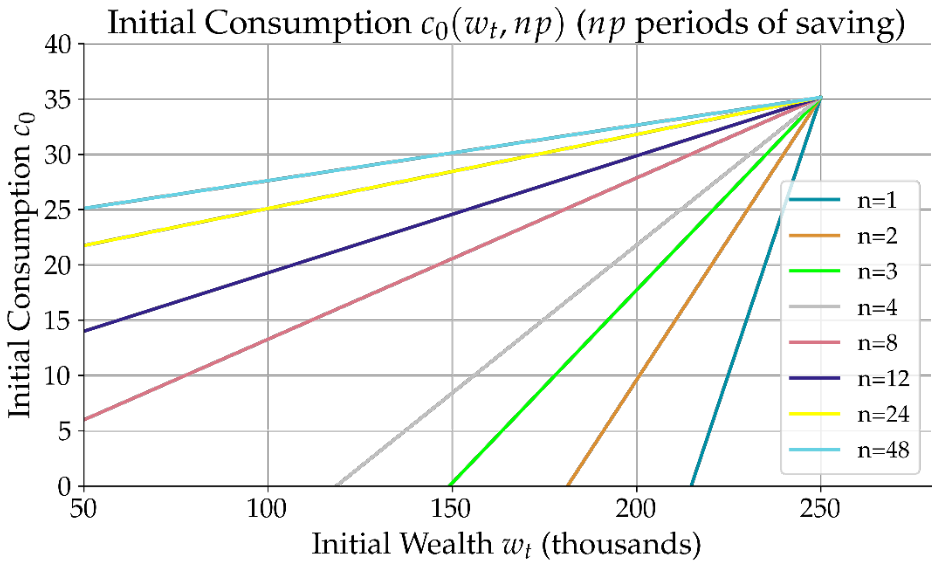

Figure 22: Present the consumption level in the period before households purchase their first house. As he decides to split the saving to shorter time (less periods) the consumption should be reduced more drastically. As he has less initial wealth, he needs to save harder and reduce consumption more drastically.

where $w_t \to \overline{w}$ from below (i.e., from the perspective of a renter preparing for ownership in the next period). In this case:

$$\mathbf{c_t^{1p}}\left(w_t \to \overline{w}\right) = \mathbf{y} + \frac{r}{R}\overline{w}{=}\mathbf{\overline{c}}$$

and the associated value function is:

$$V^{left} = V^{1p}\left(w_t \to \overline{w}\right){=}u\left(\bar{c}\right) + \beta V^{Owner} = \; u\left(\bar{c}\right) + \beta\frac{1+\theta}{1-\beta}u\left(\bar{c}\right) = \frac{1+\beta\theta}{1-\beta}u\left(\bar{c}\right)$$

In contrast, approaching from above, i.e., when $w_t \to \overline{w}$ from the perspective of a homeowner:

$$V^{right} = V^{Owner} = u\left(\bar{c}\right) + \mathbf{u^o} + \beta V^{Owner} = V^{left}{+}\;\theta u\left(\bar{c}\right)$$

This highlights a **discontinuity** in the value function at $w_t = \overline{w}$. The utility gain from ownership appears discretely as soon as the household crosses the wealth threshold. To eliminate this discontinuity and ensure a continuous value function in the neighborhood of $\overline{w}$, one would need to reformulate the model in continuous time (i.e., taking $\Delta t \to 0$).

Consumption simulation is continued in the body of the work (above).

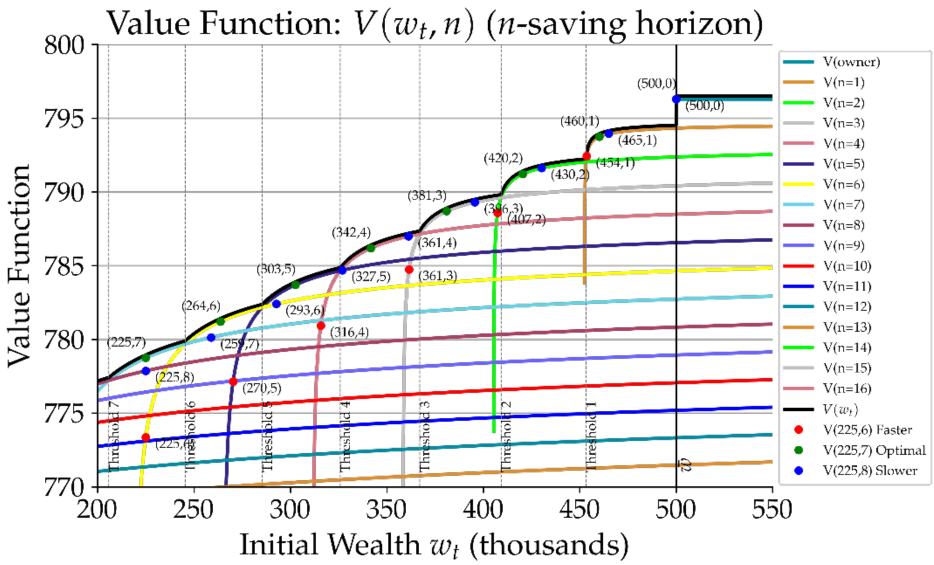

Figure 23: The value function and its dynamics are illustrated by the colored lines, which reflect the value function for specified parameter sets ($\overline{w} = 500, \quad \Delta t = quarter, \quad y = 15 * 3, R = 2\%\ ann., \ \beta = \frac{1}{R}, \ \sigma = 1.4, \ \theta = 1$), a fixed number of saving periods, n, and a given initial wealth level, w_t. The three colored dots correspond to three different choices available to the household, each starting with an initial wealth of \$225,000. Projecting this initial wealth onto the x-axis indicates that the optimal strategy is to save for seven periods (green dot). This choice allows the household to accumulate wealth over subsequent periods while remaining on the optimal path (The following green dots indicate the progression up to the home purchase). Accelerating the home purchase to just six periods (red dot) results in significant costs due to reduced consumption, which is detrimental to the household's well-being. Conversely, extending the savings period to eight years (blue dot) is slightly less favorable, as it delays homeownership.

8.4 Transition from Renting to Homeownership: Budget Constraints and Balance Sheet Dynamics

In the benchmark model, we assume that homeownership *per se* does not alter the household's net worth or flow budget constraint—at least not in the period immediately surrounding the transition to ownership. However, it is straightforward to relax this assumption in a subtle and structured manner, consistent with the formulation that follows.

Typically, before purchasing their first home, households do not carry leverage, and their net worth consists solely of accumulated assets—such as financial wealth (e.g., stocks)—which generate a cash flow stream of $r_E \cdot a$, where a denotes assets and r_E the return on it. The household's flow budget constraint in this pre-homeownership stage is given by:

$$r_E a + y = \breve{c} + hp_h + (a' - a)$$

Where y is net income, $\breve{c}$ is consumption (without dwelling), hp_h is rental expenditure (with h being housing services and p_h the market rental price per unit in terms of consumption, which include repairs, improvements, depreciation, etc.), and the last term is the wealth accumulation. This can also be expressed in alternative form as: $R_E a + y = \breve{c} + hp_h + a'$.

To become a homeowner, the household sells their financial assets a and takes out a mortgage loan of initial amount D (principal), to purchase house value qH (prince*quantity).

The *balance sheet* then becomes (by construction):

$$a + D = qH$$

Now, a represents the equity component of the house (i.e., the household's own funds), and acts as a "plug" variable ensuring balance sheet identity.

This balance sheet perspective clearly illustrates the asymmetric effects of rising house prices on **homeowners** versus **households who have not yet owned** a house. For existing homeowners, an increase in house prices translates directly into higher net worth, as the value of their asset rises while the mortgage liability remains fixed. This can lead to increased consumption through two channels: a *wealth effect*, due to the rise in net worth, and a *collateral effect*, as higher home equity enhances access to credit. In contrast, for households who are not yet homeowners, the same increase in house prices deteriorates their financial position. A more expensive home requires a larger loan and, consequently, a higher down payment and larger mortgage payments. When rising house prices are accompanied by higher rents—as is often the case—the affordability challenge intensifies further.

Balance sheet identit implying the cash flow condition (in equilibrium):

$$r_E a + r_D D = hp_h - \delta \qquad (*)$$

Here, r_D denotes the mortgage loan interest rate, which reflects the cost of the financial service provided by the lender. It is important to note that the principal repayment, typically made alongside the interest payment[20], reduces the outstanding loan balance D, thereby increasing the household's equity share a, since the asset (home) value remains constant. Although the principal payment represents a cash outflow for the household, it effectively transfers wealth back to the equity owner, that is, to the household itself. Conceptually, the monthly mortgage payment can be decomposed into two parts: (a) the true cost of financing the home purchase (the interest expense), and (b) a repayment of principal, which functions more like saving or net worth accumulation. For this reason, in the above expression, the principal repayment is netted out.

In this case, $r_E a$ becomes a required return on equity—analogous to a firm's dividend payout to shareholders. For now, we assume that the household seeks to preserve its pre-purchase financial income stream, $r_E a$, at the same level as before acquiring the house. While $hp_h - \delta$ represents the imputed rent or service flow from the housing asset (net of depreciation, repairs, improvements, etc.)[21].

Thus, the new flow budget constraint under homeownership is:

$$\boxed{hp_h} - \delta + y = \check{c} + \boxed{hp_h} + r_D D + (D - D')$$

Here, the imputed rent hp_h appears symmetrically on both sides, highlighting that the household is now both the consumer and provider of housing services. The term $D - D'$ reflects mortgage amortization, as explained above and illustrated in the example provided in Footnote 7. So, if the condition (*) holds, it guaranties that household's net worth and flow budget constraint will remain unchanged after home purchase, thus, $D - D' = a' - a$.

8.4.1 Mortgage Payments and the Flow Budget Constraint

Interestingly, it is very common for mortgage payments to follow an **equated monthly installment (EMI)** structure, and it is convenient to define these payments using the **payment-to-income (PTI)** ratio. Under this setup, the household's **flow budget constraint** can be rewritten as:

$$-\delta + y = \check{c} + PTI \cdot y - s \Rightarrow \check{c} = (1 - PTI)y - \delta$$

Assuming that the household does not save during this period (i.e., $s = 0$), either because increasing the mortgage payment would be preferable (due to higher cost and certainty compared to savings returns), or because of liquidity constraints. The term $PTI \cdot y$ represents the **total fixed mortgage payment**, structured as an annuity:

[20] For amortized mortgages—that is, loans with fixed monthly payments until full repayment—the interest is typically compounded monthly, and the fixed monthly payment is given by: $payment = \; r_D D_0 + D_0 \frac{r_D}{R_D^n - 1}$, where, the first component covers the interest, $r_D D$, while the remainder goes toward repaying the principal (n is the total number of payments).

[21] To that end, the household can be viewed as a real estate investor.

$$PTI \cdot y = \ r_D D_0 + D_0 \frac{r_D}{R_D^n - 1}$$

This fixed payment comprises two dynamic components: the **interest payment** and the **principal repayment**, as presented below:

$$PTI \cdot y = r_D D_t + (D_t - D_{t+1})$$

This decomposition illustrates that the household continue to accumulate equity (wealth) throughout the throughout the mortgage repayment period by, gradually paying down the mortgage principal.

8.4.2 Equated monthly installment

I will assumed that the monthly home mortgage payments (amortization schemes), p, are equals – that is a fixed annuities. So,

$$\mathbf{D_0} = p + pR^{-1} + pR^{-2} + \ldots + pR^{-n} - p = \frac{\left(R^{-1}\right)^{n+1} - 1}{R^{-1} - 1} p - p$$

$$= \frac{R^{-n-1} - 1 - \left(R^{-1} - 1\right)}{R^{-1} - 1} p = \frac{R^{-n-1} - R^{-1}}{\frac{1-R}{R}} p = \frac{R^{-n} - 1}{1 - R} p = \frac{\mathbf{1 - R^{-n}}}{\mathbf{r}} \mathbf{p}$$

In the case of that annuity has no end (stream of payments continues forever) we get the special case of a perpetuity: $D_0 = p/r$. It is easy to reversely get the borrower's initial payment (as all his payments):

$$\mathbf{p} = \mathbf{D_0} \frac{\mathbf{r}}{\mathbf{1 - R^{-n}}} = rD_0 + D_0 \frac{r}{1 - R^{-n}} - rD_0 = rD_0 + D_0 \frac{r - r\left(1 - R^{-n}\right)}{1 - R^{-n}}$$

$$= rD_0 + D_0 \frac{rR^{-n}}{1 - R^{-n}} = rD_0 \left(1 + \frac{1}{R^n - 1}\right)$$