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Abstract

Housing is a closely monitored and prominent sector for households. We find that households in the United States tend to overweight house price expectations when forming inflation expectations with a coefficient of 25%–45%, significantly above the weight of house prices in the inflation index. We first use two data sets, a multitude of controls, and an instrumental variable approach to address endogeneity. We then use a second strategy based on household heterogeneity. As expected, we find a significant effect of numeracy skills and whether households moved house recently. We model this household behaviour in a two-sector New Keynesian model with an overweighted and a non-overweighted sector and show that overweighted sectors are disproportionately more important for monetary policy.

Key words: Salience, inflation expectations, house price expectations, monetary policy.

JEL classification: D10, E12, E31, E52, E58.

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1 Introduction

Expectations about the economy's future developments play a pivotal role in macroeconomics. In this context, it has become increasingly important to understand how households form inflation expectations. Binder and Kamdar (2022) discuss several models and features of expected and realized inflation, including various departures from full information rational expectations (FIRE). Coibion, Gorodnichenko, Kumar, and Pedemonte (2020) find a significant role of households' priors and perceptions about inflation, their shopping experience, knowledge about monetary policy, cognitive abilities, and exposure to media coverage about the economy as main factors influencing inflation expectations.

This paper examines whether households overweight house price inflation expectations into inflation expectations. The motivation for investigating the salience of house prices is straightforward. Housing markets have received extensive media attention, especially since the Global Financial Crisis. The preoccupation of US households with housing markets has always been strong such that it has been noticed that "house price watching has become a national pastime" (Himmelberg, Mayer, and Sinai, 2005, p.67). Furthermore, houses are typically the largest asset in the household portfolio and are associated with significant wealth and collateral effects. A large majority of the population in the US are homeowners, and there is high geographic mobility, suggesting that house prices are closely monitored.[1]

In addition, it is important to note that the Consumer Price Index (CPI) only accounts for the consumption part of houses, i.e., housing services through rents and imputed rents, and not houses as assets. This implies that there is no direct impact of house prices on inflation. However, households as non-specialists may be unable to distinguish between the asset aspect of house prices and housing services. These reasons could potentially lead to overweighting of house price expectations in overall inflation expectations.

Amidst cognitive and informational constraints, it has been observed that households rely on their personal experiences and frequently observed prices to form expectations about inflation. For example, Coibion and Gorodnichenko (2015) and Patzelt and Reis (2024) show that gasoline and energy prices play an important role in determining inflation expectations by virtue of being most frequently observed by consumers. D'Acunto, Malmendier, Ospina, and Weber (2021) find similar evidence for grocery prices. Additionally, based on insights from psychology and memory research, and

[1] As per the US Census Bureau, the homeownership rate in the US stands at 66 percent in 2020 and an average person moves residence more than eleven times in their lifetime.

confirmed by studies observing household behavior in economics, it has been found that people tend to focus more on extreme experiences and large changes. Bordalo, Gennaioli, and Shleifer (2022) argue that contrasting, surprising, or prominent stimuli automatically drive the decision-makers attention and distract them from their original goals. This implies that individuals may focus disproportionately more on items for which extreme price changes have been observed, even if those items account for low weights in the official inflation measurement.

To the best of our knowledge, this paper is the first to examine whether house prices are also salient and, more specifically, whether house price inflation expectations are overweighted in inflation expectations. We indeed find a novel channel of salience through house price expectations. Using two sets of household survey data — Survey of Consumer Expectations (SCE) by the Federal Reserve Bank of New York (FRBNY) and the Survey of Consumers by the University of Michigan — we find that individuals overweight from house price expectations to their inflation expectations. We establish this result using two alternative and complementary identification strategies.

Firstly, we follow an identification strategy of using housing supply elasticity as an instrument for house price expectations. The instrument controls for possible endogeneity through common factors or omitted variables. The instrument — described in Gyourko, Saiz, and Summers (2008) and Gyourko, Hartley, and Krimmel (2021) — has been commonly employed in the literature in related contexts (e.g. Chaney, Sraer, and Thesmar, 2012; Aladangady, 2017; and Stroebel and Vavra, 2019). Across several empirical specifications, we find that house price inflation expectations contribute to overall inflation expectations with a weight in the 25-45 percent range, significantly above the weight of house prices in the consumption basket.

Our second identification strategy exploits variation in households across key variables. If house price inflation expectations are overweighted, we would expect that this feature would be more prominent in households with lower numeracy skills and also with those that, at a particular time, are more focused on the housing market. We indeed find that households with better numeracy skills still overweight but do so by less; the same holds regarding education. We also find that households who moved recently, and therefore observed housing markets more prominently, overweight by more.

Taken together, the results of both identification strategies provide strong evidence of individuals overweighting from house price expectations to their inflation expectations. Any concern about the exclusion restriction in the first strategy must correlate with numeracy skills and recently having moved home, which significantly reduces potential concerns. Furthermore, we include a comprehensive set of controls, such as time and region fixed effects, demographics and questions at the individual level. For instance, we control for past house price growth and income, among many other variables.

Our research has significant implications for monetary policy. We model this household behavior in a two-sector New Keynesian (NK) model, distinguishing between overweighted and non-overweighted sectors. We analytically derive the welfare loss function using a second-order approximation to the representative household's utility. Relative to a standard two-sector NK framework, we find that this overweighting behavior modifies the IS equation, while the NK Phillips curve and central bank's loss function remain unchanged. We show that to gauge the correct interest rate response, the central bank must be aware that consumers overweight some sectors and that movements in expected inflation in such sectors are disproportionately more important for monetary policy.

Literature Review: Our work is closely related to previous studies examining the role of the salience of frequently observed prices and large price changes in driving inflation expectations (D'Acunto et al., 2021, Coibion and Gorodnichenko, 2015, Patzelt and Reis, 2024). Our contribution is to examine whether housing also plays a role. We note that the degree of overweighting that we find related to housing is larger than that found in the literature for other goods.

Bruine de Bruin, Van der Klaauw, and Topa (2011) conducted two studies to examine how respondents taking part in national surveys form their inflation expectations in order to explain the heterogeneity between responses. The first part instructed participants to recall any price change and in the second part to recall the largest price change; in either of the cases, households reported recalling items for which price changes were perceived to be extreme and went on to report extreme inflation expectations. They found that participants had specific prices in mind while reporting their expectations in surveys and were biased towards items associated with more extreme perceived price changes.

Our work also relates to the impact of cross-sectional heterogeneity on inflation expectations. Ehrmann, Pfajfar, and Santoro (2018) find that households with pessimistic attitudes about their future incomes and purchases, or those experiencing financial difficulties, are associated with a stronger upward bias in their inflation expectations. In addition to everyday changes that households observe, Malmendier and Nagel (2016) document that individuals overweight the inflation experienced during their lifetimes in the sense that people who have lived through high inflationary episodes have systematically higher inflation expectations.

Additionally, our work connects with the literature on house prices, house price expectations, and inflation. Building on the role of experiences in shaping expectations, Kuchler and Zafar (2019) use survey data to show that individuals extrapolate from their personal experiences of local house price changes and volatility to country-wide house price inflation and that this holds irrespective of the extent of usefulness of such personal experiences. Adam, Pfäuti, and Reinelt (2022) show that households revise their house price expectations too sluggishly over time and their capital gain expectations have a positive relationship with the price-to-rent ratio. Foote, Gerardi, and Willen (2012) discuss the significance of house price expectations in rationalizing the decisions of borrowers, investors, and financial intermediaries. They show that high house price expectations is the reason why credit expanded during the housing boom before the crisis and was also allocated to low-wealth households.

The model in our paper is based on prior work on two-sector NK models. These include but are not limited to, Aoki (2001) with a flexible price sector and a sticky price sector, Erceg and Levin (2006), Barsky, House, and Kimball (2007), Petrella, Rossi, and Santoro (2019) with durable and non-durable sectors, and Galí and Monacelli (2005) with a domestic and foreign sector for a small open economy.

Our model is different but related to Adam and Woodford (2021) and Caines and Winkler (2021). The former focuses on robustly optimal policy under distorted beliefs about exogenous fundamentals, advocating leaning against the wind only if the steady state is distorted and housing is over-supplied in equilibrium. The latter examines subjective extrapolative beliefs about endogenous asset prices driving boom-bust cycles. In contrast, our model does not rely on extrapolative learning, model uncertainty, or housing being oversupplied in equilibrium.

Dietrich (2024) builds a sparsity-based model in the spirit of Gabaix (2014). Households have limited attention and endogenously focus on non-core goods such as food and energy due to their volatility. As a consequence, the central bank should focus on headline inflation rather than on core inflation, overturning the well-known proposal by Aoki (2001).[2] On the empirical side, Dietrich (2024) shows that all goods in the CPI basket are underweighted when forming inflation expectations, which is potentially consistent with prices outside the CPI basket, such as house prices, being overweighted.

The literature on housing and its macroeconomic effects is large and expanded even

[2]Our model is related but also has several different features. We obviously focus on housing rather than on non-durable goods. The expectations channel is different as in Dietrich (2024) the weight on different goods does not sum to one, due to limited attention. Also Dietrich (2024) examines which inflation measure to target in the context of simple interest rate rules with preset coefficients, while we consider fully optimal policy. The model in Dietrich (2024) highlights a very interesting interplay between monetary policy and asymmetric attention due to the volatility of prices, and gauges this effect relative to the stickiness principle.

further after the Global Financial Crisis. For instance, the seminal papers of Aoki, Proudman, and Vlieghe (2004) and Iacoviello (2005) show the importance of the interplay between house prices, borrowing constraints, and the financial accelerator. Garriga, Kydland, and Sustek (2017), among others, consider the policy implications. This paper does not build directly on such models. Instead, it finds a novel channel not identified before in this literature about the importance of housing markets — households overweight house price inflation expectations in inflation expectations. As such, this novel mechanism strengthens the importance of stabilizing housing markets and house price inflation expectations.

The paper is structured as follows: Section 2 describes the accounting benchmark to determine the impact of house price inflation on (overall price) inflation, which is later used to check the presence of overweighting in the survey data. Section 3 describes the data, and Section 4 describes the empirical results. Section 5 presents the two-sector NK model taking into account the overweighting behaviour of households, and Section 6 concludes.

2 Accounting Benchmark

To understand whether individuals are over- or under-weighting house price expectations when forming overall inflation expectations, we need to obtain a benchmark from actual U.S. data and the methodological best practices of the Bureau of Labor Statistics (BLS).

One key observation is that actual house prices are not directly reflected in the CPI. Instead, the CPI only reports the consumption part of housing services relevant to the cost-of-living index. In the United States, housing services are captured through the CPI component shelter which accounts for 32.706 percent weight in the index; shelter, in turn, has four sub-components, namely, rent of primary residence which accounts for 7.378 percent share, owner's equivalent rent (OER) which accounts for 24.043 percent, lodging away from home, and tenants and household insurance which account for 0.925 and 0.360 percent, respectively.[3]

The OER component in CPI shelter is the imputed rent of owner-occupied housing. This represents the rent that homeowners implicitly pay to themselves to live in their home, i.e., the amount they could obtain by renting it out. Since the majority of households in the US are homeowners, this component is very significant to keep track of changes in housing services. Over the last few decades, OER has been subject to

[3]Weights in overall CPI as on October 2022 from the BLS.

various methodological improvements. Up to 1983, the BLS used actual house prices to account for housing inflation, but that practice was abandoned as it reflected the asset aspect of housing and not the consumption aspect needed for CPI. Starting in 1983, owners and renters were interviewed through housing surveys to get OER and rent information, respectively. Since 1999, no homeowners have been considered in the CPI housing survey sample as they often don't have knowledge of current market rents; instead, the BLS uses market rents re-weighted per the share of homeowners and house characteristics in each region to accurately compute OER. This is considered best practice and correctly reflects that the OER must represent the opportunity cost of rents at market value, not the asset-portfolio aspect of housing.

According to this evidence, the impact of house price inflation on overall inflation is zero. However, this conclusion may be simplistic, as it only considers direct effects and excludes either indirect or general equilibrium effects. In reality, there could be effects operating through other CPI components. For instance, rents could increase with house price inflation, leading to an increase in OER and CPI inflation. We now turn to these considerations. We first plot the data as it clarifies that these indirect effects are likely to be very small; afterwards, we examine further whether or not the effect of house price inflation on overall price inflation is close to zero.

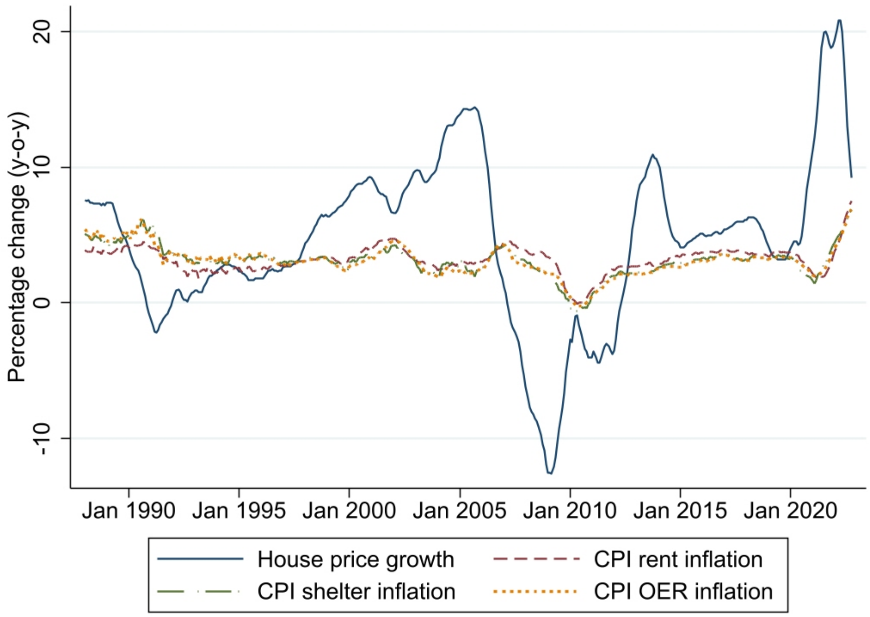
Figure 1 shows that, over the period 1987–2022, there have been some large swings in house prices, as captured by the growth rate of the S&P/Case-Shiller U.S. National Home Price Index. The figure also shows that OER and other housing-related components of shelter are much more stable and have not kept up with the large house price swings. The disconnect between house price growth and rents is also confirmed in studies using high-quality microdata. Famiglietti, Garriga, and Miravete (2023) use a quasi-natural experiment regarding Amazon's unanticipated location decision for its second headquarters and, among other findings, confirm such result. Overall, this evidence suggests that the large changes in house price inflation are not transmitted to consumer price inflation, and the benchmark coefficient is very small.[4] Below, we quantify this more precisely.

We consider several specifications to obtain a range of estimates of the impact of house price inflation on CPI (and CPI shelter) inflation and check their robustness. In each specification, we regress different CPI components on house price growth.[5] After-

[4]In a different literature but related finding, Adam, Marcet, and Beutel (2017) discuss the disconnect between stock prices and fundamentals. Adam, Kuang, and Marcet (2012) extend such concepts to housing markets.

[5]These regressions are run for two different samples, namely 1987 to 2022 and 1997 to 2022, in order to be mindful of the changes in CPI components. All specifications include twelve leads and lags of house price growth. The calculations include the sum of coefficients. The results are similar if we

Figure 1: House Price Growth and CPI Shelter Inflation



Notes: This figure shows CPI shelter inflation and two sub-components: CPI-rent and CPI-OER from the Bureau of Labor Statistics. House price growth is the growth rate of the S&P/Case-Shiller US national home price index. The sample period runs from 1987 to 2022.

wards, we multiply the coefficients of the regressions with the corresponding weight in the CPI basket (and sum those when more than one component is considered simultaneously). This procedure quantifies the impact of house price inflation on actual inflation, taking into account the direct and indirect effects through different components. The results are shown in Table 1. More details describing these steps and the calculations are reported in Appendix A.1.

Table 1: Benchmark Coefficients

Sample	Specification 1	Specification 2	Specification 3	Specification 4
1987–2022	0.004	0.03	-	0.02
1997–2022	0.03	0.04	0.03	0.02

Notes: The benchmark coefficients in this table are the product of regression coefficients from specifications 1 – 4 with the relative weight of the respective CPI component. Details of this calculation and the regression coefficients and average weights are shown in Table A.1 in Appendix A.1. Specification 3 for 1987-2022 is blank because the four components of CPI shelter, as in the current practice, came into effect from 1997 onwards.

For all specifications, the effects are very low. Specification 2 computes the bench-

do not include leads and lags.

mark through the impact of house price inflation on CPI shelter inflation. Consistent with Figure 1, the impact of house price inflation is small. Specification 3 considers instead the sub-components of CPI shelter inflation and then aggregates them back. The fourth specification focuses only on OER, which again confirms a low impact of house price inflation. A potential concern is that specifications 2 to 4 only consider the components of CPI directly related to housing. In fact, there could be indirect effects on other sectors even if these are less apparent a priori. Specification 1 considers the overall impact on CPI inflation, encompassing all sectors. The benchmark weight remains very low.

It is important to clarify that while house prices may influence rents and the cost of CPI housing services over long horizons, these effects do not affect our results. As shown in Figure 1, all series exhibit an average growth rate of approximately 4% over the full sample, indicating aligned long-run trends. However, these secular trends are not central to our analysis. Household consumption and saving decisions are primarily driven by inflation expectations over shorter horizons. Surveys similarly ask households to forecast inflation and house prices over the next twelve months. Moreover, monetary policy decisions operate on short-term horizons, typically every six weeks. Given these factors, our benchmark analysis focuses on near-term expectations.[6]

Summing up, house price growth has a small impact on CPI inflation. House price inflation is not directly reflected in the CPI as only the consumption aspect of housing should be considered, not the portfolio-asset aspect. As such, the impact is zero. Taking into account the effect of house price growth on other components of the CPI over twelve months, the resulting benchmark remains remarkably low, ranging from 0.004 to 0.04. This is the accounting benchmark that we will compare with the results from the survey respondents.

3 Data Description

We use two datasets that complement each other in terms of their sampling and survey methodologies, the range of questions asked to households, and the level of disaggregation of the survey. This study focuses on two questions from these datasets: one-year-ahead inflation expectations and one-year-ahead house price expectations. This section describes these two datasets and the main questions used for our analysis.

[6]Note footnote 5, including or excluding leads and lags up to 12 months does not change the results.

3.1 Survey of Consumer Expectations

The first dataset is the Survey of Consumer Expectations (SCE) from the Federal Reserve Bank of New York (FRBNY). Launched in 2013, this is a nationally representative, internet-based monthly survey of approximately 1300 household heads. It has a short rotating panel structure where respondents remain in the sample for at most twelve consecutive months.

The quantitative part of the survey used for this analysis consists of three categories of questions: questions that elicit expectations of binary outcomes (such as the likelihood of the US house prices being higher in twelve months), questions that elicit pointwise expectations for continuous outcomes (such as the rate of inflation over the next twelve months), and questions that elicit respondents' probability densities for forecasts of continuous outcomes. The use of questions of the third type to get the subjective probability distribution for certain continuous outcomes is one of the innovations of the SCE.[7]

This dataset consists of about 111,527 observations over the period from June 2013 to March 2022. For questions on inflation and house price expectations, we rely on expectations from density means from questions of the third type described above instead of point forecasts; similar results also hold with point forecasts. While the basic questions regarding inflation and house price expectations are asked each time the individuals take the survey, some questions on individual-specific information are limited to repeat respondents.[8] The summary statistics of the main variables from this dataset are presented in Table A.2 in Appendix A.2.

3.2 Michigan Survey of Consumers

The second dataset is the Michigan Survey of Consumers (MSC) conducted by the Survey Research Center at the University of Michigan. This nationally representative survey has been conducted since 1978, with about 500 monthly interviews. The panel component is also short-lived as respondents are interviewed at most twice and never stay in the sample beyond six months. More precisely, each month, about 40 percent of the households are those that were interviewed six months ago, and about 60 percent are first-time respondents.

[7]For more details on this dataset, see Armantier, Topa, Van der Klaauw, and Zafar (2017).

[8]To be able to control for these individual characteristics, we exclude one-time respondents from the dataset and work with repeat respondents only. Kuchler and Zafar (2019) also show that the respondents can distinguish between national house price expectations and local house price changes in the SCE data.

While this is a much older survey than the SCE, house price expectations, unlike other expectations, have only been available since 2007 and only for those respondents who are homeowners. Given this, our study covers the period from January 2007 to March 2022 and contains about 65,396 observations. The dataset is only accessible at the Census region level, and further geographical disaggregation is unavailable. Table A.3 in Appendix A.2 presents the summary statistics of the variables used from this dataset.

4 Empirical Results

We seek to address the question: How do house price expectations influence overall inflation expectations? We analyze this in the following specification

$$\pi^e_{it} = \alpha + \beta \pi^{he}_{it} + \delta X_{it} + \gamma_t + \nu_r + \epsilon_{it}, \tag{1}$$

where the dependent variable is the one-year-ahead inflation expectations for respondent i at time t, π^{he}_{it} is the one-year-ahead house price expectations for respondent i at time t, X_{it} are the individual characteristics such as demographics and other expectations, γ_t represents time fixed effects, and ν_r are region fixed effects.

Although we control for time fixed effects, it is plausible that both house price expectations and inflation expectations could be driven by a third common factor that could lead the individual to revise both expectations, or there could be an omitted variable bias from other CPI components. For this reason, Section 4.1 presents results using instrumental variables. In Section 4.2, we present evidence based on key household characteristics. The strength of the evidence comes from the two complementary approaches.

4.1 Instrumental Variables Strategy

We instrument house price expectations with the Wharton Residential Land Use Regulatory Index (WRLURI). This index is a measure of housing supply elasticity developed by Gyourko et al. (2008) and again updated by Gyourko et al. (2021) based on a national survey of local residential land use restrictions. This aggregate measure comprises eleven subindices that summarize information on different aspects of the regulatory environment. Higher values of this index indicate a stricter regulatory environment as the housing supply could be expanded less easily. We use WRLURI based on the second round of survey results completed in the year 2018 from Gyourko et al. (2021). These provide measures of regulation at the state level.

The intuition for the instrument is that during house price booms, house prices should rise more in locations where housing supply is less responsive.[9] Then, these are also the areas where house prices decline the most during housing busts. Exploiting the cross-sectional variation in housing supply elasticity is a popular approach in this literature following the seminal work of Mian and Sufi (2011). This approach is useful to isolate changes in house price expectations that are plausibly orthogonal to other factors that may directly drive the change in inflation expectations. Among others, this index was used by Chaney et al. (2012), Aladangady (2017), and Stroebel and Vavra (2019) to instrument for house price inflation.

WRLURI is time-invariant by design, as land use regulations are not frequently changed. Even though this is not a drawback of this instrument, an approach in the literature has been to induce time-series variation by using its interaction with other relevant variables of interest, e.g., see Mian and Sufi (2011). In our case, since interest rates affect the user cost of housing and impact housing demand, we use the interaction of WRLURI with the 30-year fixed mortgage rate by Freddie Mac as in Chaney et al. (2012) and Aladangady (2017).[10]

Earlier work by Coibion and Gorodnichenko (2015) found that gas and food prices influence households' inflation expectations. Therefore, we control for these expectations and also for possible endogeneity from the same. For gas price expectations, we use real gasoline taxes as the instrument. This has been previously used by Davis and Kilian (2011) and Coglianese, Davis, Kilian, and Stock (2017) with the rationale that tax changes are typically implemented with a considerable lag, making it unlikely that they are correlated with contemporaneous demand shocks. Additionally, Coglianese et al. (2017) found that consumers may be more responsive to taxes than equal-sized changes in tax-inclusive gasoline prices because of perceived persistence and salience, and also given higher media coverage to the former. We use the twelve-month lag of the global price of food index, reported by the IMF, as the instrument for food price expectations. Its value denotes the benchmark prices of its composite commodities, which are representative of the global market. As each price in this index is determined by the largest exporter of a given commodity and the index is used with a twelve-month lag, this instrument satisfies the exclusion restriction.

Another approach to controlling for endogeneity in the household survey literature

[9]This in turn implies higher house higher house price expectations as found by Kuchler and Zafar (2019).

[10]Note that we have time fixed effects and the results are very similar if we use the spread relative to the Federal Funds rate. We discuss and present these results as well.

involves employing lagged survey data as instruments, e.g., in Bachmann, Berg, and Sims (2015). In the same spirit, we take advantage of the rotating panel nature of the datasets and use the six-month lagged interview data as the instrument for the current period observation. In one specification, we incorporate these lagged observations and other previously discussed instruments from the literature to estimate an overidentified model with the GMM.

The OLS and IV results from the SCE data are presented in Table 2. The first column shows the OLS results in the full sample. We find that a one percentage point increase in house price expectations leads to higher inflation expectations by 0.24 percentage points. Comparing this with the benchmark coefficients in the range of 0.004 to 0.04, there is evidence of overweighting from house price expectations to inflation expectations. The second column of Table 2 shows the OLS results for a smaller sample where only the last interview of each household is used. This is a common approach when working with this dataset because households only stay in the survey for at most twelve months, which is a short period and households don't revise their answers by much given the timelines.[11]

The third column presents IV results using lagged expectations from previous interviews as instruments, and Column 4 uses the WRLURI index and other instruments to present the GMM results from an overidentified model. In all cases, IV coefficients are higher than the OLS coefficients. Appendix A.3 shows that the results are robust to using different instruments and individual fixed effects.[12]

The set of controls is rich. Any concern of endogeneity (or violations of the exclusion restriction) would need to be orthogonal to the controls included. We include both the time fixed effects and state fixed effects as controls, which is equivalent to including a multitude of controls. Across all specifications, the controls also include demographics such as age, income categories, education, numeracy levels, gender, marital status, homeownership, race, and years of living in a state. We also control for rent, gas, and food price expectations.[13]

The OLS and IV results from MSC data are presented in Table 3. Column (1) presents the OLS results, and we find that the coefficient on house price expectations is

[11]Similar results hold for initial interviews of households such that this is not driven by panel conditioning effects described in Binder (2019).

[12]The different instruments across various specifications in Table A.6 include (i) the twelve-month-lagged real global fertilizer price index reported by the IMF for food price expectations, (ii) the interaction of WRLURI with mortgage rate net of federal funds rate for house price expectations.

[13]Table A.4 in Appendix A.3 presents the OLS results with and without controlling for gas and food price expectations. Table A.5 presents the IV results with and without controlling for the endogeneity of gas and food price expectations in addition to house price expectations. We find that the coefficient on house price expectations is mainly unchanged.

Table 2: Baseline Results Using SCE

Inflation Expectations (1Y)	(1) OLS-Full	(2) OLS	(3) IV - 2SLS	(4) IV - GMM
House Price	0.244***	0.294***	0.453***	0.445***
Expectations (1Y)	(0.008)	(0.016)	(0.052)	(0.048)
First stage F-stat:				
House Price Expectations (1Y)			100.74	
Gas Price Expectations (1Y)			44.57	
Food Price Expectations (1Y)			65.97	
Over-identification Test:				
Hansen J-stat(Chi-sq p-value)				0.2777
Demographics	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes	Yes
R-squared	0.2071	0.2764	0.2127	0.2138
N	110054	9264	9115	9115

Notes: Column (1) has OLS results for the full sample. Column (2) has OLS results for the smaller sample of only the last observations for each household. Column (3) has IV-2SLS results using lagged expectations as instruments. Column (4) has IV-GMM results using lagged expectations and interaction of WRLURI with real mortgage rate, real global price of food index, and real gasoline taxes as instruments. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table 3: Baseline Results Using MSC

Price Expectations (1Y)	(1) OLS-Full	(2) GMM-Full	(3) OLS	(4) IV-GMM
House Price	0.016***	0.230**	0.018***	0.356**
Expectations (1Y)	(0.003)	(0.109)	(0.004)	(0.139)
Over-identification Test:				
Hansen J-statistic (Chi-sq p-value)		0.3830		0.8107
Time Fixed Effects	Yes	Yes	Yes	Yes
Region Fixed Effects	Yes	No	Yes	No
Demographics	Yes	Yes	Yes	Yes
N	58143	58143	33627	33627

Notes: Column (1) has OLS results for the full sample. Column (2) has IV-GMM results for the full sample using WRLURI, the interaction of WRLURI with real 30-year mortgage rate, and real gasoline taxes as instruments for the full sample. This specification does not include region fixed effects as they are collinear with the WRLURI instrument. Columns (3) and (4) repeat the same for first-time respondents. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

0.016, which is more in line with the benchmark. Column (2) corrects for the possible endogeneity using the instruments, and the coefficient is of similar magnitude to the SCE results. Column (3) and Column (4) look at a smaller sample where we only include the respondents when they enter the survey for the first time.

Across the four MSC specifications, we control for individual characteristics such as the respondent's age, gender, marital status, income, household size, market value of home owned, and education. We include other expectations about gas prices, respondent's personal finances, home value, and government policy. Region fixed effects for the four Census regions and time fixed effects are included to account for any other common factors driving the results. Again, we note that the set of controls is very rich in this dataset, and a violation of the exclusion restriction would need to be orthogonal to the controls.

If households overweight house price expectations into their overall inflation expectations, we should find that house price expectations can explain forecast errors. Appendix A.4 carries that analysis and shows that it is indeed the case. This is expected given our results vis-a-vis the accounting benchmark in Section 2 but is a reassuring result. The departure of household survey expectations from FIRE has been shown, among others, in Mankiw and Reis (2002), Mankiw, Reis, and Wolfers (2004), Nunes (2009, 2010).[14] This paper unveils a new mechanism operating through house price expectations.

4.2 Cross-Sectional Heterogeneity Strategy

This section examines the cross-sectional heterogeneity of households. These results strengthen those in the previous section by showing that the extent of overweighting is related to key variables that support our hypothesis.

We first examine the role of cognitive abilities captured through numeracy and education. The SCE includes a measure of respondents' numeracy, captured through questions on the basics of probability and compound interest. Participants who answer at least four of the five questions correctly are deemed to have high numeracy (Ben-David, Fermand, Kuhnen, and Li, 2018). The effect of education is captured through an individual having a minimum of a college degree versus not. In our sample, around 73 percent of individuals have a high numeracy score, and 57 percent of individuals are college graduates or higher.

The analysis of these characteristics reveals some interesting results, presented in Table 4. We find that high numeracy individuals overweight less from house price expectations to inflation expectations compared to their low numeracy counterparts. We also find that the difference between the two categories is statistically significant. The same results hold for those who are college graduates or higher, i.e., they overweight

[14]Survey expectations have also been used for other purposes. Binder (2017) uses the literature on cognition and communication to derive a measure of uncertainty from survey expectations.

Table 4: Numeracy and Education

Inflation Expectations (1Y)	(1) Numeracy	(2) Education
High Numeracy*House Price Expectations (1Y)	0.203*** (0.009)	
Low Numeracy*House Price Expectations (1Y)	0.303*** (0.014)	
Graduate*House Price Expectations (1Y)		0.200*** (0.010)
Not a Graduate*House Price Expectations (1Y)		0.277*** (0.012)
Statistical Difference in Coefficients (Wald Test)	0.0000	0.0000
Demographics	Yes	Yes
Time Fixed Effects	Yes	Yes
State Fixed Effects	Yes	Yes
R-squared	0.210	0.209
N	110054	110054

Notes: This table uses the SCE data. Column (1) looks at the impact of numeracy. Participants who answer at least four out of five questions on numeracy in the survey correctly are classified as high-numeracy individuals. Column (2) looks at the impact of the respondent having a minimum of a college degree. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

less from house price expectations to their overall inflation expectations. The difference between the two groups is statistically significant as well. These results are consistent with the hypothesis that individuals with lower levels of numeracy or educational qualifications tend to exhibit a greater tendency to overweight.

We next examine whether households who moved home recently tend to overweight house price inflation by more. This is shown in Table 5 along with how this differs for homeowners and renters. We find that those who have moved homes recently overweight house price expectations more than those who haven't, irrespective of homeownership status. This result is consistent with these households having observed the housing market more closely.

We also find that households who report a likelihood of default on a credit repayment tend to overweight by more.[15] These households are likely to have considered which category of debt to default, for example, mortgage vs credit-card debt. These households are also more likely to have considered their asset portfolio and expendi-

[15]This includes households who report more than a ten percent likelihood of default on the minimum required payments on credit and retail cards, auto loans, student loans, mortgages, or any other debt.

Table 5: By Homeownership and Having Moved Since the Last Survey

	(1)	(2)	(3)
Inflation Expectations (1Y)	All	Homeowners	Renters
Moved Home Recently*House	0.361^{***}	0.373^{***}	0.347^{***}
Price Expectations (1Y)	(0.036)	(0.049)	(0.052)
Not Moved Home Recently*House	0.240^{***}	0.223^{***}	0.276^{***}
Price Expectations (1Y)	(0.008)	(0.009)	(0.016)
Statistical Difference in Coefficients (Wald Test)	0.0007	0.0027	0.1845
Demographics	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes
R-squared	0.207	0.213	0.208
N	110037	80547	27565

Notes: This table uses SCE data. Column (1) compares house price expectations for those who have moved into a new home recently with those who have not moved recently. Columns (2) and (3) repeat the same exercise separately for homeowners and renters, respectively. Standard errors in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

tures, such as the rent versus buy-sell decision, and, as such, are more likely to pay close attention to house prices.[16]

In summary, the results in this section strengthen those of section 4.1. Firstly, the results in this section support the role of salience. Secondly, any omitted variable correlated with our housing supply elasticity instrument would also need to have a differential impact on households with different numeracy skills, education, who moved recently, and who are likely to default on a credit repayment. More results from examining cross-sectional heterogeneity in the datasets are presented in Appendix A.5.[17]

[16]Even if a household is not a homeowner, a default on a credit repayment makes it more difficult to obtain a mortgage in the near term and buy a house. Such households would also likely have considered housing markets.

[17]We find that homeownership does not exert a major influence. This is consistent with the observation that renters are likely to pay significant attention to housing markets because they may be looking to buy or may have been priced out at a certain location and looking elsewhere. Current renters may also own a house but may currently be renting due to a job or other relocation considerations. Interestingly, the coefficients, while similar economically and statistically, are higher for renters than for homeowners; this suggests that the mechanism of overweighting is not operating by a homeownership wealth effect. In this respect, and as stated before, the controls include variables along those dimensions. Finally, older households still overweight but by less, even though the statistical evidence is tenuous. This result may be due to households learning over time that the link between house prices and inflation is rather small.

Table 6: By Likelihood of Default

Inflation Expectations (1Y)	(1) All	(2) Homeowner	(3) Renter
Default*House Price Expectations (1Y)	0.272***	0.254***	0.305***
	(0.013)	(0.015)	(0.021)
No Default*House Price Expectations (1Y)	0.228***	0.216***	0.258***
	(0.009)	(0.009)	(0.018)
Statistical Difference in Coefficients (Wald Test)	0.0026	0.0077	0.0361
Demographics	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes
Other Expectations	Yes	Yes	Yes
R-squared	0.207	0.213	0.210
N	109987	80520	27541

Notes: This table uses SCE data. Column (1) compares house price expectations for those who report a likelihood of default with those who do not. Columns (2) and (3) repeat the same exercise separately for homeowners and renters, respectively. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

5 Model

In this section, we present a two-sector closed economy New Keynesian model by extending the one-sector framework of Galí (2015). As in the empirical part, the overweighting behavior is taken as given and with constant weight. The goal is to examine the consequences of overweighting for monetary policy, and tractability comes with the advantage that we can easily incorporate this mechanism in standard models. The model is a stylized framework representative of any two sectors, in which households focus more on one of the sectors relative to its true weight.

This part of the paper applies more generally to the modeling and monetary policy implications of overweighting in any good, including the findings relative to gas prices, energy, and groceries in Coibion and Gorodnichenko (2015), Patzelt and Reis (2024), and D'Acunto et al. (2021), respectively. As such, the model has two non-durable sectors.

The economy consists of three types of agents: a representative household, firms, and the central bank. We assume that there is full labor mobility between the two sectors so that there is a uniform wage rate in the economy, and that there are no sectoral linkages in production. In what follows, let O denote the overweighted sector, which is more salient to households, and N denote the non-overweighted sector.

5.1 Households

The representative infinitely-lived household chooses a composite consumption good, C_t, and supplies labor, L_t, to maximize the present discounted value of the expected utility function

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \mathbb{U}(C_t, L_t), \tag{2}$$

where $\beta \in (0,1)$ is the discount factor and

$$\mathbb{U}(C_t, L_t) = \frac{C_t^{1-\sigma}}{1-\sigma} - \frac{L_t^{1+\phi}}{1+\phi}, \tag{3}$$

where σ is the inverse of the intertemporal elasticity of substitution and ϕ is the inverse of the Frisch elasticity of labor supply. The household's aggregate consumption, C_t, depends on consumption of the overweighted good, $C_{O,t}$, and non-overweighted good, $C_{N,t}$, according to Cobb-Douglas preferences given by

$$C_t \equiv \frac{(C_{N,t})^{1-\omega} (C_{O,t})^{\omega}}{\omega^{\omega} (1-\omega)^{1-\omega}}, \tag{4}$$

where $0 < \omega < 1$ is the share of the overweighted sector in total consumption. The sectoral consumption, C_j for $j = N, O$, is in turn a CES aggregate of quantities of the continuum of differentiated goods (of variety i) in the two sectors

$$C_{j,t} \equiv \left(\int_0^1 C_{j,t}(i)^{\frac{\varepsilon_j - 1}{\varepsilon_j}} di \right)^{\frac{\varepsilon_j}{\varepsilon_j - 1}}, \;\; j = N, O,$$

where $\varepsilon_j > 1$ is the elasticity of substitution between the varieties within each sector. The aggregate price index P_t is defined as

$$P_t = (P_{N,t})^{1-\omega} (P_{O,t})^{\omega}, \tag{5}$$

where $P_{N,t}$ is the price of the non-overweighted consumption good and $P_{O,t}$ is the price of the overweighted good. Define the relative price ratio, $S_t = \frac{P_{O,t}}{P_{N,t}}$, such that

$$P_t = P_{N,t} S_t^{\omega} = P_{O,t} S_t^{\omega - 1}. \tag{6}$$

The sectoral price index is

$$P_{j,t} = \left(\int_0^1 P_{j,t}\left(i\right)^{1-\varepsilon_j} di \right)^{\frac{1}{1-\varepsilon_j}}, \ \ j = N, O,$$

where $P_{j,t}(i)$ is the price charged by firm i in sector j for $j = N, O$. The household maximizes utility (3) subject to the intertemporal budget constraint

$$\int_0^1 P_{N,t}\left(i\right) C_{N,t}\left(i\right) di + \int_0^1 P_{O,t}\left(i\right) C_{O,t}\left(i\right) di + Q_t B_t \leq B_{t-1} + W_t L_t + T_t, \qquad (7)$$

where W_t denotes the nominal wage, B_t are one-period bonds at price Q_t held by the household, T_t is a lump-sum component of income that includes dividends from ownership of firms. The household is also subject to the solvency condition $\lim_{T\to\infty} \mathbb{E}_t\{B_T\} \geq 0$ to rule out any Ponzi-type schemes.

To motivate how we bring the empirically observed household behavior into the model where individuals focus disproportionately more on one good when forming their inflation expectations, define a new parameter δ as the excess weight that households assign to the overweighted good. Also, define $\hat{\mathbb{E}}_t\pi_{t+1}$ to be the distorted expectations that are affected by overweighting and $\mathbb{E}_t\pi_{t+1}$ as the rational expectations counterpart without any overweighting. Then, we have

$$\begin{aligned} \hat{\mathbb{E}}_t\pi_{t+1} &= (1-\omega-\delta)\mathbb{E}_t\pi_{N,t+1} + (\omega+\delta)\mathbb{E}_t\pi_{O,t+1}, \\ &= \mathbb{E}_t\pi_{t+1} + \delta(\mathbb{E}_t\pi_{O,t+1} - \mathbb{E}_t\pi_{N,t+1}), \end{aligned} \qquad (8)$$

where $\mathbb{E}_t\pi_{j,t+1}, j = N, O$ are the sectoral inflation expectations. This means that the distorted expectations of inflation where households give excess weight to sector O are equivalent to rational inflation expectations plus the differential in expectations between sectors O and N weighted by δ. When there is no overweighting, i.e. $\delta = 0$, it follows that $\hat{\mathbb{E}}_t\pi_{t+1} = \mathbb{E}_t\pi_{t+1}$.

To incorporate this in the model, the expected aggregate price index growth is modified relative to (5) as follows

$$\mathbb{E}_t\left(\frac{\hat{P}_{t+1}}{\hat{P}_t}\right) = \mathbb{E}_t\left(\frac{P_{N,t+1}^{1-\omega-\delta} P_{O,t+1}^{\omega+\delta}}{P_{N,t}^{1-\omega-\delta} P_{O,t}^{\omega+\delta}}\right), \qquad (9)$$

where $\hat{P}_{t+1}/\hat{P}_t$ is the overweighted perceived price index growth for households. From the household's optimization problem, the Euler equation is

$$\beta Q_t^{-1} \mathbb{E}_t \left\{ \left(\frac{C_{t+1}}{C_t} \right)^{-\sigma} \frac{\hat{P}_t}{\hat{P}_{t+1}} \right\} = 1. \tag{10}$$

As standard in the literature, the Euler equation (10) can be log-linearized around a zero inflation steady state to determine the dynamic IS equation

$$\tilde{y}_t = \mathbb{E}_t \tilde{y}_{t+1} - \frac{1}{\sigma} \left(i_t - \hat{\mathbb{E}}_t \pi_{t+1} - r_t^n \right), \tag{11}$$

where $\tilde{y}_t \equiv y_t - y_t^n$ is the (welfare relevant) output gap, y_t^n is the natural level of output, i_t is the nominal interest rate, and $r_t^n = \rho + \sigma \psi_{ya}^n \mathbb{E}_t \Delta a_{t+1}$ is the natural real interest rate with $\psi_{ya}^n = \frac{1+\phi}{\phi+\sigma}$ and $\rho = -\log \beta$. Finally, substitute equation (8) in (11) to get

$$\tilde{y}_t = \mathbb{E}_t \tilde{y}_{t+1} - \frac{1}{\sigma} (i_t - \mathbb{E}_t \pi_{t+1} - \underbrace{\delta(\mathbb{E}_t \pi_{O,t+1} - \mathbb{E}_t \pi_{N,t+1})}_{\text{impact of overweighting}} - r_t^n). \tag{12}$$

Accordingly, the real interest rate is $r_t = i_t - \hat{\mathbb{E}}_t \pi_{t+1}$, where the impact of overweighting is reflected through $\hat{\mathbb{E}}_t \pi_{t+1}$ instead of $\mathbb{E}_t \pi_{t+1}$ in the standard NK framework.

5.2 Firms

On the production side, there are two sectors, $j = N, O$. Within each sector, a continuum of firms indexed by $i \in [0, 1]$ produce differentiated goods for consumption. Each firm faces a common production technology

$$Y_{j,t}(i) = A_{j,t} L_{j,t}(i),$$

where $Y_{j,t}(i)$ is the output of firm i in sector j, and $L_{j,t}(i)$ is the hours of labor employed by firm i in sector j. $A_{j,t}$ are the sector-specific productivity shocks that follow an autoregressive process

$$a_{j,t} = \rho_{a_j} a_{j,t-1} + \varepsilon_{a_j,t},$$

where $a_{j,t} \equiv log A_{j,t}$ with $\varepsilon_{a_j,t} \sim \mathcal{N}(0, \sigma_{a_j})$ and i.i.d. Since labor is assumed to be fully mobile across the two sectors, there is a uniform wage rate in the economy. The nominal marginal cost for each firm in sectors $j = N, O$ is

$$MC_{j,t}^n = \frac{W_t}{A_{j,t}}.$$

Firms face identical sectoral demands and take as given the aggregate price level P_t and aggregate consumption C_t. Following Calvo (1983), a firm in sector j resets its price with probability $(1-\theta_j)$ in any given period and a fraction θ_j of firms keeps their prices unchanged. Thus, sectoral prices evolve according to

$$P_{j,t} = \left[\int_{s_j(t)}^{1} P_{j,t-1}^{1-\varepsilon_j}(i)\, di + (1-\theta_j)\left(P_{j,t}^{*}\right)^{1-\varepsilon_j} \right]^{\frac{1}{1-\varepsilon_j}},$$

which simplifies to

$$P_{j,t} = \left[\theta_j P_{j,t-1}^{1-\varepsilon_j} + (1-\theta_j)\, P_{j,t}^{*} \right]^{\frac{1}{1-\varepsilon_j}},$$

where $P_{j,t}^{*}$ is the common price chosen by the firms of sector j at time t, and $s_j(t) \subset [0,1]$ represents the set of firms not re-optimizing their posted price in period t. The firms which can update their prices choose price $P_{j,t}^{*}$, which maximizes the expected present discounted value of future profits subject to a sequence of demand constraints for $k \geq 0$. That is,

$$\max_{P_{j,t}^{*}} \mathbb{E}_t \sum_{k=0}^{\infty} \theta_j^k Q_{t,t+k} \Pi_{j,t+k},$$

where $Q_{t,t+k}$ is the stochastic discount factor for nominal pay-offs between t and $t+k$, and $\Pi_{j,t+k} = P_{j,t}^{*} Y_{j,t+k} - TC_{j,t+k|t}^{n}(Y_{j,t+k})$ are the nominal profits for firms in sector j at time $t+k$ given that the price chosen at t is being charged. $Y_{j,t+k}$ is the output in period k in sector j, and $TC^n(.)$ is the nominal total cost function.

Now, consider the case where the households' overweighting behavior enters the firm's problem. This is a relevant case as Coibion and Gorodnichenko (2015) show that households' inflation expectations are a good proxy for firms' inflation expectations. Other work, for instance, Pace, Mangiante, and Masolo (2023) shows that firms' inflation expectations also depart from FIRE. Hence, we also entertain the case where overweighting enters the price-setting behavior of firms. One way to incorporate household behavior in the firm's problem is through the stochastic discount factor, $Q_{t,t+k} = \beta^k \left(\frac{C_{t,t+k}}{C_t}\right)^{-\sigma} \frac{\hat{P}_t}{\hat{P}_{t+k}}$, where $\hat{P}_t / \hat{P}_{t+k}$ reflects the overweighting. The first order condition which maximizes the firm's profits and determines the price is:

$$\mathbb{E}_t \sum_{k=0}^{\infty} \theta_j^k \left[\beta^k \left(\frac{C_{t+k}}{C_t}\right)^{-\sigma} \frac{\hat{P}_t}{\hat{P}_{t+k}} \left(\frac{P_{j,t}^{*}}{P_{j,t+k}}\right)^{-\varepsilon_j} Y_{j,t+k} \left(P_{j,t}^{*} - \frac{\varepsilon_j}{1-\varepsilon_j} MC_{j,t+k|t}^{n} \right) \right] = 0, \quad (13)$$

where $MC_{j,t+k|t}^{n}$ is the nominal marginal cost for a firm in sector j at time $t+k$ which last reset its price in t.

To determine the dynamics of inflation in terms of the sectoral output gap and relative prices, we log-linearize the firm's optimal price setting equation (13) to get

$$p^*_{j,t} = (1-\theta_j\beta)\sum_{k=0}^{\infty}\theta_j^k\beta^k\mathbb{E}_t\left[mc^r_{j,t+k} + p_{j,t+k}\right], \tag{14}$$

where $mc^r_{j,t+k}$ is the firm's real marginal cost in period $t+k$. The above equation shows that the perceived price index incorporated in the firms' problem through the stochastic discount factor does not alter the price-setting equation. The intuition is that overweighting affects both the revenue and costs equally. We show in equation (A.3) of Appendix A.6 that the terms in $\hat{P}$ drop out when log-linearising equation (13).

Simplifying equation (14) gives the standard sectoral Phillips curves in terms of the marginal cost even in the presence of overweighting

$$\pi_{j,t} = \beta\mathbb{E}_t\pi_{j,t+1} + \chi_j mc^r_{j,t} + u_{j,t}, \tag{15}$$

where $\chi_j = \frac{(1-\theta_j)(1-\theta_j\beta)}{\theta_j}$ and $u_{j,t}$ are the sector-specific cost-push shocks for $j = N, O$ that follow an exogenous AR(1) process

$$u_{j,t} = \rho_{u_j}u_{j,t-1} + \varepsilon_{u_j,t}, \qquad \varepsilon_{u_j,t} \sim \mathcal{N}(0,\sigma_{u_j}) \text{ and } i.i.d.$$

Therefore, the sectoral Phillips curves are

$$\pi_{N,t} = \beta\mathbb{E}_t\pi_{N,t+1} + \chi_N\left((\sigma+\phi)\tilde{y}_{N,t} + (1-\sigma-\phi)\omega\tilde{s}_t\right) + u_{N,t} \tag{16}$$

and

$$\pi_{O,t} = \beta\mathbb{E}_t\pi_{O,t+1} + \chi_O\left((\sigma+\phi)\tilde{y}_{O,t} + (\sigma+\phi-1)(1-\omega)\tilde{s}_t\right) + u_{O,t}, \tag{17}$$

where $\tilde{s}_t$ is the relative price ratio gap. The aggregate NK Phillips curve in the economy is the sector-weighted aggregation of the sectoral Phillips curves with $\pi_t = (1-\omega)\pi_{N,t} + \omega\pi_{O,t}$.

5.3 Welfare Function

We derive the welfare function based on the micro-foundations of the model described in the previous section. Based on Woodford (2003) and Galí (2015), assuming that the monetary authority aims to maximize the welfare of the representative household, we obtain a second-order Taylor approximation of the representative consumer's lifetime utility when the economy remains in a neighborhood of an efficient steady state. This gives the following loss function for the central bank

$$\frac{\mathcal{W}}{U_C' C} \approx -\frac{1}{2} E_0 \Sigma_{t=0}^{\infty} \beta^t \Bigg[(1-\omega)\, \tilde{y}_{N,t}^2 + \omega \tilde{y}_{O,t}^2 + (\sigma + \phi - 1)\, \tilde{y}_t^2 + \frac{\varepsilon_N}{\chi_N} (1-\omega)\, \pi_{N,t}^2 + \frac{\varepsilon_O}{\chi_O} \omega \pi_{O,t}^2 \Bigg] + t.i.p + O \left\| \xi \right\|^3, \quad (18)$$

where $t.i.p$ denotes the terms independent of policy and $O \left\| \xi \right\|^3$ includes terms of order higher than two. The welfare function balances the fluctuations in sectoral output gaps along with the variability in sectoral inflation rates.[18] Since (18) does not depend on δ, we find that the overweighting per se does not introduce an additional policy trade-off in the quadratic objective function of the central bank. The reason is that the disproportionate perception of the future price index does not affect the equations involved in deriving the second-order approximation of lifetime utility as shown in Appendix A.7.[19]

5.4 Ramsey Policy

The optimal policy problem of the central bank is to minimize the welfare loss function (18) subject to the IS equation (12) and sectoral Phillips curves (16) and (17). We show the Ramsey policy response to a markup shock in the overweighted sector in Figure 2 and compare it to the standard two-sector NK framework with no overweighting, i.e. $\delta = 0$. We assume the two sectors have equal weight and $\delta = 0.3$ in the overweighted model. Appendix A.8 shows the calibration in Table A.11.

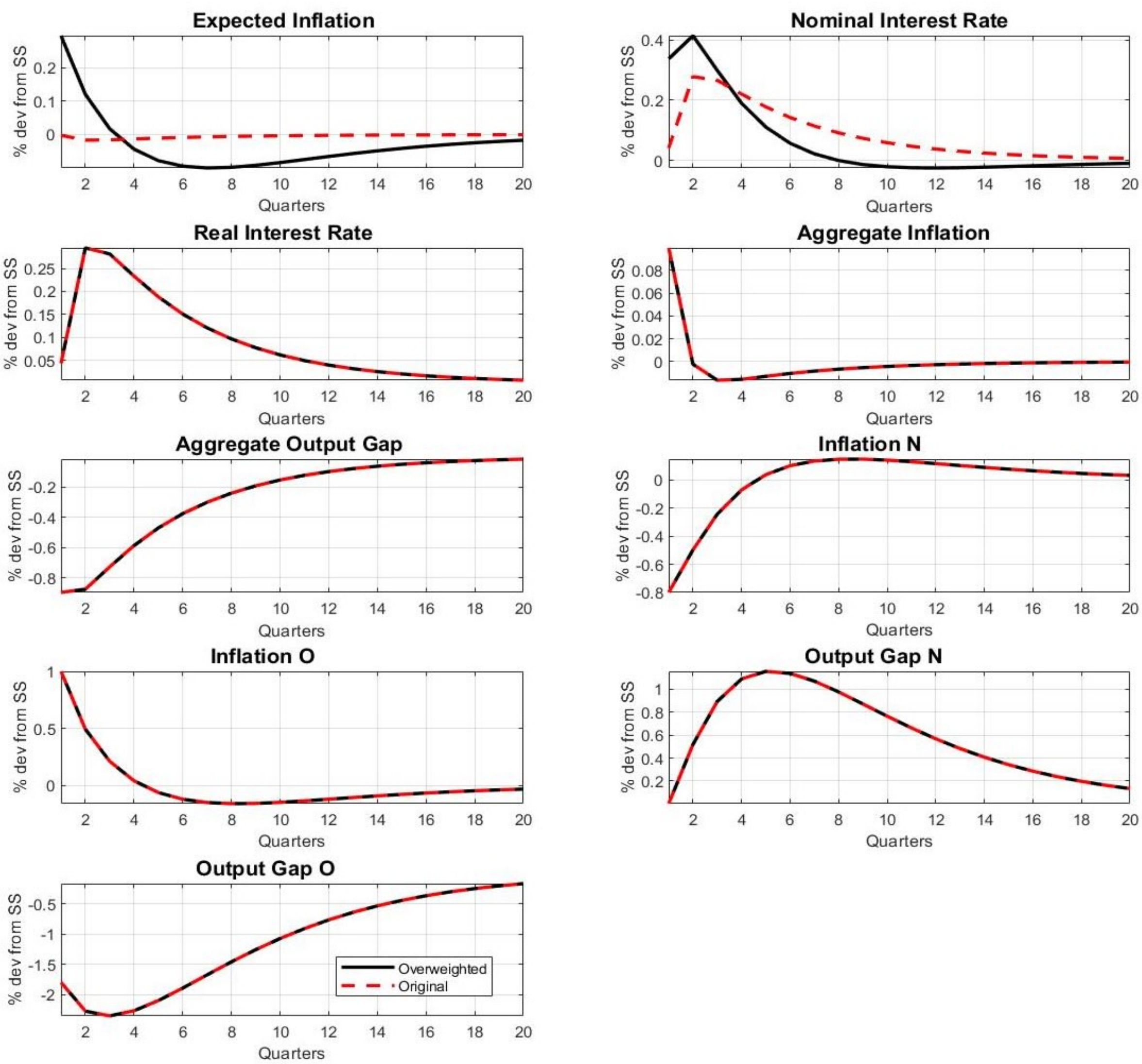
Given the results in previous sections — the model with an overweighted sector differs from the standard two-sector framework with respect to the IS equation while the NK Phillips curve and the welfare function remain the same — it is evident that all variables in the two models are equal except the nominal interest rate. The central bank needs to set the nominal interest rate taking into account expected inflation, which is different when there is overweighting, such that the real interest rate is at the correct level. Figure 2 is shown just to quantify the differential in nominal interest rates vis-a-vis the levels of other variables and to show the dynamics of the model.

Inflation in sector O increases and the output gap decreases in response to a markup shock in that sector. As sector O decreases production, wages fall, and this causes

[18]Note that with $\omega = 1$, that is by putting all weight on a single sector, this loss function becomes identical to the standard one-sector loss function as in Galí (2015).

[19]The equations involved in deriving the quadratic welfare function include: household's utility function, household's first-order conditions, production function, and market clearing.

Figure 2: Optimal Response to a Persistent Markup Shock in Sector O



Notes: The figure shows the impulse responses of selected variables to a persistent one percent markup shock in the overweighted sector. All series are in percent deviations from their steady state except for the interest rate, which is in absolute deviation from the steady state. The black line corresponds to the model with overweighting, while the red dashed line corresponds to the model without overweighting.

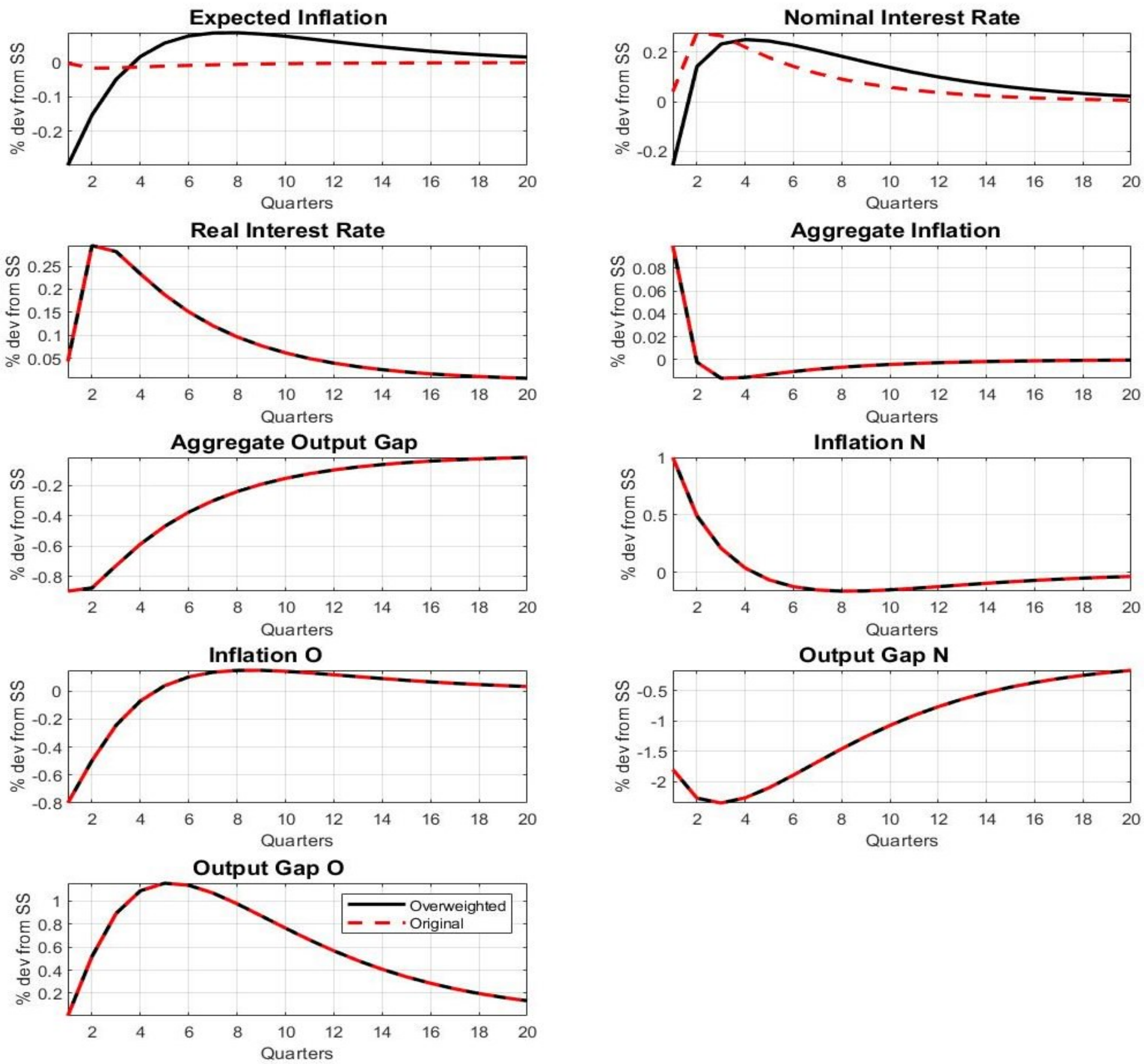
inflation in sector N to go down. On aggregate, the economy experiences higher inflation and a negative output gap. The optimal policy response of the central bank is to increase the nominal interest rate. As expected inflation in the overweighted model is higher, the nominal interest rate needs to be raised more strongly relative to the standard two-sector model.

Given the magnitude of the markup shock plotted in the figure, the inflation differential in the two sectors is about two percentage points. As the shock is expected to recede, the differential in expected inflation is smaller, about one percentage point. Given the degree of overweighting $\delta = 0.3$, this markup shock means that nominal interest rates need to go up by about 30 basis points. In contrast, they almost do not move on impact in the model without overweighting. The stronger and faster response of interest rates in the overweighting model is reversed in future periods because inflation in sector O undershoots later on.

Figure 3 shows the optimal response for a markup shock in sector N. The figure makes a simple yet important point — it is not always the case that the interest rate needs to react more in the model with overweighting. In fact, the optimal interest rate responses have the opposite sign in the two models. Needless to say, the nominal interest rate continues to be more responsive to expected inflation in the overweighted sector.

Appendix A.9 derives the model with overweighted durable and non-durable sectors. Figures A.1 and A.2 show the optimal responses of monetary policy to markup shocks. The model is less tractable, but all the qualitative features are present. The results are also similar quantitatively. The reason is that there are two opposing forces. On the one hand, Barsky et al. (2007) showed that the durable goods sector matters disproportionately more for monetary policy. This induces stronger effects. On the other hand, Erceg and Levin (2006) showed that the durable goods sector is more interest rate sensitive relative to non-durables, which reduces the required movements in nominal interest rates.

Figure 3: Optimal Response to a Persistent Markup Shock in Sector N



Notes: The figure shows the impulse responses of selected variables to a persistent one percent markup shock in the non-overweighted sector. All series are in percent deviations from their steady state except for the interest rate, which is in absolute deviation from the steady state. The black line corresponds to the model with overweighting, while the red dashed line corresponds to the model without overweighting.

6 Conclusion

The recent literature on salience has found that individuals focus disproportionately more on frequently observed prices and large price changes when forming their inflation expectations, even if those items account for low weight in official inflation measurement. The impact of gas and grocery prices in this regard has been well-established in the literature. In this paper, we find a novel channel through house prices.

The motivation to inspect whether house prices are salient arises from several observations. Housing is one of the largest purchases and a major financial decision for a household. Also, housing markets have been given substantial media attention, and even more so since the Global Financial Crisis. High homeownership rates and geographic mobility in the United States also suggest that house prices are watched closely. In addition, since houses are one of the biggest assets in a household's portfolio and are associated with significant wealth and collateral effects, there is a preoccupation with house prices among individuals.

We use two complementary empirical strategies. First, we employ an instrumental variable approach based on the elasticity of housing supply to control for possible endogeneity through common causes or omitted variable bias. In addition, we use time and region fixed effects as well as household-specific characteristics and variables such as past house valuations, which take care of many confounding explanations. We indeed find there is overweighting using two household survey datasets for the US.

Our second approach is to exploit variation among households. We find a significant impact of the cognitive abilities of individuals, as individuals with stronger numeracy skills overweight by a lesser degree. The same holds true for education. Also, households who have moved house recently overweight by more. The use of these two complementary identification strategies significantly reduces the number of possible alternative explanations. Any potential concerns of violations of the exclusion restriction in the first empirical strategy would need to correlate with the variables in the second strategy, such as having moved home recently.

Subsequently, we model this overweighting behavior in a two-sector NK model with overweighted and non-overweighted sectors. Our model is general and applies to overweighting in any sector, either housing, as in our paper, or groceries and gas, as previously proposed in the literature. We provide a simple model aimed at examining the consequences for monetary policy. We find that the model with an overweighted sector differs from the standard two-sector framework with respect to the IS equation. The NK Phillips curve and the welfare function remain the same even if firms, in addition to households, also display overweighting behavior. Crucially, the nominal interest rate needs to be set differently; the central bank needs to realize that there is overweighting on the part of the households and measure inflation expectations correctly such that it sets the policy instrument appropriately. Summing up, the optimal nominal interest rate becomes more sensitive to expectations of inflation in the overweighted sector.

In future research, we plan to explore additional datasets to examine if there is overweighting of housing in inflation expectations in more countries. In this paper, the results with IV, a powerful set of controls, and consistent results in the cross-section provide a robust set of evidence; yet, we are conducting an RCT to confirm our research hypothesis further. We unveil a novel mechanism that strengthens the importance of stabilizing housing markets. Our mechanism is unrelated to the housing literature on collateral, borrowing constraints, financial accelerator, among other features. It is desirable that future research combines the overweighting of house price expectations with such features. In a recent paper, Holden (2024) discusses the many advantages of monetary policy responding to real rates. Our work is relevant to such proposals — and to monetary policy in theory and practice — as central banks need the correct measurement of households' inflation expectations to compute the relevant real interest rate.

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Online Appendix

A.1 Accounting Benchmark

This section describes the calculation of the benchmark coefficients presented in Table 1 in Section 2.

Per best practice of the BLS, actual house prices are not directly reflected in the CPI as these are asset prices, while the CPI must only capture the consumption part of housing services. According to this direct computation, the impact of house price inflation on overall inflation would be zero. However, there could be other effects.

To get an accounting benchmark, we regress CPI inflation and components of CPI relevant to housing on house price inflation. We use four different specifications, where the right-hand-side variable is house price growth and the left-hand-side variable in the respective specification is (1) CPI inflation, (2) CPI shelter inflation, (3) subcomponents of CPI shelter inflation, and (4) OER sub-component of CPI shelter inflation. All specifications include twelve leads and lags of house price growth as controls and are run for two sample periods, 1987 to 2022 and 1997 to 2022. The sample is monthly. The regression coefficients from each specification, that is, the coefficient on house price growth and its twelve leads and lags, are then summed.

Next, we multiply the sum of regression coefficients with the respective categories' weights in the CPI in order to scale the impacts appropriately. Because we estimate the regressions over two different sample periods, we consider the average weight in the CPI over those two samples. The average weights and sum of coefficients for different categories are reported in Table A.1. This data is then used to report the final accounting benchmarks for each specification in Table 1, depending on which categories are included in each specification. The benchmark coefficients obtained in this way are robust to contemporaneous specifications as well, that is, with the exclusion of leads and lags of house price growth.

Table A.1: Relative Weights of CPI Components and Estimated Coefficients

CPI Component	CPI Inflation		Shelter		Rent of Primary Residence	
Sample	Average Weight	Coefficient	Average Weight	Coefficient	Average Weight	Coefficient
1987 – 2022	1	0.004	0.310	0.087	0.071	0.086
1997 – 2022	1	0.033	0.322	0.123	0.068	0.090

CPI Component	Lodging Away from Home		Owners Equivalent Rent of Residences		Tenants and HH's Insurance	
Sample	Average Weight	Coefficient	Average Weight	Coefficient	Average Weight	Coefficient
1987 – 2022			0.222	0.072		
1997 – 2022	0.016	0.141	0.233	0.107	0.003	-0.032

Notes: This table corresponds to intermediate calculations needed for Table 1 in the main text. Each column corresponds to a different regression for two sample periods, 1987-2022 and 1997-2022, where the dependent variable is mentioned at the top of the column. The independent variable in each column is house price growth and its twelve leads and lags. The reported coefficient in each column is the sum of coefficients of house price growth and its twelve leads and lags. The average weight under each column is the average weight of the dependent variable in the CPI index.

A.2 Summary Statistics

For the SCE data, the summary statistics for the main variables are in Table A.2. The full sample includes about 111527 observations. The average one-year-ahead inflation expectations are about 3.84 percent, the average one-year-ahead house price expectations are 4.32 percent, and the average one-year-ahead gas, food and rent price expectations are 6.99, 6.63, and 8.15 percent, respectively. The average age in the sample is around 51 years, and about 47 percent of the respondents are females. 57 percent of the respondents have at least a college degree, and 73 percent of the respondents have high numeracy skills. Additionally, 55 percent of respondents are employed full-time, 73 percent of the respondents are homeowners, and around 64 percent of respondents are married or living with someone. Around 36 percent of the respondents have household income in the range of $50000-100000, and around 29 percent have household incomes above $100000.

Table A.2: Summary Statistics for SCE

Variable	Obs	Mean	Std. Dev.	Min	Max	P25	P50	P75
Inflation Expectations (1Y)	111527	3.84	4.9	-36	36	1	3	5
House Price Expectations (1Y)	111527	4.32	5.76	-36	36	1	3	6
Food Price Expectations (1Y)	111527	6.63	6.21	-5	40	3	5	10
Gas Price Expectations (1Y)	111527	6.99	9.65	-20	50	2	5	10
Rent Expectations (1Y)	111527	8.15	21.3	-10	40	3	5	10
Graduate or Higher	111299	0.57	0.49	0	1	0	1	1
Gender (Females)	111505	0.47	0.49	0	1	0	0	1
Age	111495	50.83	15.16	17	99	38	51	63
Homeowner	111518	0.73	0.44	0	1	0	1	1
Married or living with someone	111516	0.64	0.47	0	1	0	1	1
Employed full-time	111527	0.55	0.49	0	1	0	1	1
Household Income (over 100K)	110366	0.29	0.45	0	1	0	0	1
Household Income (50-100K)	110366	0.36	0.48	0	1	0	0	1
Numeracy (high)	111487	0.73	0.44	0	1	0	1	1

For the Michigan Survey of Consumers, the summary statistics for the variables of interest are in Table A.3. The full sample includes about 65,396 observations. The average one-year-ahead inflation expectations are about 3.5 percent, the average one-year-ahead house price expectations are 1.4 percent, and the average gas price expectations are 6.08 percent. The twelve-month-ahead gas price expectations in the interview look at the expected increase/decrease in gas prices in cents per gallon. The US All-Grade Conventional Gas Price series was used to convert this into one-year-ahead gas price expectations.

The average age in the sample is around 55 years, and about 43 percent of the respondents are females. Close to 60 percent of the respondents have at least a college degree, while almost the entire sample has graduated high school. Around 71 percent of respondents are married or living with someone. The average family size is more than two individuals, and the average total household income is $108,191.

Table A.3: Summary Statistics for MSC

Variable	Obs	Mean	Std. Dev.	Min	Max	P25	P50	P75
Price Expectations (1Y)	65396	3.54	3.93	-20	20	1	3	5
House Price Expectations (1Y)	65396	1.42	4.88	-20	20	0	0	4
Gas Price Expectations (1Y)	65396	6.08	9.56	-13.91	50.77	0	2.44	9.39
College Graduate	65159	0.60	0.48	0	1	0	1	1
High School Graduate	65224	0.97	0.15	0	1	1	1	1
Age	65008	54.96	15.75	18	97	44	56	66
Gender (Females)	65396	0.43	0.49	0	1	0	0	1
Marital Status	65323	0.71	0.45	0	1	0	1	1
Family Size	65396	2.64	1.36	1	13	2	2	3
Household Income (cur USD)	62234	108191.30	88783.72	2400	500000	50000	85000	137500
Market Value of Home	65396	844797	2191885	1000	9999998	150000	250000	450000

A.3 Additional Regression Results

Table A.4 presents the OLS results before and after controlling for gas and food price expectations using the SCE data. Column (1) reports OLS coefficients for the impact of house price expectations on inflation expectations. Column (2) controls for gas price expectations. Column (3) controls for gas price expectations and food price expectations. The coefficient of house price expectations is stable, decreasing slightly with these controls. All specifications in the main text include gas and food expectations.

Table A.4: Controlling for Other Expectations

Inflation Expectations (1Y)	(1)	(2)	(3)
House Price	0.276***	0.264***	0.243***
Expectations (1Y)	(0.009)	(0.008)	(0.008)
Gas Price		0.069***	0.023***
Expectations (1Y)		(0.003)	(0.003)
Food Price			0.163***
Expectations (1Y)			(0.006)
Demographics	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
State Fixed Effects	Yes	Yes	Yes
R-squared	0.160	0.178	0.207
N	110054	110054	110054

Notes: This table uses SCE data. Column (1) reports OLS coefficients for the impact of house price expectations on inflation expectations. Column (2) controls for gas price expectations. Column (3) controls for gas price expectations and food price expectations. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

To show the impact of using instruments to control for endogeneity of different expectations, IV results analogous to Table A.4 are shown in Table A.5. Column (1) reports IV coefficients where house price expectations is the only endogenous variable and the instruments used are WRLURI and the interaction of WRLURI with real mortgage rate. Gas and food price expectations are used as exogenous controls in this regression. Column (2) reports IV results where gas price expectations are also instrumented. The instruments used are real gasoline taxes along with the ones used in Column (1). Column (3) reports IV results with food price expectations as an endogenous variable in addition to gas price expectations and food price expectations. The instruments used include the lagged real global price of food index along with those used in Column (2). State fixed effects are excluded here as they are correlated with WRLURI, which is time-invariant at the state level. The inclusion of state fixed effects in this specification (and thereby exclusion of the WRLURI) gives similar coefficients, but larger standard errors, and the model is not well identified (not shown here). Although the coefficients across columns are not very different, our preferred specification is Column (3), where we control for endogeneity in house price expectations, gas price expectations, and food price expectations.

Table A.5: Adding Instruments Sequentially

Inflation Expectations (1Y)	(1)	(2)	(3)
House Price	0.318**	0.371**	0.358***
Expectations (1Y)	(0.157)	(0.146)	(0.117)
Over-identification Test:			
Hansen J-stat (Chi-sq p-value)	0.7388	0.3609	0.5112
Demographics	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
State Fixed Effects	No	No	No
R-squared	0.195	0.179	0.121
N	110054	110054	110054

Notes: This table uses SCE data. Column (1) reports IV coefficients where house price expectations is the only endogenous variable and the instruments used are WRLURI and the interaction of WRLURI with real mortgage rate. Gas and food price expectations are used as exogenous controls in this regression. Column (2) reports IV results where gas price expectations is also endogenous in addition to house price expectations. The instruments used are real gasoline taxes along with the ones used in Column (1). Column (3) reports IV results with food price expectations also as an endogenous variable in addition to gas and food price expectations. The instruments used here are the lagged real global food price index and those used in Column (2). State fixed effects are excluded here as they are correlated with WRLURI. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

More IV specifications for the SCE data, analogous to Table 2 in the main text, are presented in Table A.6. Column (1) excludes lags of expectations as instruments. It only uses the different instruments from the literature described in the main text, namely WRLURI, the interaction of WRLURI with real mortgage rate, lagged global price of food index, and real gasoline taxes as instruments. Column (2) uses the interaction of WRLURI with the mortgage rate net of federal funds rate as an instrument, in addition to those in Column (1).

We also examine results for a different instrument for food price expectations instead of the lagged global price of food index used in the main text. Column (3) of Table A.6 uses the twelve-month lagged real fertilizer price index reported in the Commodity Data Portal of the IMF as an instrument for food price expectations, everything else is the same as in Column (1). Since high fertilizer prices would translate into higher inflation through food prices, this satisfies the exclusion restriction. State fixed effects are not included in Columns (1) to (3) as these are correlated with WRLURI, which is time-invariant at the state level, as described previously. The inclusion of state fixed effects in this specification (and thereby exclusion of the WRLURI) gives similar coefficients, but larger standard errors, and the model is not well identified (not shown here). The overidentified specification shown in Table A.6 is best suited in this regard.

Column (4) is the same as column (3) but includes lagged expectations as instruments. It is analogous to Column (4) in Table 2 with the twelve-month lagged real fertilizer price index as the instrument for food price expectations instead of the lagged real global price of food.

Table A.6: Additional Baseline Results Using SCE

Inflation Expectations (1Y)	(1)	(2)	(3)	(4)
House Price	0.358^{***}	0.366^{**}	0.414^{**}	0.462^{***}
Expectations (1Y)	(0.117)	(0.115)	(0.168)	(0.050)
Over-identification Test:				
Hansen J-stat(Chi-sq p-value)	0.5112	0.2858	0.4104	0.3431
Demographics	Yes	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes	Yes
State Fixed Effects	No	No	No	Yes
R-squared	0.121	0.166	0.121	0.204
N	110054	110054	110054	9118

Notes: Column (1) has IV-GMM results using WRLURI, the interaction of WRLURI with real mortgage rate, lagged global price of food index, and real gasoline taxes as instruments. This is the counterpart of regression (4) in Table 2 in the main text excluding lags as instruments. Column (2) has IV-GMM results as Column (1), where instead of the interaction of WRLURI with real mortgage rate, the instrument used is the interaction of WRLURI with mortgage rate net of the federal funds rate; everything else is the same. Column (3) has IV-GMM results as in Column (1), where instead of the lagged global price of food index, the instrument used is the twelve-month lagged real fertilizer price index; everything else is the same. State fixed effects are excluded in Columns (1) to (3) as they are correlated with WRLURI. Column (4) has IV-GMM results using lagged expectations and interaction of WRLURI with real mortgage rate, twelve-month lagged real fertilizer price index, and real gasoline taxes as instruments. This is the counterpart of Column (4) in Table 2 replacing lagged global price of food index with twelve-month lagged real fertilizer price index. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

The baseline regression results for SCE with individual fixed effects are shown in Table A.7, with OLS results in Column (1) and IV results in Column (2). The problem with this specification is that individuals stay at most 12 months in the sample and often much less. That means each individual reports a given inflation expectations and house price expectations and, given the short-time horizon, does not revise its expectations by much. Hence, individual fixed effects absorb most of the variation. For this reason, such results are often discarded. For instance, individual fixed effects with SCE data have been examined by Kuchler and Zafar (2019) who do not find enough statistical power for their results as individual fixed effects absorb both cross-sectional variation and differences in house price changes over time. Instead, the authors rely on the results without fixed effects where their main result is present. In our case, however, there is still evidence of overweighting relative to the benchmark.

Table A.7: Baseline with Individual Fixed Effects

	(1)	(2)
Inflation Expectations (1Y)	OLS	IV
House Price Expectations (1Y)	0.137***	0.160**
	(0.007)	(0.070)
Time Fixed Effects	Yes	Yes
State Fixed Effects	Yes	Yes
R-squared	0.104	0.131
N	110054	110054

Notes: This table uses SCE data. Column (1) has linear panel regression with individual fixed effects. Column (2) has IV panel regression with individual fixed effects; the instruments include the interaction of WRLURI with real mortgage rate, lagged global price of food index, and real gasoline taxes. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

A.4 Departure from Full Information Rational Expectations (FIRE)

This section examines the predictability of forecast error in inflation by estimating equation (A.1):

$$\pi_{t,t+1} - \pi^{e}_{it,t+1} = \alpha + \beta \pi^{he}_{it} + \delta X_{it} + \gamma_t + \nu_r + \epsilon_{i,t+1}, \tag{A.1}$$

where the dependent variable is the one-year-ahead inflation forecast error for respondent i for inflation realized at time $t+1$ for forecast provided at time t, π^{he}_{it} is the one-year-ahead house price expectations for respondent i at time t, X_{it} are the individual characteristics such as demographics and other expectations, γ_t represents time fixed effects, and ν_r are region fixed effects. Under FIRE, the forecast error is unpredictable for any information known at time t and earlier, and as such $\beta = 0$. For the SCE, we also explore the panel component, and instead of π^{he}_{it}, we consider $\pi^{he}_{i,t-1}$.

The results from this exercise are reported in Table A.8. For both the SCE and MSC data, the forecast error is predictable by house price expectations contemporaneously, as well as by one period-lagged house price expectations for the SCE. This confirms the violation of FIRE in both datasets.

Table A.8: Explaining the Forecast Error

$\pi_{t,t+1} - \pi^{e}_{it,t+1}$	(1) SCE	(2) SCE	(3) MSC
House Price Expectations at t (1Y)	-0.244***		-0.016***
	(0.008)		(0.003)
House Price Expectations at t-1 (1Y)		-0.118***	
		(0.012)	
Demographics	Yes	Yes	Yes
Time Fixed Effects	Yes	Yes	Yes
State/Region Fixed Effects	Yes	Yes	Yes
R-squared	0.222	0.161	0.325
N	110054	12954	58143

Notes: Column (1) and Column (3) look at the house price expectations in the current period for SCE and MSC, respectively. Column (2) uses the panel component of SCE and looks at the house price expectations for the previous month. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

A.5 Cross-Sectional Heterogeneity

This section presents additional results regarding the cross-sectional heterogeneity. Table A.9 presents the results by homeownership. Table A.10 presents the results by age.

Table A.9: By Homeownership

Inflation Expectations (1Y)	(1)
Homeowner*House Price Expectations (1Y)	0.229***
	(0.009)
Renter*House Price Expectations (1Y)	0.263***
	(0.015)
Statistical Diff. in Coefficients (Wald Test)	0.0450
Demographics	Yes
Time Fixed Effects	Yes
State Fixed Effects	Yes
Other Expectations	Yes
R-squared	0.205
N	110054

Notes: This table uses SCE data. Column (1) compares house price expectations for homeowners versus renters. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Next, we look at the impact of age cohorts in Table A.10. Those in the group of age over 60 overweight the least from house price expectations, but the difference across age groups is not statistically significant.

Table A.10: By Age

Inflation Expectations (1Y)	Age
Age (> 60)*House Price Expectations (1Y)	0.230***
	(0.013)
Age (40 - 60)*House Price Expectations (1Y)	0.253***
	(0.013)
Age (< 40)*House Price Expectations (1Y)	0.247***
	(0.015)
Statistical Difference in Coefficients (Wald Test)	0.4157
Demographics	Yes
Time Fixed Effects	Yes
State Fixed Effects	Yes
Other Expectations	Yes
R-squared	0.206
N	110054

Notes: This table uses SCE data. Column (1) compares house price expectations for different age cohorts, i.e., ages less than 40, between 40-60, and above 60. Standard errors are in parentheses. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

A.6 Derivation of the NKPC

This section shows the derivation of the NKPC accounting for the overweighting behavior through the stochastic discount factor. In the presence of overweighting, equation (13) in the main text for $j = N$ is

$$\frac{P^*_{N,t}}{P_{N,t-1}} \Sigma_{k=0}^{\infty} \theta_N^k E_t \left[\beta^k \left(\frac{C_{t,t+k}}{C_t} \right)^{-\sigma} \frac{P_{N,t}^{1-\omega-\delta} P_{O,t}^{\omega+\delta}}{P_{N,t+k}^{1-\omega-\delta} P_{O,t+k}^{\omega+\delta}} P_{N,t+k}^{\epsilon_N} C_{N,t+k} \right]$$

$$= \frac{\varepsilon_N}{\varepsilon_N - 1} \Sigma_{k=0}^{\infty} \theta_N^k E_t \left[\beta^k \left(\frac{C_{t,t+k}}{C_t} \right)^{-\sigma} \frac{P_{N,t}^{1-\omega-\delta} P_{O,t}^{\omega+\delta}}{P_{N,t+k}^{1-\omega-\delta} P_{O,t+k}^{\omega+\delta}} \left(P_{N,t+k}\right)^{1+\epsilon_N} C_{N,t+k} MC^r_{N,t+k|t} \frac{1}{P_{N,t-1}} \right]. \tag{A.2}$$

Taking the first-order Taylor expansion of the LHS of the above

$$\Sigma_{k=0}^{\infty} \theta_N^k \beta^k P \frac{P_N^{\epsilon_N+\omega+\delta-1}}{P_O^{\omega+\delta}} C_N \Big[1 + \left(\frac{P^*_{N,t} - P_N}{P_N} \right) - \left(\frac{P_{N,t-1} - P_N}{P_N} \right) + (-\sigma) \left(\frac{C_{t+k} - C}{C} \right)$$
$$- (-\sigma) \left(\frac{C_t - C}{C} \right) + (1 - \omega - \delta) \left(\frac{P_{N,t} - P_N}{P_N} \right) + (\omega + \delta) \left(\frac{P_{O,t} - P_O}{P_O} \right)$$
$$+ (\epsilon_N + \omega + \delta - 1) \left(\frac{P_{N,t+k} - P_N}{P_N} \right) - (\omega + \delta) \left(\frac{P_{O,t+k} - P_O}{P_O} \right) + \left(\frac{C_{N,t+k} - C_N}{C_N} \right) \Big].$$

This simplifies to

$$\Sigma_{k=0}^{\infty} \theta_N^k \beta^k P \frac{P_N^{\epsilon_N+\omega+\delta-1}}{P_O^{\omega+\delta}} C_N \Big[1 + p^*_{N,t} - p_{N,t-1} - \sigma c_{t+k} + \sigma c_t + (1-\omega-\delta) p_{N,t} + (\omega+\delta) p_{O,t}$$
$$+ (\epsilon_N + \omega + \delta - 1) \, p_{N,t+k} - (\omega + \delta) \, p_{O,t+k} + c_{N,t+k} \Big].$$

Taking the first-order Taylor expansion of the RHS

$$\frac{\varepsilon_N}{\varepsilon_N - 1} \Sigma_{k=0}^{\infty} \theta_N^k E_t \beta^k P \frac{P_N^{\epsilon_N+\omega+\delta-1}}{P_O^{\omega+\delta}} C_N MC^r_N \Big[1 + (-\sigma) \left(\frac{C_{t+k} - C}{C} \right) - (-\sigma) \left(\frac{C_t - C}{C} \right)$$
$$+ (1 - \omega - \delta) \left(\frac{P_{N,t} - P_N}{P_N} \right) + (\omega + \delta) \left(\frac{P_{O,t} - P_O}{P_O} \right) + (\omega + \delta + \epsilon_N) \left(\frac{P_{N,t+k} - P_N}{P_N} \right)$$
$$-(\omega + \delta) \left(\frac{P_{O,t+k} - P_O}{P_O} \right) + \left(\frac{C_{N,t+k} - C_N}{C_N} \right) - \left(\frac{P_{N,t-1} - P_N}{P_N} \right) + \left(\frac{MC^r_{N,t+k|t} - MC_N}{MC_N} \right) \Big],$$

which simplifies to

$$\frac{\varepsilon_N}{\varepsilon_N - 1}\Sigma_{k=0}^{\infty}\theta_N^k E_t \beta^k P \frac{P_N^{\epsilon_N+\omega+\delta-1}}{P_O^{\omega+\delta}} C_N MC_N^r \Big[1 - \sigma c_{t+k} + \sigma c_t + (1-\omega-\delta) p_{N,t} + (\omega+\delta) p_{O,t} + (\omega+\delta+\epsilon_N)\, p_{N,t+k} - (\omega+\delta)\, p_{O,t+k} + c_{N,t+k} - p_{N,t-1} + mc_{N,t+k|t}^r \Big].$$

Combining the LHS and RHS, the terms with the overweighting parameter cancel out, we get

$$\sum_{k=0}^{\infty} \theta_N^k \beta^k E_t \left(p_{N,t}^* - p_{N,t+k} \right) = \frac{\epsilon_N}{\epsilon_N - 1} MC_N^r \sum_{k=0}^{\infty} \theta_N^k \beta^k E_t \left[mc_{t+k|t}^r \right], \tag{A.3}$$

further simplifying to

$$p_{N,t}^* = (1 - \theta_N \beta) \sum_{k=0}^{\infty} \theta_N^k \beta^k E_t \left[mc_{N,t+k}^r + p_{N,t+k} \right]$$

as in equation (14) in the main text. Similarly, we get the same result for $j = O$. Thus, the overweighting incorporated through the stochastic discount factor does not change the Phillips Curve.

Proceeding similarly as in Galí (2015), subtract $p_{N,t-1}$ from both sides and simplify to get

$$\begin{aligned} p_{N,t}^* - p_{N,t-1} &= \theta_N \beta \mathbb{E}_t \left(p_{N,t+1}^* - p_{N,t} \right) + (1 - \theta_N \beta)\, mc_{N,t}^r + (1 - \theta_N) \left(p_{N,t}^* - p_{N,t-1} \right), \\ &= \beta \mathbb{E}_t \left(p_{N,t+1}^* - p_{N,t} \right) + \frac{(1 - \theta_N \beta)}{\theta_N} mc_{N,t}^r. \end{aligned}$$

Multiplying by $(1 - \theta_N)$ gives the NKPC in terms of the marginal cost

$$\pi_{N,t} = \beta \mathbb{E}_t \pi_{N,t+1} + \chi_N mc_{N,t}^r + u_{N,t}.$$

A.7 Derivation of the Welfare Function

Consider the utility function of the representative household

$$U = U\left(C_{N,t}, C_{O,t}\right) - V\left(L_{N,t}, L_{O,t}\right). \tag{A.4}$$

To derive the welfare function from the utility function, consider the second-order approximation of the utility from the consumption of the two goods. We know $\mathbf{U}\left(C_t\right) = \frac{C_t^{1-\sigma}}{1-\sigma}$and $C_t = \left(\mathrm{C_{N,t}}\right)^{1-\omega}\left(C_{O,t}\right)^{\omega}$. Then

$$\begin{aligned} U\left(\mathrm{C_{N,t}}, \mathrm{C_{O,t}}\right) = {} & U\left(C_N, C_O\right) + U'_{C_N}\left(C_{N,t} - C_N\right) + U'_{C_O}\left(C_{O,t} - C_O\right) + \frac{1}{2}U''_{C_N}\left(C_{N,t} - C_N\right)^2 \\ & + \frac{1}{2}U''_{C_O}\left(C_{O,t} - C_O\right)^2 + U''_{C_N C_O}\left(C_{N,t} - C_N\right)\left(C_{O,t} - C_O\right) + O\left\|\xi\right\|^3, \end{aligned} \tag{A.5}$$

where $O\left\|\xi\right\|^3$summarizes all the third and higher order terms.
We know, $\frac{C_{j,t} - C_j}{C_j} = c_{j,t} + \frac{1}{2}c_{j,t}^2$ where $c_{j,t} = log\left(\frac{C_{j,t}}{C_j}\right)$ is the log deviation from the steady state under sticky prices. Substituting the derivative and writing in log deviations from steady state

$$\begin{aligned} U\left(C_{N,t}, C_{O,t}\right) \approx {} & U\left(C_N, C_O\right) + U'_{C_N}C_N\Bigg[c_{N,t} + \frac{1}{2}c_{N,t}^2 + \frac{\sigma\left(\omega - 1\right) - \omega}{2}\left(c_{N,t} + \frac{1}{2}c_{N,t}^2\right)^2 \\ & + \omega\left(1 - \sigma\right)\left(c_{N,t} + \frac{1}{2}c_{N,t}^2\right)\left(c_{O,t} + \frac{1}{2}c_{O,t}^2\right)\Bigg] \\ & + U'_{C_O}C_O\left[c_{O,t} + \frac{1}{2}c_{O,t}^2 + \frac{\omega\left(1 - \sigma\right) - 1}{2}\left(c_{O,t} + \frac{1}{2}c_{O,t}^2\right)^2\right] + O\left\|\xi\right\|^3. \end{aligned} \tag{A.6}$$

Substituting $U'_c C = \left(1 - \omega\right)U'_{C_N}C_N = \omega U'_{C_O}C_O$ in the above and simplifying

$$\begin{aligned} U\left(C_t\right) - U\left(C\right) \approx U'_C C\Bigg[& \left(1 - \omega\right)c_{N,t} + \omega c_{O,t} + \left(\frac{1 - \sigma}{2}\right)\left(1 - \omega\right)^2 c_{N,t}^2 + \left(\frac{1 - \sigma}{2}\right)\omega^2 c_{O,t}^2 \\ & + \omega\left(1 - \omega\right)\left(1 - \sigma\right)c_{N,t}c_{O,t}\Bigg] + O\left\|\xi\right\|^3. \end{aligned} \tag{A.7}$$

Next, we consider the disutility of labor for the households

$$V\left(L\right) = \frac{L_t^{1+\phi}}{1 + \phi}, \tag{A.8}$$

where $L_t = L_{N,t} + L_{O,t}$. The second-order approximation of this function is

$$V\left(L_{N,t}, L_{H,t}\right) \approx V\left(L_N, L_O\right) + V'_{L_N}\left(L_{N,t} - L_N\right) + V'_{L_O}\left(L_{O,t} - L_O\right) + \frac{1}{2}V''_{L_N}\left(L_{N,t} - L_N\right)^2 + \frac{1}{2}V''_{L_O}\left(L_{O,t} - L_O\right)^2 + V''_{L_N L_O}\left(L_{N,t} - L_N\right)\left(L_{O,t} - L_O\right) + O\left\|\xi\right\|^3. \tag{A.9}$$

We know $\frac{L_N}{L} = (1-\omega)$ and $\frac{L_O}{L} = \omega$. Substituting the derivatives and further simplifying

$$V\left(L_t\right) - V\left(L\right) \approx V'_L L\Bigg[\left(1-\omega\right) l_{N,t} + \left(\frac{1-\omega}{2}\right) l_{N,t}^2 + \omega l_{O,t} + \frac{\omega}{2} l_{O,t}^2 + \frac{\phi}{2}\left(1-\omega\right)^2 l_{N,t}^2 + \frac{\phi}{2}\omega^2 l_{O,t}^2 + \phi\omega\left(1-\omega\right) l_{N,t} l_{O,t}\Bigg] + O\left\|\xi\right\|^3. \tag{A.10}$$

Combine equations $(A.7)$, $(A.10)$ and substitute $V'_L L = -U'_C C$ to get the welfare function

$$\mathcal{W} \approx U'_C C\Bigg[\left(1-\omega\right) c_{N,t} + \omega c_{O,t} + \left(\frac{1-\sigma}{2}\right)\left(1-\omega\right)^2 c_{N,t}^2 + \left(\frac{1-\sigma}{2}\right)\omega^2 c_{O,t}^2 + \omega\left(1-\omega\right)\left(1-\sigma\right) c_{N,t} c_{O,t} - \left(1-\omega\right) l_{N,t} - \left(\frac{1-\omega}{2}\right) l_{N,t}^2 - \omega l_{O,t} - \frac{\omega}{2} l_{O,t}^2 - \frac{\phi}{2}\left(1-\omega\right)^2 l_{N,t}^2 - \frac{\phi}{2}\omega^2 l_{O,t}^2 - \phi\omega\left(1-\omega\right) l_{N,t} l_{O,t}\Bigg] + O\left\|\xi\right\|^3. \tag{A.11}$$

We know $l_{j,t} = y_{j,t} - a_{j,t} + d_{j,t}$ $\forall j = N, O$ where

$$d_{jt} = log \int_0^1 \left(\frac{P_{jt}(i)}{P_{jt}}\right)^{-\varepsilon_{jt}} di. \tag{A.12}$$

Also, from market clearing we have $c_{j,t} = y_{j,t}$. Substituting in $(A.11)$

$$\frac{\mathcal{W}}{U'_C C} \approx \left(1-\omega\right) y_{N,t} + \omega y_{O,t} + \left(\frac{1-\sigma}{2}\right)\left(1-\omega\right)^2 y_{N,t}^2 + \left(\frac{1-\sigma}{2}\right)\omega^2 y_{O,t}^2 + \omega\left(1-\omega\right)\left(1-\sigma\right) y_{N,t} y_{O,t} - \left(1-\omega\right) y_{N,t} - \left(1-\omega\right) d_{N,t} - \left(\frac{1-\omega}{2}\right) y_{N,t}^2 + \left(1-\omega\right) y_{N,t} a_{N,t} - \omega y_{O,t} - \left(\frac{\omega}{2}\right)^2 y_{O,t}^2 - \omega d_{O,t} + \omega y_{O,t} a_{O,t} - \frac{\phi}{2}\left(1-\omega\right)^2 y_{N,t}^2 + \phi\left(1-\omega\right)^2 y_{N,t} a_{N,t} - \frac{\phi}{2}\left(1-\omega\right)^2 y_{O,t}^2 + \phi\omega^2 y_{O,t} a_{O,t} - \phi\omega\left(1-\omega\right) y_{N,t} y_{O,t} + \phi\omega\left(1-\omega\right) y_{N,t} a_{O,t} + \phi\omega\left(1-\omega\right) y_{O,t} a_{N,t} + t.i.p + O\left\|\xi\right\|^3, \tag{A.13}$$

where $t.i.p$ includes all the terms independent of policy.

The linear terms in (A.13) cancel out. Consider first the following quadratic terms

$$-\left(\frac{1-\omega}{2}\right) y_{N,t}^{2}+(1-\omega) y_{N,t} a_{N,t}=-\left(\frac{1-\omega}{2}\right)\left[y_{N,t}^{2}-2 y_{N,t} a_{N,t}\right]. \tag{A.14}$$

Substituting $a_{N,t}=y_{N,t}^{n}-y_{t}^{n}+a_{t}$ (where $y_{t}^{n}$and $y_{N,t}^{n}$are flexible price aggregate and sectoral outputs, respectively) in $(A.14)$

$$-\left(\frac{1-\omega}{2}\right) y_{N,t}^{2}+(1-\omega) y_{N,t} a_{N,t}=-\left(\frac{1-\omega}{2}\right)\left[\tilde{y}_{N,t}^{2}-\left(y_{N,t}^{n}\right)^{2}+2 y_{N,t} y_{t}^{n}-2 y_{N,t} a_{t}\right], \tag{A.15}$$

where $\tilde{y}_{N,t}=y_{N,t}-y_{N,t}^{n}$.

Similarly, the quadratic terms for sector O can be simplified to

$$-\left(\frac{\omega}{2}\right) y_{O,t}^{2}+\omega y_{O,t} a_{O,t}=-\left(\frac{\omega}{2}\right)\left[\tilde{y}_{O,t}^{2}-\left(y_{O,t}^{n}\right)^{2}+2 y_{O,t} y_{t}^{n}-2 y_{O,t} a_{t}\right]. \tag{A.16}$$

Next, we simplify the following quadratic terms as

$$\begin{aligned}\left(\frac{1-\sigma}{2}\right) & \left[(1-\omega)^{2} y_{N,t}^{2}+\omega^{2} y_{O,t}^{2}+2 \omega(1-\omega) y_{N,t} y_{O,t}\right] \\ & -\frac{\phi}{2}\left[(1-\omega)^{2} y_{N,t}^{2}+\omega^{2} y_{O,t}^{2}+2 \omega(1-\omega) y_{N,t} y_{O,t}\right]=\left(\frac{1-\sigma-\phi}{2}\right) y_{t}^{2}.\end{aligned} \tag{A.17}$$

Using $(1-\omega) a_{N,t}+\omega a_{O,t} \equiv a_{t}$, the remaining terms in $(A.13)$ can be simplified to

$$\phi(1-\omega)^{2} y_{N,t} a_{N,t}+\phi \omega(1-\omega) y_{O,t} a_{N,t}+\phi \omega^{2} y_{O,t} a_{O,t}+\phi \omega(1-\omega) y_{N,t} a_{O,t}=\phi y_{t} a_{t}.$$

Also, at the flexible price equilibrium $y_{t}^{n}=\frac{1+\phi}{\sigma+\phi} a_{t}$ so

$$\phi y_{t} a_{t}=\phi\left(\frac{\sigma+\phi}{1+\phi}\right) y_{t} y_{t}^{n}. \tag{A.18}$$

Combining $(A.15)$, $(A.16)$, $(A.17)$, and $(A.18)$, the welfare loss function is

$$\begin{aligned}\frac{\mathcal{W}}{U_{C}^{\prime} C} \approx & -\left(\frac{1-\omega}{2}\right) \tilde{y}_{N,t}^{2}-\frac{\omega}{2} \tilde{y}_{O,t}^{2}+\frac{1-\sigma-\phi}{2} y_{t}^{2}-(1-\sigma-\phi) y_{t} y_{t}^{n} \\ & -(1-\omega) d_{N,t}-\omega d_{O,t}+t.i.p+O\|\xi\|^{3}.\end{aligned}$$

Completing the squares in terms of aggregate output

$$\frac{\mathcal{W}}{U_C'C} \approx -\frac{1}{2}E_0\Sigma_{t=0}^{\infty}\beta^t\left[(1-\omega)\,\tilde{y}_{N,t}^2+\omega\tilde{y}_{O,t}^2+\left(\frac{\sigma+\phi-1}{2}\right)\tilde{y}_t^2+2\,(1-\omega)\,d_{N,t}+2\omega d_{O,t}\right]$$
$$+\,t.i.p+O\left\|\xi\right\|^3, \tag{A.19}$$

where $d_{j,t}=\frac{\varepsilon_j}{2}var_i p_{j,t}\,(i)$ as in Lemma 1, Galí (2015).
Based on Woodford (2003) Proposition 6.3, we know

$$\sum_{t=0}^{\infty}\beta^t var_i p_{j,t}\,(i)=\frac{1}{\chi_j}\sum_{t=0}^{\infty}\beta^t\pi_{j,t}^2,$$

where $\chi_j=\frac{(1-\theta_j)(1-\beta\theta_j)}{\theta_j}$. Therefore

$$\sum_{t=0}^{\infty}\beta^t\frac{\varepsilon_j}{2}var_i p_{j,t}\,(i)=\frac{\varepsilon_j}{2\chi_j}\sum_{t=0}^{\infty}\beta^t\pi_{j,t}^2. \tag{A.20}$$

Substituting for $d_{j,t}$ in $(A.19)$, the welfare loss function is

$$\frac{\mathcal{W}}{U_C'C} \approx -\frac{1}{2}E_0\Sigma_{t=0}^{\infty}\beta^t\Bigg[(1-\omega)\,\tilde{y}_{N,t}^2+\omega\tilde{y}_{O,t}^2+(\sigma+\phi-1)\,\tilde{y}_t^2$$
$$+\frac{\varepsilon_N}{\chi_N}(1-\omega)\,\pi_{N,t}^2+\frac{\varepsilon_O}{\chi_O}\omega\pi_{O,t}^2\Bigg]+t.i.p+O\left\|\xi\right\|^3. \tag{A.21}$$

A.8 Parameters

Table A.11: Parameters and Standard Deviation of Shocks

Parameter		Value	Source
Discount factor	β	0.99	Galí (2015)
Inverse IES	σ	2	Petrella et al. (2019)
Inverse Frisch elasticity of labor supply	ϕ	3	Petrella et al. (2019)
Elasticity of substitution between goods (N)	ε_N	9	Galí (2015)
Elasticity of substitution between goods (O)	ε_O	9	Galí (2015)
Price stickiness in sector N	θ_N	0.75	Galí (2015)
Price stickiness in sector O	θ_O	0.75	Galí (2015)
Cost-push shock persistence in sector N	ρ_{u_N}	0.8	Galí (2015)
Cost-push shock persistence in sector O	ρ_{u_O}	0.8	Galí (2015)
Share of sector O in consumption	ω	0.5	Own calculations
Overweighting parameter	δ	0.3	Own calculations
Cost-push shock in N standard deviation	σ_{u_N}	11.358	Own calculations
Cost-push shock in O standard deviation	σ_{u_O}	11.358	Own calculations

Notes: This table shows the parameter values used in Figures 2 and 3 in the main text. The two sectors are taken to be symmetric. The standard deviations of cost-push shock parameters are based on our calculations to normalize sectoral inflation to exhibit a one percent increase.

A.9 Model with Durable Goods

We extend our baseline model to two sectors that produce durable and non-durable goods. The economy consists of three types of agents: a representative household, firms, and the central bank. We assume full labor mobility between the two sectors, a uniform wage rate in the economy, and abstract from any inter-sectoral linkages. In this model, d denotes the durable goods sector, and sector n denotes the non-durable goods sector.

A.9.1 Households

The representative infinitely-lived household chooses a composite consumption good, H_t, and supplies labor, L_t, to maximize the present discounted value of the expected utility function

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \mathbb{U}(H_t, L_t), \tag{A.22}$$

where $\beta \in (0, 1)$ is the discount factor and

$$\mathbb{U}(H_t, L_t) = \frac{H_t^{1-\sigma}}{1-\sigma} - \frac{L_t^{1+\phi}}{1+\phi}, \tag{A.23}$$

where σ is the inverse of inter-temporal elasticity of substitution and ϕ is the inverse of the Frisch elasticity of labor supply. The household's aggregate consumption, H_t, depends on consumption of the non-durable good, $C_{n,t}$, and the stock of durable good, D_t, according to a Cobb-Douglas technology given by

$$H_t \equiv (C_{n,t})^{\mu_n} (D_t)^{\mu_d}, \tag{A.24}$$

with $\mu_n + \mu_d = 1$, where μ_n and μ_d are the shares of the non-durable good and durable stock in the composite consumption good. Durable goods are accumulated according to the law of motion given by

$$D_t = C_{d,t} + (1 - \Delta) D_{t-1}, \tag{A.25}$$

where Δ is the depreciation rate of the durable good. Households maximize utility subject to the following budget constraint

$$P_{n,t} C_{n,t} + P_{d,t} C_{d,t} + B_t = R_{t-1} B_{t-1} + W_t L_t + T_t, \tag{A.26}$$

where W_t denotes the nominal wages, B_t are one-period risk-free bonds remunerated at the rate R_t, T_t is a lump-sum component of income like dividends from ownership of firms. $P_{n,t}$ and $P_{d,t}$ are sectoral prices. We also define the aggregate price deflator or the aggregate price index as in Barsky et al. (2007) and Barsky, Boehm, House, and Kimball (2016) as

$$P_t = \frac{P_{n,t}C_{n,t} + P_{d,t}C_{d,t}}{\bar{P}_n C_{n,t} + \bar{P}_d C_{d,t}}, \tag{A.27}$$

where $\bar{P}_n$ and $\bar{P}_d$ are akin to base year prices and taken to be equal to 1. The optimality conditions from the first order conditions for $C_{n,t}$, D_t, L_t, B_t, and P_t are as follows,

$$\Lambda_{1,t} = \frac{\mu_n H_t^{1-\sigma}}{P_t C_{n,t}} - \Lambda_{2.t}(\frac{P_t - P_{n,t}}{P_t}), \tag{A.28}$$

$$\frac{\mu_n H_t^{1-\sigma}}{C_{n,t}} - \Lambda_{2,t}(P_t - P_{n,t}) = \frac{\beta R_t}{E_t \pi_{t+1}} \left(\frac{\mu_n H_{t+1}^{1-\sigma}}{C_{n,t+1}} - \Lambda_{2,t+1}(P_{t+1} - P_{n,t+1}) \right), \tag{A.29}$$

$$\Lambda_{1,t} = -\Lambda_{2,t}, \tag{A.30}$$

$$H_t = C_{n,t}^{\mu_n} D_t^{\mu_d}, \tag{A.31}$$

$$\begin{aligned} &\frac{\mu_d H_t^{1-\sigma}}{P_t D_t} + \beta(1-\Delta)\Lambda_{1,t+1}\pi_{t+1} + \Lambda_{2,t}(\frac{P_{d,t}}{P_t} - 1) \\ &\quad + \beta(1-\Delta)\Lambda_{2,t+1}(\pi_{t+1} - \frac{P_{d,t+1}}{P_t}) = \Lambda_{1,t}. \end{aligned} \tag{A.32}$$

$$L_t^{\phi} = \Lambda_{1,t} W_t. \tag{A.33}$$

Note that $\Lambda_{1,t}$ is the Lagrange multiplier associated with constraint (A.26) and $\Lambda_{2,t}$ is associated with (A.27).

A.9.2 Firms

The firms' side is as in the baseline model. Two distinct economic sectors produce non-durable (sector n) and durable (sector d) goods, respectively. As before, there is a continuum of firms indexed by $i \in [0, 1]$ within each sector $j = n, d$, which produce differentiated goods for consumption. Each firm faces a common production technology

$$Y_{j,t}(i) = A_{j,t} L_{j,t}(i),$$

where $Y_{j,t}(i)$ is the output of firm i in sector j, and $L_{j,t}(i)$ is the hours of labor employed by firm i in sector j. $A_{j,t}$ is the sector-specific productivity shock. Price-setting is staggered as in Calvo (1983), and the first-order condition, which maximizes the firm's profits and determines the price, is as before in equation (13) in the main text.

A.9.3 Equilibrium

The market clearing conditions require $C_{j,t} = Y_{j,t}$, $j = n, d$ and $Y_t = Y_{n,t} + Y_{d,t}$ in the goods market, and $L_t = L_{n,t} + L_{d,t}$ in the labor market. The model is log-linearized around the non-stochastic, zero inflation steady state. The linearized market clearing condition is

$$y_t = (1-\omega)c_{n,t} + \omega c_{d,t},$$

where $(1-\omega)$ is the steady-state expenditure share of non-durable goods. Accordingly, the price aggregation then is

$$p_t = (1-\omega)p_{n,t} + \omega p_{d,t}.$$

The steady-state relationship between the utility and expenditure shares is[20]

$$\Delta\frac{(1-\omega)}{\omega} = \frac{\mu_n}{\mu_d}(1-\beta(1-\Delta)).$$

The equilibrium conditions are

$$\lambda_{1,t} = (1-\sigma)h_t - c_{n,t} - p_{n,t}, \tag{A.34}$$

$$(1-\sigma)h_t - c_{n,t} + p_t = (1-\sigma)E_t h_{t+1} - E_t c_{n,t+1} + i_t - E_t\pi_{n,t+1} - E_t\pi_{t+1} + p_{t+1}, \tag{A.35}$$

$$(1-\beta(1-\Delta))[(1-\sigma)h_t - d_t] + (1-\Delta)\beta[E_t\lambda_{1,t+1} + E_t p_{d,t+1}] - p_{d,t} = \lambda_{1,t}, \tag{A.36}$$

$$\pi_{n,t} = \beta\pi_{n,t+1} + \chi_n mc^r_{n,t} + u_{n,t}, \tag{A.37}$$

$$\pi_{d,t} = \beta\pi_{d,t+1} + \chi_d mc^r_{d,t} + u_{d,t}, \tag{A.38}$$

where (A.38) and (A.38) are the sectoral Phillips curves, $u_{n,t}$ and $u_{d,t}$ are sector specific cost-push shocks, and

$$\chi_n = \frac{(1-\theta_n)(1-\beta\theta_n)}{\theta_n},$$

$$\chi_d = \frac{(1-\theta_d)(1-\beta\theta_d)}{\theta_d}.$$

A.9.4 Welfare Function

We derive the welfare function based on the micro-foundations of the model described in the previous section. Based on Woodford (2003) and Galí (2015), assuming that the monetary authority aims to maximize the welfare of the representative household, we obtain a second-order Taylor approximation of the representative consumer's lifetime utility, (A.22), when the economy remains in a neighborhood of an efficient steady state. This gives the following loss

[20] Note that utility shares, μ_n and μ_d, are distinct from the consumption shares, $(1-\omega)$ and ω. When $\Delta = 1$, we return to the model with two non-durable goods and the shares are equalized.

function for the central bank

$$\frac{\mathcal{W}}{U_C'C} \approx -\frac{1}{2}\mathbb{E}_0\Sigma_{t=0}^{\infty}\beta^t\Bigg((\sigma-1)\left(\mu_n\tilde{c}_{n,t}+\mu_d\tilde{d}_t\right)^2+\phi\frac{\mu_n}{1-\omega}\tilde{y}_t^2+\mu_n\tilde{y}_{n,t}^2$$
$$+\frac{\mu_d\Delta}{1-\beta\left(1-\Delta\right)}\tilde{y}_{d,t}^2+\frac{\varepsilon_N}{\chi_n}\mu_n\pi_{n,t}^2+\frac{\varepsilon_d}{\chi_d}\frac{\mu_d\Delta}{1-\beta(1-\Delta)}\pi_{d,t}^2$$
$$+\frac{\mu_d(1-\Delta)}{\Delta(1-\beta(1-\Delta))}(\tilde{d}_t-\tilde{d}_{t-1})^2\Bigg)+t.i.p+O\left\|\xi\right\|^3, \tag{A.39}$$

where $t.i.p$ denotes the terms independent of policy and $O\left\|\xi\right\|^3$ includes terms of order higher than two.

A.9.5 Incorporating the Overweighting Behavior

As before, we incorporate the overweighting behavior of the households observed in the empirical results. The durable goods sector is more salient to the households such that households assign $(\omega+\delta)$ weight to the expenditure of this sector where δ is the overweighting parameter. When we incorporate this into our model, we find that the Euler equation (A.35) is modified to

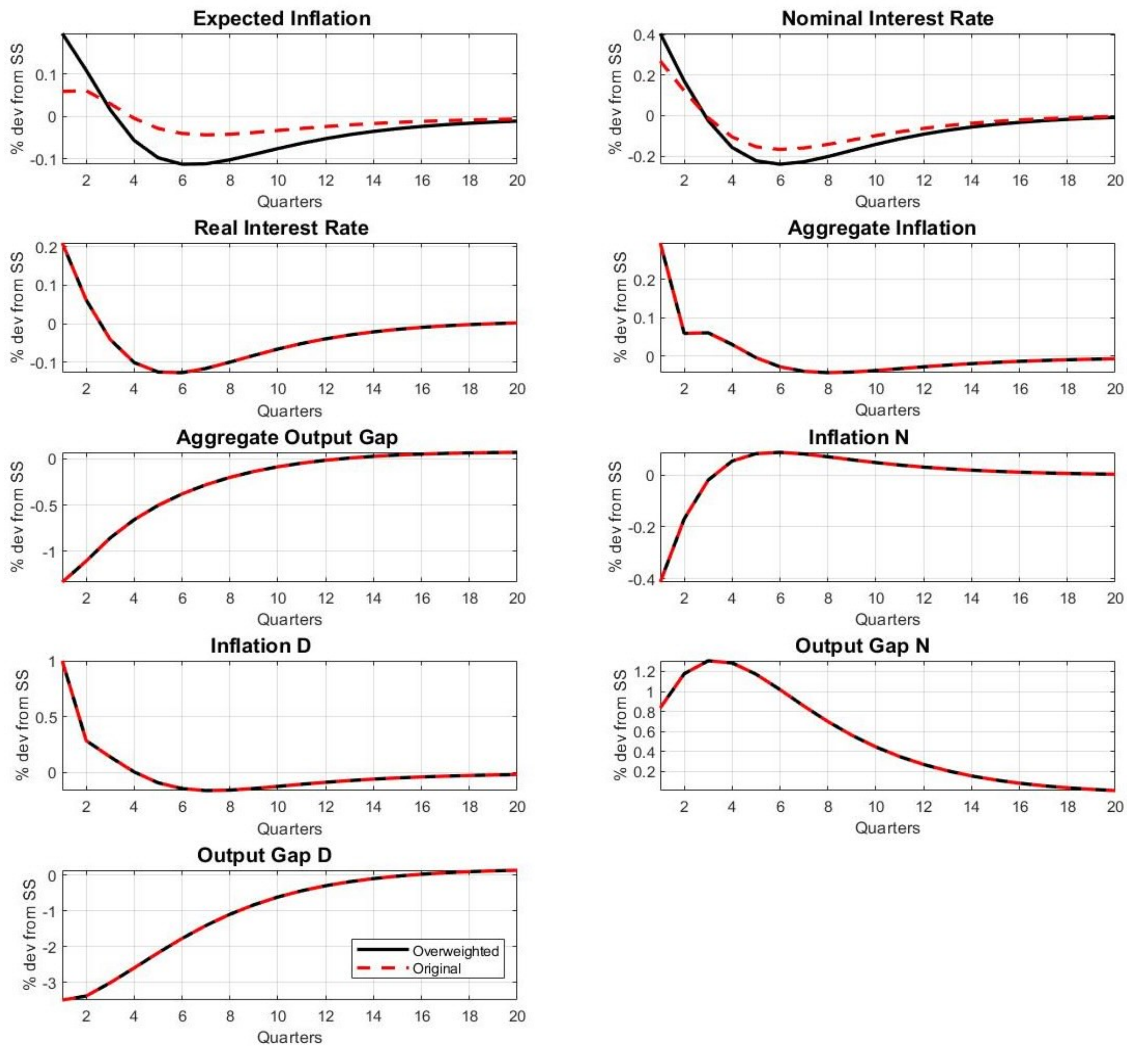
$$(1-\sigma)h_t - c_{n,t} + p_t = (1-\sigma)E_t h_{t+1} - E_t c_{n,t+1} + i_t - E_t\pi_{n,t+1} - \hat{E}_t\pi_{t+1} + p_{t+1}, \tag{A.40}$$

where $\hat{E}_t\pi_{t+1}$ captures in the impact of overweighting. We don't find any additional effect of the overweighting behavior on the sectoral Phillips curves and the welfare function of the central bank, as in the baseline model with two non-durable goods. Given this, it is sufficient to set the nominal rate in line with the expected inflation to stabilize the distortions from overweighting, which we show in the following section.

A.9.6 Ramsey Policy

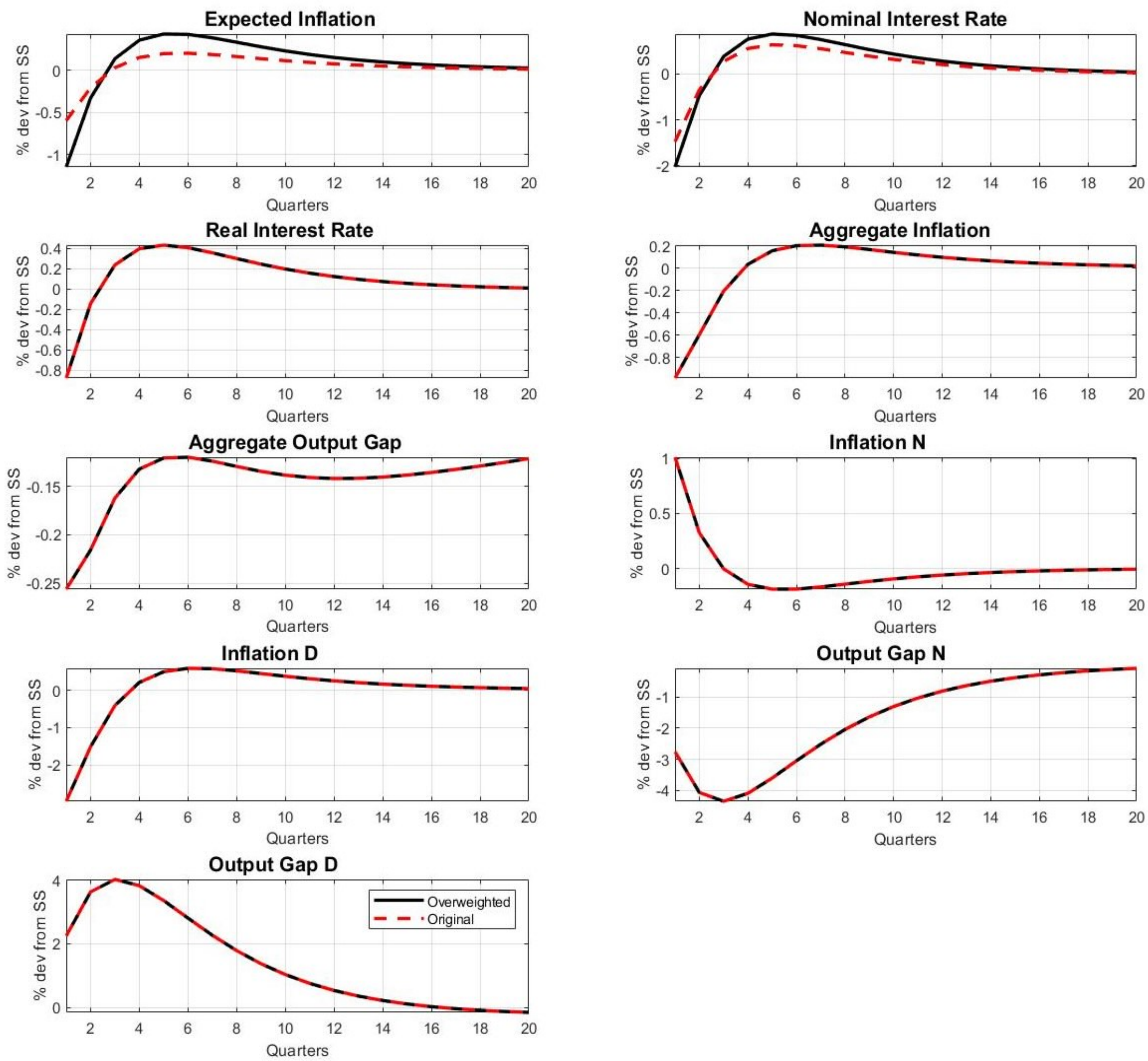
To facilitate comparison with the baseline non-durable goods model, the durable and non-durable goods have an equal expenditure share such that $\omega = 0.5$. However, the durable goods sector is more flexible, so $\theta_D = 0.25$, as in Petrella et al. (2019). We look at the Ramsey policy response to a markup shock in the overweighted durable goods sector in Figure (A.1) and the response to a markup shock in sector N in Figure (A.2). Across both cases, the final allocations in the model with and without overweighting are the same, including the real interest rate. The policy instrument, the nominal interest rate, is different and has to move in line with the expected inflation.

Figure A.1: Optimal Response to a Persistent Markup Shock in Sector D



Notes: The figure shows the impulse responses of selected variables to a persistent one percent markup shock in the overweighted, durable goods sector. All series are in percent deviations from their steady state except for the interest rate, which is in absolute deviation from the steady state. The black line corresponds to the model with overweighting, while the red dashed line corresponds to the model without overweighting.

Figure A.2: Optimal Response to a Persistent Markup Shock in Sector N



Notes: The figure shows the impulse responses of selected variables to a persistent one percent markup shock in the non-overweighted, non-durable goods sector. All series are in percent deviations from their steady state except for the interest rate, which is in absolute deviation from the steady state. The black line corresponds to the model with overweighting, while the red dashed line corresponds to the model without overweighting.