Impact of Inflation on Time Use of Individuals

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Abstract

This paper explores the causal impact of inflation on time allocation of individuals, combining empirical evidence with theoretical analysis. Using aggregated micro-level data from the American Time Use Survey and inflation expectations from the Survey of Professional Forecasters, I develop a novel two-stage local projection model with instrumental variables to estimate time use responses to inflationary shocks. The empirical model effectively addresses the endogeneity issue, showing that inflation increases the time devoted to market work while reducing time allocated to home production and leisure. To provide a theoretical foundation for these patterns, I study a Dynamic Stochastic General Equilibrium model with a home production sector that incorporates both demand and supply shocks. The model's predictions are consistent with the empirical findings and offer new insights into the dynamics of time allocation during inflationary periods.

Keywords: Inflation Shocks, Time Use, Local Projection, DSGE Model

1 Introduction

Three major recessions in over the past two decades have shown us how economic downturns can significantly restructure individuals' daily time use. As unemployment rises and working hours decline, people have a choice to reallocate their forgone market work time to other activities such as home production, leisure, or searching for a job. However, the ways in which inflation influences these choices remain understudied. After decades of dormant inflation, the U.S. experienced a sharp increase in inflation that 12-month change in the consumer price index (CPI) peaked at 8.9 percent in June 2022. Although it gradually declined to 2.3 percent by May 2025, this episode marked a new and prolonged period of high inflation. In this context, an important and timely question arises that how does inflation can affect individuals' daily allocation of time. For example, some people may extend their working hours to keep up with the rising expenses, while others may substitute market consumption with more home production to lessen the effects of inflation on

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their living costs.

This paper explores how individuals reallocate their time across daily activities in response to inflation, both empirically and theoretically. For the empirical part, a two-stage local projection model is developed to estimate the causal effect of inflation on time use, utilizing data from the American Time Use Survey (ATUS). A variation of Philips curve is introduced as an instrumental variable for the first stage to address the endogeneity of inflation. The findings show that a one-standard-deviation increase in inflation leads to an increase of 0.5 hours in market work, a decrease of 0.3 hours in home production, and a reduction of 0.6 hours in leisure. For the theoretical part, a Dynamic Stochastic General Equilibrium (DSGE) with home production sector is extended to simulate the inflationary environment following exogenous demand and supply side shocks. The results show that time reallocation depends on the source of inflation: in response to expansionary demand-driven inflation, individuals substitute leisure and home production with market work; under contractionary supply-driven inflation, they give up leisure for market work and home production.

Inflation Related Literature Previous research has studied the negative impact of inflation on household consumption and wealth. For example, using a two-sector monetary model, Aruoba and Schorfheide (2011) analyze the impact of inflation on households' welfare and argue that it effectively acts as taxation on holding money, raising the opportunity cost of holding cash. This mechanism reduces real money balances and, in turn, lowers equilibrium consumption. Kaplan and Schulhofer-Wohl (2017) document household-level inflation heterogeneity, showing that although all households face the same nominal inflation rate, lower-income families often experience higher inflation, resulting in reduced real income and welfare. Similarly, Yang (2023) and Cravino et al. (2020) explore the heterogeneity in the inflation experience across income groups through the expenditure channel. The former finds that expansionary shocks lead to higher inflation for low- and middle-income households, as they spend a larger share of their income on goods with more flexible prices. The latter show that the prices of the goods consumed by high-income households are stickier and less volatile than those of the goods consumed by middle-income households following a monetary policy shock. Using micro-data of Michigan Survey of Consumers, Bachmann et al. (2015) suggest that inflation reduces households' propensity to spend. However, other studies point to potential benefits of inflation for certain households, particularly those holding nominal long-term debt, which is known as Fisher effect[1]. Doepke and Schneider (2006) find that a moderate level of inflation can redistribute wealth by lowering the real value of nominal assets and liabilities, indirectly transferring wealth from lenders to borrowers. Auclert (2019) further show that because net borrowers typically have higher marginal propensities to consume, inflation generated by monetary expansions can boost aggregate consumption via redistribution from nominal savers to borrowers. Yang (2023) also find that inflationary shocks benefit low-income households not only through debt devaluation but also via stronger earnings growth, while deflationary shocks harm them.

[1] See Fisher (1933)

Using a randomized control trial (RCT), Hackethal et al. (2023) find that households increase their planned and actual consumption when they are given information about the erosion of their nominal debt due to inflationary shock. Pilossoph and Ryngaert (2024), Stantcheva (2024), and Afrouzi et al. (2024) document a shift in the time individuals devote to job search activities in response to the recent post-covid inflation. This paper contributes to the growing literature on the economic effects of inflation by estimating its causal impact on time allocation.

Time-Use Related Literature Literature of time use can be divided into two parts of microeconomics and macroeconomics. Microeconomic studies have flourished since Bureau of Labor Statistics (BLS) began recording diary data on daily activities in ATUS. Before this rich data set, researchers had only limited, older, and isolated data on time use categories other than working hours. [2]. However, longer historical working hours data are available in Current Population Survey (CPS) or Panel Study of Income Dynamics (PSID) as a measure for labor market activity.

In microeconomic time-use studies, seminal studies focus on individuals' behavioral responses through time use during the Great Recession and the COVID-19 pandemic. For instance, Aguiar et al. (2013) employed ATUS to analyze how individuals reallocate their forgone market hours of working to other categories of time use during great recession of 2008. In addition to observing shifts in time allocation towards activities such as job searching, leisure, and various home production tasks like child care, shopping, health, and education, they found that home production is highly elastic. To estimate substitution rate of forgone working hours with leisure and home production, they needed to deal with endogeneity due to natural reduction in working hours during a recession. By introducing state variation in unemployment across the US as an instrumental variable, they estimate home production devours around 30 percent of forgone market work hours, with leisure activities taking up 50 percent and job searching accounting for 2 to 6 percent. However, they do not discuss time periods with high inflation. Furthermore, in comparison to pre-2008 levels, authors of this paper document an uptrend in leisure time and a declining trend in work hours and home production. Before this paper, there are several research that studied trends in time use of individuals (McGrattan and Rogerson (2004), Aguiar and Hurst (2007), Ramey (2007), Ramey and Francis (2009), and Ramey (2009), see for review). Combining ATUS and CPS, Alon et al. (2020) studied the gender disparities in time use during the recent pandemic recession. They argued that during the Great Recession, men experienced higher job losses, whereas in the recent COVID-19 recession, women were disproportionately affected due to childcare and daycare closures. Following that, they found how the pandemic negatively impacted women's employment, widening gender disparities in the labor market. And also, by using Leave and Job Flexibilities Module of ATUS, Pabilonia and Vernon (2022) studied the difference of time reallocation of workers when they work from home compared to the office.

[2]For example: Americans' Use of Time (Fall 1965 and Spring 1966), Time Use in Economic and Social Accounts (Fall 1975 – Summer 1976), and Americans' Use of Time Accounts (January – December 1985)

While some studies date back to the early 1990s on time use in macroeconomics, there has been less research. The pioneering works of Benhabib et al. (1991) and Greenwood and Hercowitz (1991) introduce home production into a Real Business Cycle (RBC) model to examine the cyclical allocation of time and capital between market and home production. They argued that adding home sector to the RBC models and letting it to interact with market production may help having a deeper understanding of macroeconomic variables. Gomme et al. (2001) found a positive correlation between households and business investment over the business cycle. Gomme and Rupert (2007) compared different RBC models under different parameter calibrations for models with and without home production. Additionally, Aruoba et al. (2016) studied the impact of home production on construction sector. They suggest that monetary issues, such as higher inflation or nominal interest rate, incentivize home production activities, leading to increased investment in housing and higher home prices. In the context of the DSGE model, Lester (2014) integrated home production in a New Keynesian setting with staggered prices. The findings suggest that households substitute not only away from their leisure time, but also away from their home production, following positive exogenous shocks to technology and money supply.

The empirical analysis of this research is inspired by Cacciatore et al. (2024) work (hereafter CGH), who examine the impact of economic uncertainty on time use and its macroeconomic implications. Using Chicago Board Options Exchange Volatility Index (VIX) as a proxy for uncertainty, they find that higher levels of VIX, reduces market working hours, and has a modest effect on leisure. CGH specify a local projection with instrument (LP-IV) to estimate IRFs for market, non-market, and leisure hours in response to uncertainty shocks. Unlike CGH, this paper uses ATUS data to construct time use categories, whereas CGH rely on BLS "Aggregate Hours: Nonfarm Payrolls" for market hours and generate non-market and leisure time using substitution elasticities. They also develop a dynamic structural model to align their empirical findings with theory.

The theoretical model of this paper builds on Gnocchi et al. (2016) (hereafter GHP). They framed a standard New Keynesian model with home production sector to study the substitutability between market and home goods. The model presented here extends GHP by introducing four types of shocks: two demand-side of government spending and household discount factor, and two supply-side of technology and markup, whereas GHP focus solely on fiscal multiplier shock. Moreover, the theoretical results in this study are supported by empirical evidence.

Despite extensive research on time use, the impact of inflation on individuals' time allocation remains understudied. To fill this gap, this study employs a local projection regression model to identify the impact of inflation on market work, home production, and leisure hours. My paper makes four contributions to the literature. First, it develops a novel instrumental variable to address the endogeneity of inflation, a common challenge in macroeconomic research. This instrument leverages a modified version of the Philips curve, using lagged variables arguing that past values are unlikely to influence contemporaneous outcomes.

Second, the study introduces a two-stage local projection model to estimate the causal effect of inflation on time use, utilizing data from ATUS. Time use categories are constructed according to Aguiar and Hurst (2007), and then aggregated for analysis. In the first stage, inflation is estimated via a variation of the Philips curve including lagged variables of inflation expectation and output gap, ensuring the exogeneity of right hand side variables on inflation. Then, in the second stage, the estimated inflation from the first stage, along with other control variables, is fed to the local projection model to identify its effects on time use categories. Empirically, a one-standard-deviation rise in inflation increases market work by 0.5 hours, reduces home production by 0.4 hours, and cuts leisure by 0.6 hours. Third, the paper extends a theoretical model to simulate households' behavioral responses to inflation under exogenous demand- and supply-side shocks. Fourth, by comparing the theoretical model's predictions with the empirical evidence, the paper introduces a new approach to identify the source of inflation.

The model reveals that the way households adjust their time use highly depends on the source of inflation. When inflation caused by demand-side shock, people substitute their time allocated to home production and leisure with working in the market. On the contrary, they give away market work in favor of home production and leisure in case of supply-side inflationary shock. Also, regardless of its origin, inflation raises the marginal utility of market goods consumption —a wealth effect —thereby boosting labor supply. Furthermore, including a home production sector flattens the labor supply curve, as individuals can substitute between home and market work rather than sacrificing leisure, this is the substitution effect. Parameter analysis hints intensified household responses when elasticity of substitution between time use categories and probability of price resetting by firms are higher.

The origins of inflation remain a long-standing debate in macroeconomics. While the high inflation of the 1970s is widely attributed to oil-related supply factors, some researchers, such as Primiceri (2006), argue that demand-side factors, including monetary policy, played a significant role. This debate has regained prominence in the aftermath of the post-COVID inflation surge. For example, Jordà et al. (2022), De Soyres et al. (2022), Di Giovanni et al. (2023), Bianchi et al. (2023) and Bergholt et al. (2024) characterize recent inflation as primarily demand-driven, whereas Bernanke and Blanchard (2025) and Smets and Wouters (2024) view it as supply-driven. Other researchers, such as Ball et al. (2022), Beaudry et al. (2025), and Shapiro (2024) find evidence for a mixed contribution from both supply and demand forces. However, this study opens a new indirect avenue for identifing the source of inflation by analyzing household time allocation responses. Aligning the theoretical analysis with empirical evidence suggests that, since 2003, the start of the data period, inflation has likely been driven primarily by demand-side shocks.

The rest of this paper is structured as following. Section 2 describes empirical analysis focusing on the data and the LP-IV model. Section 3 introduces the theoretical framework and calibration. Section 4 discusses results, mechanisms, and parameter sensitivity. Finally, Section 5 concludes the paper.

2 Empirical Analysis

The empirical analysis begins by presenting key facts and correlations from the data. In business cycle research, the macroeconomic literature typically relies on time series analysis and de-trending methods for time series such as time use variables. However, because the available data span only a relatively short period (since 2003), applying conventional macroeconomic techniques is challenging. Therefore, I first document how different time use categories have evolved with inflation over time, both at the individual and aggregate levels. These observed patterns then motivate the model setup described in this section.

2.1 Data Set

This study draws on two main datasets: the ATUS, which measures the amount of time individuals allocate to activities such as market work, home production, and leisure, and the Survey of Professional Forecasters (SPF) from the Federal Reserve Bank of Philadelphia, used here as a proxy for aggregate inflation expectations. ATUS has been collected since 2003, making it relatively recent, whereas SPF data extend back to 1981 (Q3). Given the shorter time span of ATUS, the analysis in this paper is limited to the 2003–2024 period. Data is discussed in the next section.

2.1.1 Micro-level Data

Among the various datasets tracking time use of individuals, the ATUS has drawn significant interest from researchers as a resourceful dataset for studying how people allocate their time. Other datasets, such as the CPS and the National Longitudinal Surveys, collect information on market work hours, while the Panel Study of Income Dynamics (PSID) and the Health and Retirement Survey collect data on both market and non-market hours. However, these datasets often rely on non-diary recall data from interviewees, which can lead to inaccuracies. The ATUS addresses this issue by surveying respondents to recall their previous day's activities from 4 AM to 4 AM of the interview day, in 15 minutes intervals, asking how, where, and with whom they spent their time. Their responses are then categorized into activity categories by survey staff. The dataset contains about 252,000 interviews conducted by the BLS between 2003 and 2024, drawn from the existing CPS sample pool about three months after respondents' last CPS interview. Only one individual per household is selected while they are not followed over time. Although the ATUS sample size is modest relative to the US population, demographic weighting ensures that the data are nationally representative. Besides, One of ATUS's key strengths is its continuous data collection, enabling researchers to observe and analyze changes in time use patterns over time. As a result, ATUS functions as a repeated cross-sectional dataset, which can be aggregated over specific periods (e.g., monthly, quarterly, annually) to produce time series variables.

For this study, the main outcome variables are market Work, home production, and leisure hours. These categories were constructed by cleaning and processing the raw ATUS data [3] following the methods in Aguiar and Hurst (2007) and Aguiar et al. (2013). Details of data generation are provided in Appendix A.1.

2.1.2 Aggregated-level Data

To specify inflation, a time series regression model is developed that combines the lagged inflation expectations from the SPF with the output gap. The SPF began in 1968 (Q4), originally conducted by the American Statistical Association (ASA) and the National Bureau of Economic Research (NBER), was eventually handed over to the Philadelphia Fed in 1990(Q2). However, quarterly CPI inflation expectations from professional forecasters have only been available since 1981(Q3). In this survey, forecasters provide quarterly estimates for the next five quarters, along with annual projections for the current and following year. Since the time series variables are considered quarterly, next-quarter CPI inflation expectations—at the mean [4], median [5], 25th percentile, and 75th percentile levels[6]—are selected for the first-stage time series regression model, with the median used as the baseline. Projections are reported as annualized quarter-over-quarter percent changes in the quarterly average price index. Figure 17 in Appendix A.2 presents inflation expectations alongside actual inflation since 1981(Q3). Other macroeconomic variables used in this paper include quarterly CPI inflation, real GDP, and potential real GDP, all obtained from the Federal Reserve Bank of St. Louis (Fred) database. Aggregated data preparation is provided in Appendix A.2.

2.2 Inflation and Time Use Categories Relations

Before developing the main empirical model, the relationship between inflation and time use categories is first examined using the simple regression model of 1. In this model, time use variables (in hours) are regressed on inflation (in percent), where β_2^j captures the trends mentioned in the literature review; declining working hours and home production, and increasing leisure. The purpose of this regression is only to draw correlations not causal effects.

The estimated coefficients in Table 1 show that a one-percentage-point increase in inflation is associated with an increase of 0.205 hours in market work for the working-age population (age between 16 and 65) and 0.147 hours for the total population, accompanied by a reduction in leisure of 0.11 and 0.07 hours, respectively. Although the coefficients for home production are small and statistically insignificant, the exhaustive nature of time use allocation justifies including it in the analysis. These results indicate a conditional correlation between inflation and time use categories. Furthermore, Figures 14, 15, and 16 in Appendix A.1 illustrate the unconditional correlations between inflation and the aggregated time use categories, complementing the

[3] See https://www.bls.gov/tus/data.htm

[4] The data can be downloaded directly from the Philadelphia Federal Reserve's website https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/mean-forecasts

[5] The data can be downloaded directly from the Philadelphia Federal Reserve's website https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/median-forecasts

[6] The data can be downloaded directly from the Philadelphia Federal Reserve's website https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/dispersion-forecasts

results in Table 1.

With the above preliminary findings as a backdrop, a two-stage LP-IV approach is implemented to address the question on which this paper focuses. In this framework, the impact of inflation is identified by estimating the local projection regression on time series variables for market work, home production, and leisure hours.

$$H_{it}^{j} = \beta_0 + \beta_1^j \pi_t + \beta_2^j t + \varepsilon_{it}^j \tag{1}$$

Table 1

	Market Work (Hour)		Home Production (Hour)		Leisure (Hour)	
	(1)	(2)	(1)	(2)	(1)	(2)
Inflation (%)	0.147***	0.205***	0.018	-0.006	-0.070	-0.110**
	(0.054)	(0.062)	(0.031)	(0.035)	(0.048)	(0.055)
N	252808	198635	252808	198635	252808	198635

Standard errors in parentheses.

$*p < 0.10$, $**p < 0.05$, $***p < 0.01$

(1): All population, (2): Working age population

2.3 Local Projection Model

Because inflation is inherently endogenous, the first step in estimating its impact on time use is to identify an inflation shock that can be treated as exogenous. The local projection with instrumental variables (LP-IV) method is a macroeconomic econometric technique used to estimate the dynamic causal effects of an endogenous variable (e.g., inflation, output, unemployment) on another variable while addressing endogeneity through an instrument. This approach combines two ideas: Local Projections (LP), proposed by Jordà (2005), and instrumental variables (IV). LP is a well-known alternative to vector autoregressions (VARs) for estimating IRFs. Instead of requiring correct specification of the entire system and deriving IRFs from it, LP estimates a sequence of horizon-specific regressions of the form in equation 2.

$$y_{t+h} = \alpha_h + \beta_h x_t + \gamma_h z_t + \epsilon_{t+h} \tag{2}$$

Here, y_{t+h} is the outcome h periods ahead, x_t is the shock or variable of interest, z_t are control variables (lags, trends, etc.), and β_h directly gives the IRF at horizon h. Using this specification, x_t is correlated with the error term ϵ_{t+h}, or in technical words it is endogenous. Instrument z_t can be used to satisfy two conditions: (1) relevance—it is correlated with x_t, and (2) exogeneity—it is uncorrelated with ϵ_{t+h}. Putting these ideas together, at each horizon h, we estimate IV regressions instead of OLS, as shown in equation 3.

$$y_{t+h} = \alpha_h + \beta_h \widetilde{x}_t + \gamma_h z_t + \epsilon_{t+h} \tag{3}$$

where $\widetilde{x}_t$ is the predicted value from the first stage, and the sequence of β_h across horizons traces the causal impulse response to the instrumented shock, estimated independently at each horizon [7].

Regression model 4 remove contemporaneous influence of other macroeconomic variables on inflation by estimating inflation using lagged values of inflation expectations and the output gap, arguing that the lagged variables contain only past shocks, not current innovations. In other words, lagged inflation expectations and output gap are unaffected by the current-quarter inflation shock but remain correlated with current-quarter inflation. This ensures they do not capture other shocks correlated with ϵ_{t+h}, thereby satisfying the IV conditions.

The first stage model is specified in 4 and regression table is provided in Appendix B Table 2. The F-statistic of 16.13 with a p-value close to zero suggests that variables in the first-stage have explanatory power for the dependent variable.

$$\pi_t = \alpha + \sum_{i=1}^{p} \phi_i^{\pi} E_{t-i}\pi_{t+1} + \sum_{i=1}^{p} \phi_i^{Y} \Delta Y_{t-i} + \mu_t^{\pi} \tag{4}$$

where, π_t denotes inflation, $E_t\pi_{t+1}$ is the next period's inflation expectation, and ΔY_t represents percentage deviation of real GDP Y_t, from potential GDP Y_t^n, and μ_t^{π} is the residual term.

After fitting inflation using first-stage regression model in 4, the LP model in 5 is applied to estimate responses of time use categories following a one-standard deviation inflation shock. For identification, the predicted inflation $\widetilde{\pi}_t$ from the first stage is used as an instrument, rather than the observed inflation directly from data. The LP specification is given by 5:

$$H_{t+\kappa}^{j} - H_{t-1}^{j} = \delta_\kappa + \gamma_\kappa \widetilde{\pi}_t + \sum_{i=1}^{p} \phi_\pi \widetilde{\pi}_{t-i} + \sum_{i=1}^{p} \phi_{h^j} \Delta H_{t-i}^{j} + \varepsilon_t^{j} \tag{5}$$

where κ stands for horizon (set to 12 quarters), $\widetilde{\pi}_t$ is the instrumented inflation from equation 4, and H_t^j corresponds to market work, home production, and leisure hours for $j \in \{1, 2, 3\}$, respectively. ΔH_{t-i}^j denotes the first difference of time use categories added as control variables to the model. Following CGH, number of lags is set to three. The left-hand side of the regression 5 measures the first difference in time use.

[7] See Ramey and Zubairy (2018)

Figure 1 plots IRF for changes (in hours) of market work, home production, and leisure in response to one-standard deviation shock in inflation. The results show that such a shock increases market work by about 0.5 hours, while reducing home production by 0.3 hours and leisure by 0.6 hours. Additional IRFs for different inflation expectation levels (mean, 25th percentile, and 75th percentile) are reported in Appendix A.1, all of which exhibiting patterns similar to those found for the median expectations.

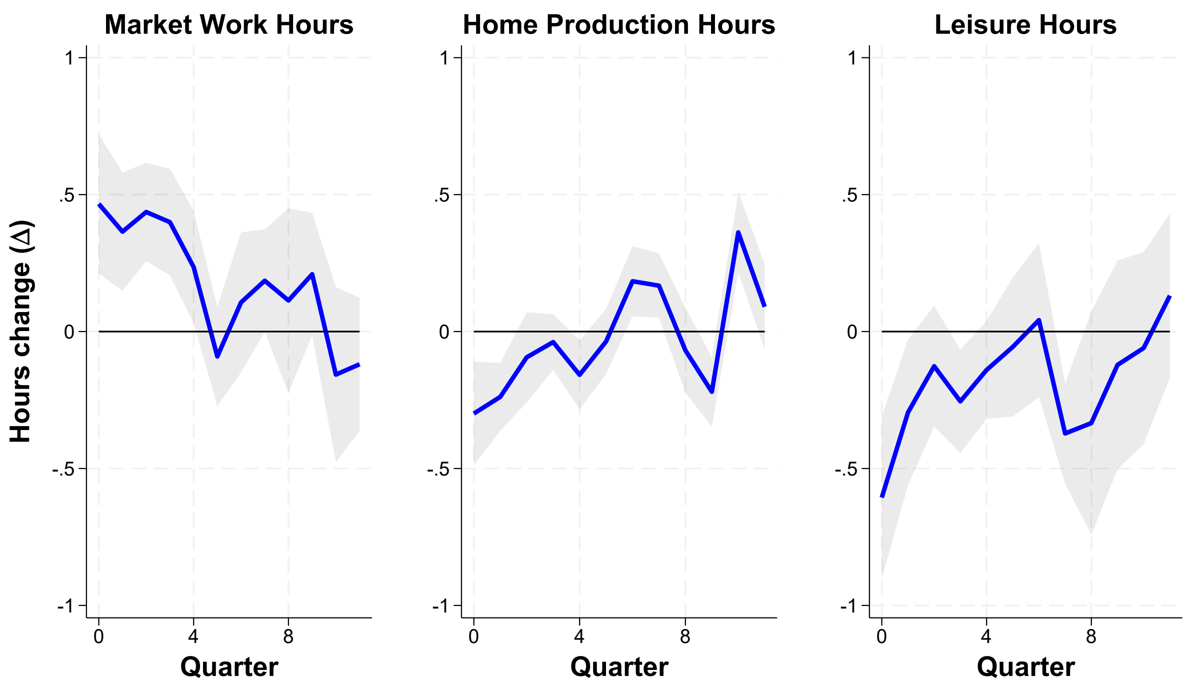

Figure 1: Estimated impulse responses of market work, home production, and leisure to a 1-standard-deviation shock in the inflation rate, using the median of next-quarter inflation expectations. Shaded areas indicate 68-percent confidence interval around estimate. Data from 2003:Q1–2023:Q4.

2.4 The main source of inflation

Identifying sources of inflation continues to be a cornerstone of macroeconomic research. This paper contributes to this discussion by showing that households' time use responses to inflation found in the previous section provide an indirect means of identifying its underlying sources over the past two decades. To validate this result, I develop a mechanism in which household time allocation responses differ depending on whether the shock is demand- or supply-driven. Comparing the theoretical predictions with the direction of IRFs in empirical evidence confirms that inflation in the United States since 2003–the beginning of the data period–has been predominantly demand-driven. This conclusion aligns with Afrouzi et al. (2024), who argue that inflationary pressures may have been the dominant factor driving real wage dynamics and labor market flows between 2021 and 2024.

As a robustness check, the series "Average Weekly Hours of Production and Nonsupervisory Employees, Total

Private" from the Current Employment Statistics (CES)—available from FRED[8]—is used as an alternative proxy for market work. Although this measure differs substantially from ATUS data in both aggregation and target population (it is based on reports from businesses and government agencies), it serves as a useful benchmark for validating the estimation results and offers additional insights due to its longer time span. The corresponding IRF is presented in Appendix B, Figure 21. While the shape of the response differs from the ATUS-based IRF, splitting the CES data into two subperiods —pre-2003 and post-2003, for consistency with the ATUS sample —reveals an upward shift in responses in the post-2003 period. This support the idea that individuals' reactions to inflation vary depending on its origin. Specifically, during the early 1980s to early 2000s, a period mainly characterized by supply-driven inflation, the response corresponds to a decline in market work. In contrast, during the early 2000s to early 2020s, generally a demand-driven period, the response is not strictly positive but is notably higher than in the earlier period. Taken together, the evidence presented in this paper highlights the value of time use data as a complementary tool for understanding macroeconomic shocks and their underlying causes. The next section builds a theoretical model to explain the mechanisms underlying these empirical patterns.

3 Theoretical Analysis

In this section, I frame a model of how households respond to inflationary shock by their daily time allocation, all else equal, can causally generate the patterns documented in Section 2. My goal is to have the model match the time-series patterns qualitatively but not quantitatively. The model extends the baseline for an otherwise standard new Keynesian model to simulate an inflationary environment. Through the lens of the model, different shocks on demand and supply sides are introduced into the model to assess if the response of household depend on the source of shock.

3.1 The Model

This section develops the baseline for an otherwise-standard new Keynesian model to take the empirical finding into theoretical accounts. The model features optimization problems for households, firms, government, and a central bank following a variant of the Taylor rule. Each firm produces differentiated goods in an imperfect competition market, giving the power to set the price rather than taking it. However, there is a restriction on price adjustment that follows a staggered price setting by Calvo (1983).

3.1.1 Households

A representative household maximizes the lifetime utility function, $U(C_t, l_t)$, over streams of consumption C_t —a combination of market and home goods—and leisure l_t. They begin the period time t owning capital stock k_t^m, which can be rented to firms at prices r_t^k, and k_t^h which is used for home production. They are

[8]This series can be downloaded from https://fred.stlouisfed.org/series/AWHNONAG

also given the choice of allocating their time to the market, home, and leisure which are denoted h_t^m, h_t^h, and l_t, respectively. By working in the market,, they can produce intermediate goods and receive a real wage w_t, or they can work at home to provide non-storable and non-tradable home goods, which are exclusively consumable. The model normalizes the total available time to 1, with time allocated to market work, home production, and leisure being mutually exclusive, which is formulated as equation 6.

$$h_t^m + h_t^h = h_t, \quad l_t = 1 - h_t, \tag{6}$$

Households utilize k_t^h through allocated time of h_t^h to produce home goods following the Cobb-Douglas production function as 7 shows.

$$c_t^h = (k_t^h)^{\alpha_2}(h_t^h)^{1-\alpha_2}, \quad \alpha_2 \in [0,1] \tag{7}$$

The model assumes that households are price takers in both goods and labor market. They can buy infinite range of market goods i indexed by $i \in [0,1]$ at price of $P_t(i)$ with elasticity of substitution of $\varepsilon_t > 1$ within goods. Although market goods can be consumed as $c_t^m(i)$, or stored as investment $I_t(i)$ for each good, they can be aggregated as 8.

$$c_t^m = \left[\int_0^1 (c_t^m(i))^{\frac{\varepsilon_t - 1}{\varepsilon_t}}\, di\right]^{\frac{\varepsilon_t}{\varepsilon_t - 1}}, \quad I_t = \left[\int_0^1 (I_t(i))^{\frac{\varepsilon_t - 1}{\varepsilon_t}}\, di\right]^{\frac{\varepsilon_t}{\varepsilon_t - 1}}, \quad P_t = \left[\int_0^1 P_t(i)^{1-\varepsilon_t} di\right]^{\frac{1}{1-\varepsilon_t}} \tag{8}$$

And, for given capital stock and investment of k_t^m and I_t at time t, capital stock needed for the next period of time follows the low of motion in 9

$$k_{t+1} = (1-\delta)k_t + I_t - \frac{\xi}{2}\left(\frac{k_{t+1}}{k_t} - 1\right)^2 \tag{9}$$

where, $\delta \in (0,1]$ stands for depreciation rate and $\xi > 0$ captures capital adjustment cost. Households aggregate their consumption combining market and home goods through CES function 10, where the elasticity of substitution between market and home goods is measured to be constant and equal to $\frac{1}{1-b_1}$.

$$C_t = \left[\alpha_1 (c_t^m)^{b_1} + (1-\alpha_1)(c_t^h)^{b_1}\right]^{\frac{1}{b_1}}, \quad \alpha_1 \in [0,1], \quad b_1 < 1, \tag{10}$$

At time t, the household endows a one-period risk-free portfolio of B_t and invests in B_{t+1} for the next period of time, while receiving dividends T_t from firm profits as a shareholder in an imperfectly competitive market.

To conclude, household maximizes their utility function for the given dividend of T_t and the initial values of capital, k_0, and risk-free assets, B_0. Dividend T_t is not a decision variable since it is a transfer payment like lump-sum tax. At each period of time, household needs to optimize problem below by choosing optimal values for these decision variables: $\{c_t^m, c_t^h, h_t^m, h_t^h, k_t^m, k_t^h, k_{t+1}, B_{t+1}\}$.

$$\underset{\{c_t^m, c_t^h, h_t^m, h_t^h, k_t^m, k_t^h, k_{t+1}, B_{t+1}\}}{Max} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U(C_t, l_t) \tag{11a}$$

subject to:

$$U(C_t, l_t) = \frac{\left[(C_t)^b (l_t)^{1-b}\right]^{1-\sigma} - 1}{1-\sigma}, \quad b \in (0,1), \quad \sigma \geq 1 \tag{11b}$$

$$C_t = \left[\alpha_1 (c_t^m)^{b_1} + (1-\alpha_1)(c_t^h)^{b_1}\right]^{\frac{1}{b_1}}, \quad \alpha_1 \in [0,1], \quad b_1 < 1 \tag{11c}$$

$$c_t^h = (k_t^h)^{\alpha_2} (h_t^h)^{1-\alpha_2} \tag{11d}$$

$$h_t = h_t^m + h_t^h \tag{11e}$$

$$l_t = 1 - h_t \tag{11f}$$

$$k_t = k_t^m + k_t^h \tag{11g}$$

$$\mathbb{E}_t \left\{Q_{t,t+1} B_{t+1}\right\} + P_t \left(c_t^m + I_t\right) \leq B_t + P_t w_t h_t^m + P_t r_t^k k_t^m + T_t \tag{11h}$$

$$I_t = k_{t+1} - (1-\delta) k_t + \frac{\xi}{2} \left(\frac{k_{t+1}}{k_t} - 1\right)^2 \tag{11i}$$

First-order conditions are provided in the Appendix C.2.

3.1.2 Firms

In the presented model, there is a continuum of intermediate goods indexed by $i \in [0,1]$ produced by infinite number of firms in a monopolistically competitive market. These firms rent labor and capital stock from households in perfectly competitive markets to produce the market good $Y_t(i)$ using the common constant-returns-to-scale (CRS) Cobb-Douglas production function, as shown in equation 12, where A_t represents the level of technology and α_3 the share of capital in production.

$$Y_t(i) = A_t \left(k_t^m(i)\right)^{\alpha_3} \left(h_t^m(i)\right)^{1-\alpha_3}, \quad \alpha_3 \in [0,1]. \tag{12}$$

All firms must satisfy the demand function specified in equation 14b and follow the Calvo price mechanism introduced by Calvo (1983) while aggregate price level P_t and aggregate demand Y_t are taken as given. Calvo price setting allows only a fraction $(1-\theta)$ to re-optimize their nominal price $P_t(i)$ over any period of time t where θ represents price stickiness, so that $\theta = 0$ implies no price rigidities. Because firms follow the same production function with the same production factors supplied in perfect competition markets, their marginal cost would be identical. After dividing nominal marginal cost MC_t by price P_t, cost function can be derived in 13, where $\Psi_t(.)$ and Γ_t are the cost function and the real marginal cost, respectively.

$$\Psi_t(.) = MC_t Y_t = P_t \Gamma_t Y_t \tag{13}$$

Therefore, the producers' profit maximization problem can be formulated as 14a where $Q_{t,t+j}$ denotes the stochastic discount factor at time t for the nominal profits j-periods ahead.

$$\underset{\{P(t)_i\}}{Max}\ \mathbb{E}_t \sum_{j=0}^{\infty} \theta^j Q_{t,t+j} \left[\underbrace{P_t(i) Y_{t+j}(i)}_{\text{revenue}} - \underbrace{P_{t+j}\Gamma_{t+j} Y_{t+j}(i)}_{\text{cost}} \right] \tag{14a}$$

subject to:

$$Y_t(i) = \left[\frac{P_t(i)}{P_t}\right]^{-\varepsilon_t} Y_t^d, \tag{14b}$$

$$Q_{t,t+j} = \beta^j \mathbb{E}_t \left\{ \frac{\lambda_{t+j}}{\lambda_t} \Pi_{t,t+j}^{-1} \right\}. \tag{14c}$$

while $\Pi_{t,t+j} = \frac{P_{t+j}}{P_t}$, and Γ_t stands for real marginal cost of one additional unit of good i which is constant for all firms due to the CRS production function and perfect competition in the labor and capital market, as factors of production. By solving the cost minimization problem for the firm, real marginal cost satisfies the following condition:

$$r_t^k = \frac{A_t \Gamma_t \alpha_3 Y_t(i)}{k_t^m(i)} \tag{15}$$

$$w_t = \frac{A_t \Gamma_t (1-\alpha_3) Y_t(i)}{h_t^m(i)}. \tag{16}$$

3.1.3 Government and Monetary Policy

The market aggregates all intermediate goods i in the production function 17 and clear market goods demanded by households, investment and government expenditures in equation 18, labor in equation 20, and capital in equation 21. The aggregated government expenditures are shown as equation 19.

$$Y_t = \left[\int_0^1 (Y_t(i))^{\frac{\varepsilon_t - 1}{\varepsilon_t}} \, di \right]^{\frac{\varepsilon_t}{\varepsilon_t - 1}} \tag{17}$$

$$Y_t = Y_t^d = c_t^m + I_t + G_t \tag{18}$$

$$G_t = \left[\int_0^1 (G_t(i))^{\frac{\varepsilon_t - 1}{\varepsilon_t}} \, di \right]^{\frac{\varepsilon_t}{\varepsilon_t - 1}} \tag{19}$$

$$h_t^m = \int_0^1 h_t^m(i) di \tag{20}$$

$$k_t^m = \int_0^1 k_t^m(i) di \tag{21}$$

The model is characterized as a cashless economy in which monetary authority extends a variation of the Taylor rule in 22, incorporating the nominal interest rate, inflation targeting, and the output gap, all in multiplicative form. The parameter $\rho_m \in [0, 0.9]$ is smoother in interest rate, which means monetary authorities avoid abrupt rate changes, placing weight on past policy. $\Phi_\Pi \in [1.05, 2.5]$ indicates how aggressively the central bank responds to deviations from target inflation, $\Phi_y \in [0.05, 0.25]$ is the policy response to output gap.

$$(1 + R_t) = (1 + R_{t-1})^{\rho_m} \left(\beta^{-1} \Pi_t^{\Phi_\pi} \left(\frac{Y_t}{Y_t^n} \right)^{\Phi_y} \right)^{1-\rho_m} \tag{22}$$

3.2 Calibration and Exogenous Processes

Calibration of the baseline model begins with setting the investment-to-capital ratio equal to the depreciation rate, $\frac{I}{K} = \delta$. The steady-state condition from equation C40 leads to equation 23, where choosing $\beta = 0.995$ implies an annual inflation rate of $\Pi = \%2$. To normalize the capital used in market and home production relative to GDP, the auxiliary variables $K^m = \frac{k^m}{Y}$ and $K^h = \frac{k^h}{Y}$ are defined. Similarly, government expenditure is expressed as a share of output, $g = \frac{G}{Y}$. Furthermore, the steady-state values for the time allocated to market and home production, h^m and h^h, are calibrated to 0.19 and 0.11, respectively, in line with ATUS data. Parameter b_1 is calibrated such that the implied substitution elasticity between home and market goods, $\frac{1}{1-b_1}$, equals to 2. In addition, the elasticity of substitution between intermediate goods ε is set to 6 to ensure a 20% profit margin for producers, which yields the real marginal cost of $\Gamma = \frac{\varepsilon - 1}{\varepsilon}$. All time-invariant variables are interpreted as steady-state values.

$$\beta(1 - \delta + r^k) = 1 \Rightarrow r^k = \frac{1 - \beta(1 - \delta)}{\beta} \tag{23}$$

Substituting K^m into equation 15 yields the capital share parameter α_3 as shown in equation 24. Then, by normalizing the level of technology A to 1, the steady-state level of total output Y can be derived from equation 25.

$$\alpha_3 \frac{\Gamma}{K^m} = r^k \Rightarrow \alpha_3 = \frac{K^m r^k}{\Gamma} \tag{24}$$

$$Y = (K^m Y)^{\alpha_3} (h^m)^{1-\alpha_3} \Rightarrow Y = (K^m)^{\frac{\alpha_3}{1-\alpha_3}} h^m \tag{25}$$

Using the total capital equation 11g, along with the investment-to-capital ratio and the government expenditure ratio, the steady-state level of investment is derived as $Y\delta(K^m + K^h)$, which in turn determines market good consumption, as shown in equation 26.

$$c^m = Y(1 - g - \delta(k^m + k^h)) \tag{26}$$

Next, the wage w is determined using the marginal cost of labor equation 16, as shown in equation 27.

$$w = \Gamma(1-\alpha_3)\frac{Y}{h^m} \tag{27}$$

Household optimality conditions that are listed in 28 imply α_2 as presented in 29. Substituting this into the home goods consumption equation yields the steady-state expression for c^h in equation 30.

$$\gamma = \lambda r^k, \quad \gamma = \mu\alpha_2\frac{c^h}{k^h}, \quad \lambda = \frac{U_l}{w}, \quad \mu = \frac{U_l}{1-\alpha_2}\frac{h^h}{c^h} \tag{28}$$

$$\frac{\alpha_2}{1-\alpha_2}\frac{h^h}{k^h} = \frac{r^k}{w} \Rightarrow \alpha_2 = \frac{r^k k^h}{r^k k^h + wh^h} \tag{29}$$

$$c^h = (k^h)^{\alpha_2}(h^h)^{1-\alpha_2} \tag{30}$$

From the optimality conditions in equation 28, the relationships between the Lagrange multipliers can be derived as shown in equation 31 which subsequently yields the expression for α_1 in equation 32. Likewise, dividing λ by λw in equation 33 and steady state for $l = 1-(h^m+h^h)$ suggests 34 for the value of b.

$$\frac{\lambda}{\mu} = \frac{\alpha_2}{r^k}\frac{c^h}{k^h}, \quad \frac{\lambda}{\mu} = \frac{\alpha_1}{1-\alpha_1}(\frac{c^m}{c^h})^{b_1-1} \tag{31}$$

$$\alpha_1 = \frac{(1-\alpha_2)(c^h)^{b_1}}{(1-\alpha_2)(c^h)^{b_1} + wh^h(c^m)^{b_1-1}} \tag{32}$$

$$\frac{\lambda}{\lambda w} = \frac{U_C(C,l)\alpha_1\left(\frac{c^m}{C}\right)^{b_1-1}}{U_l(C,l)} = \frac{b}{1-b}\alpha_1 l(c^m)^{b_1-1}C^{-b_1} \tag{33}$$

$$b = \frac{1}{wl\alpha_1(c^m)^{b_1-1}C^{-b_1}+1} \tag{34}$$

In this study, the logarithm of household discount factor β, fiscal multipliers g, and markup ε are modeled as stochastic variables, while the level of technology a evoloves exogenously according to a first-order autoregressive process, AR(1), to generate inflationary dynamics. The shocks to β and g are interpreted as demand-side and expansionary, whereas the shocks to a and ε represent supply-side and contractionary disturbances. The variables η^β, η^g, η^a, and η^ε denote the first-moment shocks, capturing innovations to the levels of stochastic processes for the household discount factor, government expenditures, level of technology, and markup, respectively. All four shocks are assumed to be independent and normally distributed with zero mean and unit variance. All four shocks are assumed to be independent and normally distributed with zero mean and unit standard deviation. The parameters ρ associated with each process capture the persistence of their respective AR(1) dynamics. Innovation processes are shown in 35a, 35b, 35c, and 35d, and calibration for these parameters are reported in Table 3.

$$\ln \beta_t = (1 - \rho_b) \ln \bar{\beta} + \rho_b \ln \beta_{t-1} + \eta_t^{\beta} \tag{35a}$$

$$\ln g_t = (1 - \rho_g) \ln \bar{g} + \rho_g \ln g_{t-1} + \eta_t^{g} \tag{35b}$$

$$a_t = (1 - \rho_a)\bar{a} + \rho_a a_{t-1} + \eta_t^{a} \tag{35c}$$

$$\ln \varepsilon_t = (1 - \rho_\epsilon) \ln \bar{\varepsilon} + \rho_\epsilon \ln \varepsilon_{t-1} + \theta_\varepsilon \eta_{t-1}^{\varepsilon} + \eta_t^{\varepsilon} \tag{35d}$$

All other parameters are taken from GHP paper which are reported in Table 3 of Appendix G.

4 Results and Discussion

The model is solved for quarterly periods of time, and simulations are conducted using the Dynare package in MATLAB. In order to replicate an inflationary environment, positive shocks are imposed on demand-side variables, while negative shocks are applied to supply-side variables. In this section, first, the IRFs results for baseline model, and then, discussions on the theoretical results are provided, highlighting its limitations and possible generalizations.

4.1 Baseline Results

The baseline model is solved using shock sizes calibrated to the standard deviations reported in Smets and Wouters (2007)[9]. The corresponding IRFs are constructed by linearly aggregating the effects of four distinct shocks of household discount factor, government expenditures, technology, and markup which are presented in Figure 2. It is assumed that all shocks hit the economy at the same time making an inflationary environment. Although the quantitative magnitudes of the baseline IRFs do not perfectly align with the empirical estimates, their qualitative patterns are consistent: market work increases while time allocated to home production and leisure declines.

[9]For the rest of theoretical experiments, standard deviations are assumed equal to one.

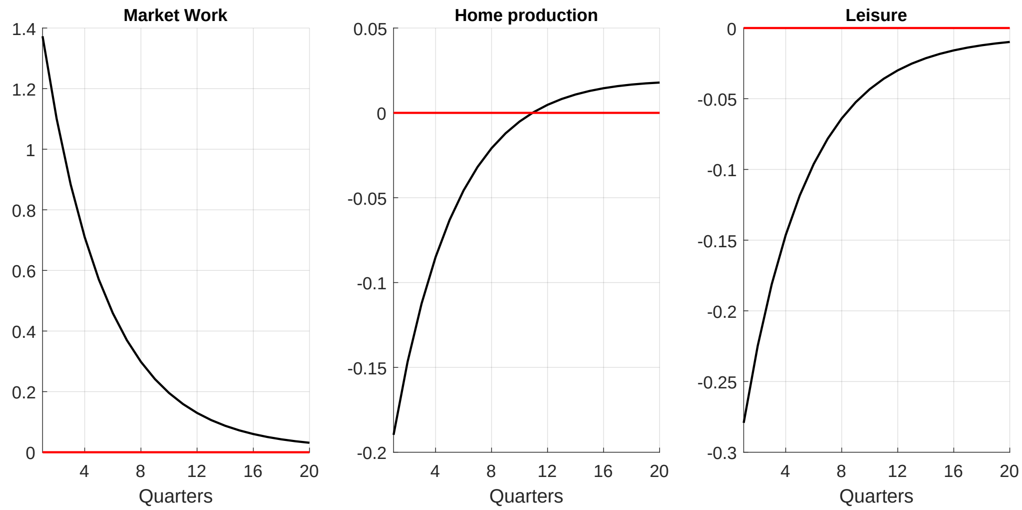

Figure 2: The impulse responses are calculated as the linear sum of shocks—measured in standard deviations following Smets and Wouters (2007)—to the household discount factor, government expenditures, technology level, and price markups. Variables are in percentage deviations from the steady state.

4.2 Mechanism Inspection

To gain deeper insight into the home sector's effect on household behavior, two mechanisms are inspected in Figures 3 and 4, corresponding to inflation driven by a demand shock and a supply shock, respectively. Since market work, home production, and leisure are normal goods, a higher market wage increases the relative price of leisure and home production. In the case of higher wages following an expansionary demand shock, households substitute away from home production and leisure, now relatively more expensive, toward market work, which becomes relatively cheaper. This reflects the substitution effect. At the same time, an inflationary environment increases the weight households place on λ, as a result, shifting the labor supply curve to the right and reducing the time allocated to home production and leisure– reflecting the wealth effect. These effects are stronger in the right panel, where home production is not an option, leading to a greater labor supply. In contrast, having the option to produce home goods cushions households by allowing them to offset part of the decline in market goods consumption, resulting in lower labor supply and higher wages compared to the no–home production scenario. This mechanism is visualized in Figure 3.

Similarly, Figure 4 shows the mechanism under a contractionary supply-side shock. These negative supply shocks will reduce labor demand given that firms will want to hire less labor due to a reduction in output. In response, households substitute market hours with more home production to offset the decline in market goods consumption. Unlike demand shocks, a negative supply shock would not generate a hot labor market since output and labor demand both fall. Equilibrium is instead determined by the interaction of two opposing forces: the substitution effect, which reduces labor supply due to lower wages, and the wealth effect, which can still shift the labor supply curve to the right as households increase the value they place on λ.

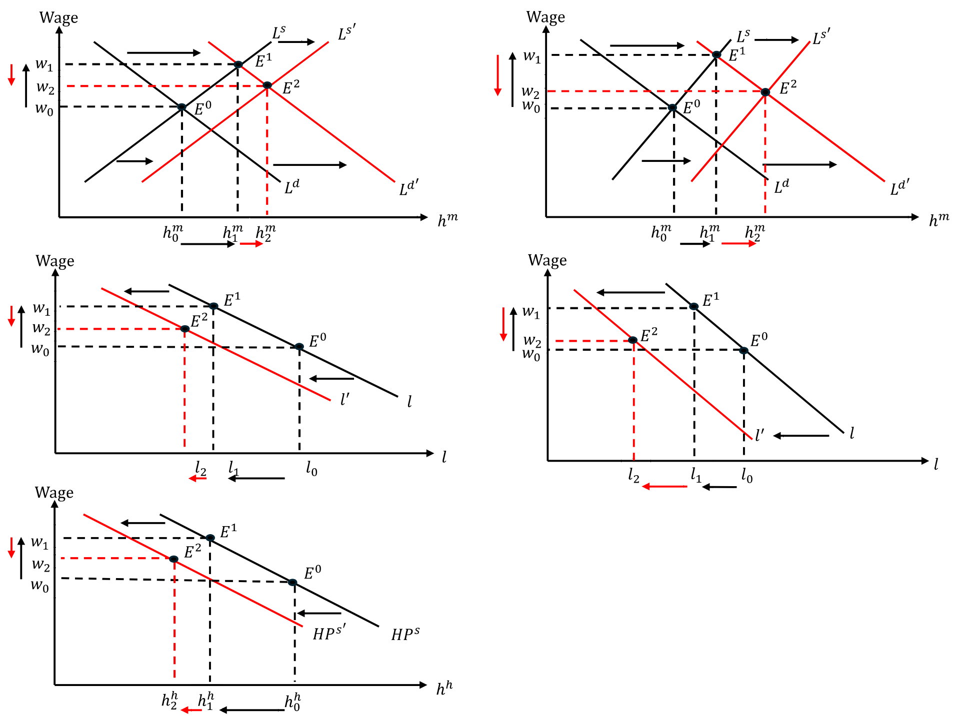

Figure 3: Expansionary demand driven inflation mechanism. L^s, L^d, l, and HP denote for labor supply, labor demand, leisure, and home production. Left panel shows the model including home sector, and the right panel for the model without home sector.

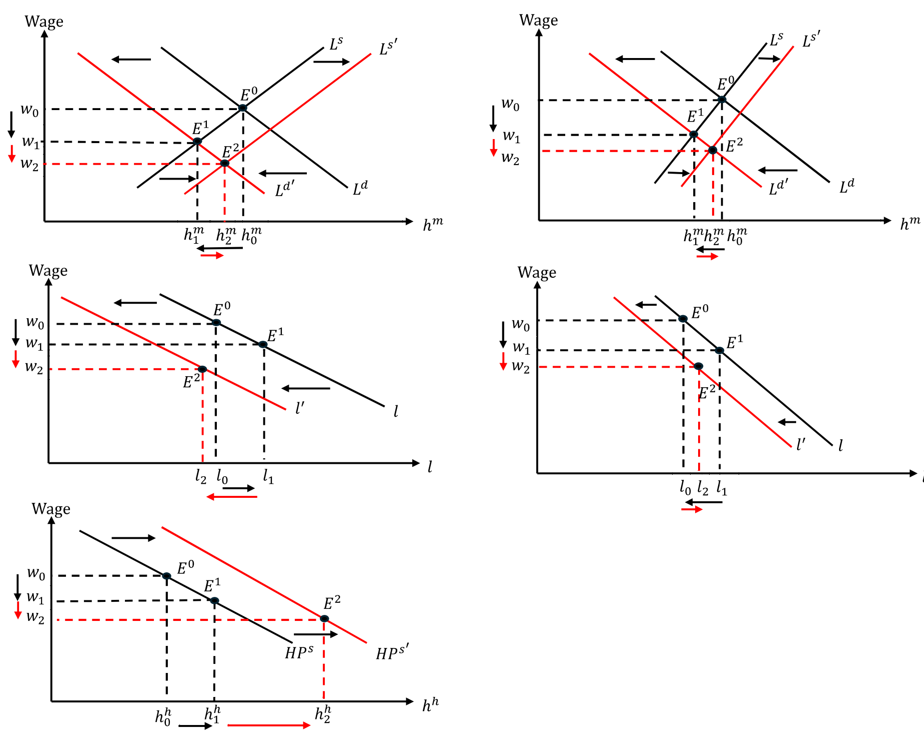

Figure 4: Contractionary supply driven inflation mechanism. L^s, L^d, l, and HP denote for labor supply, labor demand, leisure, and home production. Left panel shows the model including home sector, and the right panel for the model without home sector.

4.2.1 Wealth Effect

From optimization theory, the Lagrange multiplier λ tells us how much the maximum utility increases when the budget constraint is relaxed by one unit. When the budget constraint is expressed in real terms (divided by price), λ represents the increase in utility from one additional unit of wealth. Thus, according to the optimality condition in equation C27, the marginal utility of wealth λ equals the marginal utility of market goods consumption U_{c^m}.

With this interpretation, Figure 5 shows that a demand-side shock leads to higher inflation, increased output, and a rise in the marginal utility of market goods consumption. Likewise, Figure 6 illustrates that a supply-side shock also raises inflation and marginal utility but reduces output. As a result, in either case, higher inflation is associated with a higher marginal utility of market goods consumption from the household's perspective, a higher λ, which in turn influences their time allocation decisions between market work, home production, and leisure.

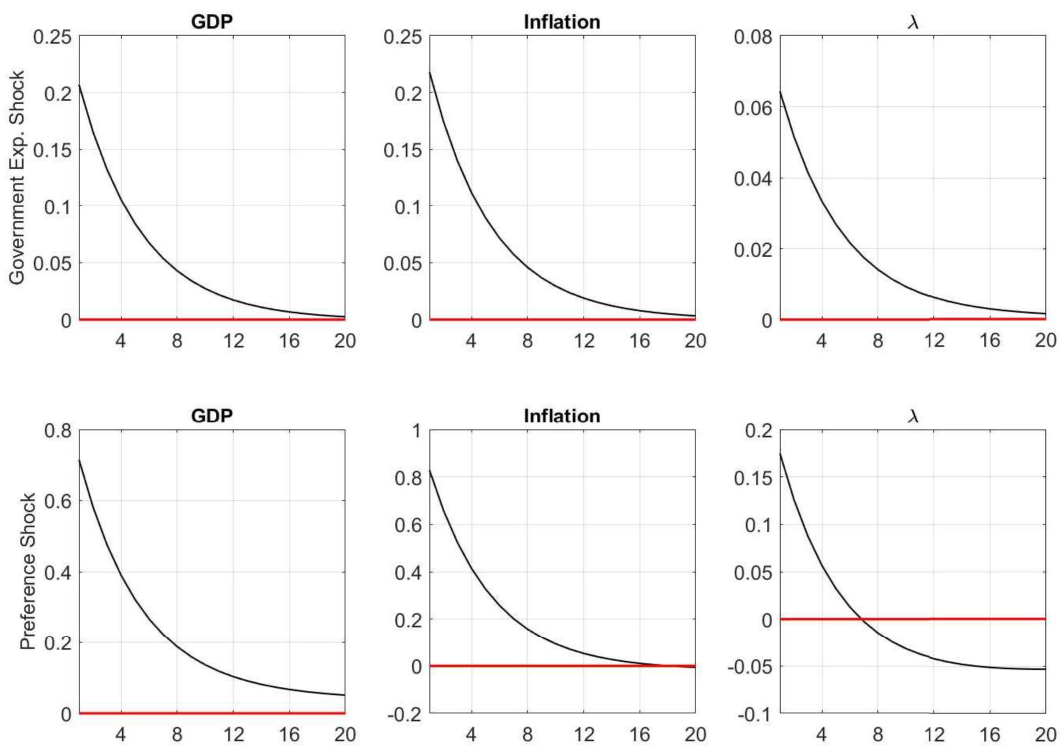

Figure 5: Impulse responses following a one-standard-deviation fiscal multiplier, upper panel, and household preference shocks, lower panel. λ stands for marginal utility of market goods consumption. Variables are in percentage deviations from the steady state.

To further explore household behavior under a higher perceived marginal utility of consumption, λ, time allocation decisions are analyzed under two scenarios: one that includes home production and one that does

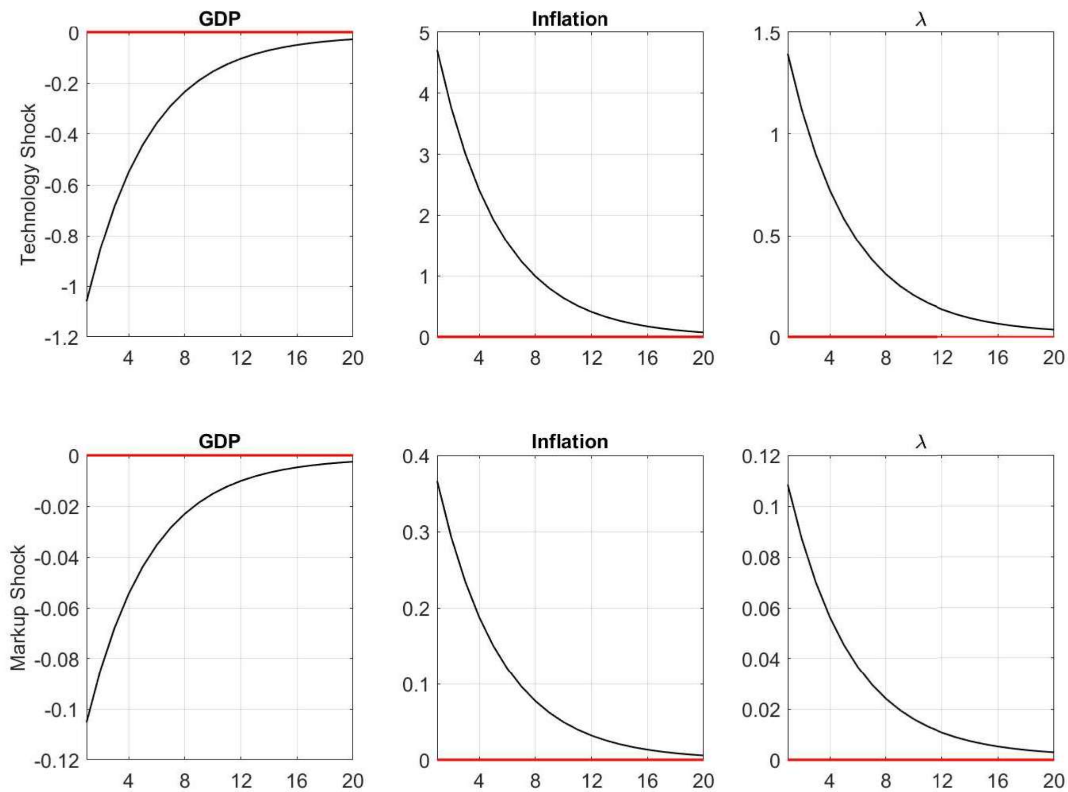

Figure 6: Impulse responses following a one-standard-deviation technology, upper panel, and markup shocks, lower panel. λ denotes marginal utility of market goods consumption. Variables are in percentage deviations from the steady state.

not. Figure 7 shows how individuals adjust their time allocation in response to changes in the real wage w. As expected, a higher wage encourages more time in market work, less in home production, and consequently a reduction in leisure time. When individuals place a higher value on the marginal utility of consumption, such that $\lambda_2 > \lambda_1$, the market labor supply curve shifts to the right, while the home production and leisure curves shift to the left—an outcome I interpret as the wealth effect.

On the other hand, Figure 8 depicts a model where time for home production is fixed. The qualitative direction of responses remain the same; however, the shifts in market labor supply and leisure are more pronounced. These results are consistent with Cacciatore et al. (2024), which finds that for a given level of w, a higher λ induces households to shift away from home production and leisure toward market work, and in the absence of home production, this shift occurs entirely at the expense of leisure.

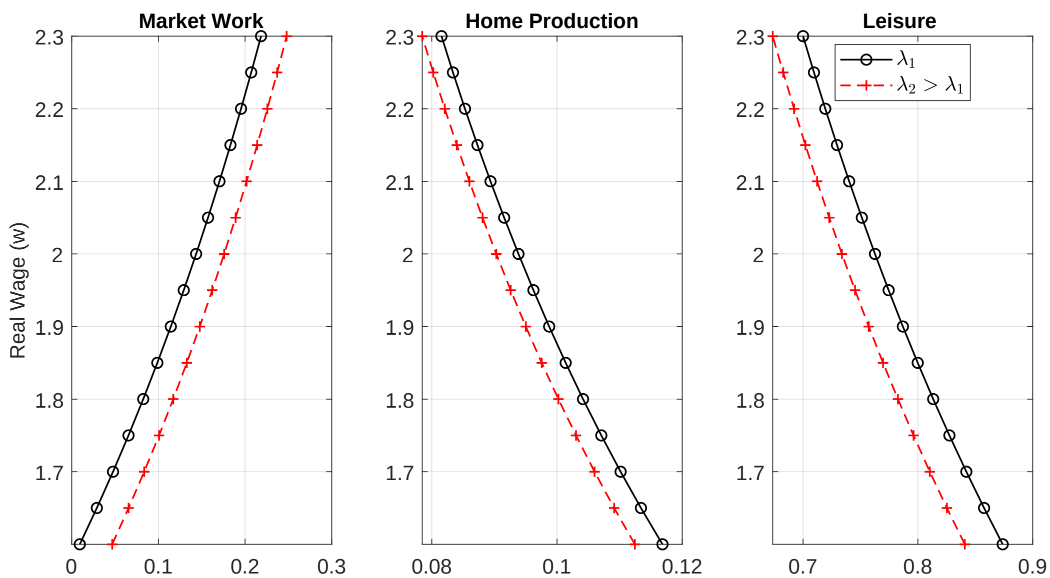

Figure 7: Time use responses to real wage and marginal utility of market goods consumption (λ) in the model with home production.

4.2.2 Substitution Effect

To analyze the effect of the home sector on household decisions, the partial equilibrium problem of household is solved for their key decision variables as functions of real wage w. To obtain these value functions for C, c^m, c^h, h^m, h^h, k^m, k^h, and l, I solve the system of equations derived from the household's equilibrium conditions. In this step, capital k_{ss} and the Lagrange multiplier λ_{ss} are held fixed at the steady-state level, allowing the analysis to focus on how the variables of interest respond to changes in wages. The value functions are provided in E. The results, presented in Figure 9, show that home production leads to flatter market labor supply and leisure curves compared to a model with a fixed amount of housework. In the model without choice of home production, the steeper market hours curve suggests that individuals require

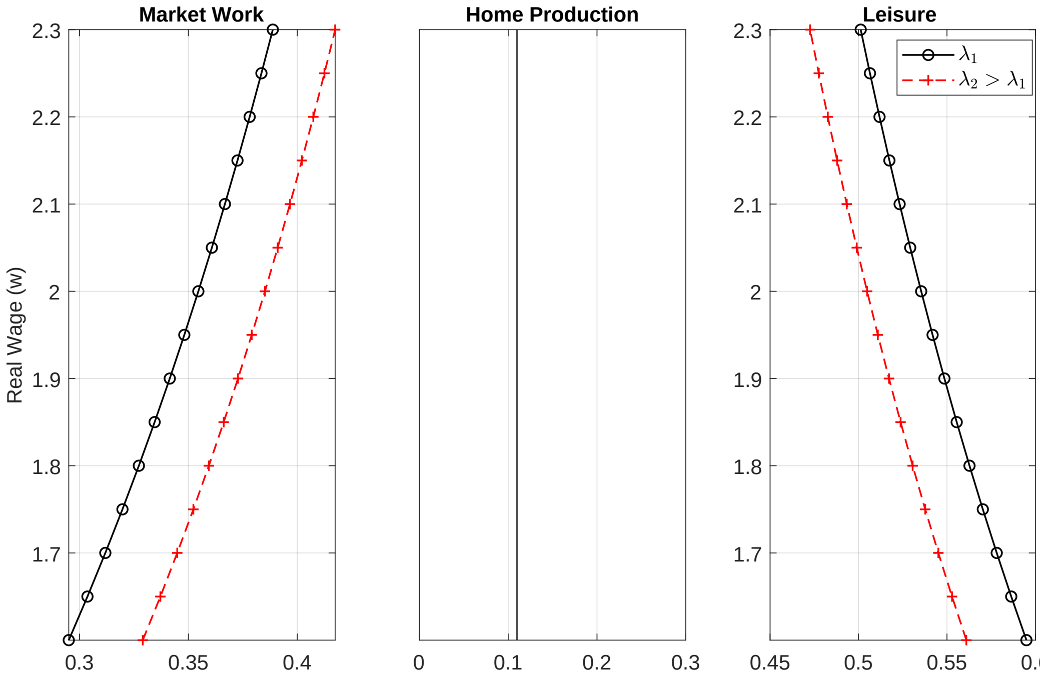

Figure 8: Time use responses to real wage and marginal utility of market goods consumption (λ) in the model without home production.

a higher wage to give up leisure and work more in the market. In contrast, households with home production increase their market work even at lower wages, as they have option to substitute housework time rather than their valued leisure. In other words, leisure is more expensive than housework in terms of relative prices. I consider these substitution between daily activities as the substitution effect. Figure 9 supports the arguments in Cacciatore et al. (2024) under a CRRA preference function.

4.3 Counterfactual Analysis

The magnitude and persistence of responses to inflation can vary substantially with the underlying structural parameters of the model. Specifically, I vary two parameters that play central roles in household and firm behavior: (i) the elasticity of substitution between market-produced and home-produced goods $\frac{1}{1-b_1}$, which governs how easily households shift their consumption between these two types of goods, and (ii) the probability of price resetting $1-\theta$, which captures the degree of price rigidity in the economy. The following subsections present IRFs computed for alternative values of these two key parameters as counterfactual analysis. In the following subsections, IRFs for different values of two parameters of elasticity of substitution between market and home goods $\frac{1}{1-b_1}$ and the probability of price resetting $1-\theta$ are analyzed.

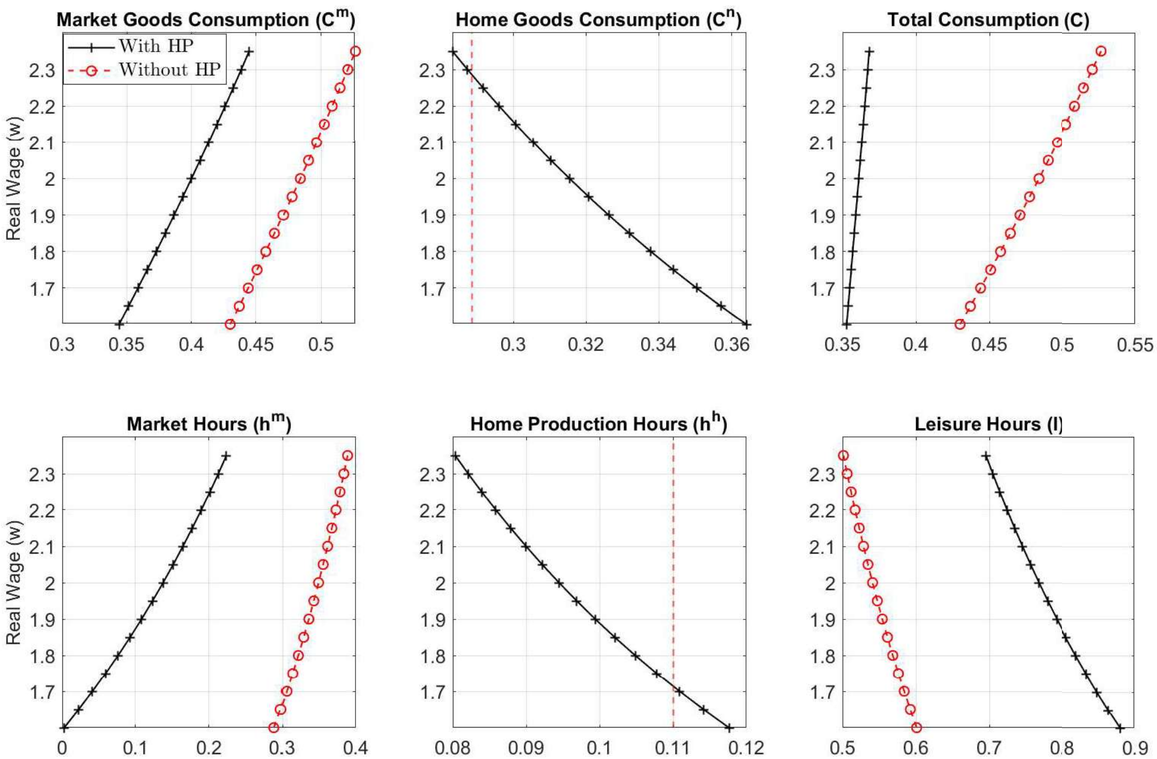

Figure 9: Comparison of time allocation and consumption responses in models with and without home production.

4.3.1 Elasticity of Substitution Between Market and Home Goods

Figure 10 shows the effect of an expansionary government expenditure shock on individuals' time use and consumption for different values of elasticity between market and home goods. The results indicate that higher elasticity leads to greater substitution of home goods with market work. In contrast, as shown in Figure 11, higher elasticity results in greater substitution of market work with home goods following a supply-side markup shock.

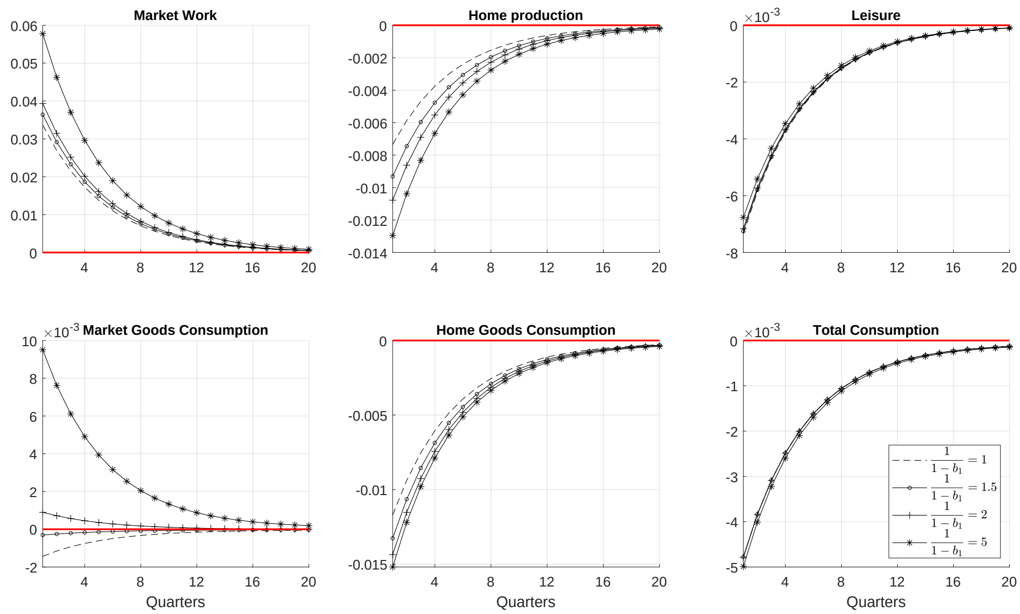

Figure 10: Impulse responses following a one-standard-deviation government expenditure shock for elasticity of $\frac{1}{1-b_1}$. Variables are in percentage deviations from the steady state.

4.3.2 Probability of Price Resetting $(1-\theta)$

Figures 12 and 13 analyze the effect of the probability of price resetting, θ, on household time use and consumption. A higher θ indicates stickier prices, meaning firms adjust prices less frequently, while a lower θ reflects more frequent price adjustments, approaching a flexible-price environment. According to these IRFs, when firms can adjust their prices more often, households tend to shift time from market work to housework and leisure due to a lower real wage. These substitutions reduce output, market goods consumption, and total consumption. In contrast, when prices are sticky, the opposite occurs. Lower inflation and a higher real wage encourage more market work, leading to higher market goods consumption and increased output. Thus, flexible prices raise inflation and reduce output by shifting household labor from market work to home production and leisure.

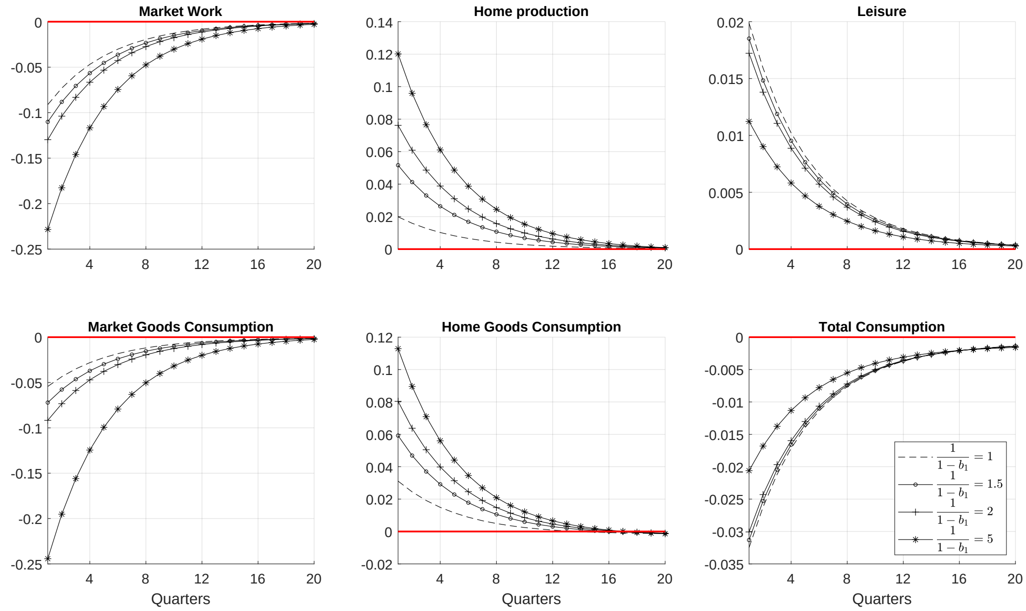

Figure 11: Impulse responses following a one-standard-deviation markup shock for different elasticity of $\frac{1}{1-b_1}$. Variables are in percentage deviations from the steady state.

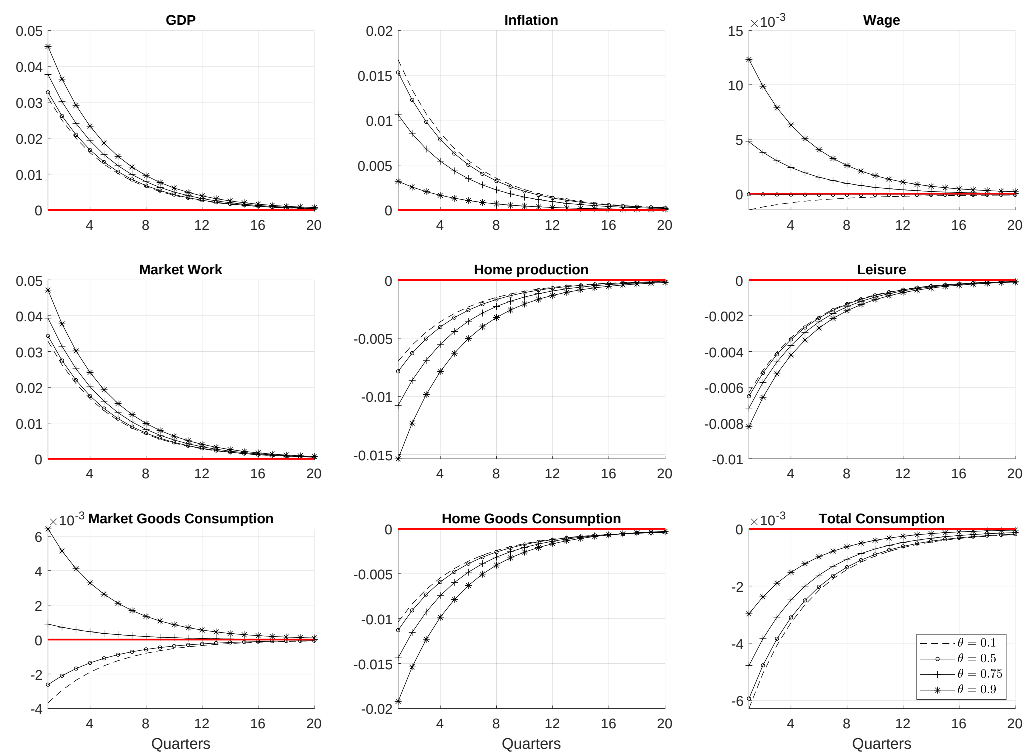

Figure 12: Impulse responses following a one-standard-deviation government expenditure shock for different values of θ. Variables are in percentage deviations from the steady state.

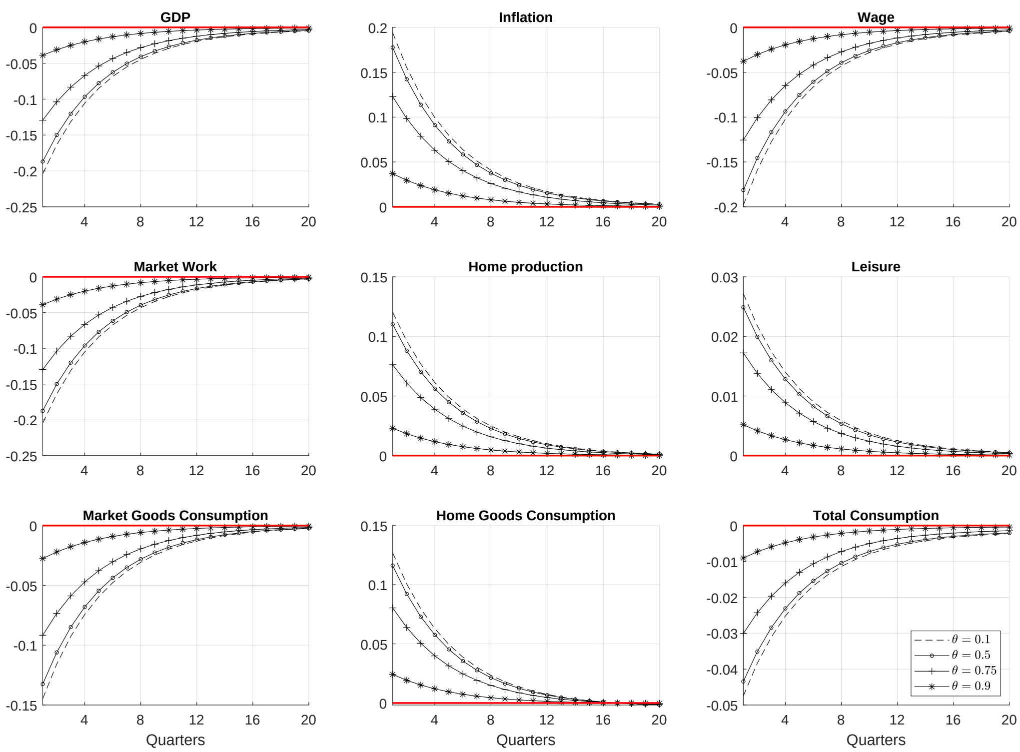

Figure 13: Impulse responses following a one-standard-deviation markup shock for different values of θ. Variables are in percentage deviations from the steady state.

5 Conclusion

The dynamics of inflation in the United States have shown significant fluctuations over the past two decades. Although periods of low inflation have generally dominated, recent hikes have renewed interest in studying its potential effects on household behavior. While the impact of inflation on consumption is well studied, its influence on time allocation remains largely overlooked. This study addresses this gap by exploring how inflation shapes individuals' daily time use by combining data from ATUS with macroeconomic variables, including inflation expectations from the Survey of Professional Forecasters. To estimate the effects of inflation on market work, home production, and leisure, I develop a novel two-stage LPIV approach that addresses embedded endogeneity in the study of inflation. The findings reveal that inflation's impact extends beyond consumption expenditures to non-market activities such as producing home goods and leisure. These classes of activities, while central to people's welfare, labor supply, consumption, and saving decisions, are often ignored when calculating the national accounts. Empirically, the results show that inflationary shocks increase time spent in market work while reducing time devoted to home production and leisure.

To interpret these findings, I extend a variant of DSGE model to include a home production sector, introducing household preference and government spending shocks as demand-side drivers, and technology and markup shocks as supply-side drivers. The results indicate that the behavioral response to inflation depends on its source. Theoretical demand-sided results match the empirical evidence that people give away their time allocated to home production and leisure to working more in market, supporting the idea that inflation after 2003 was predominantly demand-driven. Model optimality conditions also suggest that, regardless of its origin, inflation raises the marginal utility of market goods consumption, implying that households place a higher value on such consumption during inflationary periods. I identify this channel as the wealth effect, which increases labor supply in all cases. The substitution effect, by contrast, depends on wage changes. Moreover, the magnitude of household responses to inflation rises with the elasticity of substitution between market and home goods, as well as with the probability of price adjustments.

This analysis assumes separable household preferences, but future research could extend the framework to non-separable or recursive utility function such as Epstein-Zin preferences, to allow for greater risk aversion. Employing ATUS data and the Bayesian approach can also open a new way to estimate parameters in DSGE models. Furthermore, it would be fruitful for future work to adapt the model to state-dependent environments, such as high versus low unemployment or high versus low inflation to capture potentially asymmetric effects. Additional extensions could incorporate other time-use categories, such as shopping or job search, and account for household heterogeneity.

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Online Appendix

"The Impact of Inflation on Time Use of Individuals"

Jalal Bagherzadeh

A Data Description

A.1 ATUS Data

The ATUS data is collected from the BLS website https://www.bls.gov/tus/data.htm, specifically from the datasets of "atusact-0322", "atusresp-0322", "atusrost-0322", and "atussum-0322", which were downloaded directly from the BLS data center. Following data cleaning procedures in line with Aguiar and Hurst (2007), I selected variables such as "Year", "Month", "Date", "Region", "Age", "Sex", "Race", "Marital status", "Education", "Full time/ Part time status", "Weekly earning" from personal data of individuals. Additionally, the following individual-level time use variables were chosen: "Personal care", "Eating and drinking", "Household activities", "Purchasing goods and services", "Caring for and helping household members", "Caring for and helping non-household members", "Working and Work-related Activities", "Organizational, civic, and religious activities", "Leisure and sports", "Telephone calls, mail, and e-mail", and "Other activities, not elsewhere classified." The data covers the period from January 2003 to end of December 2024, including all individuals and years within the dataset. Since one of the main variables of interest is working time, a subset is restricted to the working-age population, defined as individuals aged 16 to 65. Due to COVID-related restrictions, data for April 2020 is unavailable and is excluded from the analysis.

Different categories of time use were aggregated to create variables for market work hours, home production hours, and leisure hours at the individual level. These variables are constructed at individual level as following: Working Hours includes time spent on working, work-related activities, travel related to work, and travel related to work-related activities. Leisure Hours consist of activities such as watching TV, socializing, sleeping, eating, personal care, and other leisure activities. Home production hours include core home production tasks, such as meal preparation and housework, home ownership activities, gardening, pet care, and car maintenance at home. By aggregating data over time periods such as months, quarters, or years, I was able to collapse the panel data into time series variables.

Figures 14, 15, and 16 illustrate the trends in time use categories, specifically market work, home production, and leisure hours, respectively.

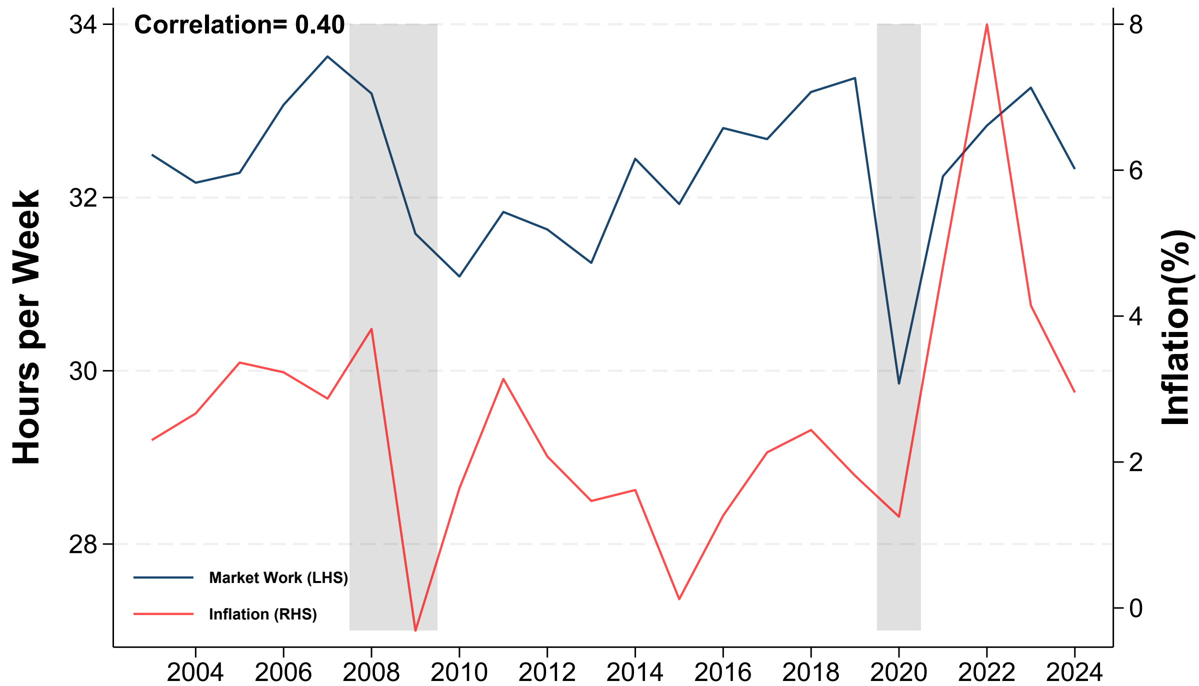

Figure 14: De-trended market work hours of working-age population and quarterly CPI inflation. Author's calculation using ATUS data. Shaded areas show recessionary periods as defined by the NBER.

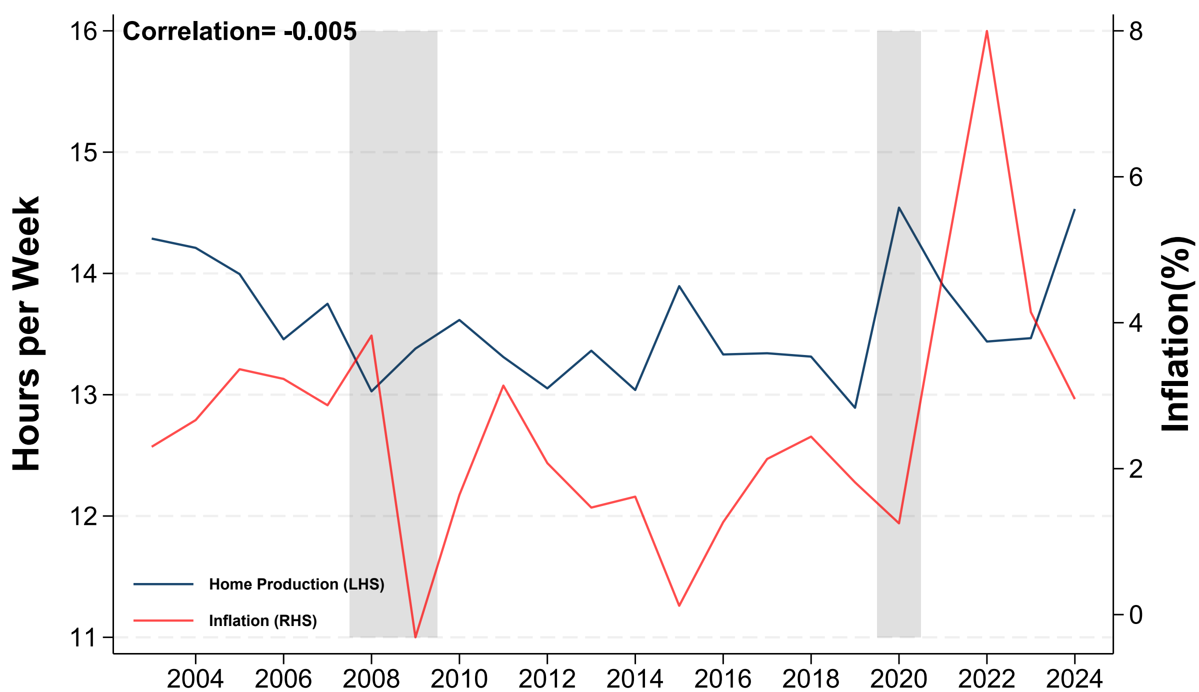

Figure 15: De-trended home production hours of working-age population and quarterly CPI inflation. Author's calculation using ATUS data. Shaded areas show recessionary periods as defined by the NBER.

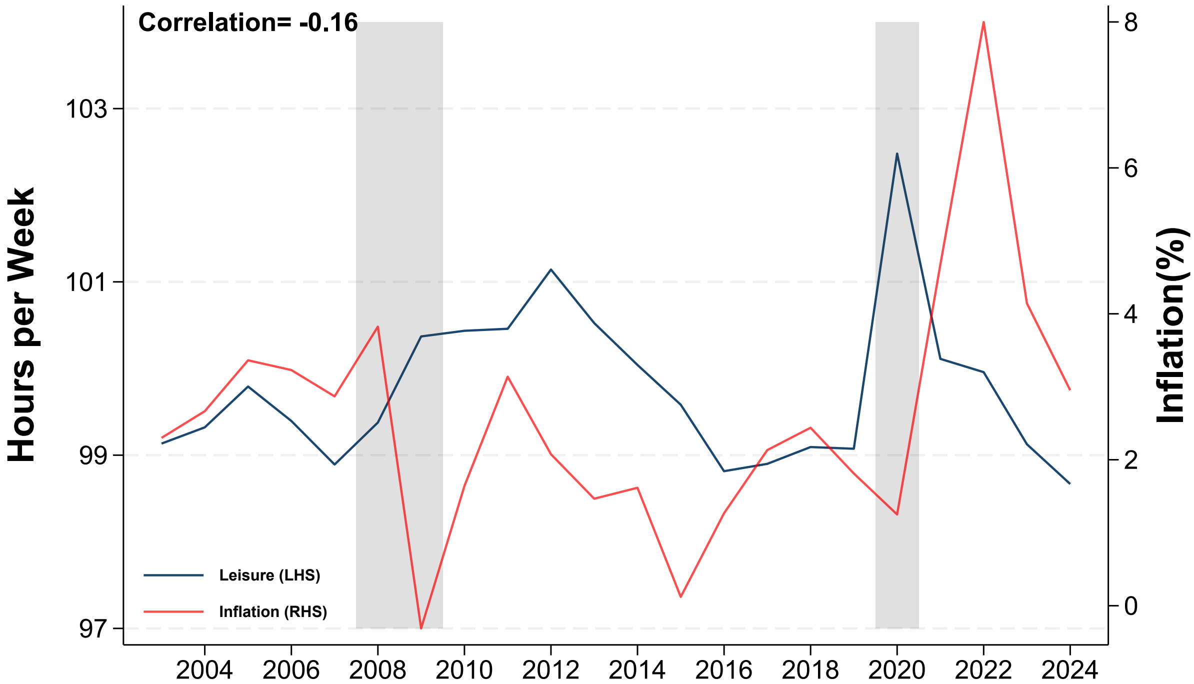

Figure 16: De-trended leisure hours of working-age population and quarterly CPI inflation. Author's calculation using ATUS data. Shaded areas show recessionary periods as defined by the NBER.

A.2 Aggregated Data

All next-quarter inflation expectations are measured quarterly and sourced from the Survey of Professional Forecasters. Time series for the mean, median, 25th percentile, and 75th percentile levels can be directly downloaded from the Philadelphia Federal Reserve's website: `https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/mean-forecasts`, `https://www.philadelphiafed.org/surveys-and-dat` `real-time-data-research/median-forecasts`, `https://www.philadelphiafed.org/surveys-and-data/real-time-data-research/dispersion-forecasts`, respectively. The Consumer Price Index (CPI) is obtained from `https://fred.stlouisfed.org/series/CPIAUCSL` and used to construct quarterly 12-month inflation rates. Real potential gross domestic product is downloaded from FRED who extracted the series from U.S. congressional Budget Office (`https://fred.stlouisfed.org/series/GDPPOT`). Real GDP is obtained from `https://fred.stlouisfed.org/series/GDPC1` and used to calculate the percentage deviation from potential GDP as: $(\frac{GDP-Potential\ GDP}{Potential\ GDP}) \times 100$. For robustness check, the series ”Average Weekly Hours of Production and Nonsupervisory Employees, Total Private (AWHNONAG)”, compiled by U.S. Bureau of Labor Statistics is used as a proxy for market work. This series can be accessed from FRED at `https://fred.stlouisfed.org/series/AWHNONAG`.

B Impulse Response Functions for Inflation Shock

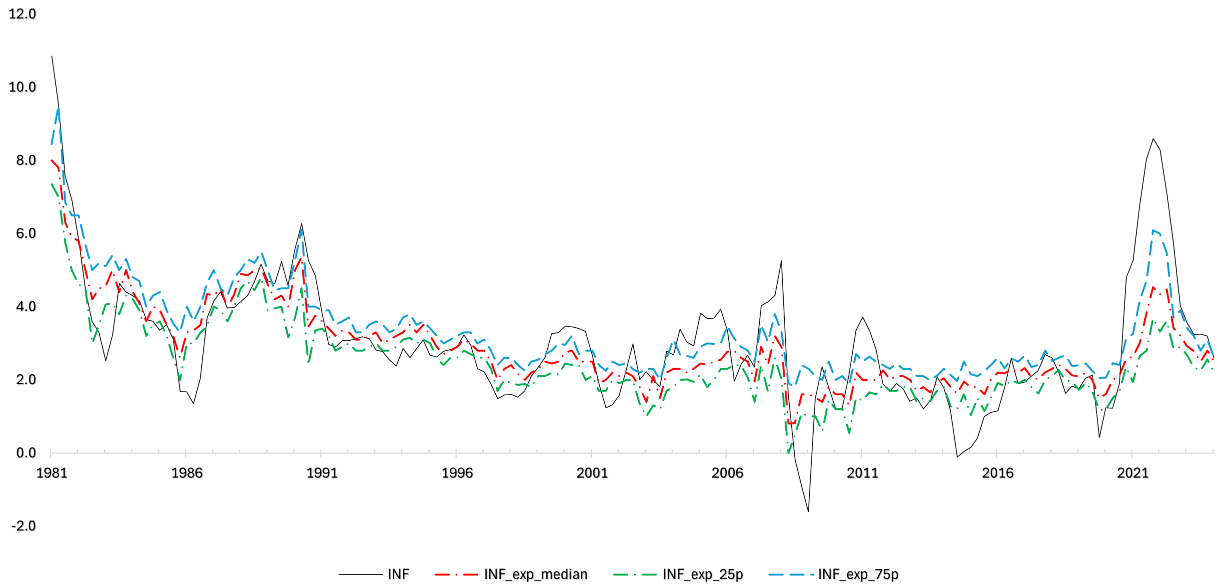

Figure 17: Inflation and inflation expectations from SPF. Data from 2003:Q1–2024:Q4.

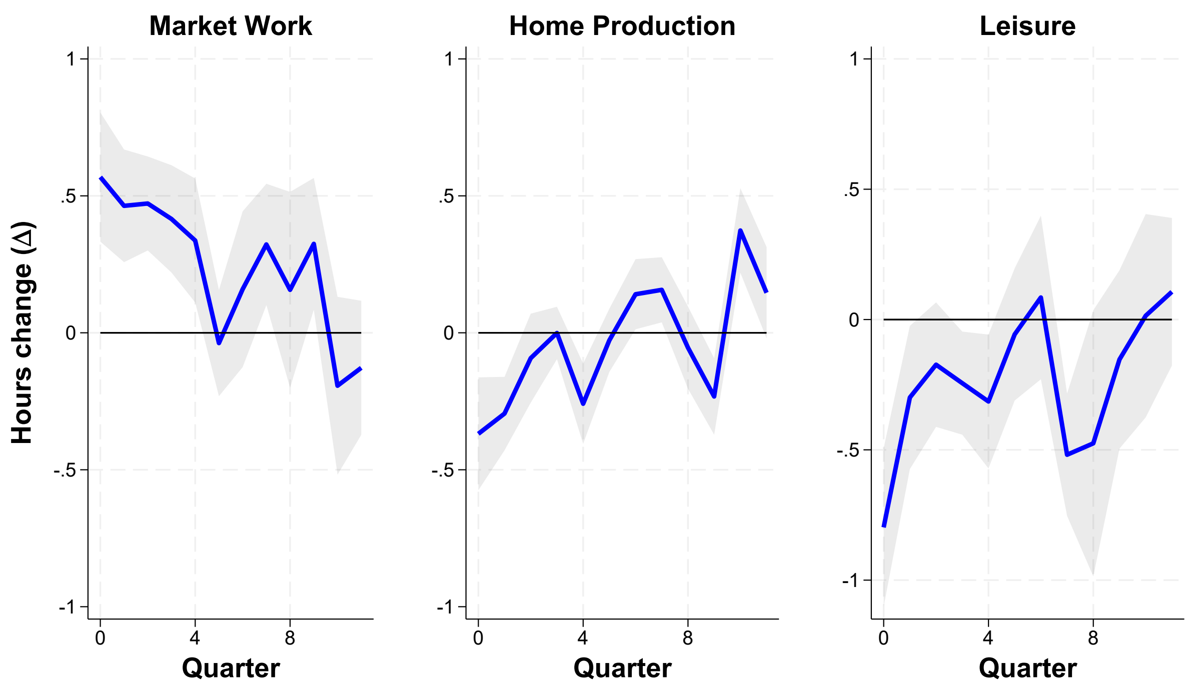

Figure 18: Estimated impulse responses of market work, home production, and leisure hours to 1-standard-deviation shock in the inflation rate, using the mean level of next-quarter inflation expectations. Shaded areas indicate 68-percent confidence interval around estimate. Data from 2003:Q1–2024:Q4.

Table 2: 1-Stage Regression Result

	$\widetilde{\pi}$
L1.$E_t\pi_{t+1}$	2.056***
	(0.416)
L2.$E_t\pi_{t+1}$	0.415
	(0.4)
L3.$E_t\pi_{t+1}$	-0.551*
	(0.301)
L1.ΔY_t	0.09
	(0.119)
L2.ΔY_t	-0.007
	(0.08)
L3.ΔY_t	-0.066
	(0.089)
Constant	-1.714***
	(0.641)
Observations	85
R^2	0.594
F-statistics	16.13
Prob > F	0.0000

$*p < 0.10$, $**p < 0.05$, $***p < 0.01$

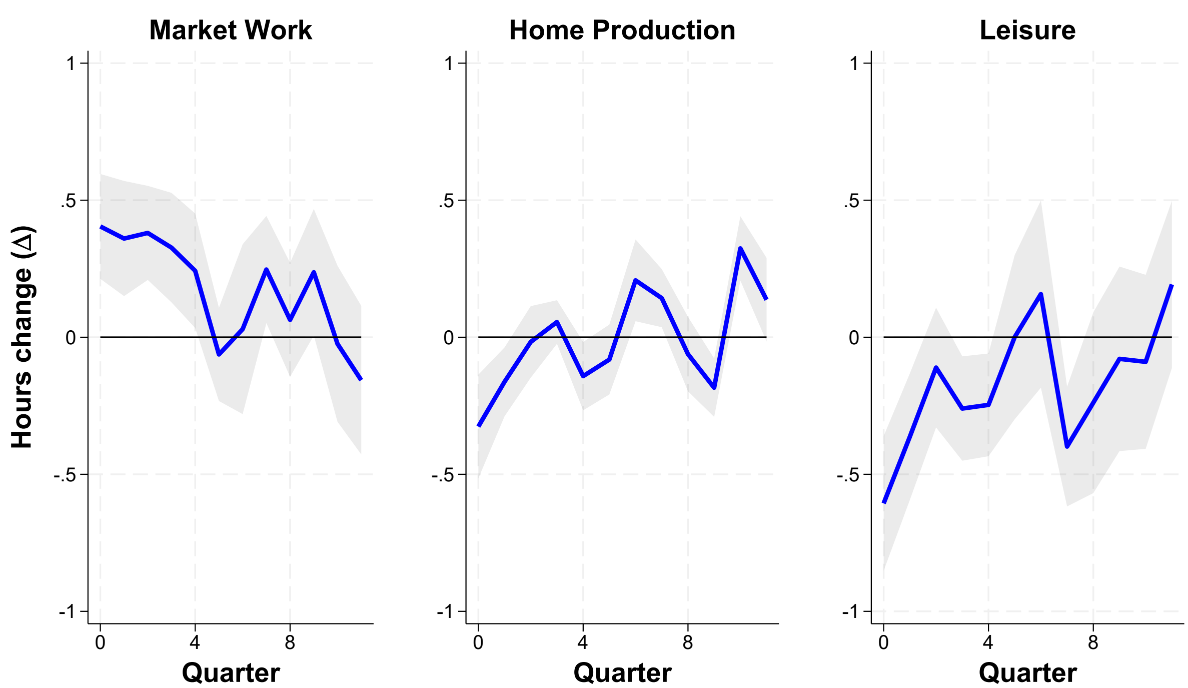

Figure 19: Estimated impulse responses of market work, home production, and leisure hours to 1-standard-deviation shock in the inflation rate, using the 25th percentile level of next-quarter inflation expectations. Shaded areas indicate 68-percent confidence interval around estimate. Data from 2003:Q1–2024:Q4.

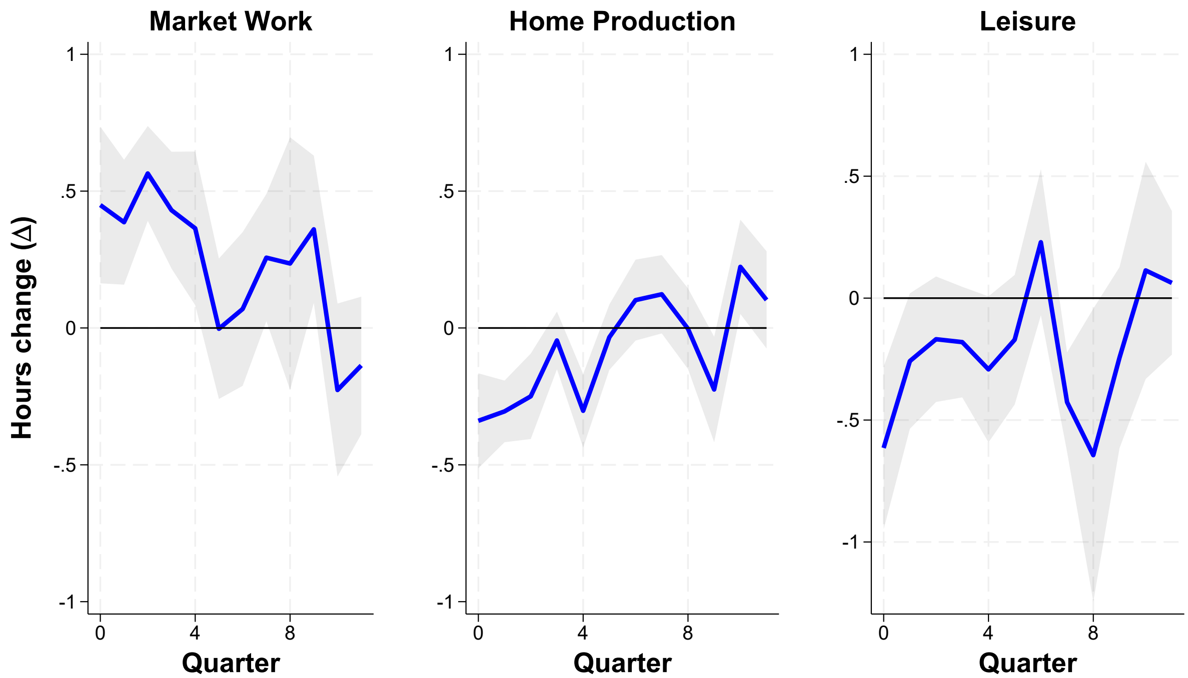

Figure 20: Estimated impulse responses of market work, home production, and leisure hours to 1-standard-deviation shock in the inflation rate, using the 75th percentile level of next-quarter inflation expectations. Shaded areas indicate 68-percent confidence interval around estimate. Data from 2003:Q1–2024:Q4.

C Model

The representative household maximizes their utility function respect to the consumption of a single good, C_t, and leisure, l_t.

$$Max\ \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t U(C_t, l_t) \tag{C1}$$

The marginal utility of consumption and leisure, $U_{c,t}$ and $U_{l,t}$ for the period are assumed to be positive and non-increasing for a continuous and twice differentiable function, which mathematically means below conditions are satisfied.

$$U_{c,t} \equiv \frac{\partial U(C_t, l_t)}{\partial C_t} > 0, \quad U_{c,t} \equiv \frac{\partial^2 U(C_t, l_t)}{\partial C_t^2} \leq 0 \tag{C2}$$

$$U_{l,t} \equiv \frac{\partial U(C_t, l_t)}{\partial l_t} > 0, \quad U_{c,t} \equiv \frac{\partial^2 U(C_t, l_t)}{\partial l_t^2} \leq 0 \tag{C3}$$

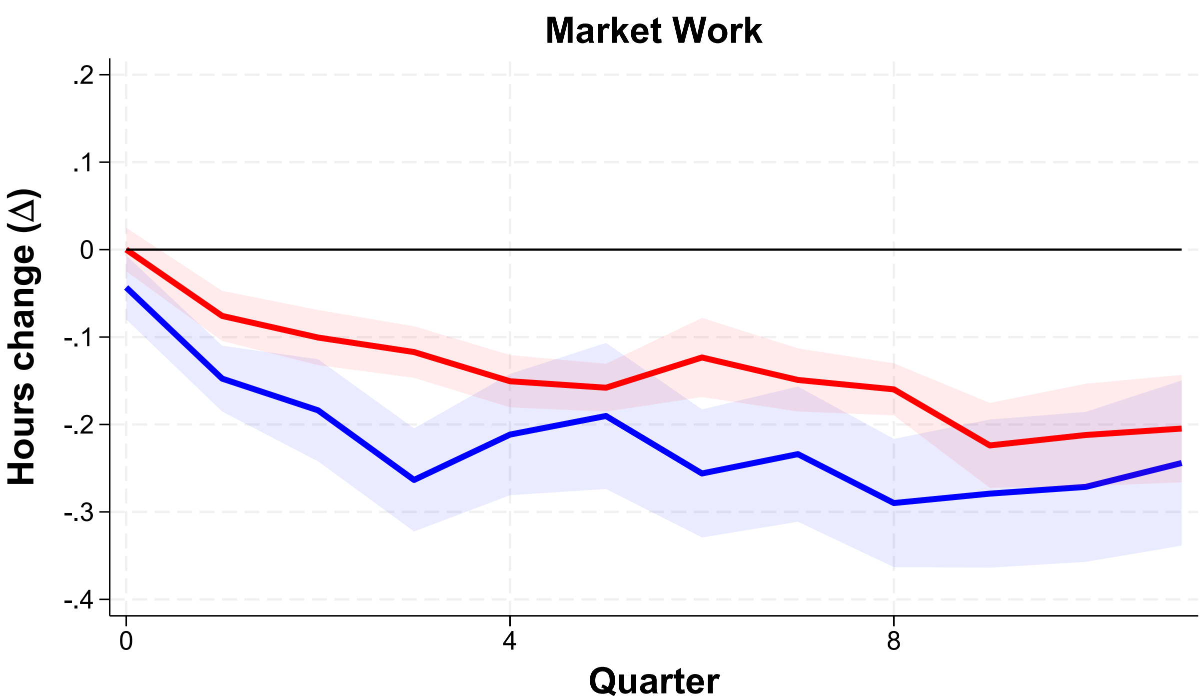

Figure 21: Estimated impulse responses of market work to 1-standard-deviation shock in the inflation rate, using the median level of next-quarter inflation expectations. The series "Average Weekly Hours of Production and Non-supervisory Employees: Total Private" downloaded directly from the FRED database. Blue line provides the IRF for data during the 1981:Q3–2002:Q4. Red line provides the IRF for data during the 2003:Q1–2024:Q4.

If we assume that the household is currently on the optimal plan, any deviation from decision variables including current period consumption and leisure hours should not change the level of utility. Otherwise, the assumption that the current policy lies on the optimum plan is violated. The deviation can be an increase in consumption, dC_t or an increase in leisure hours, dl_t, but consumption and leisure hours in other periods of time are kept unchanged. Changes in utility function can be written as follows:

$$U_{c,t}dC_t + U_{l,t}dl_t = dU = 0 \tag{C4}$$

For any pair of (dC_t, dl_t) and after substituting in the budget constraint, the condition below must be maintained.

$$P_t dC_t = W_t dh_t^m \tag{C5}$$

Similarly, if household reallocates consumption between periods of t and $t+1$ while leaving other periods of time unchanged, the utility function at the optimal level needs to follow the conditions below.

$$U_{c,t}dC_t + \beta \mathbb{E}_t\{U_{c,t+1}dC_{t+1}\} = 0 \tag{C6}$$

$$P_{t+1}dC_{t+1} = -\frac{P_t}{Q_{t,t+1}}dC_t \tag{C7}$$

Where, $Q_{t,t+1}$ is the price of a risk-free asset, such as bonds, that pays one unit of money at maturity of $t+1$ purchased at t. The latter equation implies that household can increase their consumption at period of time $t+1$ only if they save $P_t dC_t$ at time t and allocate to the risk-free asset. By substituting C5 into C4 and C7 into C6, the optimal conditions for consumption and leisure hours can be obtained by

$$\frac{U_{l,t}}{U_{c,t}} = \frac{w_t}{P_t} \tag{C8}$$

$$Q_{t,t+1} = \beta\, \mathbb{E}_t \left\{ \frac{U_{c,t+1}}{U_{c,t}} \cdot \frac{P_t}{P_{t+1}} \right\} \tag{C9}$$

that the latter one is called intertemporal optimality condition. Household maximizes their consumption for the given expenditure level of Z_t

$$\int_0^1 P_t(i)C_t(i)\, di \equiv Z_t \tag{C10}$$

$$\mathcal{L} = \left[\int_0^1 c_t^m(i)^{\frac{\varepsilon_t - 1}{\varepsilon_t}}\, di\right]^{\frac{\varepsilon_t}{\varepsilon_t - 1}} - \lambda \left(\int_0^1 P_t(i) c_t^m(i)\, di - Z_t\right) \tag{C11}$$

$$c_t^m(i)^{-\frac{1}{\varepsilon_t}} \left[\int_0^1 c_t^m(i)^{\frac{\varepsilon_t - 1}{\varepsilon_t}}\, di\right]^{\frac{1}{\varepsilon}} = \lambda P_t(i) \tag{C12}$$

$$(c_t^m(i))^{-\frac{1}{\varepsilon}} (c_t^m)^{\frac{1}{\varepsilon}} = \lambda P_t(i), \quad i \in [0,1] \tag{C13}$$

For any two goods (i, j),

$$c_t^m(i) = c_t^m(j) \left(\frac{P_t(i)}{P_t(j)}\right)^{-\varepsilon_t} \tag{C14}$$

By substituting in expenditure equation C10, it yields consumption for good i.

$$c_t(i) = \left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t} \frac{Z_t}{P_t} \tag{C15}$$

$$c_t^m = \left[\int_0^1 (c_t^m(i))^{\frac{\varepsilon_t - 1}{\varepsilon_t}}\, di\right]^{\frac{\varepsilon_t}{\varepsilon_t - 1}} = \left[\int_0^1 \left(\left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t} \frac{Z_t}{P_t}\right)^{\frac{\varepsilon_t - 1}{\varepsilon_t}} di\right]^{\frac{\varepsilon_t}{\varepsilon_t - 1}} \tag{C16}$$

$$c_t^m = \frac{Z_t}{P_t} P_t^{\varepsilon_t} \left[\int_0^1 (P_t(i))^{1-\varepsilon_t} di\right]^{\frac{\varepsilon_t}{\varepsilon_t - 1}} = \frac{Z_t}{P_t} \tag{C17}$$

$$c_t^m P_t = Z_t = \int_0^1 P_t(i) c_t^m(i)\, di \tag{C18}$$

$$\int_0^1 P_t(i) c_t^m(i)\, di = c_t^m P_t \tag{C19}$$

$$c_t^m(i) = \left(\frac{P_t(i)}{P_t}\right)^{-\varepsilon_t} c_t^m \tag{C20}$$

C.1 Aggregated Price Dynamics

According to Calvo (1983), only $1-\theta$ firms are allowed to reset their prices at period t when all firms choose an identical optimal price of P_t^*.

$$P_t = \left[\int_{S(t)} P_{t-1}(i)^{1-\varepsilon} di + (1-\theta)\left(P_t^*\right)^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}} = \left[\theta\left(P_{t-1}\right)^{1-\varepsilon} + (1-\theta)\left(P_t^*\right)^{1-\varepsilon}\right]^{\frac{1}{1-\varepsilon}} \tag{C21}$$

Where, $S(t) \subset [0,1]$ denotes the set of firms not reoptimizing their prices in period t. After dividing both sides by P_{t-1},

$$(\frac{P_t}{P_{t-1}})^{1-\varepsilon} = \theta + (1-\theta)\left(\frac{P_t^*}{P_{t-1}}\right)^{1-\varepsilon} \tag{C22}$$

$$\frac{P_t^*}{P_{t-1}} = \frac{P_t^*}{P_t}\frac{P_t}{P_{t-1}} = \frac{P_t^*}{P_t}\Pi_t \tag{C23}$$

where, $\Pi_t \equiv \frac{P_t}{P_{t-1}}$. Then, equation C22 can be rewritten in the form of C25 which states the normalized optimal price relative to the aggregate price level.

$$(\Pi_t)^{1-\varepsilon} = \theta + (1-\theta)\left(\frac{P_t^*}{P_t}\Pi_t\right)^{1-\varepsilon} \tag{C24}$$

$$\frac{P_t^*}{P_{t-1}} = (\frac{1-\theta\Pi_t^{\varepsilon-1}}{(1-\theta)})^{\frac{1}{1-\varepsilon}} \tag{C25}$$

C.2 First-order Conditions

$$\begin{aligned}\mathcal{L} = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{\left[\left[\alpha_1(c_t^m)^{b_1} + (1-\alpha_1)(c_t^h)^{b_1}\right]^{\frac{b}{b_1}}(l_t)^{1-b}\right]^{1-\sigma} - 1}{1-\sigma}& \\ + \mu_t\left[(k_t^h)^{\alpha_2}(h_t^h)^{1-\alpha_2} - c_t^h\right]& \\ + \gamma_t\left[k_t - k_t^m - k_t^h\right]& \\ + \frac{\lambda_t}{P_t}\left\{B_t + w_t P_t h_t^m + r_t^k P_t k_t^m - \mathbb{E}_t(Q_{t,t+1}B_{t+1}) - P_t c_t^m - P_t\left[k_{t+1} + (1-\delta)k_t + \frac{\xi}{2}\left(\frac{k_{t+1}}{k_t} - 1\right)^2\right]\right\}&\end{aligned} \tag{C26}$$

$$\{c_t^m\}: \quad \lambda_t = U_{c^m}(C_t, l_t) = U_C(C_t, l_t)\alpha_1\left(\frac{c_t^m}{C_t}\right)^{b_1-1} \tag{C27}$$

$$\{c_t^n\}: \quad \mu_t = U_C(C_t, l_t)(1-\alpha_1)\left(\frac{c_t^h}{C_t}\right)^{b_1-1} \tag{C28}$$

$$\{h_t^m\}: \quad \lambda_t w_t = U_l(C_t, l_t) \tag{C29}$$

$$\{h_t^h\}: \quad U_l(C_t, l_t) = \mu_t(1-\alpha_2)\left(\frac{c_t^h}{h_t^h}\right) \tag{C30}$$

$$\{k_t^m\}: \quad \gamma_t = \lambda_t r_t^k \tag{C31}$$

$$\{k_t^n\}: \quad \gamma_t = \mu_t \alpha_2 \left(\frac{c_t^h}{k_t^h}\right) \tag{C32}$$

$$\{k_{t+1}\}: \quad \beta\mathbb{E}\left\{\frac{\lambda_{t+1}}{\lambda_t}\left[1+\frac{\xi}{k_t}\left(\frac{k_{t+1}}{k_t}-1\right)\right]\right\}^{-1}\left[1-\delta+\frac{\xi}{k_t}\left(\frac{k_{t+2}}{k_{t+1}}-1\right)\left(\frac{k_{t+2}}{k_{t+1}}\right)\right]+\beta\mathbb{E}\left\{\gamma_{t+1}\right\}=1 \tag{C33}$$

$$\{B_{t+1}\}: \quad \lambda_t \mathbb{E}_t\{Q_{t,t+1}\} = \beta\mathbb{E}_t\left\{\frac{\lambda_{t+1}}{\pi_{t+1}}\right\} \tag{C34}$$

Integrating equations C28 and C30 yields equation C35 and equations C27 and C29 draw the expression C36.

$$\frac{U_l(C_t, l_t)}{U_C(C_t, l_t)} = \frac{(1-\alpha_1)(1-\alpha_2)c_t^h}{h_t^h}\left(\frac{c_t^h}{C_t}\right)^{b_1-1} \tag{C35}$$

$$\frac{U_l(C_t, l_t)}{U_C(C_t, l_t)} = w\alpha_1\left(\frac{c_t^m}{C_t}\right)^{b_1-1} \tag{C36}$$

$$\frac{\alpha_1}{1-\alpha_1}\left(\frac{c_t^m}{C_t}\right)^{b_1-1} = \frac{1-\alpha_2}{w}\frac{c_t^h}{h_t^n} \tag{C37}$$

Marginal utility of households for consumption and labor can be derived in the form of equations C38 and C39.

$$U_C(C_t, l_t) = bC_t^{b(1-\sigma)-1}(l_t)^{(1-b)(1-\sigma)} \tag{C38}$$

$$U_l(C_t, l_t) = (1-b)C_t^{b(1-\sigma)}(l_t)^{(1-b)(1-\sigma)-1} \tag{C39}$$

$$\beta \mathbb{E}_t \left\{ \frac{\lambda_{t+1}}{\lambda_t} \left[1 + \frac{\xi}{k_t} \left(\frac{k_{t+1}}{k_t} - 1 \right) \right]^{-1} \left[1 - \delta + r_{t+1}^k + \xi \left(\frac{k_{t+2}}{k_{t+1}} - 1 \right) \left(\frac{k_{t+2}}{k_{t+1}^2} \right) \right] \right\} = 1 \tag{C40}$$

D General Equilibrium Condition

$$C_t = \left[\alpha_1 (c_t^m)^{b_1} + (1-\alpha_1)(c_t^h)^{b_1} \right]^{\frac{1}{b_1}} \tag{D1}$$

$$c_t^h = (k_t^h)^{\alpha_2}(h_t^h)^{1-\alpha_2} \tag{D2}$$

$$k_t = k_t^m + k_t^h \tag{D3}$$

$$k_{t+1} = (1-\delta)k_t + I_t - \frac{\xi}{2} \left(\frac{k_{t+1}}{k_t} - 1 \right)^2 \tag{D4}$$

$$\left(\frac{\alpha_1}{1-\alpha_1} \right) \left(\frac{c_t^m}{c_t^h} \right)^{b_1 - 1} = \frac{1-\alpha_2}{w_t} \left(\frac{c_t^h}{h_t^h} \right) \tag{D5}$$

$$\left(\frac{\alpha_1}{1-\alpha_1} \right) \left(\frac{c_t^m}{c_t^h} \right)^{b_1 - 1} = \left(\frac{\alpha_2}{r_t^k} \right) \left(\frac{c_t^h}{k_t^h} \right) \tag{D6}$$

$$w_t(1 - h_t^m - h_t^h) = \left(\frac{1-b}{b\alpha_1} \right) (c_t^m)^{1-b} C_t^{b_1} \tag{D7}$$

$$\beta \mathbb{E}_t \left\{ \frac{\lambda_{t+1}}{\lambda_t} \left[1 + \frac{\xi}{k_t} \left(\frac{k_{t+1}}{k_t} - 1 \right) \right] \right\}^{-1} \left[1 - \delta + r_{t+1}^k + \xi \left(\frac{k_{t+2}}{k_{t+1}} - 1 \right) \left(\frac{k_{t+2}}{k_{t+1}} \right) \right] = 1 \tag{D8}$$

$$\beta \mathbb{E}_t \left\{ \frac{\lambda_{t+1}}{\lambda_t} (1 + R_t) \Pi_{t+1}^{-1} \right\} = 1 \tag{D9}$$

$$\frac{P_t^*}{P_t} = \left(\frac{1 - \theta \Pi_t^{\epsilon - 1}}{1 - \theta} \right)^{-\dfrac{1}{\epsilon - 1}} \tag{D10}$$

$$\lambda_t = b\alpha_1 (1 - h_t^m - h_t^h)^{(1-b)(1-\sigma)} (c_t^m)^{b_1 - 1} c_t^{(b_1 - \sigma) - b_1} \tag{D11}$$

$$\frac{P_t^*}{P_t} = \frac{x_{1,t}}{x_{2,t}} \tag{D12}$$

$$x_{1,t} = [C_{m,t} + I_t + G_t] \left(\frac{\epsilon(1 - \tau)}{\epsilon - 1} \right) RMC_t + \beta\theta \mathbb{E}_t \left\{ \frac{\lambda_{t+1}}{\lambda_t} \Pi_{t+1}^{\epsilon} x_{1,t+1} \right\} \tag{D13}$$

$$x_{2,t} = [c_t^m + I_t + G_t] + \beta\theta \mathbb{E}_t \left\{ \frac{\lambda_{t+1}}{\lambda_t} \Pi_{t+1}^{\epsilon - 1} x_{2,t+1} \right\} \tag{D14}$$

$$Y_t = c_t^m + I_t + G_t \tag{D15}$$

$$Y_t = \Delta_t^{-1} (k_t^m)^{\alpha_3} (h_t^m)^{1 - \alpha_3} \tag{D16}$$

$$\alpha_3 RMC_t \left(\frac{\Delta_t Y_t}{k_t^m} \right) = r_t^k \tag{D17}$$

$$(1 - \alpha_3) RMC_t \left(\frac{\Delta_t Y_t}{h_t^m} \right) = w_t \tag{D18}$$

$$\Delta_t = (1 - \theta) \left(\frac{P_t^*}{P_t} \right)^{-\epsilon} + \theta \Pi_t^{\epsilon} \Delta_{t-1} \tag{D19}$$

E Partial Equilibrium: Value Functions

Solving the partial equilibrium of the household problem yields value functions for the decision variables C, c^m, c^h, h^m, h^h, k^m, k^h, and l as a function of wage w. o obtain these value functions, the system of equations derived from the equilibrium conditions is solved while holding the capital variable k_{ss} and the Lagrange multiplier λ_{ss} fixed at their steady-state values.

$$C = \left[\alpha_1 (c^m)^{b_1} + (1-\alpha_1)(c^h)^{b_1}\right]^{\frac{1}{b_1}} \tag{E1}$$

$$c^h = (k^h)^{\alpha_2} (h^h)^{1-\alpha_2} \tag{E2}$$

$$k_{ss} = k^m + k^h \tag{E3}$$

$$l = 1 - h^m - h^h \tag{E4}$$

$$\left(\frac{\alpha_1}{1-\alpha_1}\right)\left(\frac{c^m}{c^h}\right)^{b_1-1} = \frac{1-\alpha_2}{w(.)}\left(\frac{c^h}{h^h}\right) \tag{E5}$$

$$\left(\frac{\alpha_1}{1-\alpha_1}\right)\left(\frac{c^m}{c^h}\right)^{b_1-1} = \left(\frac{\alpha_2}{r^k}\right)\left(\frac{c^h}{k^h}\right) \tag{E6}$$

$$\lambda_{ss} = b\alpha_1 (l)^{(1-b)(1-\sigma)} (c^m)^{b_1-1} c^{(b_1-\sigma)-b_1} \tag{E7}$$

$$w(.)l = \left(\frac{1-b}{b\alpha_1}\right)(c^m)^{1-b} C^{b_1} \tag{E8}$$

F Inflation and Welfare

$$dU = U_c dC + U_l dl \tag{F1}$$

$$\frac{dU}{d\Pi} = U_c \frac{dC}{dc^m}\frac{dc^m}{d\Pi} + U_c \frac{dC}{dc^h}\frac{dc^h}{d\Pi} + U_l \frac{dl}{dh^m}\frac{dh^m}{d\Pi} + U_l \frac{dl}{dh^h}\frac{dh^h}{d\Pi} \tag{F2}$$

$$\frac{dU}{d\Pi} = \underbrace{U_c\alpha_1 \left(\frac{c^m}{C_t}\right)^{b_1-1} \frac{dc^m}{d\Pi}}_{\text{A}} + \underbrace{U_c(1-\alpha_1)\left(\frac{c^h}{C_t}\right)^{b_1-1} \frac{dh^h}{d\Pi}}_{\text{B}} \tag{F3}$$

$$+ \underbrace{U_l \frac{dl}{dh^m}\frac{dh^m}{d\Pi}}_{\text{C}} + \underbrace{U_l \frac{dl}{dh^h}\frac{dh^h}{d\Pi}}_{\text{D}} \tag{F4}$$

with $\frac{dl}{dh^h} = \frac{dl}{dh^m} = -1$ and assuming $c^h = h^h$. From households' optimality conditions we have

$$\lambda = U_c \frac{dC}{dc^m} \tag{F5}$$

$$\frac{U_l(C_t, l_t)}{U_c(C_t, l_t)} = w_t\alpha_1 \left(\frac{c_t^m}{C_t}\right)^{b_1-1} \tag{F6}$$

$$\frac{U_l(C_t, l_t)}{U_c(C_t, l_t)} = (1-\alpha_1)\left(\frac{c_t^h}{C_t}\right)^{b_1-1} \tag{F7}$$

such that terms B and C cancel out and we are left with terms A and D only.

$$\begin{aligned}
\frac{dU}{d\Pi} &= U_c\alpha_1 \left(\frac{c_t^m}{C_t}\right)^{b_1-1} \frac{dc^m}{d\Pi} - U_l \frac{dh^m}{d\Pi} \\
&= U_c\alpha_1 \left(\frac{c_t^m}{C_t}\right)^{b_1-1} \frac{dc^m}{d\Pi} - w_t U_c\alpha_1 \left(\frac{c_t^m}{C_t}\right)^{b_1-1} \frac{dh^h}{d\Pi} && \text{(F8)} \\
&= U_c\alpha_1 \left(\frac{c_t^m}{C_t}\right)^{b_1-1} \left[\frac{dc^m}{d\Pi} - w_t \frac{dh^m}{d\Pi}\right] && \text{(F9)}
\end{aligned}$$

In the following, the marginal utility of market goods consumption is mathematically proved to be positive:

$$\frac{d\lambda}{d\Pi} = \frac{dU_{c^m}}{d\Pi} = U_c \frac{dC}{dc^m}\frac{dc^m}{d\Pi} = U_c\alpha_1 \left(\frac{c_t^m}{C_t}\right)^{b_1-1} \frac{dc^m}{d\Pi} \tag{F10}$$

G Parametrization

Table 3: Parameter Values

Parameter	Value	Description
β	0.995	Discount factor

Table 3 – Continued

Parameter	**Value**	**Description**
σ	2.0	Risk aversion
δ	0.025	Capital depreciation rate
ξ	252.5	Capital adjustment costs
α_1	0.511	Expenditure share on market goods
α_2	0.328	Capital share home goods production function
α_3	0.176	Capital share market goods production function
Φ_π	1.50	Monetary policy inflation coefficient
ρ_m	0.0	Interest rate smoother
$\frac{1}{1-b_1}$	2	Elasticity of substitution between market and home consumption
b	0.508	Elasticity of substitution between total consumption and leisure
ϵ	6	Elasticity of substitution of intermediate goods
θ	0.75	Constant probability of resetting prices
ρ_β	0.8	Persistence household discount factor shock
ρ_g	0.8	Persistence government expenditures shock
ρ_a	0.8	Persistence TFP shock
ρ_ϵ	0.8	Persistence markup shock
σ_β	0.018513	Household discount factor shock, std. deviation
σ_g	0.006090	Government expenditures shock, std. deviation
σ_a	0.004618	TFP shock, std. deviation
σ_ϵ	0.001455	Markup shock, std. deviation