Shopping Time and Frictional Goods Markets: Implications for the New-Keynesian Model

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Abstract

How do goods market frictions reshape the New-Keynesian model? This paper extends the NK framework by incorporating costly household search effort and imperfect matching in goods markets, based on the observed procyclical behavior of shopping time. The model shows that search-and-matching (SaM) frictions in the goods market lead to lower long-run GDP due to idle capacity and a reduction in potential GDP. The Phillips curve becomes (slightly) steeper, the Euler equation flatter, and capacity utilization and total factor productivity become endogenous. These results depend on the trade-off between flexible search costs and sticky prices driving endogenous price elasticity and search productivity channels. Despite these changes, the model retains a five-equation reduced form in line with common NK models. This framework allows for a deeper understanding of goods market inefficiencies and their implications for macroeconomic dynamics and policy, offering new insights into the transmission of macroeconomic shocks and the role of monetary policy.

Keywords: Search-and-Matching, Goods Market Dynamics, Capacity Utilization, Phillips Curve, Euler equation

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1. Introduction

The assumption that goods markets clear, even with sticky prices, remains foundational in the New-Keynesian (NK) model. While labor market models have incorporated search-and-matching (SaM) frictions, goods markets have received less attention. However, evidence suggests that search costs and matching inefficiencies introduce frictions that can obscure key transmission mechanisms of macroeconomic shocks. These frictions affect resource allocation and amplify or dampen demand and supply dynamics over the business cycle.

Goods markets, like labor markets, exhibit frictions that hinder seamless transactions. Everyday examples highlight these mismatches: a table at a restaurant may sit empty while diners queue, reflecting peak demand contrasts with underutilization during off-peak hours. A bakery might sell out of bread in the morning but face unsold inventory later. Car dealerships illustrate mismatches as buyers wait months for custom orders while used car prices soar due to shortages. Firms also sift through numerous supplier proposals before selecting one. These examples underline inefficiencies where transactions fail to materialize, leaving resources underutilized and demand unmet.

Data underscore the significance of idle capacity and its link to search-and-matching frictions. U.S. industry operates at an average capacity utilization rate of 84%, with a quarterly standard deviation of 1.54%. Consumer durables exhibit a 9% stockout rate (Bils and Klenow (2004)), while marketing expenses — indicative of firms' efforts to match with buyers — account for 6% of U.S. GDP (Hall (2012)). Empirical studies show that shopping effort varies with the business cycle. For instance, shopping time is procyclical, increasing with income and driven by the search for additional consumption rather than lower prices (Petrosky-Nadeau et al. (2016)). This contrasts with countercyclical job search effort in labor markets, where individuals search more during downturns. Understanding these dynamics is critical to assessing the effects of goods market frictions on aggregate demand and supply. This paper builds on these insights to address the following research question:

> *How does costly shopping effort and imperfect matching influence the supply and demand transmission channels of the New-Keynesian model?*

Traditional NK models, while effective in analyzing monetary policy and inflation (e.g. Rotemberg (1982); Christiano et al. (2005)), often assume frictionless goods markets. This work extends the New-Keynesian framework (e.g. Erceg et al. (2000)) by integrating goods market SaM dynamics. I calibrate the model using labor share Phillips curve estimates from Gali and Gertler (1999); Sbordone (2002), ensuring it remains symmetric to the reduced-form NK model but with different effects on unobserved variables. By including unemployment (Gali (2011)) and home production (Benhabib et al. (1991); Greenwood and Hercowitz (1991)), this model allows for a richer analysis of resource allocation. Unlike earlier research focusing on firm-driven capacity utilization (McAdam and Willman (2013); Kuhn and George (2019)), this paper emphasizes market outcomes driven by household decisions, aligning closer with the demand-driven responses observed in the empirical literature. I build on the discussion of the response of hours worked to technology shocks (e.g. Gali (1999); Basu et al. (2006)) and extend it in light of endogenous capacity utilization.

The paper also draws on the extensive literature on search frictions in goods markets. Seminal works by Diamond (1971, 1982) highlight how search costs influence price setting and market dynamics. This tradition is extended in recent DSGE models that incorporate costly search effort (e.g. Head et al. (2012); Kaplan and Menzio (2016)). Benabou (1988, 1992) combines costly search effort with costly price adjustment and analyze the interplay of those two margins. In contrast, this paper focuses on matching inefficiencies for available goods. Thus, it diverges from the "New Monetarist" tradition and situates itself firmly within the "New Keynesian" framework.

Lastly, this research builds on recent studies that integrate SaM frictions into general equilibrium models (e.g. Michaillat and Saez (2015); Petrosky-Nadeau and Wasmer (2015); Huo and Rios-Rull (2020); Qiu and Rios-Rull (2022); Bai et al. (2024)). It extends the approach of Michaillat and Saez (2015) by incorporating sticky prices, introducing a dynamic trade-off between search effort and price adjustment over the business cycle. While similar in spirit to Qiu and Rios-Rull (2022), this paper shifts the focus from search for varieties (build on Huo and Rios-Rull (2020)) to available quantities, offering a complementary perspective. The literature on customer capital, i.e. Gourio and Rudanko (2014); Paciello et al. (2019), differs as the approach focusses on internal firm dynamics instead of household search input and market processes.

This paper incorporates a search-and-matching (SaM) framework into a small-scale New-Keynesian DSGE model. Goods market frictions arise from costly search effort by households and a matching process that links search effort and goods supply to trade relationships. Additionally, a home production component is included to capture the broader implications of household time allocation decisions. The model is linearized and solved analytically to decompose its channels, allowing for a detailed examination of how frictions impact the slopes of the Phillips curve and the Euler equation. To analyze the aggregate dynamics, the model is simulated using Dynare, focusing on the joint behavior of inflation and capacity utilization — a proxy for search effort. This approach provides a comprehensive understanding of how goods market frictions shape key macroeconomic transmission channels.

I find that the New-Keynesian model with goods market search-and-matching (SAM) nests the standard NK model, linking variable capacity utilization to inflation and the output gap. In the steady state, the model predicts a decrease in both real and potential GDP, driven by idle capacity and the impact of goods market SaM on markups and firm pricing power. The dynamic model can be reduced to a five-equation system, similar to Erceg et al. (2000), showing the same reduced-form relationships with altered slopes. Capacity utilization and the price elasticity are endogenous and influenced by firm market power and goods market frictions. Capacity utilization increases with search effort productivity but decreases with firm pricing power.

The Phillips curve slope depends on this trade-off and can be steeper or flatter than in the NK model. For the baseline calibration, I find the Phillips curve slope is 4% steeper, reducing the sensitivity of the output gap to inflation variation. The Euler equation slope is flatter by up to 89%, as marginal search costs, determined by market tightness, act as an additional inflationary term. Monetary policy becomes less effective in influencing aggregate demand, as search costs are only indirectly affected by policy.

Overall, I find that the output gap varies less than in the benchmark NK model for the same business cycle shocks, monetary policy is less effective in steering aggregate demand, and capacity utilization is endogeneous and driven by all shocks through the tradeoff between search cost and sticky prices. Adding sticky wages reduces the overall quantitative impact of goods market SaM on the model economy and thus the difference to the benchmark NK model. However, the qualitative results remain the same.

The rest of the paper is organized as follows. Section 2 develops the theoretical model. Section 3 discusses the model dynamics by deriving the linearized first-order conditions and identifying separate channels of amplification. Section 4 derives a five-equation output gap version of the model, shows how goods market search-and-matching changes the slopes of the Phillips curve and Euler equation. Section 5 shows simulations of the aggregate effects of exogenous shocks on the model economy and conducts robustness exercises by extending the model. Section 6 discusses the results in light of the literature and concludes.

2. Model Setup: Aggregate Demand and Capacity Utilization

The model is based on the canonical New-Keynesian model à la Erceg et al. (2000). The main features include monopolistic competition à la Dixit and Stiglitz (1977) and price adjustment cost à la Rotemberg (1982). The novel feature of the paper is goods market search-and-matching (SaM) à la Michaillat and Saez (2015). In contrast to the literature, this paper builds on the sticky price assumption as a determinant of variable household search effort and capacity utilization over the business cycle. Household search effort on the goods market is an input in the goods market matching process. This feature follows the "dis-equilibrium" optimizing framework in an equilibrium model where goods markets can run excess demand or excess supply.

2.1. Goods Markets Setup

Households and firms meet on goods markets where costly household search effort and imperfect matching lead to excess demand or supply of goods, both in the steady-state and over the business cycle. Both states of the market are equlibrium processes, as marginal search cost are equalized to trade benefits. The goods market is segmented along a continuum $i \in (0, 1)$ of differentiated final goods, $T_t(i)$, as search is directed following Moen (1997).

Households exert costly search effort, $H_{S,t}(i)$, for each variety i and each firm i supplies its idle production capacity, $S_t(i)$. Each customer relationship trades one unit of one variety of the differentiated good. Customer relationships are given by

$$T_t(i) \quad = \quad \psi_t \left[\gamma_S H_{S,t}(i)^{\Gamma_S} + (1-\gamma_S)\, S_t(i)^{\Gamma_S}\right]^{\frac{1}{\Gamma_S}}, \tag{1}$$

where $\psi_t > 0$ is the matching efficiency which fluctuates following an exogenous shock. $0 < \gamma_S \leq 1$ is a demand elasticity determining the impact of household search effort on goods market matching. $-\infty < \Gamma_S < 1$ is the input factor elasticity of substitution. Taken together, those three parameters determine the *search productivity channel* of the model. Goods market tightness for variety i is given by demand relative to supply, $x_t(i) = \frac{H_{S,t}(i)}{S_t(i)}$. It is an indicator of excess demand in the economy. The probability of a household to find a final good i is given by $f_t(i) = \frac{T_t(i)}{H_{S,t}(i)}$. Each firm produces exactly one variety of the differentiated good. The probability of a firm i to sell a unit of its good is given by $q_t(i) = \frac{T_t(i)}{S_t(i)}$. It constitutes the *capacity utilization channel* of the model as it combines the search productivity channel with the capacity supply decision.

2.2. Households

There are infinitely many households on the unit interval. Each household searches for market goods, supplies hours to the labor market and home production, and consumes both market and home production goods. Each household maximizes his intertemporal utility[1]

$$\mathbb{U}_t(j) \;=\; \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \frac{1}{1-\sigma}\left[C_t(j) - \frac{\mu_S H_{S,t}(j)^{1+\nu_S}}{1+\nu_S} - \frac{\mu_H H_{H,t}(j)^{1+\nu_H}}{1+\nu_H} - \frac{\mu_M H_{M,t}(j)^{1+\nu_M}}{1+\nu_M}\right]^{1-\sigma},$$

where $0 \leq \beta < 1$ and $\sigma > 0$. Each household allocates time to total search hours, $H_{S,t}(j) = \int_0^1 H_{S,t}(i,j)di$, total home production hours, $H_{H,t}(j)$, and total market hours, $H_{M,t}(j)$, where $\mu_S, \mu_H, \mu_M > 0$. The inverse of their supply elasticity is given by $\nu_S, \nu_H, \nu_M \geq 0$.

[1]The utility function follows Greenwood et al. (1988) preferences. Any wealth effects between consumption and household search effort cancel out, which is a necessary condition to obtain a balanced growth path. Total hours worked is also placed within the GHH preference structure to symmetrically model time used either in market work or search effort.

The disutility created by search effort constitutes the *search cost channel* of the model. Households receive utility from consuming a composite good

$$C_t(j) \;=\; \left[\gamma_H C_{H,t}(j)^{\Gamma_H} + (1-\gamma_H)\, C_{M,t}(j)^{\Gamma_H}\right]^{\frac{1}{\Gamma_H}}, \tag{2}$$

where market goods, $C_{M,t}(j) = T_t(j)$, and home production goods, $C_{H,t}(j) = H_{H,t}(j)$, are inputs to a CES aggregator with $0 \leq \gamma_H < 1$ and $-\infty < \Gamma_H \leq 1$.
As there are infinitely many households, the market goods finding probability for variety i, $f_t(i)$, is exogenous to each household. The aggreagte market consumption bundle is determined by a Dixit and Stiglitz (1977) index

$$T_t(j) = \left(\int_0^1 T_t(i,j)^{\frac{\epsilon-1}{\epsilon}} di\right)^{\frac{\epsilon}{\epsilon-1}},$$

where $1 \leq \epsilon \leq \infty$ determines the elasticity of substitution between two varieties of market consumption goods. The interplay of monopolistic competition and search frictions determines the *price elasticity of demand channel* given by

$$\Xi_{P,t} \;=\; (-\epsilon)\, \frac{\xi_{C_M}\left(\frac{T_t(j)}{T_t(i,j)}\right)^{\frac{1}{\epsilon}} - c'_{S,t}(i,j)}{\xi_{C_M}\left(\frac{T_t(j)}{T_t(i,j)}\right)^{\frac{1}{\epsilon}} + \epsilon \frac{\partial c'_{S,t}}{\partial T_t(i,j)} T_t(i,j)}, \tag{3}$$

where $\xi_{C_M,t} = (1-\gamma_H)\left(\frac{C_{M,t}}{C_t}\right)^{\Gamma_H - 1}$ and $c'_{S,t}(i,j) = \mu_S \frac{H_{S,t}(j)^{\nu_S}}{f_t(i,j)}$ are marginal search cost. The price elasticity of demand is endogenous and decreases in goods market tightness. It reduces to its constant textbook NK counterpart, $\Xi_{P,t} = (-\epsilon)$ for $\mu_S = 0$. A formal derivation is provided in Appendix A.3.4. Each household follows his intertemporal budget constraint

$$B_t(j) = (1 + r_{t-1})\, B_{t-1}(j) + (1 - c_{W,t}(j))\, W_t H_{M,t}(j) - \int_0^1 P_t(i) T_t(i,j) di + \Pi_{F,t}(j),$$

where $B_t(j)$ are one-period nominal bonds, which pay the nominal interest rate, r_t. Labor income is given by $(1 - c_{W,t}(j))\, W_t H_{M,t}(j) di$, where W_t is the nominal market wage and

$c_{W,t}(j) = \frac{\kappa_W}{2}\left(\frac{W_t(j)}{W_{t-1}(j)} - \pi_W\right)^2$ are nominal wage adjustment cost determined by $\kappa_W \geq 0$. π_W is steady-state nominal wage inflation. Final good expenses are given by $\int_0^1 P_t(i)T_t(i,j)di$, where $P_t(i)$ is the price for final good i. $\Pi_t(j)$ are firm dividends paid to the households by a mutual fund where each household owns an equal share.

2.3. Labor Unions

There is a labor union that aggregates specialized household labor and supplies it to each firm i. The labor union maximizes its profits according to

$$\Pi_{U,t} = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta_{0,t}\left[W_t \int_0^1 H_{M,t}(i)di - W_t \int_0^1 H_{M,t}(j)dj\right],$$

where $H_{M,t}(i)$ is labor supplied to firm i, and $H_{M,t}$ is aggregate labor available to the labor union. It aggregates specialized household labor according to Dixit and Stiglitz (1977) given by

$$H_{M,t} = \left(\int_0^1 H_{M,t}(j)^{\frac{\epsilon_W - 1}{\epsilon_W}} dj\right)^{\frac{\epsilon_W}{\epsilon_W - 1}},$$

where $1 \leq \epsilon_W \leq \infty$ determines the substitutability of specialized labor.

2.4. Firms

There are infinitely many firms on the unit interval. Each firm produces a unique variety of the final good and supplies its idle production capacity, $S_t(i)$, to the goods market. Each firm employs labor in a linear production capacity function, $Y_{M,t}(i) = A_t H_{M,t}(i)$, where $A_t > 0$ is an exogenous technology process. Each firm i maximizes its profits by

$$\Pi_{F,t} = \mathbb{E}_0 \sum_{t=0}^{\infty} \beta_{0,t}\left[P_t(i)T_t(i) - W_t H_{M,t}(i)\right],$$

where $\beta_{0,t}$ is the period discount factor of the firm[2]. Idle production capacity is given by

$$(1 + c_{P,t}(i))\, S_t(i) = \quad Y_{M,t}(i), \tag{4}$$

where $c_{P,t}(i) = \frac{\kappa_P}{2}\left(\frac{P_t(i)}{P_{t-1}(i)} - \pi\right)^2$ are proportional convex Rotemberg (1982) price adjustment cost determined by $\kappa_P \geq 0$. π are is steady-state price inflation. Each firm controls the market of its variety as it has the monopoly over this variety of the consumption good. It controls the market outcome for its variety i by jointly determining available production capacity, $S_t(i)$, and the goods price, $P_t(i)$, such that firm profits are maximized. Price setting follows Michaillat and Saez (2014), which is a combination of directed search by Moen (1997) and convex Rotemberg (1982) price adjustment cost. Each firm maximizes its profits by optimally setting the trade-off between its price and goods selling probability, $q_t(i)$, as determined by the price elasticity of demand (3). Firm decisions depend on this nexus of search frictions and monopoly power.

2.5. General Equilibrium

The real gross domestic product is determined by aggregate consumption, $GDP_t = T_t$, which is the numeraire good of the economy. The central bank follows a Taylor (1993)-type rule and sets the nominal interest rate according to

$$\frac{1 + r_t}{1 + r} \quad = \quad \left(\frac{1 + r_{t-1}}{1 + r}\right)^{i_r} \left[\left(\frac{1 + \pi_t}{1 + \pi}\right)^{i_\pi} \left(\frac{GDP_t}{GDP_{N,t}}\right)^{i_{Gap}}\right]^{1-i_r} M_t, \tag{5}$$

where r and π are central bank targets, $GDP_{N,t}$ is potential output as given by the flexible price version of the model, $i_r \geq 0$ determines policy inertia, and $i_\pi, i_{Gap} \geq 0$ are policy coefficients. M_t is a monetary policy shock. All exogenous shocks follow an AR(1) proces given by

$$X_t \quad = \quad X^{1-\rho_X} X_{t-1}^{\rho_X} \varepsilon_{X,t}, \quad \varepsilon_{X,t} \sim \mathcal{N}(0,\, \sigma_X^2)$$

[2]The period discount factor of the firm is equal to the household stochastic discount factor as all firms are owned by the household mutual fund.

where $0 \leq \rho_X < 1$ determines the autocorrelation of the shock, and $\varepsilon_{X,t}$ is a white noise random process around a normal distribution with zero mean and standard deviation σ_X.

3. The Trade-Off between Search Cost and Sticky Prices

In this section, I derive the steady-state economy, the (intertemporal) decision rules, and show the impact of goods market SaM. For the remainder of the paper, I take two assumptions that simplify the exposition of the model without altering its core message: First, all firms share the same technology and thus are summarized by a representative firm. Second, demand is equal to supply in steady-state, $x = 1$. The model is linearized around its deterministic steady-state. Variables with a hat indicate percentage (point) deviations[3] from steady-state, e.g. $\hat{x}_t$. Detailed derivations can be found in Appendix A.

3.1. The Long-Run Economy (Steady-State)

The steady-state of the goods market SaM economy shows two main deviations from the benchmark NK model. First, goods market SaM reduces overall economic activity. Second, steady-state idle capacity creates a wedge between available and used production capacity. The steady-state of the firm follows from goods market machting (6), optimal price setting (7), and cost minimization (8), given by

$$q = \psi, \tag{6}$$

$$c'_S = \gamma_S \frac{\epsilon - 1}{\epsilon} \xi_{C_M}, \tag{7}$$

$$mc = \frac{\epsilon - 1}{\epsilon + \frac{\gamma_S}{1-\gamma_S}}, \tag{8}$$

where $\xi_{C_M} = \chi_{C_M} \frac{C}{C_M} \geq 0$, and $\chi_{C_M} = (1 - \gamma_H) \left(\frac{C_M}{C}\right)^{\Gamma_H} \geq 0$. Capacity utilization, q, is set by matching efficiency, ψ[4]. Marginal search cost and firm marginal cost decrease as ϵ

[3]Variables that are given in levels in the non-linear model are approximated by percentage deviations from steady-state and variables given in percent in the non-linear model are approximated by percentage point deviations from steady-state.

[4]The simple representation of steady-state capacity utilization follows from the assumption $x = 1$ in steady-state. Otherwise, goods market tightness and the structure of the goods market play a role as well. However, in almost all cases in a quantitatively negligible way.

decreases. Firms gain market power and increase price markups which leads to households decreasing their search effort to balance the overall costs of a good. Marginal search cost increase while firm marginal cost decrease in the marginal productivity of search effort, γ_S. Households expand search effort supply as it becomes more productive. Firms increase price markups as the price elasticity of demand decreases in marginal search cost. Due to the trade-off between market and home produced goods, marginal search cost increase in the marginal productivity of the market goods, ξ_{C_M}, as they become more valuable relative to home produced goods.

The steady-states of the household are determined by marginal utility out of market consumption net of marginal search cost (9) and by the kernel of marginal utility out of composite consumption (10). They are given by

$$\begin{aligned} muc &= \left(1 - \gamma_S \frac{\epsilon - 1}{\epsilon}\right) \frac{\xi_{C_M}}{(\mathcal{U}_C C)^{\sigma}}, && (9) \\ \mathcal{U}_C &= 1 - \frac{\chi_{C_H}}{1 + \nu_H} - \chi_{C_M} \frac{\epsilon - 1}{\epsilon} \left(\frac{\gamma_S}{1 + \nu_S} + \frac{1 - \gamma_S}{1 + \nu_M} \frac{\epsilon_W - 1}{\epsilon_W} \right), && (10) \end{aligned}$$

where $\chi_{C_H} = \gamma_H \left(\frac{C_H}{C}\right)^{\Gamma_H} \geq 0$. Marginal utility of market consumption (9) decreases in marginal search cost and thus in the relative marginal productivity of search effort, γ_S. Its trade-off with home produced goods is given by ξ_{C_M}. It is normalized by marginal utility of composite consumption (10).

Marginal utility of composite consumption, $(\mathcal{U}_C C)^{-\sigma}$, decreases in its level, especially for a low intertemporal elasticity of substitution, $\frac{1}{\sigma}$. Due to Greenwood et al. (1988) preferences, it depends on time allocated to home production, market production, and search effort. It shows a trade-off between alternative time use. As in Greenwood et al. (1988); Benhabib et al. (1991); Greenwood and Hercowitz (1991) marginal utility increases in hours supplied to home and market production, depending on their expenditure shares χ_{C_H} and χ_{C_M}. The novel feature of search effort supply shifts time allocation from market hours to search effort as its marginal productivity, γ_S, increases. The same pattern emerges if $\frac{\nu_M}{\nu_S}$ increases as market hours supply becomes less elastic relative to search hours supply. The market structure plays a crucial role for the trade-off between labor supply and search effort. There applies a labor market mark-down and a goods market mark-up to labor supply while search effort directly works through the goods market and hence only faces the price mark-up. This pattern puts labor supply at a productive disadvantage to search effort supply as it faces one additional friction in its allocation to produce consumption goods.

The overall size of the market economy derives from *steady-state real GDP* - determined by production capacity and its utilization rate - and is given by

$$C_M \; = q \times \underbrace{\left(q \cdot \frac{1-\gamma_S}{\mu_M} \cdot \frac{\epsilon_W - 1}{\epsilon_W} \cdot \frac{\epsilon - 1}{\epsilon} \cdot \xi_{C_M} \right)^{\frac{1}{\nu_M}}}_{\text{Total market hours } (H_M)}, \tag{11}$$

where $C_H = \left[\frac{\gamma_H}{\mu_H} C^{1-\Gamma_H} \right]^{\frac{1}{1+\nu_H - \Gamma_H}}$ and composite consumption is given by (2). Production capacity, $Y_M = H_M$, is determined by supplied labor, which in turn is determined by (i) labor productivity, (ii) wage mark-down, price mark-up, and marginal productivity of market goods, and (iv) capacity utilization as described by (6). Total market hours - thus production capacity - decrease in goods market frictions, γ_S, as higher marginal search cost decrease marginal utility and higher price markups decrease labor demand. Capacity utilization amplifies output as it increases capacity utilization but also production capacity through labor demand.

Lemma 1. *Steady-state real GDP is lower compared to the benchamrk NK model as available production capacity is not fully utilized due to the* ***capacity utilization channel****. However, available production capacity is reduced as well as the* ***search cost channel*** *reduces labor supply and the* ***price elasticity chnanel*** *reduces labor demand.*

3.2. Dynamic Economy: The Trade-Off between Prices and Utilization

In the short-run, the model economy is driven by the trade-off between sticky prices and marginal search cost. It is determined by the behavior of marginal search cost, capacity utilization, and alternative time-use in home production.

Marginal Search Cost. Firms target an optimal marginal search cost of households[5] by setting goods supply and market prices in the trade-off between firm marginal cost and capacity utilization to maximize their profits. *Marginal search cost* are given by

$$\boldsymbol{\hat{c}'_{S,t}} = (\epsilon - \gamma_S (\epsilon - 1))\, \boldsymbol{\hat{mc}_t} - \phi_{C_H} \boldsymbol{\hat{C}_{M,t}} + \frac{\Gamma_S}{\gamma_S \psi} \left(\boldsymbol{\hat{q}_t} - \boldsymbol{\hat{\psi}_t} \right), \tag{12}$$

where $\phi_{C_H} = (1 - \Gamma_H) \left(1 - \left[1 - \frac{1-\Gamma_H}{1+\nu_H-\Gamma_H} \chi_{C_H} \right]^{-1} \chi_{C_M} \right) \geq 0$. First, they increase in firm marginal cost as firms reduce their price markups and households exert higher marginal search cost in response to lower goods prices. The impact increases in goods market competition. However, the *price elasticity channel* reduces this impact. Second, marginal search cost decrease in output due to the trade-off with home produced goods. The impact of the channel increases in ϕ_{C_H} as home produced goods increase their share and become less substitutable. Third, marginal search cost decrease in goods market tightness, $\hat{x}_t = \psi^{-1} \left(\hat{q}_t - \hat{\psi}_t \right)$, for $\Gamma_S < 0$. Tight goods markets indicate excess search effort which is less productive in creating matches as Γ_S decreases. Hence, households reduce search effort to balance their *search cost channel*.

Firm Marginal Cost. Labor is the only production input in this economy and the main driver of firm marginal cost. However, goods market frictions lead to idle capacity and wage adjustment cost distort labor allocation. *Firm marginal cost* are given by

$$\begin{aligned} \boldsymbol{\hat{mc}_t} = & \left(\nu_M + \frac{\epsilon \phi_{C_H}}{\epsilon - \gamma_S (\epsilon - 1)} \right) \boldsymbol{\hat{C}_{M,t}} + \frac{\gamma_S (\epsilon - 1)}{\epsilon - \gamma_S (\epsilon - 1)} \boldsymbol{c'_{S,t}} \\ & - (1 + \nu_M) \left(\boldsymbol{\hat{q}_t} + \boldsymbol{\hat{A}_t} \right) + \nu_M \left(\frac{\epsilon_W - 1}{\epsilon_W} \right)^{\frac{1}{\nu_M}} \boldsymbol{\hat{u}_t}, \end{aligned} \tag{13}$$

which increase in output and unemployment through the labor market, and decrease in TFP as in the benchmark NK model. Goods market SaM introduces two new channels to firm marginal cost. On the one hand, given a targeted increase in output, firms must cut prices

[5] Firms target a constrained optimal equilibrium on the goods market with fixed shares of search effort and goods supply due to the CES matching function and directed search following Moen (1997).

by more due to the *price elasticity channel.* An implied increase in marginal search cost and home production decreases the price elasticity of demand. Hence, household demand reacts less to price changes. It follows that firm marginal cost increase more strongly. On the other hand, an increase in search effort also works through the *capacity utilization channel.* Higher utilization lowers firm marginal cost as less capacity is idle. Overall, the impact of goods market SaM on firm marginal cost depends on which of the two channels is dominant.

Capacity Utilization. Frictional goods markets require search effort and goods supply to form successful matches. *Capacity utilization* is given by

$$\boldsymbol{\hat{q}_t} = \frac{\psi}{1+\nu_S}\frac{\gamma_S}{1-\gamma_S}\left[\boldsymbol{\hat{c}'_{S,t}} - \nu_S \boldsymbol{\hat{C}_{M,t}}\right] + \frac{\psi}{1-\gamma_S}\boldsymbol{\hat{\psi}_t}, \tag{14}$$

which increases in marginal search cost as households expand their search effort. The search effort implied by marginal search cost decreases in convex search cost, $\nu_S > 0$, which decreases the impact of marginal search cost on capacity utilization. Further, for $\nu_S > 0$, the search effort per consumption unit decreases in output as cost convexity increases, thus decreases capacity utilization. Those two effects constitute the *search cost channel.* A matching efficiency shock increases capacity utilization exogenously. All three channels increase their impact on capacity utilization in γ_S - the *search productivity channel.* Together, the two channels constitute the *capacity utilization channel.*

Lemma 2. *Fluctuations in capacity utilization are driven by the trade-off between marginal search cost and price markups. They are driven by the trade-off between the* ***price elasticity channel*** *and the* ***capacity utilization and search productivity channels****. Variation in capacity utilization is strictly increasing in the substitutability of matching inputs.*

Optimal Price Setting. The *centerpiece of the analysis of the paper* is the trade-off between marginal search cost and sticky goods prices. It is summarized by the *New-Keynesian Phillips* *curve* given by

$$\hat{\boldsymbol{\pi}}_{\boldsymbol{t}} = \frac{\Big(\epsilon - \gamma_S\left(\epsilon - 1\right)\Big)\hat{\boldsymbol{mc}}_{\boldsymbol{t}} + \frac{\Gamma_S}{\psi}\left(\hat{\boldsymbol{q}}_{\boldsymbol{t}} - \hat{\boldsymbol{\psi}}_{\boldsymbol{t}}\right)}{\kappa_P\left(1 - \gamma_S\right)} + \hat{\boldsymbol{\xi}}_{\boldsymbol{t}} + \beta\mathbb{E}_t\hat{\boldsymbol{\pi}}_{\boldsymbol{t+1}}, \tag{15}$$

where inflation increases in firm marginal cost[6] - thus in marginal search cost as shown by (12). The pass-through of marginal cost to prices increases in goods market competition and decreases in the *price elasticity channel*. Higher firm marginal cost decrease price markups and hence increase marginal search cost and capacity utilization. Whether marginal search cost and capacity utilization increase in total depends on the impact of the home production and convex search cost channels. If capacity utilization increases, it increases goods market tightness, which leads to a smaller increase in inflation, marginal search cost, and capacity utilization.

For $\Gamma_S < 0$, inflation decreases in goods market tightness, $\hat{x}_t = \psi^{-1}\left(\hat{q}_t - \hat{\psi}_t\right)$, as firms lower prices to induce higher search effort which is sluggish to respond due to the low substitutability - a reduction in the *search productivity channel*. Price setting is sluggish due to price adjustment cost, κ_P, forward-looking, and distorted by cost-push shocks, $\hat{\xi}_t$. The slope of the Phillips curve increases in γ_S as demand becomes less price elastic through the marginal search cost channel. As we target slope estimates in the literature, this implies a larger κ_P. For a given κ_P, the slope increases making prices more flexible in the goods market SaM model.

Lemma 3. *The trade-off between marginal search cost and sticky prices has two components. First, the "flexible price component" describing the optimal time allocation between search, home production, and market production. And second, its trade-off with price adjustment cost, as described by (15). For $\Gamma_S = 0$ and $\gamma_H = 0$, fluctuations in marginal search cost, $\hat{c}'_{S,t}$, are entirely driven by sticky prices and otherwise constant.*

[6]Firm marginal cost determine the labor share, $\hat{ls}_t = \hat{mc}_t$, as in the benchmark NK model. We use this equivalence to match the slope of the labor share Phillips curve to estimates in the literature (i.e. Gali and Gertler (1999); Sbordone (2002)). The estimate is potentially biased by goods market tightness. However, as long as Γ_S is close to Cobb-Douglas, the bias is quantitatively small.

Unemployment and Hours Worked. The labor market has two margins - hours worked and Keynesian unemployment. *Hours worked* can be derived from the production function and resource constraint given by

$$\boldsymbol{\hat{H}_{M,t}} \quad = \quad \boldsymbol{\hat{C}_{M,t}} - \boldsymbol{\hat{A}_t} - \psi^{-1}\boldsymbol{\hat{q}_t}, \tag{16}$$

where capacity utilization, $\hat{q}_t$, drives hours worked through labor productivity - symmetric to the TFP shock - in contrast to the benchmark NK model. If capacity utilization is procyclical, goods market SaM decreases fluctuations in hours worked, vice-versa. Unemployment is determined by sticky wage inflation. The *wage Phillips curve* is given by

$$\boldsymbol{\hat{\pi}_{W,t}} \; = (-1)\frac{\nu_M}{\kappa_W}\left(\frac{(\epsilon_W - 1)^{1+\nu_M}}{\epsilon_W}\right)^{\frac{1}{\nu_M}} \boldsymbol{\hat{u}_t} + \beta \mathbb{E}_t \boldsymbol{\hat{\pi}_{W,t+1}}, \tag{17}$$

where $\epsilon_W \geq 1$ and $\kappa_W \geq 0$. As both prices and nominal wages are sticky, the development of real wages is given by $\hat{w}_t \; = \; \hat{\pi}_{W,t} - \hat{\pi}_t + w_{t-1}$. The real wage is given by $\hat{w}_t = \hat{mc}_t + \hat{lpr}_t$, where $\hat{lpr}_t = \hat{C}_{M,t} - \hat{H}_{M,t}$ is labor productivity.

Consumption Euler Equation. Intertemporal consumption allocation of the representative household is determined by the real interest rate but also depends on marginal search cost in this setup. The *consumption Euler equation* is given by

$$\boldsymbol{\hat{r}_t} - \mathbb{E}_t \boldsymbol{\hat{\pi}_{t+1}} \; = \phi_{\mathbb{M},C_M} \boldsymbol{\Delta \hat{C}_{M,t+1}} + \phi_{\mathbb{M},c_S} \mathbb{E}_t \boldsymbol{\Delta \hat{c}'_{S,t+1}} - \phi_{\mathbb{M},H_M} \boldsymbol{\Delta \hat{H}_{M,t+1}}, \tag{18}$$

where Δ indicates growth rates and the composite parameters are summarized by

$$\begin{aligned}
\phi_{\mathbb{M},C_M} &= \frac{\phi_{C_H}}{1 - \gamma_S \frac{\epsilon-1}{\epsilon}} + \sigma \frac{\chi_{C_M}}{\mathcal{U}_C}\left(1 - \frac{\gamma_S}{1+\nu_S}\frac{\epsilon - 1}{\epsilon}\right) > 0, \\
\phi_{\mathbb{M},c_S} &= \gamma_S \frac{\epsilon - 1}{\epsilon}\left[\frac{1}{1 - \gamma_S \frac{\epsilon-1}{\epsilon}} - \sigma \frac{\chi_{C_M}}{\mathcal{U}_C}\frac{1}{1+\nu_S}\right] > 0, \\
\phi_{\mathbb{M},H_M} &= \sigma \frac{\chi_{C_M}}{\mathcal{U}_C}\left(1 - \gamma_S\right)\frac{\epsilon_W - 1}{\epsilon_W}\frac{\epsilon - 1}{\epsilon} > 0.
\end{aligned}$$

There are two channels. A direct channel determining intertemporal consumption allocation as a trade-off between market consumption and its marginal search cost. And an indirect channel - identified by $\sigma \frac{\chi_{C_M}}{\mathcal{U}_c}$ - featuring the impact of time allocation on marginal utility growth following non-separability of the Greenwood et al. (1988) preferences[7].

The direct channel features an "inflation-like" term through the *search cost channel*. If real interest rates increase, households shift consumption to the future. However, households balance overall costs of market goods. When future marginal search cost are expected to increase, households reduce their shift to future consumption. Hence, marginal search cost growth affect intertemporal consumption allocation like inflation. The Euler equation shows how to price availability (thus the *search cost channel*) relative to the goods price.

The indirect channel features the impact of time allocated to market production, home production, and search effort on marginal utility. An increase in γ_S increases the *search productivity channel* which shifts the weight from market consumption and labor supply to marginal search cost in the marginal utility function. This shift is amplified by the *search cost channel* as search effort becomes more elastic in $\frac{1}{\nu_S}$. Overall, goods market SaM amplifies the impact of a change in the real interest rate[8].

Lemma 4. *The growth in expected marginal search cost is inflationary. Changes in goods market tightness affect intertemporal consumption allocation through the* ***search cost and productivity channels****, even if inflation is constant.*

3.3. Calibration

I calibrate the model to replicate the business cycle behavior of the U.S. economy between 1985q1 and 2019q4. Time is in quarters. Common parameters follow the NK literature, i.e. Christiano et al. (2010). The home production parameters follow Gnocchi et al. (2016). An overview is given in table 1.

[7] If we assume preference following King et al. (1988) instead of Greenwood et al. (1988), the indirect effect drops out as all elements in the utility function become additively separable.

[8] See also the discussion about time allocation in marginal utility given in section 3.1.

Table 1: Calibration Overview

Parameter	Value	Parameter	Value	Parameter	Value
β	0.99	ψ	$\bar{cu} = 0.86$	π	0
σ	1.5	γ_S	0.31	π_W	0
μ_M	$\bar{H}_M = 1$	Γ_S	-0.27	σ_A	0.0064
μ_H	$\frac{\bar{H}_H}{\bar{H}_M} = 0.5393$	γ_H	0.55	σ_M	0.001
μ_S	$\frac{\bar{H}_S}{\bar{H}_M} = 0.1854$	Γ_H	0.5	σ_P	0.1
ν_M	$\frac{1}{0.72}$	ϵ_W	$\bar{u} = 0.043$	σ_T	0.0064
ν_H	ν_M	κ_W	Slope $= -0.026$	ρ_A	0.9
ν_S	ν_M	i_R	0.8	ρ_M	0.5
ϵ	Markup $= 1.2$	i_π	1.7	ρ_P	0.8
κ_P	Slope $= 0.047$	i_{Gap}	0.12	ρ_T	0.8

Goods market matching efficiency, ψ, targets a steady-state capacity utilization rate of 86%, which is a weighted average of industry and service sector capacity utilization in the data. The demand elasticity with respect to goods market matching, γ_S, varies in the literature between 0.11 (Bai et al. (2024)) and 0.31 (Qiu and Rios-Rull (2022)). I set $\gamma = 0.28$ and $\Gamma_S = -0.27$[9] loosley following Qiu and Rios-Rull (2022) as their setup is closest to this paper featuring sticky prices.

There are three types of time use in the model - labor supply, home production, and search effort. I set μ_M by normalizing the labor supply, $\bar{H}_M$, to one. The home production disutility parameter, μ_H, is set by targeting its average time use relative to labor supply, $\frac{\bar{H}_H}{\bar{H}_M} = 0.5393$, as described by the American Time Use Survey (ATUS). The same approach for μ_S would imply targeting $\frac{\bar{H}_S}{\bar{H}_M} = 0.1854$. However, as this implies $x = 0.1854$, goods markets would show a significant excess supply in steady-state. Alternatively, I calibrate $x = 1$[10], i.e. demand equal to supply. The labor supply elasticity, ν_M, has varying estimates in the literature, see e.g. Keane and Rogerson (2012). As I focus on hours worked (intensive margin) in this paper, I follow Heathcote et al. (2010) and set $\nu_M = \frac{1}{0.72}$. The elasticity of search effort, ν_S, varies significantly in the literature between 0 (e.g. Michaillat and Saez (2015)), close to 0

[9]The matching function is Cobb-Douglas in most cases in the literature. However, Qiu and Rios-Rull (2022) explicitly estimate a CES matching function.Technically, they use a matching function between search effort and available varieties of goods, not the amount of goods supply as in this paper. However, I use their estimates as the two margins are closely linked.

[10]This calibration strategy is equivalent to using the ATUS values but setting an additional search effort technology parameter such that $x = 1$ in steady-state.

(e.g. Qiu and Rios-Rull (2022)), and approximately 5 (e.g. Bai et al. (2024)). A natural starting point[11] is to assume the same supply elasticity as for labor supply, see i.e. Gnocchi et al. (2016); Huo and Rios-Rull (2020).

The steady-state unemployment rate, $\bar{u} = 4.3\%$, is set by choosing $\epsilon_W = \frac{(1+\bar{u})^{\nu_M}}{(1+\bar{u})^{\nu_M}-1}$. The NK wage Phillips curve (17) is determined by unemployment. Thus, I set $\kappa_W = (-1)\frac{(\epsilon_W-1)\nu_M}{slope_w}\frac{\bar{u}}{1+\bar{u}}$ by targeting an estimate of the slope equal to -0.026 in the linearized model (see e.g. Erceg et al. (2000); Gali and Gambetti (2019)).The elasticity of differentiated goods, ϵ, is set by targeting a steady-state price markup of 1.2. ϵ depends on γ_S - as shown in (8) - as $x = 1$ in steady-state by assumption. I set the price adjustment cost parameter, κ_P, by targeting the slope of the linearized labor share Phillips curve. I use a slope estimate of 0.047 following Gali and Gertler (1999).

4. The Tradeoff between Marginal Search Cost and Sticky Prices

How does the trade-off between search cost and goods prices change the behavior of aggregate demand and supply compared to the benchmark New-Keynesian model? In this section, I derive the flexible price model and the reduced form output gap model to analyze the overall impact of goods market SaM on the NK model. I show that goods market SaM reduces the slope of the Euler equation while the impact on the slope of the New-Keynesian Phillips curve is ambiguous. Capacity utilization and labor productivity become endogenous, even with flexible prices and wages.

4.1. Flexible Prices and the Time-Allocation Tradeoff

The flexible price model acts as the reference point of the output gap model as it shows how the model economy fluctuates absent nominal frictions - $\kappa_P, \kappa_W = 0$ - and cost-push

[11] Alternative values for $\frac{\nu_S}{\nu_M} \lesseqgtr 1$ will be considered throughout the paper though. For instance, labor supply varies more in the extensive margin which shows lower supply elasticities, while search effort is thought of varying more in the intensive margin. Such an economy is represented by $\nu_S < \nu_M$. Most papers in the literature follow this calibration strategy (i.e. Michaillat and Saez (2015); Qiu and Rios-Rull (2022)).

shocks. From (17) we derive $u_t^N = 0$ if $\kappa_W = 0$. From (15) we derive

$$\boldsymbol{\hat{mc}_t^N} = \frac{(-1)}{(\epsilon - \gamma_S(\epsilon-1))} \frac{\Gamma_S}{\psi} \left(\boldsymbol{\hat{q}_t^N} - \boldsymbol{\hat{\psi}_t} \right), \tag{19}$$

for $\kappa_P = 0$. For $\Gamma_S = 0$, firm marginal cost are constant (as in the textbook NK model). It follows that marginal search cost (12) decrease in output due to the trade-off with home production, which in turn decreases capacity utilization (14), especially if $\nu_S > 0$. For $\Gamma_S < 0$, the decrease in marginal search cost (12) is amplified by the decrease in firm marginal cost and goods market tightness. The decrease in firm marginal search cost is more substantial as the *price elasticity of demand* decreases in γ_S.

The aggregate impact on flexible price output is given by

$$\boldsymbol{\hat{C}_{M,t}^N} = (\nu_M + \phi_{C_H})^{-1} \left[\epsilon \left(1 - \gamma_S \frac{\epsilon - 1}{\epsilon} \right) \boldsymbol{\hat{mc}_t^N} + \frac{1+\nu_M}{\psi} \left(\boldsymbol{\hat{q}_t^N} + \boldsymbol{\hat{A}_t} \right) \right], \tag{20}$$

where both firm marginal cost and capacity utilization are endogenous for $\Gamma_S, \nu_S, \phi_{C_H} \neq 0$ in contrast to the benchmark NK model. Countercyclical marginal search cost and capacity utilization dampen the initial increase in output in the flexible price model[12]. The propagation of the TFP shock is symmetric to that. The matching efficiency shock shows the opposite behavior as capacity utilization and goods market tightness increase exogenously as long as $\psi + \gamma_S > 1$. This initial propagation increases marginal cost and thus amplifies the impulse response of output in γ_S. Marginal search cost decrease which lowers the initial increase in capacity utilization somewhat but does not change the overall amplification.

Table 2 shows relative slopes of the flexible price model compared to the benchmark NK model. First, the propagation of TFP shocks is identical to the benchmark model as $\nu_S, \phi_{C_H}, \Gamma_S = 0$. However, the amplification of the matching efficiency shock is 45% higher. Adding home production diminishes the output response to a TFP shock by 13% and reduces its response

[12]A special case is given for $\gamma_H = 0$, $\nu_S = 0$, and $\Gamma_S = 0$, but $\gamma_S > 0$: Firm marginal cost and marginal search cost are constant. Hence, endogenous capacity utilization is constant. In this case, the amplification of TFP shocks is identical to the benchmark model. The amplification of matching efficiency shocks might differ as it drives capacity utilization exogenously. The constant level of goods market SaM variables follows directly from the proportionality of marginal search cost to goods prices in the directed search framework.

Table 2: Relative slope change with goods market SaM

Benchmark		Benchmark NK			+ Home Production		
		γ_S	ν_S	Γ_S	γ_S	ν_S	Γ_S
Potential GDP	$\hat{A}_t$	1.00	0.69	0.71	0.87	0.69	0.71
	$\hat{\psi}_t$	1.45	1.00	1.00	1.26	0.99	0.99
Natural Interest Rate	$\hat{A}_t$	1.00	0.69	0.85	0.79	0.66	0.75
	$\hat{\psi}_t$	1.45	1.00	1.16	1.14	0.95	1.00

NOTE: The values displayed show the relative slopes of the flexible price model compared to its benchmark model without goods market SaM. We consider separately both the benchmark NK model with and without home production. The three columns show the impact of different elements of goods market SaM, starting with only $\gamma_S > 0$, then adding $\nu_S > 0$, and lastly adding $\Gamma_S < 0$, each calibrated as in section 3.3.

to a matching efficiency shock by 19%-points as it introduces a trade-off between search hours and home prodution hours. Second, adding convex search disutility, $\nu_S > 0$, to the home production model decreases the propagation of both shocks to output by 18%-points and 27%-points respectively. It renders the home production channel (almost) obsolete as the reduction in the amplification is (almost) identical for both models including and excluding the home production channel. Third, the difference in slopes to the benchmark model decreases for $\Gamma_S < 0$. However, as Γ_S is close to a Cobb-Douglas calibration, the impact of the endogenous marginal cost channel is quantitatively neglegible in the flexible price model.

The natural interest rate acts as a monetary policy target in the sticky price economy, even though it does not affect flexible price output. It is given by

$$\begin{aligned}\boldsymbol{\hat{r}_t^N} &= \left(\phi_{\mathbb{M},C_M} - \phi_{\mathbb{M},H_M} - \phi_{\mathbb{M},c_S}\phi_{C_H}\right)\boldsymbol{\Delta\hat{C}^N_{M,t+1}} \\ &\quad - \phi_{\mathbb{M},c_S}\frac{1-\gamma_S}{\gamma_S}\epsilon\left(1-\gamma_S\frac{\epsilon-1}{\epsilon}\right)\boldsymbol{\Delta\hat{mc}^N_{t+1}} + \phi_{\mathbb{M},H_M}\left(\psi^{-1}\boldsymbol{\Delta\hat{q}^N_{t+1}} + \boldsymbol{\Delta\hat{A}_{t+1}}\right),\end{aligned} \tag{21}$$

where growth in the capacity utilization rate drives up the natural interest rate symmetrically to TFP growth, and growth in marginal cost decreases the natural interest rate as tighter future goods markets imply lower marginal search cost in the future. Table 2 shows the relative slopes of the flexible price model compared to the benchmark without goods market SaM. The propagation of shocks to the natural interest rate follows a similar pattern as for output. However, setting $\Gamma_S < 0$ increases the relative slopes for both shocks significantly.

The marginal cost channel (Γ_S) has a quantitatively significant impact on the natural interest rate compared to its impact on output.

Overall, adding goods market SaM leads to a lower propagation of TFP shocks to output and a stronger propagation of matching efficiency shocks to output. The natural interest rate shows a similar pattern. Firm marginal cost and capacity utilization fluctuate endogenously over the business cycle without nominal frictions. However, aggregate demand shocks do not affect output in the flexible price economy.

4.2. The Reduced-Form Output Gap Model

Let us consider the full model with nominal frictions. The model presented in section 3.2 can be summarized by five equations - a consumption Euler equation (22), a New-Keynesian price Phillips curve (23), a New-Keynesian wage Phillips curve (24), a law of motion for real wages (25), and a policy rule determining the nominal interest rate (26). The analysis focusses on the tradeoff between the inflation rates and the output and unemployment gaps, which are defined as deviations from their flexible price counterpart, i.e. $\tilde{C}_{M,t} = \hat{C}_{M,t} - \hat{C}^N_{M,t}$. The five-equation reduced-form gap model including goods market SaM is given by

$$\begin{aligned}
\hat{\boldsymbol{r}}_{\boldsymbol{t}} - \hat{\boldsymbol{r}}^N_t - \mathbb{E}_t \hat{\boldsymbol{\pi}}_{\boldsymbol{t+1}} &= \Theta_{\mathbb{M},C_M}\left[\tilde{\boldsymbol{C}}_{\boldsymbol{M,t+1}} - \tilde{\boldsymbol{C}}_{\boldsymbol{M,t}}\right] + \Theta_{\mathbb{M},u}\left[\tilde{\boldsymbol{u}}_{\boldsymbol{t+1}} - \tilde{\boldsymbol{u}}_{\boldsymbol{t}}\right], &(22)\\
\hat{\boldsymbol{\pi}}_{\boldsymbol{t}} &= \frac{1}{\kappa_P}\left[\Theta_{\pi,C_M}\tilde{\boldsymbol{C}}_{\boldsymbol{M,t}} + \Theta_{\pi,u}\tilde{\boldsymbol{u}}_{\boldsymbol{t}}\right] + \hat{\boldsymbol{\xi}}_{\boldsymbol{t}} + \beta\mathbb{E}_t\hat{\boldsymbol{\pi}}_{\boldsymbol{t+1}}, &(23)\\
\hat{\boldsymbol{\pi}}_{\boldsymbol{W,t}} &= (-1)\,\frac{\epsilon_W - 1}{\kappa_W}\phi_u\tilde{\boldsymbol{u}}_{\boldsymbol{t}} + \beta\mathbb{E}_t\hat{\boldsymbol{\pi}}_{\boldsymbol{W,t+1}}, &(24)\\
\hat{\boldsymbol{\pi}}_{\boldsymbol{W,t}} - \hat{\boldsymbol{\pi}}_{\boldsymbol{t}} &= \Theta_{w,C_M}\left[\tilde{\boldsymbol{C}}_{\boldsymbol{M,t}} - \tilde{\boldsymbol{C}}_{\boldsymbol{M,t-1}}\right] + \Theta_{w,u}\left[\tilde{\boldsymbol{u}}_{\boldsymbol{t}} - \tilde{\boldsymbol{u}}_{\boldsymbol{t-1}}\right], &(25)\\
\hat{\boldsymbol{r}}_{\boldsymbol{t}} &= i_r\hat{\boldsymbol{r}}_{\boldsymbol{t-1}} + (1-i_r)\left[i_\pi\hat{\boldsymbol{\pi}}_{\boldsymbol{t}} + i_{Gap}\tilde{\boldsymbol{C}}_{\boldsymbol{M,t}}\right] + \hat{\boldsymbol{M}}_{\boldsymbol{t}}, &(26)
\end{aligned}$$

where the slopes of the Euler equation are given by

$$\begin{aligned}
\Theta_{\mathbb{M},C_M} &= \phi_{\mathbb{M},C_M} - \phi_{\mathbb{M},H_M}\left(1-\theta_{C_M}\right)\\
&\quad + \phi_{\mathbb{M},c_S}\frac{\Big(\epsilon - \gamma_S\left(\epsilon-1\right)\Big)\nu_M + \left(\epsilon-1\right)\phi_{C_H} - \left[\Big(\epsilon-\gamma_S\left(\epsilon-1\right)\Big)\left(1+\nu_M\right) - \frac{\Gamma_S}{\gamma_S}\right]\theta_{C_M}}{1-\gamma_S\left(\epsilon-1\right)}, &(27)\\
\Theta_{\mathbb{M},u} &= \phi_{\mathbb{M},H_M}\theta_u + \phi_{\mathbb{M},c_S}\frac{\Big(\epsilon-\gamma_S\left(\epsilon-1\right)\Big)\phi_u - \left[\Big(\epsilon-\gamma_S\left(\epsilon-1\right)\Big)\left(1+\nu_M\right) - \frac{\Gamma_S}{\gamma_S}\right]\theta_u}{1-\gamma_S\left(\epsilon-1\right)}, &(28)
\end{aligned}$$

the slopes of the Phillips curve are given by

$$\Theta_{\pi,C_M} = \frac{\epsilon-\gamma_S(\epsilon-1)}{1-\gamma_S}\cdot\frac{\nu_M+\phi_{C_H}-\Big[1+\nu_M-\Gamma_S\Big]\theta_{C_M}}{1-\gamma_S(\epsilon-1)}, \tag{29}$$

$$\Theta_{\pi,u} = \frac{\epsilon-\gamma_S(\epsilon-1)}{1-\gamma_S}\cdot\frac{\phi_u-\Big[1+\nu_M-\Gamma_S\Big]\theta_u}{1-\gamma_S(\epsilon-1)}, \tag{30}$$

and the slopes of the real wage equation are given by

$$\Theta_{w,C_M} = \frac{\nu_M+\phi_{C_H}-\Big(\nu_M+(\epsilon-1)\Big[\gamma_S-\frac{\Gamma_S}{\epsilon-\gamma_S(\epsilon-1)}\Big]\Big)\theta_{C_M}}{1-\gamma_S(\epsilon-1)}, \tag{31}$$

$$\Theta_{w,u} = \frac{\phi_u-\Big(\nu_M+(\epsilon-1)\Big[\gamma_S-\frac{\Gamma_S}{\epsilon-\gamma_S(\epsilon-1)}\Big]\Big)\theta_u}{1-\gamma_S(\epsilon-1)}. \tag{32}$$

The four goods market SaM channels can be clearly identified in the reduced-form model. First, the *search productivity channel* is described by γ_S and Γ_S. Second, the *search cost channel* is described by $\phi_{\mathbb{M},C_M}$, $\phi_{\mathbb{M},H_M}$, and $\phi_{\mathbb{M},c_S}$. Third, the *price elasticity channel* is described by $\gamma_S(\epsilon-1)$, which vanishes for perfect complements $\epsilon=1$. And fourth, the *capacity utilization channel* as a combination of the previous channels wowrking through the resource constraint can be summarized by its output and unemployment gap slopes as given by

$$\theta_{C_M} = \frac{\gamma_S}{1-\gamma_S}\cdot\frac{\Big(\epsilon-\gamma_S(\epsilon-1)\Big)\nu_M+(\epsilon-1)\,\phi_{C_H}-\Big(1-\gamma_S(\epsilon-1)\Big)\nu_S}{\frac{\gamma_S}{1-\gamma_S}\Big(\epsilon-\gamma_S(\epsilon-1)\Big)(1+\nu_M)-\frac{\Gamma_S}{1-\gamma_S}+\Big(1-\gamma_S(\epsilon-1)\Big)(1+\nu_S)}, \tag{33}$$

$$\theta_u = \frac{\gamma_S}{1-\gamma_S}\cdot\frac{\Big(\epsilon-\gamma_S(\epsilon-1)\Big)\phi_u}{\frac{\gamma_S}{1-\gamma_S}\Big(\epsilon-\gamma_S(\epsilon-1)\Big)(1+\nu_M)-\frac{\Gamma_S}{1-\gamma_S}+\Big(1-\gamma_S(\epsilon-1)\Big)(1+\nu_S)}. \tag{34}$$

Proposition 1. *The goods market search-and-matching model reduces to a benchmark New-Keynesian model if $\gamma_S=0$, $\mu_S=0$, and $\psi=1$. The goods market search-and-matching model nests the benchmark New-Keynesian model as in Gali (2015).*

Proof. See Appendix B.5. □

The reduced-form model given by (23) to (26) has the identical functional form as New-Keynesian models in Erceg et al. (2000); Gali (2011). By Proposition 1, the goods market SaM model is a nested version of the benchmark NK model. Goods market SaM changes the slopes of the reduced-form model and the relationships with aggregate variables that can be derived from it. We analyze the impact of goods market SaM in turn on the propagation of capacity utilization, the demand side given by the Euler equation, the supply side given by the Phillips curve, and the labor market.

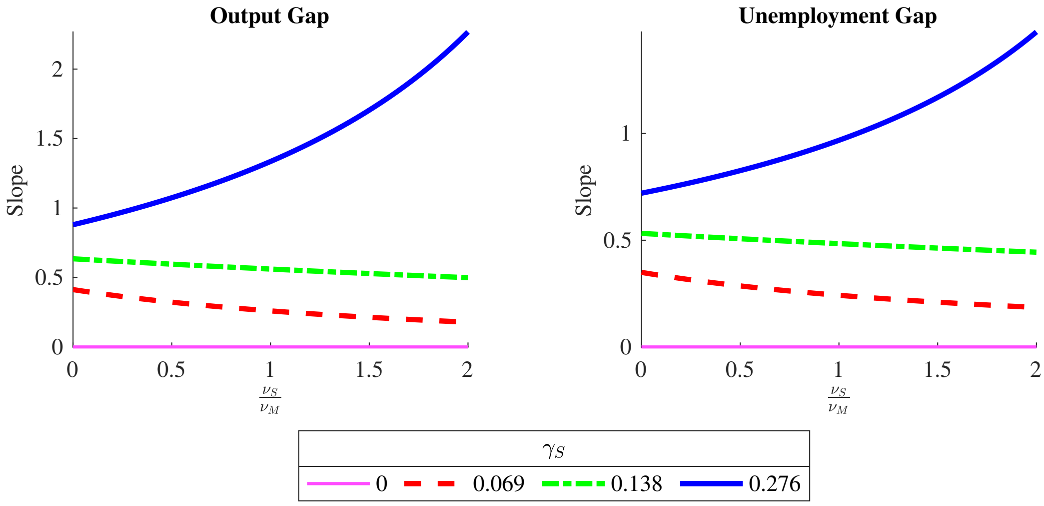
4.3. Capacity Utilization and Endogenous Productivity

The salient feature of the goods market SaM model in resource allocation is the endogeneity of capacity utilization and labor productivity. Unobserved search effort drives a wedge between the output gap and unemployment gap determined by the capacity utilization gap given by

$$\tilde{q}_t \ = \theta_{C_M} \tilde{C}_{M,t} + \theta_u \tilde{u}_t, \tag{35}$$

where the output gap slope is determined by θ_{C_M} as in (33), and the unemployment gap slope is determined by θ_u as in (34). Whether the unemployment gap is a good proxy for the output gap depends on the behavior of the capacity utilization gap and its correlation to the unemployment gap. Figure 1 shows how goods market SaM frictions affect the output and unemployment gap slopes compared to the benchmark model - as given by proposition 1.
The capacity utilization channel shows stronger variation in both the output and unemployment gaps as the *search productivity channel* becomes more salient, i.e. γ_S increases. The variation in the unobserved matching input increases, which drives the variation of the utilization of available capacity. However, search effort is only productive in creating matches and driving capacity utilization if there is some substitutability between the matching inputs. For $\Gamma_S \to -\infty$, there is no variation in the capacity utilization gap over the business cycle as the *search productivity channel* vanishes. This is shown by the black lines in Figure 1 being virtually identical to the horizontal zero line.
The impact of $\frac{\nu_S}{\nu_M}$ on the slope of the capacity utilization gap depends on the *price elasticity channel*. The propagation of both labor supply and search effort decreases in γ_S as the price elasticity of demand decreases. However, as $\gamma_S(\epsilon - 1) > 1$, the search effort channel switches signs. A decrease in search effort supply elasticity amplifies capacity utilization as the *price*

Figure 1: Slopes of the capacity utilization equation (5-eq model)



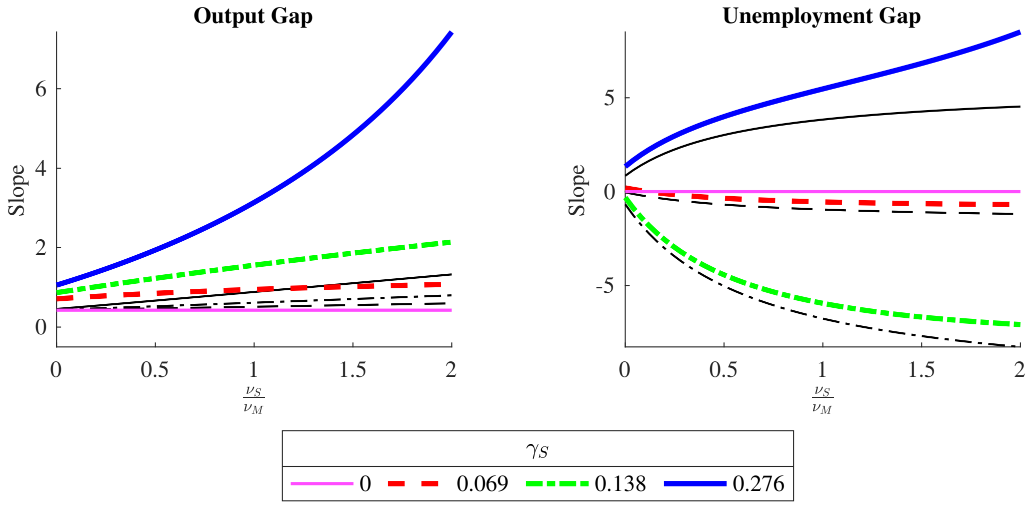
NOTE: The graphs show the impact of varying ν_S with a fixed ν_M on the slopes of the capacity utilization equation (inclduing home production). The benchmark model is shown by the full horizontal line ($\gamma_S = 0$). The goods market SaM model is shown in two variants for three different values of γ_S indicated by the dashed, dashed-dotted, and full lines. First, the bold-colored lines show $\Gamma_S = -0.27$ (default). Second, the thin-black lines show $\Gamma_S = -9999$ implying an substitution elasticity of ≈ 0 for the matching inputs.

elasticity channel dominates the *search cost channel* of ν_S. This pattern is easily visible in fig. 1 as the slopes of both the output and unemployment gaps decrease for $\gamma_S = 0.069$, are mostly constant[13] for $\gamma_S = 0.138$, and increase in ν_S for $\gamma_S = 0.276$.

For the baseline calibration, we find an output gap slope of 1.33 and an unemployment gap slope of 0.97 for the capacity utilization gap. This specification implies an overall procyclical response of the capacity utilization gap, heavily driven by the *price elasticity channel* dominating the *search cost channel*. Given that the output and unemployment gaps covary negatively and the output gap normally varies more, the variation of the capacity utilization gap should also be quantitatively sizeable. This finding implies procylical endogenous productivity as available resources are utilized more in booms than in recessions.

[13]While we solve for γ_S such that the price elasticity and search cost channels for ν_S cancel exactly out, ν_S still has an impact on the model steady-state which influences ϕ_{C_H}.

Figure 2: Slopes of the Euler equation (5-eq model)



NOTE: The graphs show the impact of varying ν_S with a fixed ν_M on the slopes of the Euler equation (incldluing home production). The benchmark model is shown by the full horizontal line ($\gamma_S = 0$). The goods market SaM model is shown in two variants for three different values of γ_S indicated by the dashed, dashed-dotted, and full lines. First, the bold-colored lines show $\Gamma_S = -0.27$ (default). Second, the thin-black lines show a substitution elasticity of ≈ 0 for the matching inputs.

4.4. Euler Equation: Search Cost and Inflation

An increase in the difference between real and natural interest rates leads to a decrease in consumption growth - thus to a decrease in the output gap growth - as households increase their savings. While the Euler equation is a cornerstone of the NK model, it is widely critized for overstating the impact of real interest rates on intertemporal consumption decisions (see e.g. Ascari et al. (2021)). Figure 2 shows how goods market SaM frictions affect the output and unemployment gap slopes of the Euler equation - as given in (22) - compared to the benchmark model - as given by proposition 1.

The benchmark model shows an output gap slope of the Euler equation of 0.43 and an unemployment gap slope of 0.00. Those slopes implies that a 1% increase in the real interest rate gap leads to a 2.33% decrease in the output gap growth. Adding goods market SaM leads to larger slopes of the Euler equation as γ_S increases. However, while the there is an unambiguous increase in the slope of the output gap, the sign on the unemployment gap slope is ambiguous.

The *search cost channel* becomes more salient for both slopes as $\phi_{\mathbb{M},c'_S}$ increases while $\phi_{\mathbb{M},C_M}$ and $\phi_{\mathbb{M},H_M}$ decrease. The impact of marginal search cost disutility, $\phi_{\mathbb{M},c_S}$, is driven by the impact of firm marginal cost (13). The numerator summarizes the trade-off between the *search cost and capacity utilization channels*. Marginal search cost increase in firm marginal cost which vary more as labor supply elasticity decreases or the share of home production increases (for the output gap slope). Capacity utilization in turn increases in search effort and reduces firm marginal cost due to higher utilization. Both increase in γ_S. The *search productivity* channel increases in Γ_S, rendering the *capacity utilization channel* obsolete if matching inputs are perfect complements.

The denominator summarizes the trade-off between the *search cost and price elasticity channels*. If $\gamma_S(\epsilon - 1) < 1$, search cost increase in firm marginal cost and decrease in capacity utilization as described above. However, if $\gamma_S(\epsilon - 1) > 1$, the sign of the denominator changes leading the *price elasticity channel* to dominate. Hence, increases in capacity utilization now increase the slope of the output gap Euler equation as they decrease the price elasticity of demand more than the search cost, leading to a lower impact of real interest rates on output gap growth. This channel increases in ν_S as search disutility is more convex.

Compared to the slopes of the capacity utilization gap, the output gap Euler slope increases unambiguously in $\frac{\nu_S}{\nu_M}$, as an increase in ν_S also decreases search effort and thereby the overall consumption level. As the unemployment gap does not affect consumption, its slope decreases in ν_S as long as the *search cost channel* dominates the *price elasticity channel* and switches signs thereafter.

Overall, there is significant variation in the increase of the output gap slope of the Euler equation between 2.44 to 17.28 times the value of the benchmark model. For the slope of the unemployment gap we find variation of similar magnitudes as for the output gap slope - a channel that is missing in the benchmark model. For our preferred calibration, the output gap Euler equation slope is 3.14 - 7.3 times larger than in the benchmark model - and the unemployment gap slope is 5.47. Taking for instance Okun's law as the correlation between output and unemployment gap, the joint slope is 0.81, almost twice the slope of the benchmark model. This difference implies that monetary policy must adjust its interest rates twice as much to achieve the same impact as in benchmark model.

Proposition 2. *The slope of the Euler equation decreases in $\frac{\nu_S}{\nu_M}$, γ_S, and Γ_S. Average and marginal search cost increase in all three parameters making search cost a larger share of overall consumption costs. It follows that monetary policy has a lower impact on aggregate demand as goods market prices comprise a smaller share of the overall consumption costs.*

Proof. See (22) and Appendix B.5. □

4.5. Phillips Curve: Tradeoff between Search Effort and Sticky Prices

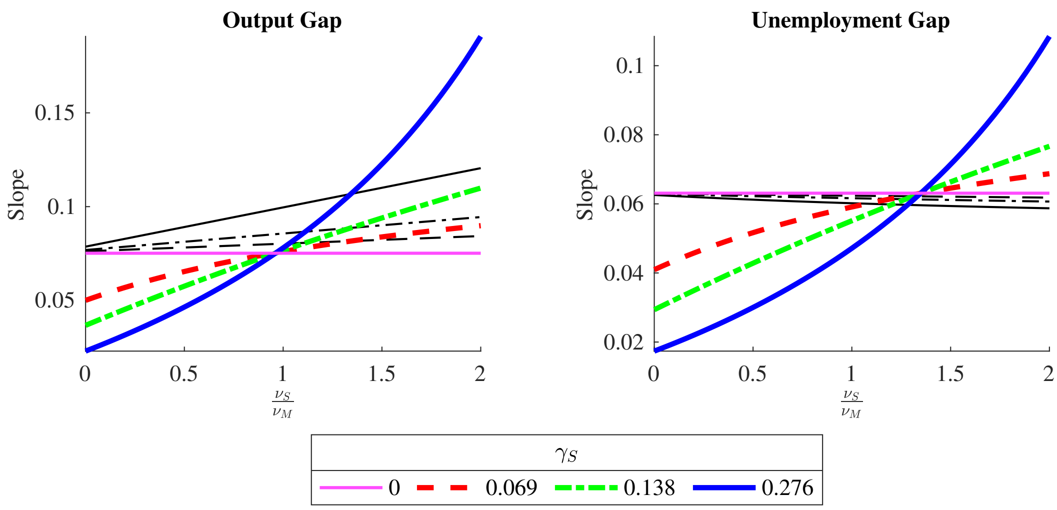
An increase in the output gap leads to an increase in inflation as firms balance higher cost of production by increasing (sticky) prices. An increase in the unemployment gap leads to an increase in inflation as wages and thus marginal cost are above their flexible price counterpart. Prices become more sticky as goods markets become less competitive. Figure 3 shows how goods market SaM frictions affect the output and unemployment gap slopes of the Phillips curve Θ_{π,C_M} and $\Theta_{\pi,u}$ - as given in (23) - under different calibrations and compared to the benchmark model[14].

For the benchmark model, the output gap slope is approximately 0.075 while the unemployment slope is 0.063. Adding goods market SaM can lead to either an increase or decrease in both slopes while the slope of the labor share Phillips curve is fixed in calibration by construction. In general, the impact of goods market SaM on both slopes increases in γ_S. While the *price elasticity channel* reduces the pass-through of marginal costs, the *search productivity channel* increases price adjustment as goods prices comprise a lower share of the composite price, which implies that firms must change prices more aggressively to induce the required search effort.

The second term constitutes the variation in firm marginal cost. As for the Euler equation, they decrease in labor supply elasticity and increase in the home production share (for the output gap slope), while they decrease in the *capacity utilization channel*. The impact of

[14] I recalibrate the price adjustment cost parameter, κ_P, under each parameter specification to match the slope of the labor share Phillips curve in the data.

Figure 3: Slopes of the Phillips curve (5-eq model)



NOTE: The graphs show the impact of varying ν_S with a fixed ν_M on the slopes of the Phillips (inclduing home production). The benchmark model is shown by the full horizontal line ($\gamma_S = 0$). The goods market SaM model is shown in two variants for three different values of γ_S indicated by the dashed, dashed-dotted, and full lines. First, the bold-colored lines show $\Gamma_S = -0.27$ (default). Second, the thin-black lines show a substitution elasticity of ≈ 0 for the matching inputs.

the *capacity utilization channel* vanishes as matching inputs become perfect complements, $\Gamma_S \to -\infty$. As $\gamma_S\,(\epsilon - 1) > 1$, the sign switches as the *price elasticity channel* becomes the dominant driver of firm marginal cost.

Whether the slopes of the Phillips curve are flatter or steeper than in the benchmark model depends on $\frac{\nu_S}{\nu_M}$. For $\bar{\nu}_{SM}\,(\Gamma_S)$ the slopes are identical to the benchmark model. It increases in Γ_S through the *search productivity channel*[15]. Hence, search effort supply can be less elastic than labor supply as long as substitutability of matching inputs is high.

The slopes of the Phillips curve are steeper than in the benchmark model as search effort becomes less elastic relative to market hours, $\frac{\nu_S}{\nu_M} > \bar{\nu}_{SM}\,(\Gamma_S)$, vice-versa. $\frac{\nu_S}{\nu_M}$ affects the *capacity utilization channel* only. As it increases, marginal search cost increase, thus variation in capacity utilization decreases, leading to higher firm marginal cost variation and a steeper Phillips curve. Firms adjust prices more to induce additional search effort given convex

[15] In the calibrated model, there are two distinct values for the output gap, $\bar{\nu}_{SM,C} = 0.96$, and unemployment gap, $\bar{\nu}_{SM,ue} = 1.34$. For $\Gamma_S \to -\infty$, both converge to zero.

marginal search cost. As $\gamma_S(\epsilon - 1) > 1$, the *price elasticity channel* dominates, leading to a significantly steeper Phillips curve for any $\frac{\nu_S}{\nu_M}$ as prices must adjust even more aggressively to induce additional household search effort.

Overalll, the range of the output gap Phillips curve is between 31% and 250% of the benchmark slope. The range for the unemployment gap Phillips curve is between 27% and 171% of the benchmark slope. The calibrated output gap Phillips curve is approximately 4% steeper and the unemployment gap Phillips curve is approximately 25% flatter than in the benchmark model. Taking for instance Okun's law as the correlation between output and unemployment gap, the joint slope is 0.087, about 20% flatter than in the benchmark model. Prices react less to movements in the output gap. This pattern follows mainly from sticky wages and their impact on firm marginal cost and search effort. Otherwise, the slope would be slightly larger than in the benchmark model.

Proposition 3. *Each firm targets an optimal share of matching inputs given the CES matching function. The slope of the output gap Phillips curve increases in $\frac{\nu_S}{\nu_M}$, as firms must adjust prices more aggressively to induce changes in search effort. The variation in prices increases for high γ_S and Γ_S as search effort becomes a more productive matching input and thus justifies even larger price changes (thus higher price adjustment costs).*

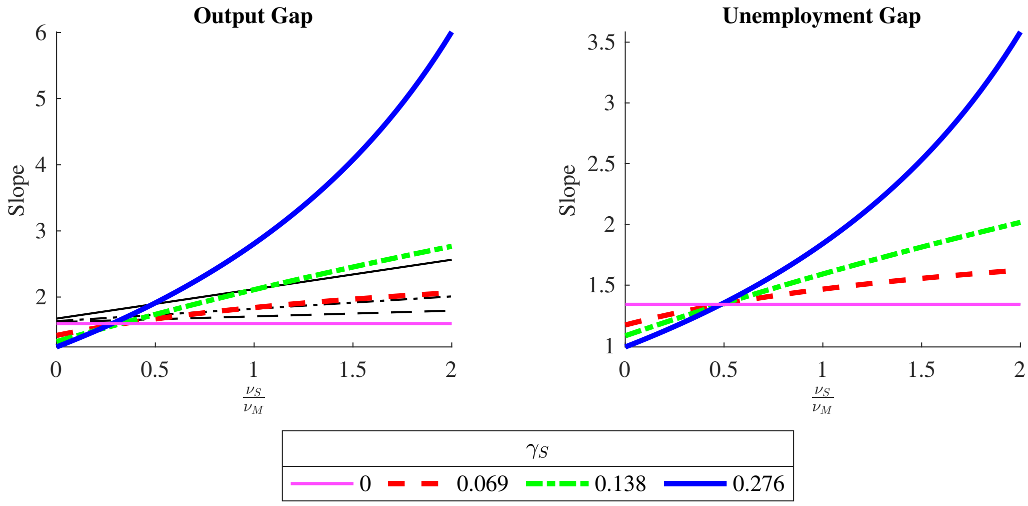
Proof. See (23) and Appendix B.5. □

4.6. Real Wages and the Aggregate Impact

The wage Phillips curve is unaffected by goods market SaM. As the slope of the price Phillips curve deviates with goods market SaM, real wage growth is affected as well. Both the output gap and unemployment gap slopes show the same pattern as the slopes of the Phillips curve when adding goods market SaM. They are determined by the trade-off between the *search cost and capacity utilization channels* in the numerator and the trade-off between the *search cost and price elasticity channels* in the denominator.

Figure 4 shows the output gap and unemployment gap slopes of the real wage growth equation. In the benchmark model, the output gap slope has a coefficient of 1.60 and the

Figure 4: Slopes of the real wage equation (5-eq model)



NOTE: The graphs show the impact of varying ν_S with a fixed ν_M on the slopes of the real wage equation (inclduing home production). The benchmark model is shown by the full horizontal line ($\gamma_S = 0$). The goods market SaM model is shown in two variants for three different values of γ_S indicated by the dashed, dashed-dotted, and full lines. First, the bold-colored lines show $\Gamma_S = -0.27$ (default). Second, the thin-black lines show a substitution elasticity of ≈ 0 for the matching inputs.

unemployment gap slope has a coefficient of 1.34. As we introduce goods market SaM the coefficients vary significantly between 1.25 and 6.00 for the output gap and between 1.00 and 3.58 for the unemployment gap, mainly driven by the *price elasticity channel*. As fig. 4 show, the variation is amplified by the *capacity utilization channel*, which vanishes for $\Gamma_S \to -\infty$. For the default calibration, the output gap slope is 2.81 and the unemploymen gap slope is 1.84. Hence, real wage growth is significantly more volatile in both gaps. Reformulating (25) for unemploymeng gap growth shows that the unemployment gap moves less to real wage growth but more to output gap growth. This pattern represents the increasing impact of the capacity utilization gap on labor markets.

The overall impact of goods market SaM depends on the interplay of the Phillips curves, the Euler equation, and the variation in the unemployment gap. The Euler equation slope increasesly unambiguously implying a lower response of output gap growth to changes in the real interest rate gap. The price Phillips curve and real wage growth equation show ambiguous changes depending on $\frac{\nu_S}{\nu_M}$. Thus, price and real wage inflation can be either less or more responsive to the output and unemployment gaps, depending on the calinration. The wage Phillips curve slope is unchanged by goods market SaM. As there are four different values of $\bar{\nu}_{SM}$ where the output gap and unemployment gap slopes of the price Phillips curve and the real wage growth equation are identical to their benchmarl slope, we simplify by assuming two cases: First, search effort supply is significantly more elastic than labor supply, i.e. $\frac{\nu_S}{\nu_M} = 0$. And second, search effort supply is significantly less elastic than labor supply, i.e. $\frac{\nu_S}{\nu_M} = 2$. The aggregate impact of those two cases is laid out in corollary 1. For a quantitative statement of the aggregate impact of goods market SaM we have to solve the model and refer to simulation methods in the next section.

Corollary 1. *Case 1: For $\frac{\nu_S}{\nu_M} < \bar{\nu}_{SM}$, a flatter Phillips curve amplifies nominal effects while a flatter Euler equation dampens them. The two effects counteract each other.*
Case 2: For $\frac{\nu_S}{\nu_M} > \bar{\nu}_{SM}$, a steeper Phillips curve and a flatter Euler equation dampen nominal effects. The two effects amplify each other.

5. Simulation Analysis: Three Scenarios

The model features four channels summarizing the impact of goods market SaM: The *search cost, search productivity, price elasticity, and capacity utilization channels.* In the previous section, we have seen that the *search cost channel* plays a crucial role in determining the slopes of the Euler equation, while the *search productivity channel* does so for the price Phillips curve. Both channels are amplified by the *capacity utilization channel*, especially if the *price elasticity channel* plays a dominant role.

In this section, I analyze the aggregate impact of goods market SaM on the model economy for common business cycle shocks using impulse response analysis. To highlight the different goods market SaM channels, I construct three scenarios: First, an economy where search effort is a productive matching input that can substitute for goods supply and goods markets are competitive in a sense that differentiated goods can be rather easily substituted for one another. Second, an economy where search effort is a strict complement to goods supply in matching and goods markets are competitive as in scenario one. And third, an economy where search effort is a substitute for goods supply as in scenario one, but goods markets are non-competitive in a sense that the elasticity of substitution between differentiated goods is (close to) zero. We use Dynare (Adjemian et al. (2024)) to solve and simulate the model economy.

5.1. Scenario 1: Search Effort as Substitutes in Competitive Goods Markets

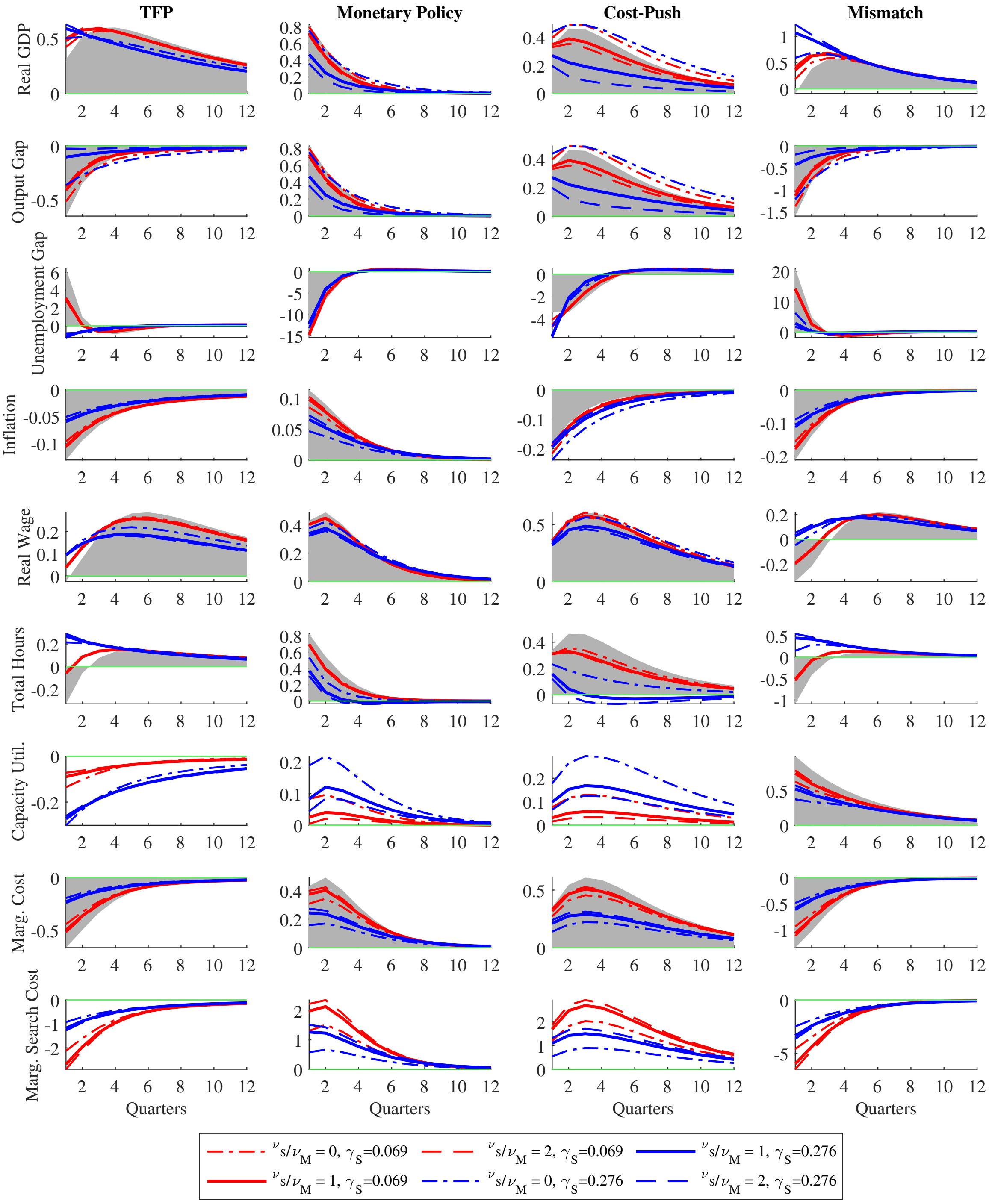
The aggregate impact of supply and demand for each exogenous shock are given in fig. 5. The figures show the impulse responses of the benchmark model as grey areas, the calibrated model as the blue line (case 1), $\frac{\nu_S}{\nu_M} \approx 0$ as the dashed-dotted line (case 2), and $\frac{\nu_S}{\nu_M} = 2$ as the dashed line. The red curves show the same three cases for a model where the *search cost channel* is larger than the *price elasticity channel*. Deviations are in percent (points) from steady-state. Periods are in quarters.

Output and Unemployment Gaps, Inflation, and Real GDP. All impulse responses are shown for expansionary shocks, i.e. real GDP increases, which implies a negative output gap and positive unemployment gap for TFP and matching efficiency shocks, and a positive output gap and negative unemployment gap for the policy and cost-push shock. Inflation follows the output gap except for the cost-push shock due to its exogenous inflation component. The matching efficiency shock is qualitatively symmetric to the TFP shock in the benchmark model. However, quantitatively it shows stronger variation in inflation and the output gap for a similar response of real GDP.

Adding goods market SaM leads to a reduction of the output and unemployment gap impulse response for all four shocks. The inflation impulse responses decreases symmetrically, except for the cost-push shock where inflation is driven exogenously. Real GDP impulse responses increase in the output gap, hence are larger for TFP and matching efficiency shocks and smaller for monetary policy and cost-push shocks. There is an increasing disconnect between real GDP and the output gap for the TPF and matching efficiency shocks, especially if γ_S is large enough such that the *price elasticity channel* dominates the *search cost channel*.

For $\frac{\nu_S}{\nu_M} < \bar{\nu}_{SM}$ (case 1), the impact of goods market SaM on the model economy is smaller as the Euler equation slope increases and a flatter Phillips curve slope counteracts this impact.

Figure 5: Impulse Responses of the Sticky Price & Wage Economy (Scenario 1)



NOTE: The graphs show the impulse responses of the sticky price model to a TFP, monetary policy, cost-push, and matching efficiency shock. The benchmark NK model is shown in grey. The blue line shows the impulse responses for the calibrated model. The dotted lines shows the impulse responses for $\frac{\nu_S}{\nu_M} = 0.5$ and the dashed lines for $\frac{\nu_S}{\nu_M} = 1.5$. The red lines show the impulse responses for $\gamma_S = 0.11$ for the same three cases.

The dashed-dotted impulse responses are converging back to the benchmark model impulse responses, especially for the output gap and real GDP. The change in inflation responses is less pronounced as the output gap varies more but the slope of the Phillips curve decreases. For $\frac{\nu_S}{\nu_M} < \bar{\nu}_{SM}$ (case 2), we find the opposite pattern. The impact of goods market SaM is amplified through both a flatter Euler equation slope and a steeper Phillips curve slope. Inflation impulse responses only slightly change as the output gap varies less coupled with more flexible price setting. Both cases have a more significant impact on the IRFs if the *price elasticity channel* dominates, i.e. γ_S is large, which also represents the significantly different slopes for $\gamma_S = 0.276$ in figs. 1 to 4.

Marginal Search Cost, Capacity Utilization, and Hours Worked. The impact of the *capacity utilization channel* on the model economy can be summarized by variation in the capacity utilization rate. As shown in (14), it varies in firm marginal cost and marginal search cost. Its variation increases in γ_S while the variation in firm marginal cost and marginal search cost decrease. The *price elasticity channel* amplifies those effects, especially if $\frac{\nu_S}{\nu_M} < \bar{\nu}_{SM}$. As marginal cost fall for TFP shocks, marginal search cost and capacity utilization fall as well. This pattern is along the lines of Basu et al. (2006). For monetary policy and cost-push shocks we find the opposite behavior due to increasing firm marginal cost. The matching efficiency shock shows a similar behavior as the TFP shock, however, capacity utilization increases due to the exogenous shock even though the endogenous channels work in the other direction.

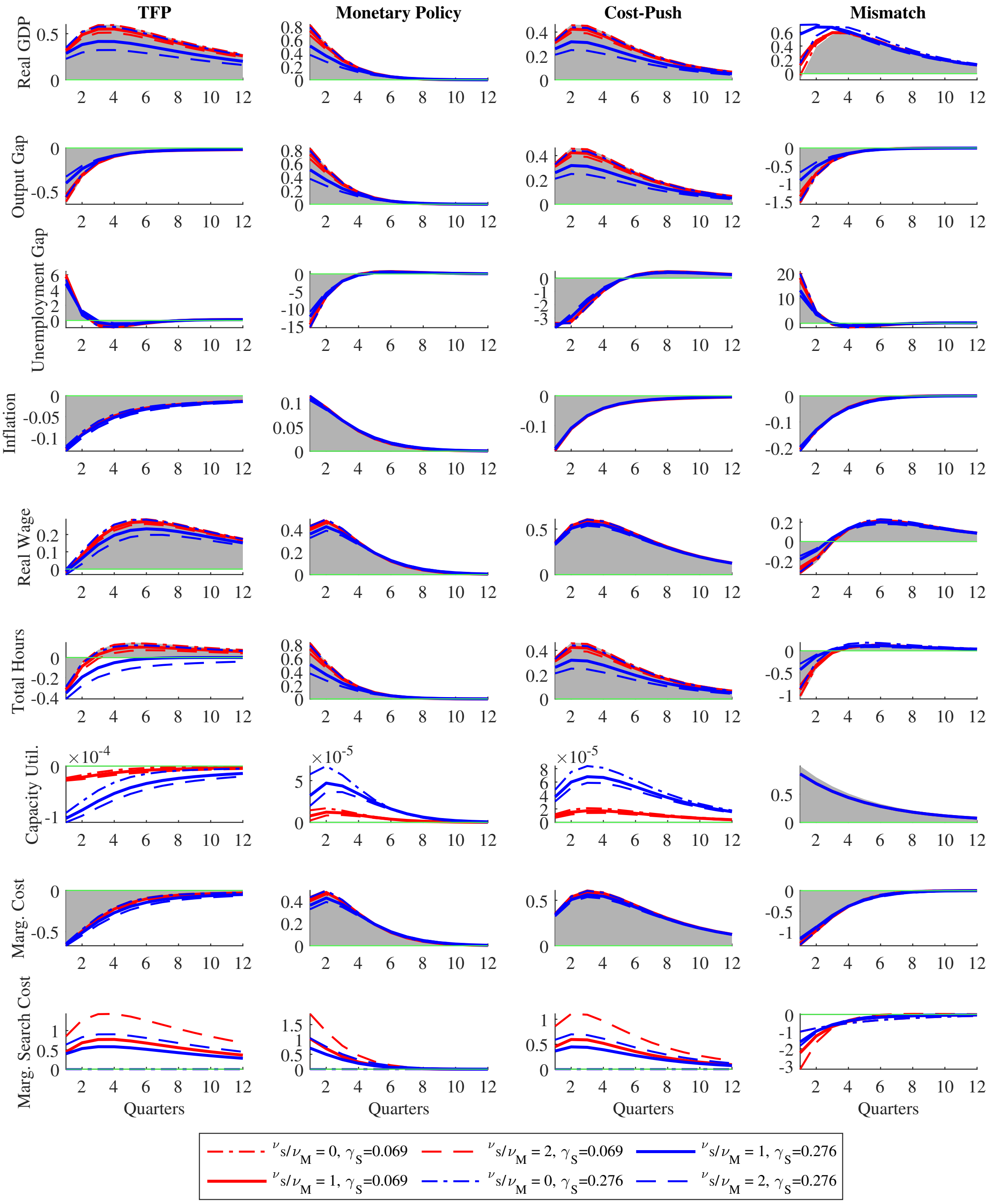
The *capacity utilization channel* drives marginal productivity of labor. Labor demand decreases in capacity utilization as marginal productivity increases. As (16) shows, total hours worked in proportion to output depends on exogenous TFP shocks and variations in capacity utilization. For the monetary policy and cost-push shocks, procyclical capacity utilization lowers labor demand. As γ_S increases, total hours worked impulse responses can even turn slightly negative, but being mostly acyclical (featuring a strong *price elasticity channel*). For the TFP and matching efficiency shocks, countercyclical capacity utilization leads to higher labor demand. It turns the classic result (see e.g. Gali (1999)) of an initial drop in hours worked following TFP shocks around and increases in γ_S. Hours worked for both shocks become pronounced procyclical for high values of γ_S.Overall, we find that the IRFs in the goods market SaM model look more like flexible price model responses as γ_S increases. The output gap for TFP and matching efficiency shocks is close to acyclical while monetary policy shocks have up to half the impact on consumption growth compared to the benchmark model. Capacity utilization endogeneizes productivity in a simple 5-equation NK model, turning around common results of the labor market in the NK literature. While $\frac{\nu_S}{\nu_M} \lesseqgtr \bar{\nu}_{SM}$ has a distinct impact on the slopes of the Phillips curve and Euler equation, its impact on the impulse responses can be substituted by a change in γ_S.

5.2. Scenario 2: Search Effort as Complements in Competitive Goods Markets

In this next experiment, we shut off the *capacity utilization channel* compared to scenario 1 by setting $\Gamma_S \approx -\infty$. The three other SaM channels are present, however, their impact is affected by the missing *capacity utilization channel.* This scenario studies the idea of search effort as a cyclical component creating disutility to the household and a trade-off in time allocation, however, not affecting capacity utilization. As there is no clear evidence on the search effort elasticity of matching, this scenario acts as a lower bound of the impact of goods market SaM on the NK model.

Output and Unemployment Gaps, Inflation, and Real GDP. In contrast to scenario 1, the IRFs of the goods market SaM economy are significantly closer to the benchmark model IRFs. The output gap varies significantly for both TFP and matching efficiency shocks, the unemployment gap is almost identical to its benchmark model counterpart, and output follows the same hump-shaped patter for all shocks except the monetary policy shock. There are no qualitative differences, however, the monetary policy shock still shows a significantly lower response of output up to a third less as households demand elasticity is lower due to the search cost additional to goods prices. However, the economy with strong matching complements requires a large γ_S such that the *price elasticity channel* is dominant to create

Figure 6: Impulse Responses of the Sticky Price & Wage Economy (Scenario 2)



NOTE: The graphs show the impulse responses of the sticky price model to a TFP, monetary policy, cost-push, and matching efficiency shock. The benchmark NK model is shown in grey. The blue line shows the impulse responses for the calibrated model. The dotted lines shows the impulse responses for $\frac{\nu_S}{\nu_M} = 0.5$ and the dashed lines for $\frac{\nu_S}{\nu_M} = 1.5$. The red lines show the impulse responses for $\gamma_S = 0.11$ for the same three cases.

such quantitative effects in the IRFs.

Marginal Search Cost, Capacity Utilization, and Hours Worked. As search effort and goods supply are perfect complements, there is virtually no variation in capacity utilization and firm marginal cost are (almost) unaffected by goods market SaM. Marginal search cost, however, vary significantly over the business cycle as there is no consumption without search effort. Two differences arise though. First, the variation in marginal search cost is lower as capacity utilization cannot act as an amplification mechanism. And second, following from the first point, marginal search cost is procyclical for TFP shocks as the negative amplification from capacity utilization is missing. Total hours worked show a similar picture as in the benchmark NK model, pronounced procyclical for demand and cost-push shocks, and a initial negative response turning into a positive response for both supply shocks. As γ_S increases such that the *price elasticity channel* becomes dominat, the response of marginal search cost and total hours worked is more negative compared to the benchmark NK model, except for the the matching efficiency shock.

Overall, scenario 2 shows the importance of the ability of search effort to substitute for goods supply in matching to create endogenous capacity utilization and productivity, thus lower variation in the output gap and a positive response of total hours worked following a TFP shock. The *price elasticity without capacity utilization channel* amplifies total hours worked in the other direction. However, the smaller response of output growth to monetary policy shocks persists in this economy.

5.3. Scenario 3: Search Effort as Substitutes in Monopolistic Goods Markets

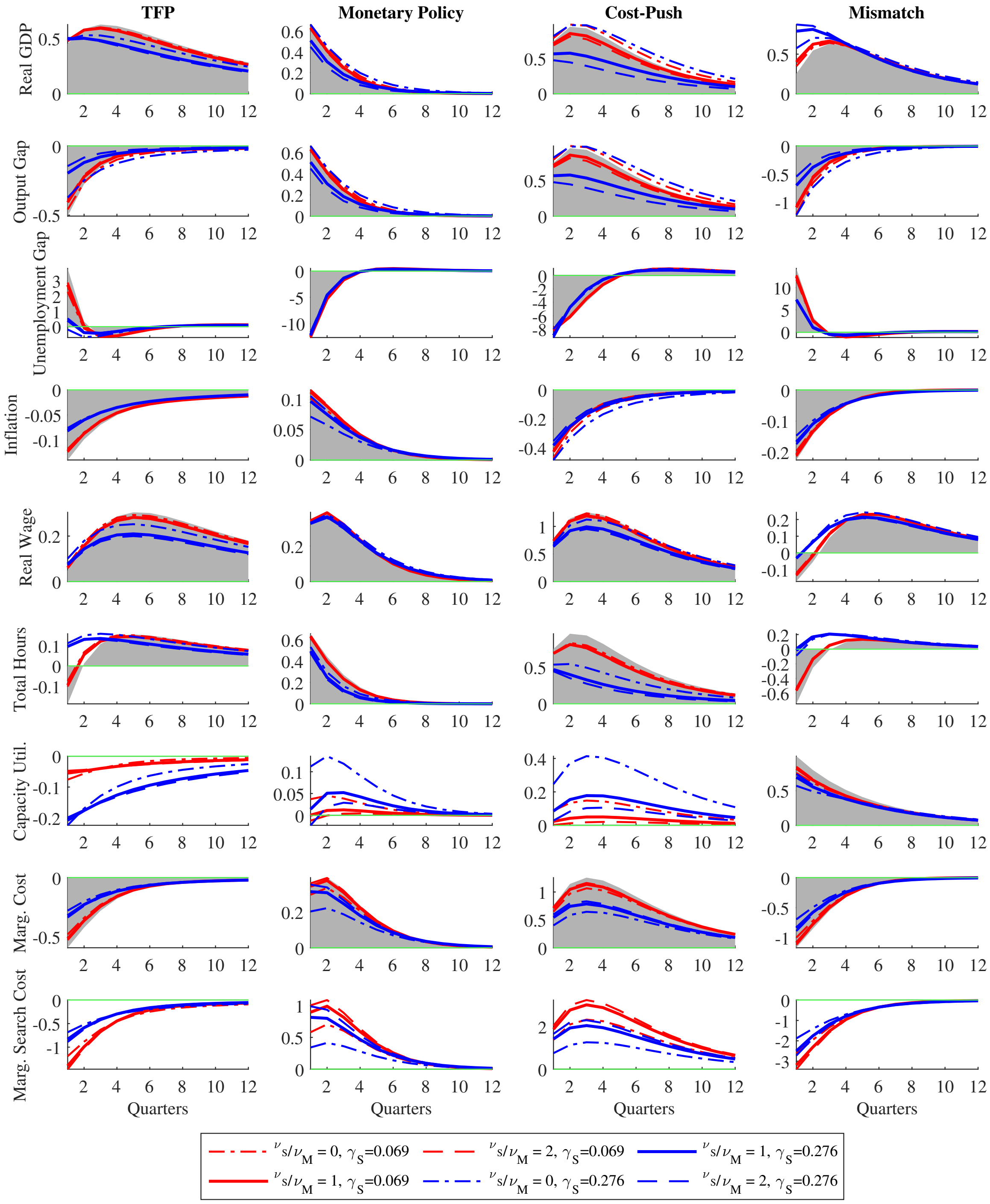
In this next experiment, we again allow for substitutability between search effort and goods supply in the matching but function, but decrease the substitutability between differentiated goods, which in turn increases the market power of each firm. The *price elasticity channel* vanishes for $\epsilon \to 1$. However, as this would imply an infinitely large price markup, the equilibrium is unfeasibile. Instead, we calibrate ϵ such that steady-state markups are equal to $\approx 68\%$ as in e.g. Smets and Wouters (2007). All goods market SaM channels are present. However, the impact of the *price elasticity channel* is significantly reduced.

Output and Unemployment Gaps, Inflation, and Real GDP. In contrast to scenario 1, the IRFs of the goods market SaM model are closer to the benchmark model. The output gap varies more than in scenario 1, but less than in scenario 2. Hence, the *capacity utilization channel* is the main driver behind the almost acyclical output gap IRFs for TFP and matching efficiency shocks, which also translates to less cyclical unemployment gaps for those two shocks. As inflation follows the output gap, we find that the reduction in cyclicality also is mainly a result of the *capacity utilization channel*. Monetary policy shocks show a lower response to output than in the benchmark model. However, it is closer to it than scenario 2. While the impact of the *price elasticity channel* is significantly reduced due to lower substitutability of differentiated goods, the model still requires a significant γ_S to create noticeable fluctuations in capacity utilization, thus output (gap) and inflation.

Marginal Search Cost, Capacity Utilization, and Hours Worked. As search effort and goods supply are substitutable, there is significant variation in capacity utilization and firm marginal cost vary less than in the benchmark model. Marginal search cost vary as in scenario 1 with a countercyclical variation of marginal search cost following TFP shocks. Total hours worked show a similar picture as in scenario 1 less countercyclical responses for TFP and matching efficiency shocks, even procyclical for $\gamma_S = 0.276$. As γ_S increases the *search productivity channel* drives the variation in the *capacity utilizaiton channel* up while the *price elasticity channel* is subdued.

Overall, scenario 3 shows qualitative similarity to scenario 1 while its quantitative impact is subdued. This result shows that the *capacity utilization channel* drives the differences in IRFs resulting from adding goods market SaM while the *price elasticity channel* amplifies IRFs in either scenario.

Figure 7: Impulse Responses of the Sticky Price & Wage Economy (Scenario 3)



NOTE: The graphs show the impulse responses of the sticky price model to a TFP, monetary policy, cost-push, and matching efficiency shock. The benchmark NK model is shown in grey. The blue line shows the impulse responses for the calibrated model. The dotted lines shows the impulse responses for $\frac{\nu_S}{\nu_M} = 0.5$ and the dashed lines for $\frac{\nu_S}{\nu_M} = 1.5$. The red lines show the impulse responses for $\gamma_S = 0.11$ for the same three cases.

5.4. Robustness Analysis

TO BE ADDED LATER!

Hours Adjustment Costs.

Firm Inventories and Long-Term Contracts.

Capital Allocation and Utilization.

6. Concluding Remarks

This paper introduces an extension to the New-Keynesian framework by integrating goods market search-and-matching frictions, which offers a richer understanding of macroeconomic dynamics. By incorporating costly household search effort and imperfect matching, the model uncovers how goods market frictions impact key macroeconomic variables such as capacity utilization, inflation, and the output gap. The results highlight that search frictions reduce long-run GDP through idle capacity and the impact on firm pricing power, while also altering the slope of the Phillips curve and Euler equation.

The trade-off between search costs and prices leads to endogenous capacity utilization, which varies over the business cycle and is influenced by the balance between firm market power and goods market frictions. Furthermore, the inclusion of sticky prices amplifies the role of these frictions, especially in demand-driven markets, and provides new insights into the less effective transmission of monetary policy. Despite these complexities, the model retains a structure similar to the textbook New-Keynesian model.

Overall, this paper paves the way for further exploration of goods market characteristics within the New-Keynesian framework, offering new perspectives on the relationship between search frictions, monetary policy, and business cycle dynamics. The model's implications are crucial for understanding how market inefficiencies shape economic outcomes and could inform future research on macroeconomic policy and its effectiveness. As a precise description of the labor market is a necessary feature to describe capacity utilization data, future research should include labor market search-and-matching and an hours per worker margin.

A wide variety of goods market features like advertising, long-term contracts, inventories, or multi-good trades per match could also be included to further enrich the model.

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TECHNICAL APPENDIX

Appendix A. Complete Model Setup and First-Order Condition Derivations

Appendix A.1. Goods Market Setup

The goods market is differentiated along the lines of each goods variety i. Each household j buys every good i. Each variety is produced by a single firm. The goods market law of motion on each market follows

$$T_t(i,j) \; = \; (1-\delta_T)\, T_{t-1}(i,j) + m_t(i,j), \tag{A.1}$$

where matching on each market is given by

$$m_t(i,j) \; = \psi_{S,t}\left[\gamma_S H_{S,t}(i,j)^{\Gamma_S} + (1-\gamma_S) S_t(i,j)^{\Gamma_S}\right]^{\frac{1}{\Gamma_S}}. \tag{A.2}$$

The matching probabilities of households and firms are respectively given by

$$f_t(i,j) \; = \frac{m_t(i,j)}{H_{S,t}(i,j)} \; = \; \psi_{S,t}\left[\gamma_S + (1-\gamma_S) x_t(i,j)^{-\Gamma_S}\right]^{\frac{1}{\Gamma_S}}, \tag{A.3}$$

$$q_t(i,j) \; = \frac{m_t(i,j)}{S_t(i,j)} \; = \; \psi_{S,t}\left[\gamma_S x_t(i,j)^{\Gamma_S} + (1-\gamma_S)\right]^{\frac{1}{\Gamma_S}}, \tag{A.4}$$

$$x_t(i,j) \; = \frac{H_{S,t}(i,j)}{S_t(i,j)} \; = \; \frac{q_t(i,j)}{f_t(i,j)}. \tag{A.5}$$

Appendix A.2. Labor Union: Aggregator and Quadratic Hours Adjustment Cost

Optimization Problem of the Labor Union.

$$\begin{aligned}\mathcal{L} = \max_{H_{M,t},H_{M,t}(i),H_{M,t}(j)} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta_{0,t} \Bigg\{ & \left[W_t \int_0^1 H_{M,t}(i)di - \int_0^1 W_t(j) H_{M,t}(j)dj - c_{HM,t} W_t H_{M,t} \right] \\ & - \Omega_{1,t} \left[H_{M,t} - \left(\int_0^1 H_{M,t}(j)^{\frac{\epsilon_W - 1}{\epsilon_W}} dj \right)^{\frac{\epsilon_W}{\epsilon_W - 1}} \right] \\ & - \Omega_{2,t} \left[H_{M,t} - \int_0^1 H_{M,t}(i)di \right] \Bigg\}\end{aligned}$$

First-order condition (labor union):.

$$W_t(j) \left(\frac{H_{M,t}(j)}{H_{M,t}} \right)^{\frac{1}{\epsilon_W}} = W_t \phi_{HM,t}, \tag{A.6}$$

where

$$\phi_{HM,t} = 1 - c_{HM,t} - c'_{HM,t} + \mathbb{E}_t \beta_{t,t+1} \frac{W_{t+1}}{W_t} \left(\frac{H_{M,t+1}}{H_{M,t}} \right) c'_{HM,t+1},$$

with

$$\begin{aligned} c_{HM,t} &= \frac{\Phi_{HM}}{2} \left(\frac{H_{M,t}}{H_{M,t-1}} - 1 \right)^2, \\ c'_{HM,t} &= \Phi_{HM} \left(\frac{H_{M,t}}{H_{M,t-1}} - 1 \right) \frac{H_{M,t}}{H_{M,t-1}}. \end{aligned}$$

Appendix A.3. Optimization Problem: Households of Type j

Appendix A.3.1. Lagrange Maximization Problem (Households)

The utility maximization problem of each household is given by

$$
\begin{aligned}
\mathcal{L} = & \max_{\substack{C_t(i,j),D_t(i,j),H_t(i,j),W_t(i,j),\\ B_t(i,j),K_t(i,j),I_t(i,j)}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \Bigg\{ \mathbb{U}\Big(C_t(j), H_{S,t}(i,j), H_{H,t}(j), H_{M,t}(j) \Big) \\
& - \lambda_{1,t} \Bigg[B_t(j) - (1+r_{t-1})\, B_{t-1}(j) + \int_0^1 P_t(i,j) T_t(i,j) di \\
& \qquad - \Big(1 - c_{W,t}(j)\Big) W_t(j) H_{M,t}(j) - P_t r_{K,t} e_{M,t}(j) K_{M,t-1}(j) - \Pi_t \Bigg] \\
& - \lambda_{2,t} \Bigg[C_t(j) - \Big(\gamma_H C_{H,t}(j)^{\Gamma_H} + (1-\gamma_H)\, C_{M,t}(j)^{\Gamma_H} \Big)^{\frac{1}{\Gamma_H}} \Bigg] \\
& - \int_0^1 \lambda_{3,t}(i,j) \Bigg[T_t(i,j) - (1-\delta_T)\, T_{t-1}(i,j) - f_t(i,j) H_{S,t}(i,j) \Bigg] di \\
& - \lambda_{4,t} \Bigg[H_{M,t}(j) - \left(\frac{W_t^*}{W_t(j)} \phi_{HM,t} \right)^{\epsilon_W} H_{M,t} \Bigg] \\
& - \lambda_{5,t} \Bigg[K_{M,t}(j) - \Big(1 - \delta_M\left(e_{M,t}(j)\right)\Big) K_{M,t-1}(j) - \Big(1 - c_{MI,t}(j)\Big) I_{M,t}(j) \Bigg] \\
& - \lambda_{6,t} \Bigg[K_{H,t}(j) - \Big(1 - \delta_H\left(e_{H,t}(j)\right)\Big) K_{H,t-1}(j) - \Big(1 - c_{HI,t}(j)\Big) I_{H,t}(j) \Bigg] \\
& - \lambda_{7,t} \Bigg[\left(\int_0^1 T_t(i,j)^{\frac{\epsilon-1}{\epsilon}} di \right)^{\frac{\epsilon}{\epsilon-1}} - C_{M,t}(j) - I_{M,t}(j) - I_{H,t}(j) \Bigg] \Bigg\},
\end{aligned}
$$

where

$$
C_{H,t}(j) \; = H_{H,t}(j)^{1-\alpha_H} \Big[e_{H,t}(j) K_{H,t-1}(j) \Big]^{\alpha_H},
$$

and it is assumed that the no-Ponzi scheme condition $\lim_{T\to\infty} \mathbb{E}_t B_T(j) \geq 0$ holds.

Appendix A.3.2. Functional Forms (Households)

Cost functions. Adjustment costs and capital depreciation are described by

$$
\begin{aligned}
c_{W,t}(j) &= \frac{\kappa_W}{2}\left(\frac{W_t(j)}{W_{t-1}(j)}-1\right)^2, \\
\delta_{M,t}(j) &= \delta_{M1}+\frac{\delta_{M2}\delta_{M3}}{2}\left(e_{M,t}(j)-1\right)^2+\delta_{M3}\Big(e_{M,t}(j)-1\Big), \\
\delta_{H,t}(j) &= \delta_{H1}+\frac{\delta_{H2}\delta_{H3}}{2}\left(e_{H,t}(j)-1\right)^2+\delta_{H3}\Big(e_{H,t}(j)-1\Big), \\
c_{MI,t}(j) &= \frac{\kappa_{MI}}{2}\left(\frac{I_{M,t}(j)}{I_{M,t-1}(j)}-1\right)^2, \\
c_{HI,t}(j) &= \frac{\kappa_{HI}}{2}\left(\frac{I_{H,t}(j)}{I_{H,t-1}(j)}-1\right)^2.
\end{aligned}
$$

Utility Function:. There are four versions of the utility function. Preferences either follow Greenwood et al. (1988) or King et al. (1988) and the convexity of search effort disutility can either apply to overall household search effort or firm-specific search effort.

GHH preferences (aggregate/firm-specific convexity in search disutility):

$$
\mathbb{U}_t(i,j) = \frac{1}{1-\sigma}\left[C_t(j)-\mu_S\frac{\int_0^1 H_{S,t}(i,j)^{1+\nu_S}di}{1+\nu_S}-\mu_H\frac{H_{H,t}(j)^{1+\nu_H}}{1+\nu_H}-\mu_M\frac{H_{M,t}(j)^{1+\nu_M}}{1+\nu_M}\right]^{1-\sigma} \tag{A.7}
$$

$$
\mathbb{U}_t(i,j) = \frac{1}{1-\sigma}\left[C_t(j)-\mu_S\frac{\left(\int_0^1 H_{S,t}(i,j)di\right)^{1+\nu_S}}{1+\nu_S}-\mu_H\frac{H_{H,t}(j)^{1+\nu_H}}{1+\nu_H}-\mu_M\frac{H_{M,t}(j)^{1+\nu_M}}{1+\nu_M}\right]^{1-\sigma} \tag{A.8}
$$

KPR preferences (aggregate/firm-specific convexity in search disutility):

$$
\mathbb{U}_t(i,j) = \frac{C_t(j)^{1-\sigma}}{1-\sigma}-\mu_S\frac{\left(\int_0^1 H_{S,t}(i,j)di\right)^{1+\nu_S}}{1+\nu_S}-\mu_H\frac{H_{H,t}(j)^{1+\nu_H}}{1+\nu_H}-\mu_M\frac{H_{M,t}(j)^{1+\nu_M}}{1+\nu_M} \tag{A.9}
$$

$$
\mathbb{U}_t(i,j) = \frac{C_t(j)^{1-\sigma}}{1-\sigma}-\mu_S\frac{\int_0^1 H_{S,t}(i,j)^{1+\nu_S}di}{1+\nu_S}-\mu_H\frac{H_{H,t}(j)^{1+\nu_H}}{1+\nu_H}-\mu_M\frac{H_{M,t}(j)^{1+\nu_M}}{1+\nu_M} \tag{A.10}
$$

FOC composite consumption (aggregate/firm-specific convexity in search disutility):

$$
\frac{\partial\mathbb{U}_t(i,j)}{\partial C_t(j)} = \left[C_t(j)-ghh\left(\mu_S\frac{H_{S,t}(j)^{1+\nu_S}}{1+\nu_S}+\mu_H\frac{H_{H,t}(j)^{1+\nu_H}}{1+\nu_H}+\mu_M\frac{H_{M,t}(j)^{1+\nu_M}}{1+\nu_M}\right)\right]^{-\sigma} \tag{A.11}
$$

$$
\frac{\partial\mathbb{U}_t(i,j)}{\partial C_t(j)} = \left[C_t(j)-ghh\left(\mu_S\frac{\int_0^1 H_{S,t}(i,j)^{1+\nu_S}di}{1+\nu_S}+\mu_H\frac{H_{H,t}(j)^{1+\nu_H}}{1+\nu_H}+\mu_M\frac{H_{M,t}(j)^{1+\nu_M}}{1+\nu_M}\right)\right]^{-\sigma} \tag{A.12}
$$

FOC search effort (aggregate/firm-specific convexity in search disutility):

$$\frac{\partial \mathbb{U}_t(i,j)}{\partial H_{S,t}(i,j)} = \left[ghh \frac{\partial \mathbb{U}_t(i,j)}{\partial C_t(j)} + (1-ghh)\right](-\mu_S)\left(\int_0^1 H_{S,t}(i,j)di\right)^{\nu_S} \tag{A.13}$$

$$\frac{\partial \mathbb{U}_t(i,j)}{\partial H_{S,t}(i,j)} = \left[ghh \frac{\partial \mathbb{U}_t(i,j)}{\partial C_t(j)} + (1-ghh)\right](-\mu_S) H_{S,t}(i,j)^{\nu_S} \tag{A.14}$$

FOCs home and market labor supply:

$$\frac{\partial \mathbb{U}_t(i,j)}{\partial H_{H,t}(j)} = \left[ghh \frac{\partial \mathbb{U}_t(i,j)}{\partial C_t(j)} + (1-ghh)\right](-\mu_H) H_{H,t}(j)^{\nu_H} \tag{A.15}$$

$$\frac{\partial \mathbb{U}_t(i,j)}{\partial H_{M,t}(j)} = \left[ghh \frac{\partial \mathbb{U}_t(i,j)}{\partial C_t(j)} + (1-ghh)\right](-\mu_M) H_{M,t}(j)^{\nu_M} \tag{A.16}$$

where ghh is an indicator variable for the GHH preferences.

Appendix A.3.3. First-Order Conditions (Households)

In the summarized FOCs of the household below, both KPR and GHH preferences are incorporated. Set $ghh = 0$ for KPR preferences and $ghh = 1$ for GHH preferences. Further, the cost functions from above are implemented as well.

$$\begin{aligned}&\left[\frac{\partial \mathbb{U}_t(i,j)}{\partial H_{M,t}(j)} + muc_t(j) w_t(j)\Big(1 - c_{W,t}(j)\Big)\right] \epsilon_W \left(\frac{W_t^*}{W_t(j)}\phi_{HM,t}\right)^{\epsilon_W} \\ &= muc_t(j) w_t(j)\left[1 - c_{W,t}(j) - c'_{W,t}(j)\right] + \beta muc_{t+1}(j) w_{t+1}(j) \frac{H_{M,t+1}(j)}{H_{M,t}(j)} c'_{W,t+1}(j)\end{aligned} \tag{A.17}$$

$$\mathbb{W}_{C,t}(j) = \frac{\partial \mathbb{U}_t(i,j)}{\partial C_t(j)} (1-\gamma_H) \left(\frac{C_{M,t}(j)}{C_t(j)}\right)^{\Gamma_H - 1} \tag{A.18}$$

$$(-1)\frac{\partial \mathbb{U}_t(i,j)}{\partial H_{H,t}(j)} = \frac{\partial \mathbb{U}_t(i,j)}{\partial C_t(j)} \gamma_H (1-\alpha_H) \left(\frac{C_{H,t}(j)}{C_t(j)}\right)^{\Gamma_H - 1} \frac{C_{H,t}}{H_{H,t}(j)} \tag{A.19}$$

$$muc_t(j)\frac{P_t(i,j)}{P_t} = \frac{\frac{\partial \mathbb{U}_t(i,j)}{\partial H_{S,t}(i,j)}}{f_t(i,j)} - \beta(1-\delta_T)\frac{\frac{\partial \mathbb{U}_{t+1}(i,j)}{\partial H_{S,t+1}(i,j)}}{f_{t+1}(i,j)} + \mathbb{W}_{C,t}(j)\left(\frac{T_t(j)}{T_t(i,j)}\right)^{\frac{1}{\epsilon}} \tag{A.20}$$

$$muc_t(j) = \beta\frac{1+r_t}{1+pi_{t+1}} muc_{t+1}(j) \tag{A.21}$$

$$Q_{M,t}(j) = \beta\left[muc_{t+1}(j) r_{K,t+1} e_{M,t+1} + (1 - \delta(e_{M,t+1}(j))) Q_{M,t+1}(j)\right] \tag{A.22}$$

$$\mathbb{W}_{C,t}(j) = Q_{M,t}(j)\left[1 - c_{MI,t}(j) - c'_{MI,t}(j)\right] + \beta Q_{M,t+1}(j)\frac{I_{M,t+1}(j)}{I_{M,t}(j)} c'_{MI,t+1}(j) \tag{A.23}$$

$$r_{K,t} = \frac{Q_{M,t}(j)}{muc_t(j)} \frac{\partial \delta(e_{M,t}(j))}{\partial e_{M,t}(j)} \tag{A.24}$$

$$\begin{aligned}Q_{H,t}(j) &= \beta\gamma_H\alpha_H\frac{\partial \mathbb{U}_{t+1}(i,j)}{\partial C_{t+1}(j)}\left(\frac{C_{H,t+1}(j)}{C_{t+1}(j)}\right)^{\Gamma_H-1}\frac{C_{H,t+1}(j)}{K_{H,t}(j)} \\ &\quad + \beta\left[1 - \delta(e_{H,t+1}(j))\right] Q_{H,t+1}(j)\end{aligned} \tag{A.25}$$

$$\mathbb{W}_{C,t}(j) = Q_{H,t}(j)\left[1 - c_{HI,t}(j) - c'_{HI,t}(j)\right] + \beta Q_{H,t+1}(j)\frac{I_{H,t+1}(j)}{I_{H,t}(j)} c'_{HI,t+1}(j) \tag{A.26}$$

$$\frac{\partial \delta(e_{H,t}(j))}{\partial e_{H,t}(j)} = \gamma_H\alpha_H\left(\frac{C_{H,t}(j)}{C_t(j)}\right)^{\Gamma_H-1}\frac{C_{H,t}(j)}{e_{H,t}(j)}\frac{\frac{\partial \mathbb{U}_t(i,j)}{\partial C_t(j)}}{Q_{H,t}(j) K_{H,t-1}(j)} \tag{A.27}$$

where

$$c'_{S,t} = (-1)\frac{\frac{\partial \mathbb{U}_t(i,j)}{\partial H_{S,t}(i,j)}}{f_t(i,j)}. \tag{A.28}$$

Appendix A.3.4. Derivation of price elasticity of demand

Starting point: Inverse demand function derived from household FOCs:

$$\begin{aligned}\frac{P_t(i,j)}{P_t} &= \frac{\mathbb{W}_{C,t}(j)}{muc_t(j)}\left(\frac{T_t(j)}{T_t(i,j)}\right)^{\frac{1}{\epsilon}} - \frac{ghh\frac{\partial \mathbb{U}_t(j)}{\partial C_t(j)} + (1-ghh)}{muc_t(j)} c'_{S,t}(i,j) \\ &+ \beta \mathbb{E}_t \frac{muc_{t+1}(j)}{muc_t(j)} \frac{ghh\frac{\partial \mathbb{U}_{t+1}(j)}{\partial C_{t+1}(j)} + (1-ghh)}{muc_{t+1}(j)} c'_{S,t+1}(i,j)\end{aligned}$$

First derivative:

$$\begin{aligned}\frac{\frac{\partial P_t(i,j)}{\partial T_t(i,j)}}{P_t} &= \frac{-1}{\epsilon \cdot T_t(i,j)} \frac{\mathbb{W}_{C,t}}{muc_t(j)}\left(\frac{T_t(j)}{T_t(i,j)}\right)^{\frac{1}{\epsilon}} - \frac{\partial c'_{S,t}(i,j)}{\partial T_t(i,j)} \frac{ghh\frac{\partial \mathbb{U}_t(i,j)}{\partial C_t(j)} + (1-ghh)}{muc_t(j)} \\ &+ \beta\left(1-\delta_T\right) \mathbb{E}_t \frac{\partial c'_{S,t+1}(i,j)}{\partial T_t(i,j)} \frac{ghh\frac{\partial \mathbb{U}_{t+1}(i,j)}{\partial C_{t+1}(j)} + (1-ghh)}{muc_t(j)}\end{aligned} \tag{A.29}$$

Price elasticity of demand:

$$\Xi_{P,T,t} = \frac{P_t(i,j)}{T_t(i,j)} \cdot \frac{\partial T_t(i,j)}{\partial P_t(i,j)} \tag{A.30}$$

Benchmark case (setting $\gamma_S = 0 \Rightarrow c'_{S,t} = 0$):

$$\Xi_{P,T,t} = (-\epsilon) \quad \forall t$$

As the model nests the textbook NK model, the price elasticity reduces to a constant as the model reduces to its benchmark case. The price elasticity of demand in the goods market SaM model depends on marginal search cost and decreases in those. Marginal search cost depend on goods market tightness and are thus a general equilibrium object which depends on price setting and goods supply of firms. It depends on the shock whether this general equilibrium object increases or decreases the price elasticity of households.

Appendix A.4. Optimization Problem: Goods Firms of Type i

Appendix A.4.1. Lagrange Maximization Problem (Firms):

The profit maximization of each firm is given by

$$
\begin{aligned}
\mathcal{L} \;=\; & \max_{\substack{T_t(i,j),S_t(i,j),x_t(i,j)\\ P_t(i,j),H_t(i),K_{Me,t}(i)}} \mathbb{E}_0 \sum_{t=0}^{\infty} \beta_{0,t} \Bigg\{ \left[\int_0^1 P_t(i,j) T_t(i,j) dj - W_t(i) H_{M,t}(i) - P_t r_{K,t} K_{Me,t}(i) \right] \\
& - \phi_{1,t} \Bigg[\int_0^1 \Big(1 + c_{P,t}(i,j)\Big) S_t(i,j) dj - A_t H_{M,t}(i)^{1-\alpha_M} K_{Me,t}(i)^{\alpha_M} \\
& \qquad + (1-\delta_T) \int_0^1 T_{t-1}(i,j) dj - (1-\delta_I) \int_0^1 \Big(1 - q_{t-1}(i,j)\Big) S_{t-1}(i,j) dj \Bigg] \\
& - \int_0^1 \phi_{2,t}(i,j) \Big[T_t(i,j) - (1-\delta_T) T_{t-1}(i,j) - m_t(i,j) \Big] dj \\
& - \int_0^1 \phi_{3,t}(i,j) \Bigg[\frac{P_t(i,j)}{P_t} - \frac{\mathbb{W}_{C,t}(j)}{muc_t(j)} \left(\frac{T_t(j)}{T_t(i,j)} \right)^{\frac{1}{\epsilon}} + c'_{S,t}(i,j) \frac{ghh \frac{\partial \mathbb{U}_t(i,j)}{\partial C_t(j)} + (1-ghh)}{muc_t(j)} \\
& \qquad - \beta (1-\delta_T) c'_{S,t+1}(i,j) \frac{ghh \frac{\partial \mathbb{U}_{t+1}(i,j)}{\partial C_{t+1}(j)} + (1-ghh)}{muc_{t+1}(j)} \Bigg] \Bigg\},
\end{aligned}
$$

where $Y_{M,t}(i) = A_t H_{M,t}(i)^{1-\alpha_M} K_{Me,t}(i)^{\alpha_M}$. The last constraint states the household consumption demand constraint derived in (A.20) and aggregated over all households. Price adjustment costs are given by

$$
c_{P,t}(i,j) \;=\; \frac{\kappa}{2} \left(\frac{P_t(i,j)}{P_{t-1}(i,j)} - 1 \right)^2 .
$$

Appendix A.4.2. First-Order Conditions (Firms):

$$w_t = (1-\alpha_M)\,A_t\left(\frac{K_{Me,t}(i)}{H_{M,t}(i)}\right)^{\alpha_M} mc_{Y,t}(i) \tag{A.31}$$

$$r_{K,t} = \alpha_M A_t\left(\frac{K_{Me,t}(i)}{H_{M,t}(i)}\right)^{\alpha_M-1} mc_{Y,t}(i) \tag{A.32}$$

$$\begin{aligned}\frac{P_t(i,j)}{P_t} &= pr_t(i,j)+\varphi_t(i,j)\frac{\mathbb{W}_{C,t}(j)}{muc_t(j)}\frac{1}{\epsilon}\left(\frac{T_t(j)}{T_t(i,j)}\right)^{\frac{1}{\epsilon}}T_t(i,j)^{-1}\\ &\quad+\mathbb{E}_t\beta_{t,t+1}\,(1-\delta_T)\,\frac{P_{t+1}}{P_t}\,[mc_{Y,t+1}(i)-pr_{t+1}(i,j)]\end{aligned} \tag{A.33}$$

$$\begin{aligned}mc_{Y,t}(i) &= \frac{1}{1+c_{P,t}(i,j)}\Big[q_t(i,j)pr_t(i,j)-\mathbb{I}_{HS}\cdot\varphi_t(i,j)\nu_S\frac{c'_{S,t}(i,j)}{S_t(i,j)}\frac{ghh\frac{\partial\mathbb{U}_t(i,j)}{\partial C_t(j)}+(1-ghh)}{muc_t(j)}\\ &\qquad+\mathbb{E}_t\beta_{t,t+1}\frac{P_{t+1}}{P_t}\,(1-\delta_I)\,(1-q_t(i,j))\,mc_{Y,t+1}(i)\Big]\end{aligned} \tag{A.34}$$

$$\varphi_t(i,j) = \frac{\frac{muc_t(j)\gamma_S x_t(i,j)^{\Gamma_S}\frac{m_t(i,j)}{c'_{S,t}(i,j)}}{(1-\gamma_S)-\mathbb{I}_{HS}\cdot\nu_S\left[\gamma_S x_t(i,j)^{\Gamma_S}+(1-\gamma_S)\right]}}{ghh\frac{\partial\mathbb{U}_t(i,j)}{\partial C_t(j)}+(1-ghh)}\left[pr_t(i,j)-\mathbb{E}_t\beta_{t,t+1}\frac{P_{t+1}}{P_t}\,(1-\delta_I)\,mc_{Y,t+1}(i)\right] \tag{A.35}$$

$$c'_{P,t}(i,j) = \frac{\frac{P_t(i,j)}{P_t}\Big[T_t(i,j)-\varphi_t(i,j)\Big]}{mc_{Y,t}(i)S_t(i,j)}+\mathbb{E}_t\beta_{t,t+1}\frac{P_{t+1}}{P_t}\frac{mc_{Y,t+1}(i)S_{t+1}(i,j)}{mc_{Y,t}(i)S_t(i,j)}c'_{P,t+1}(i,j) \tag{A.36}$$

where $\mathbb{I}_{HS}$ is an indicator variable for the alternative search effort disutility preferences, $H_{S,t}(j) = \left(\int_0^1 H_{S,t}(i,j)^{1+\nu_S}di\right)$. Marginal cost have to be corrected by capacity utilization to be comparable to the textbook NK model with

$$mc_t = \frac{mc_{Y,t}}{e_{S,t}}, \tag{A.37}$$

where $e_{S,t}(i) = \frac{T_t(i)}{Y_{M,t}(i)}$ is the short-run capacity utilization of available firm capacity.

Appendix A.5. Symmetric Model

Appendix A.5.1. Representative Household

The FOCs and constraints of the symmetric model follow the assumption that all firms have the same technology and all households the same preferences. We can therefore drop the firm indexes i of differentiated goods and the household indexes j of differentiated labor, as both are given by representative good and labor supply. The system of representative household FOCs is given by

$$\begin{aligned}
(-1)\frac{\partial \mathbb{U}_t}{\partial H_{M,t}} &= muc_t w_t \left(1-c_{W,t}\right)\left(1-\frac{1}{\epsilon_W c_{HM,t}^{\epsilon_W}}\right) + muc_t w_t \frac{1}{\epsilon_W c_{HM,t}^{\epsilon_W}} c'_{W,t} \\
&\quad - \beta \mathbb{E}_t muc_{t+1} w_{t+1} \frac{1}{\epsilon_W c_{HM,t}^{\epsilon_W}} \frac{H_{M,t+1}}{H_{M,t}} c'_{W,t+1}
\end{aligned} \tag{A.38}$$

$$muc_t = \beta \mathbb{E}_t \frac{1+r_t}{1+\pi_{t+1}} muc_{t+1}, \tag{A.39}$$

$$muc_t = \mathbb{W}_{C,t} + \frac{\frac{\partial \mathbb{U}_t}{\partial H_{S,t}}}{f_t} - \beta\left(1-\delta_T\right)\mathbb{E}_t \frac{\frac{\partial \mathbb{U}_{t+1}}{\partial H_{S,t+1}}}{f_{t+1}}, \tag{A.40}$$

$$\mathbb{W}_{C,t} = \frac{\partial \mathbb{U}_t}{\partial C_t}\left(1-\gamma_H\right)\left(\frac{C_{M,t}}{C_t}\right)^{\Gamma_H - 1}, \tag{A.41}$$

$$(-1)\frac{\partial \mathbb{U}_t}{\partial H_{H,t}} = \frac{\partial \mathbb{U}_t}{\partial C_t}\gamma_H\left(1-\alpha_H\right)\left(\frac{C_{H,t}}{C_t}\right)^{\Gamma_H - 1}\frac{C_{H,t}}{H_{H,t}}, \tag{A.42}$$

$$\begin{aligned}
Q_{M,t} &= \beta \mathbb{E}_t muc_{t+1} e_{M,t+1} r_{K,t+1} \\
&\quad + \beta \mathbb{E}_t Q_{M,t+1}\left(1-\delta_{M1} - \frac{\delta_{M2}\delta_{M3}}{2}\left(e_{M,t+1}-1\right)^2 - \delta_{M3}\left(e_{M,t+1}-1\right)\right),
\end{aligned} \tag{A.43}$$

$$\mathbb{W}_{C,t} = Q_{M,t}\left[1-c_{MI,t}-c'_{MI,t}\right] + \beta \mathbb{E}_t Q_{M,t+1} c'_{I,t+1}\frac{I_{M,t+1}}{I_{M,t}}, \tag{A.44}$$

$$muc_t = \frac{Q_{M,t}}{r_{K,t}}\left[\delta_{M2}\delta_{M3}\left(e_{M,t}-1\right)+\delta_{M3}\right], \tag{A.45}$$

$$\begin{aligned}
Q_{H,t} &= \beta \mathbb{E}_t \frac{\partial \mathbb{U}_{t+1}}{\partial C_{t+1}}\gamma_H \alpha_H \left(\frac{C_{H,t+1}}{C_{t+1}}\right)^{\Gamma_H - 1}\frac{C_{H,t+1}}{K_{H,t}} \\
&\quad + \beta \mathbb{E}_t Q_{H,t+1}\left(1-\delta_{H1} - \frac{\delta_{H2}\delta_{H3}}{2}\left(e_{H,t+1}-1\right)^2 - \delta_{H3}\left(e_{H,t+1}-1\right)\right),
\end{aligned} \tag{A.46}$$

$$\mathbb{W}_{C,t} = Q_{H,t}\left[1-c_{HI,t}-c'_{HI,t}\right] + \beta \mathbb{E}_t Q_{H,t+1}\frac{I_{H,t+1}}{I_{H,t}} c'_{HI,t+1}, \tag{A.47}$$

$$Q_{H,t} = \frac{\frac{\partial \mathbb{U}_t}{\partial C_t}\gamma_H \alpha_H \left(\frac{C_{H,t}}{C_t}\right)^{\Gamma_H - 1}\frac{C_{H,t}}{e_{H,t}}}{K_{H,t-1}\left(\delta_{H2}\delta_{H3}\left(e_{H,t}-1\right)+\delta_{H3}\right)}, \tag{A.48}$$

where

$$
\begin{aligned}
c'_{W,t} &= \kappa_W \left(\frac{W_t}{W_{t-1}} - 1\right)\frac{W_t}{W_{t-1}} && \text{(A.49)}\\
c_{HM,t} &= 1 - \frac{\phi_{HM}}{2}\left(\frac{H_{M,t}}{H_{M,t-1}} - 1\right)^2 - \phi_{HM}\left(\frac{H_{M,t}}{H_{M,t-1}} - 1\right)\frac{H_{M,t}}{H_{M,t-1}} && \text{(A.50)}\\
&\quad + \mathbb{E}_t \frac{1+\pi_{W,t+1}}{1+r_t}\phi_{HM}\left(\frac{H_{M,t+1}}{H_{M,t}} - 1\right)\left(\frac{H_{M,t+1}}{H_{M,t}}\right)^2 && \text{(A.51)}\\
\frac{\partial \mathbb{U}_t}{\partial C_t} &= \left[C_t - ghh\left(\mu_S \frac{H_{S,t}^{1+\nu_S}}{1+\nu_S} + \mu_H \frac{H_{H,t}^{1+\nu_H}}{1+\nu_H} + \mu_M \frac{H_{M,t}^{1+\nu_H}}{1+\nu_H}\right)\right]^{-\sigma} && \text{(A.52)}\\
\frac{\partial \mathbb{U}_t}{\partial H_{S,t}} &= \left(ghh\frac{\partial \mathbb{U}_t}{\partial C_t} + (1-ghh)\right)(-\mu_S)H_{S,t}^{\nu_S} && \text{(A.53)}\\
\frac{\partial \mathbb{U}_t}{\partial H_{H,t}} &= \left(ghh\frac{\partial \mathbb{U}_t}{\partial C_t} + (1-ghh)\right)(-\mu_H)H_{H,t}^{\nu_H} && \text{(A.54)}\\
\frac{\partial \mathbb{U}_t}{\partial H_{M,t}} &= \left(ghh\frac{\partial \mathbb{U}_t}{\partial C_t} + (1-ghh)\right)(-\mu_M)H_{M,t}^{\nu_M} && \text{(A.55)}
\end{aligned}
$$

Appendix A.5.2. Representative Firm

The system of representative goods firm FOCs is given by

$$
\begin{aligned}
w_t &= (1-\alpha_M)\,A_t\left(\frac{K_{Me,t}}{H_{M,t}}\right)^{\alpha_M} mc_{Y,t}, && \text{(A.56)}\\
r_{K,t} &= \alpha_M A_t\left(\frac{K_{Me,t}}{H_{M,t}}\right)^{\alpha_M - 1} mc_{Y,t}, && \text{(A.57)}\\
pr_t &= 1 - \varphi_t \frac{\mathbb{W}_{C,t}}{muc_t}\frac{1}{\epsilon}T_t^{-1} - (1-\delta_T)\,\mathbb{E}_t\frac{1+\pi_{t+1}}{1+r_t}\left[mc_{Y,t+1} - pr_{t+1}\right], && \text{(A.58)}\\
mc_{Y,t} &= \frac{1}{1+c_{P,t}}\Bigg[q_t pr_t - \mathbb{I}_{HS}\cdot\varphi_t\nu_S\frac{c'_{S,t}}{S_t}\frac{ghh\frac{\partial \mathbb{U}_t}{\partial C_t} + (1-ghh)}{muc_t} && \\
&\qquad + \mathbb{E}_t\frac{1+\pi_{t+1}}{1+r_t}(1-\delta_I)(1-q_t)\,mc_{Y,t+1}\Bigg], && \text{(A.59)}\\
\varphi_t &= \frac{\frac{muc_t\gamma_S x_t^{\Gamma_S}\frac{m_t}{c'_{S,t}}}{(1-\gamma_S)-\mathbb{I}_{HS}\cdot\nu_S\left[\gamma_S x_t^{\Gamma_S}+(1-\gamma_S)\right]}}{ghh\frac{\partial \mathbb{U}_t}{\partial C_t} + (1-ghh)}\left[pr_t - \mathbb{E}_t\frac{1+\pi_{t+1}}{1+r_t}(1-\delta_I)\,mc_{Y,t+1}\right], && \text{(A.60)}\\
c'_{P,t} &= \frac{T_t}{mc_{Y,t}S_t}\left[1 - \frac{\varphi_t}{T_t}\right] + \beta\mathbb{E}_t\frac{1+\pi_{t+1}}{1+r_t}\frac{mc_{Y,t+1}S_{t+1}}{mc_{Y,t}S_t}c'_{P,t+1}. && \text{(A.61)}
\end{aligned}
$$

Appendix A.5.3. Constraints and General Equilibrium

The system of household, firm, and market constraints and policy rules is given by

$$T_t = (1-\delta_T)\, T_{t-1} + q_t S_t \tag{A.62}$$

$$x_t = \frac{q_t}{f_t} \tag{A.63}$$

$$C_t = \left(\gamma_H C_{H,t}^{\Gamma_H} + (1-\gamma_H)\, C_{M,t}^{\Gamma_H}\right)^{\frac{1}{\Gamma_H}} \tag{A.64}$$

$$C_{H,t} = H_{H,t}^{1-\alpha_H} \left[e_{H,t} K_{H,t-1}\right]^{\alpha_H} \tag{A.65}$$

$$K_{M,t} = (1-\delta(e_{M,t}))\, K_{M,t-1} - (1-c_{MI,t})\, I_{M,t} \tag{A.66}$$

$$K_{H,t} = (1-\delta(e_{H,t}))\, K_{H,t-1} - (1-c_{HI,t})\, I_{H,t} \tag{A.67}$$

$$T_t = C_{M,t} + I_{M,t} + I_{H,t} \tag{A.68}$$

$$(1+c_{P,t})\, S_t = Y_{M,t} - (1-\delta_T)\, T_{t-1} + (1-\delta_I)\,(1-q_t)\, S_{t-1} \tag{A.69}$$

$$u_t = \left[\frac{w_t}{\mu_M} \frac{muc_t}{ghh \frac{\partial \mathbb{U}_t}{\partial C_t} + (1-ghh)}\right]^{\frac{1}{\nu_M}} \frac{1}{H_{M,t}} - 1 \tag{A.70}$$

$$\frac{1+r_t}{1+r} = \left(\frac{1+r_{t-1}}{1+r}\right)^{i_r} \left[\left(\frac{\pi_t}{\pi}\right)^{i_\pi} \left(\frac{GDP_t}{GDP_{N,t}}\right)^{i_{Gap}}\right]^{1-i_r} M_t \tag{A.71}$$

Appendix B. Reduced-Form Model

Appendix B.1. Simplified System of Non-Linear Equation

Households.

$$
\begin{aligned}
\mu_M H_{M,t}^{\nu_M} &= \frac{muc_t \frac{w_t}{\epsilon_W}\left[(\epsilon_W - 1)(1 - c_{W,t}) + c'_{W,t}\right] - \beta \mathbb{E}_t muc_{t+1} \frac{H_{M,t+1}}{H_{M,t}} \frac{w_{t+1}}{\epsilon_W} c'_{W,t+1}}{ghh \frac{\partial \mathbb{U}_t}{\partial C_t} + (1 - ghh)} \\
\mu_H H_{H,t}^{\nu_H} &= \frac{\frac{\partial \mathbb{U}_t}{\partial C_t} \gamma_H (1 - \alpha_H) \left(\frac{C_{H,t}}{C_t}\right)^{\Gamma_H - 1} \frac{C_{H,t}}{H_{H,t}}}{ghh \frac{\partial \mathbb{U}_t}{\partial C_t} + (1 - ghh)} \\
muc_t &= \frac{\partial \mathbb{U}_t}{\partial C_t} (1 - \gamma_H) \left(\frac{C_{M,t}}{C_t}\right)^{\Gamma_H - 1} - c'_{S,t}\left(ghh \frac{\partial \mathbb{U}_t}{\partial C_t} + (1 - ghh)\right) \\
muc_t &= \beta \mathbb{E}_t \frac{1 + r_t}{1 + \pi_{t+1}} muc_{t+1} \\
\frac{\partial \mathbb{U}_t}{\partial C_t} &= \left[C_t - ghh\left(\mu_S \frac{H_{S,t}^{1+\nu_S}}{1 + \nu_S} + \mu_H \frac{H_{H,t}^{1+\nu_H}}{1 + \nu_H} + \mu_M \frac{H_{M,t}^{1+\nu_M}}{1 + \nu_M}\right)\right]^{-\sigma}
\end{aligned}
$$

Firms.

$$
\begin{aligned}
w_t &= (1 - \alpha_M) A_t H_{M,t}^{-\alpha_M} mc_{Y,t} \\
pr_t &= 1 - \varphi_t \frac{\frac{\partial \mathbb{U}_t}{\partial C_t} (1 - \gamma_H) \left(\frac{C_{M,t}}{C_t}\right)^{\Gamma_H - 1}}{muc_t} \frac{1}{\epsilon} T_t^{-1} \\
mc_{Y,t} &= \frac{1}{1 + c_{P,t}} \left[q_t pr_t - \mathbb{I}_{HS} \cdot \varphi_t \nu_S \frac{c'_{S,t}}{S_t} \frac{ghh \frac{\partial \mathbb{U}_t}{\partial C_t} + (1 - ghh)}{muc_t}\right] \\
\varphi_t &= \frac{muc_t}{ghh \frac{\partial \mathbb{U}_t}{\partial C_t} + (1 - ghh)} \cdot \frac{\gamma_S x_t^{\Gamma_S} \frac{m_t}{c'_{S,t}} pr_t}{(1 - \gamma_S) - \mathbb{I}_{HS} \cdot \nu_S \left[\gamma_S x_t^{\Gamma_S} + (1 - \gamma_S)\right]} \\
c'_{P,t} &= \frac{T_t}{mc_{Y,t} S_t} \left(1 - \frac{\varphi_t}{T_t}\right) + \mathbb{E}_t \frac{1 + \pi_{t+1}}{1 + r_t} \frac{mc_{Y,t+1} S_{t+1}}{mc_{Y,t} S_t} c'_{P,t+1}
\end{aligned}
$$

Constraints and General Equilibrium.

$$
\begin{aligned}
c'_{S,t} &= \mu_S \frac{C_{M,t}^{\nu_S}}{f_t^{1+\nu_S}} \\
C_t &= \left[\gamma_H C_{H,t}^{\Gamma_H} + (1-\gamma_H)\, C_{M,t}^{\Gamma_H}\right]^{\frac{1}{\Gamma_H}} \\
C_{H,t} &= H_{H,t}^{1-\alpha_H} \\
C_{M,t} &= \frac{q_t}{1+c_{P,t}} A_t H_{M,t}^{1-\alpha_M} \\
C_{M,t} &= \psi \left[\gamma_S x_t^{\Gamma_S} + (1-\gamma_S)\right]^{\frac{1}{\Gamma_S}} S_t \\
S_t &= \frac{C_{M,t}}{q_t} \\
u_t &= \left[\frac{w_t}{\mu_M} \frac{muc_t}{ghh\frac{\partial \mathbb{U}}{\partial C_t} + (1-ghh)}\right]^{\frac{1}{\nu_M}} \frac{1}{H_{M,t}} - 1 \\
\frac{1+r_t}{1+r} &= \left(\frac{1+r_{t-1}}{1+r}\right)^{i_r} \left[\left(\frac{\pi_t}{\pi}\right)^{i_\pi} \left(\frac{GDP_t}{GDP_{N,t}}\right)^{i_{Gap}}\right]^{1-i_r} M_t
\end{aligned}
$$

Appendix B.2. Linearized System of Equations

Households.

$$\hat{\pi}_{W,t} = (-1)\frac{\epsilon_W - 1}{\kappa_W}\phi_u \hat{u}_t + \beta \mathbb{E}_t \hat{\pi}_{W,t+1} \tag{B.1}$$

$$\hat{r}_t - \mathbb{E}_t\hat{\pi}_{t+1} = (-1)\left(\mathbb{E}_t \hat{muc}_{t+1} - \hat{muc}_t\right) \tag{B.2}$$

$$\hat{muc}_t = \hat{uC}_t - \frac{\phi_{C_H}}{1-\phi_\epsilon}\hat{C}_{M,t} - \frac{\phi_\epsilon}{1-\phi_\epsilon}\left[\hat{c}'_{S,t} - (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M}\hat{C}_{M,t}\right] \tag{B.3}$$

$$
\begin{aligned}
\hat{uC}_t = (-\sigma)\mathcal{U}\Bigg[&\left(\phi_{C_M} - \mathbb{I}_{ghh}\left(\frac{\phi_{H_S}}{1+\nu_S} + \frac{\phi_{H_H}}{1-\alpha_H}\frac{1-\Gamma_H - \sigma(1-\mathbb{I}_{ghh})}{\frac{1+\nu_H}{1-\alpha_H} - \Gamma_H}\phi_{C_M}\right)\right)\hat{C}_{M,t} \\
&-\mathbb{I}_{ghh}\frac{\phi_{H_S}}{1+\nu_S}\hat{c}'_{S,t} - \mathbb{I}_{ghh}\frac{\phi_{H_M}}{1-\alpha_M}\hat{H}_{M,t}\Bigg]
\end{aligned} \tag{B.4}
$$

Firms.

$$\hat{w}_t = \hat{mc}_t + \hat{q}_t + \hat{A}_t - \alpha_M \hat{H}_{M,t} \tag{B.5}$$

$$\begin{aligned} \hat{mc}_t = &\left(\frac{\alpha_M + \nu_M}{1-\alpha_M} + \frac{\phi_{C_H}}{1-\phi_\epsilon} + (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M}\right)\hat{C}_{M,t} \\ &+ \frac{\phi_\epsilon}{1-\phi_\epsilon}\left(\hat{c}'_{S,t} - (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M}\hat{C}_{M,t}\right) + \phi_u\hat{u}_t - \frac{1+\nu_M}{1-\alpha_M}\left(\hat{q}_t + \hat{A}_t\right) \end{aligned} \tag{B.6}$$

$$\hat{\pi}_t = \frac{\frac{\epsilon-1}{\epsilon}\left[\phi_{C_H}\hat{C}_{M,t} + \hat{c}'_{S,t} - (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M}\hat{C}_{M,t} - \frac{\Gamma_S}{\phi_\gamma}\left(\hat{q}_t - \hat{\psi}_t\right)\right]}{\kappa_P\left[\frac{\epsilon-1}{\epsilon} - (1+\mathbb{I}_{HS}\nu_S)\,\phi_\epsilon\right]} + \hat{\xi}_t + \beta\mathbb{E}_t\hat{\pi}_{t+1} \tag{B.7}$$

$$\begin{aligned} &\left[\frac{\epsilon-1}{\epsilon} - (1+\mathbb{I}_{HS}\nu_S)\,\phi_\epsilon\right]\hat{mc}_t \\ = &\left[\frac{\phi_\epsilon}{1-\phi_\epsilon}\left(\frac{1}{\epsilon} - \mathbb{I}_{HS}\nu_S\phi_\epsilon\right)\left(\frac{1}{\phi_\gamma} - \mathbb{I}_{HS}\nu_S\frac{1+\phi_\gamma}{\phi_\gamma}\right) + \mathbb{I}_{HS}\nu_S\phi_\epsilon\right]\left(\hat{c}'_{S,t} - (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M}\hat{C}_{M,t}\right) \\ &+ \frac{\phi_{C_H}}{\epsilon}\left(1 - \frac{\frac{1}{\epsilon - \mathbb{I}_{HS}\nu_S\phi_\epsilon}}{1-\phi_\epsilon}\right)\hat{C}_{M,t} - \frac{\frac{1}{\epsilon} - \mathbb{I}_{HS}\nu_S\phi_\epsilon}{1-\phi_\epsilon}\frac{\epsilon-1}{\epsilon}\frac{\Gamma_S}{\phi_\gamma}\left(\hat{q}_t - \hat{\psi}_t\right) \end{aligned} \tag{B.8}$$

Constraints.

$$\hat{q}_t = \frac{\phi_\gamma}{1+\nu_S}\left[\hat{c}'_{S,t} - \nu_S\hat{C}_{M,t}\right] + (1+\phi_\gamma)\,\hat{\psi}_t \tag{B.9}$$

$$\hat{H}_{M,t} = \frac{1}{1-\alpha_M}\left[\hat{C}_{M,t} - \hat{q}_t - \hat{A}_t\right] \tag{B.10}$$

$$\hat{w}_t = \hat{\pi}_{W,t} - \hat{\pi}_t + \hat{w}_{t-1} \tag{B.11}$$

Appendix B.3. 5-Equation Reduced-Form Model

$$\begin{aligned} \hat{r}_t - \mathbb{E}_t\hat{\pi}_{t+1} &= \Theta_{\mathbb{M},C_M}\mathbb{E}_t\Delta\hat{C}_{M,t+1} + \Theta_{\mathbb{M},U}\mathbb{E}_t\Delta\hat{U}_{t+1} + \Theta_{\mathbb{M},\psi}(1-\rho_\psi)\,\hat{\psi}_t + \Theta_{\mathbb{M},A}(1-\rho_A)\,\hat{A}_t \\ \hat{\pi}_{W,t} &= (-\nu_M)\,\frac{\epsilon_W - 1}{\kappa_W}\hat{U}_t + \beta\mathbb{E}_t\hat{\pi}_{W,t+1} \\ \hat{\pi}_t &= \frac{\Theta_{\pi,C_M}\hat{C}_{M,t} + \Theta_{\pi,U}\hat{U}_t - \Theta_{\pi,\psi}\hat{\psi}_t - \Theta_{\pi,A}\hat{A}_t}{\kappa_P\left(\frac{\epsilon-1}{\epsilon} - \phi_\epsilon\,(1+\mathbb{I}_{HS}\nu_S)\right)} + \hat{\xi}_t + \beta\mathbb{E}_t\hat{\pi}_{t+1} \\ \hat{\pi}_{W,t} - \hat{\pi}_t &= \Theta_{w,C_M}\Delta\hat{C}_{M,t} + \Theta_{w,U}\Delta\hat{U}_t - \Theta_{w,\psi}\Delta\hat{\psi}_t + \Theta_{w,A}\Delta\hat{A}_t \end{aligned}$$

where

$$\begin{aligned}
\Theta_{\mathbb{M},C_M} =& \phi_{\mathbb{M},C_M} + \phi_{\mathbb{M},q}\Theta_{q,C_M}; \quad \Theta_{\mathbb{M},U} = \phi_{\mathbb{M},q}\Theta_{q,U}; \quad \Theta_{\mathbb{M},\psi} = \phi_{\mathbb{M},\psi} + \phi_{\mathbb{M},q}\Theta_{q,\psi}; \quad \Theta_{\mathbb{M},A} = \phi_{\mathbb{M},A} + \phi_{\mathbb{M},\shortparallel}\Theta_{q,A} \\
\Theta_{\pi,C_M} =& \phi_{\pi,C_M} + \phi_{\pi,q}\Theta_{q,C_M}; \quad \Theta_{\pi,U} = \phi_{\pi,q}\Theta_{q,U}; \quad \Theta_{\pi,\psi} = \phi_{\pi,\psi} + \phi_{\pi,q}\Theta_{q,\psi}; \quad \Theta_{\pi,A} = \phi_{\pi,q}\Theta_{q,A} \\
\Theta_{w,C_M} =& \phi_{mc,C_M} - \frac{\alpha_M}{1-\alpha_M} + \left(\phi_{mc,q} + \frac{1}{1-\alpha_M}\right)\Theta_{q,C_M}; \quad \Theta_{w,U} = \nu_M + \left(\phi_{mc,q} + \frac{1}{1-\alpha_M}\right)\Theta_{q,U} \\
\Theta_{w,\psi} =& \phi_{mc,\psi} + \left(\phi_{mc,q} + \frac{1}{1-\alpha_M}\right)\Theta_{q,\psi}; \quad \Theta_{w,A} = \frac{1}{1-\alpha_M} - \phi_{mc,A} - \left(\phi_{mc,q} + \frac{1}{1-\alpha_M}\right)\Theta_{q,A}
\end{aligned}$$

Capacity utilization is given by

$$\hat{q}_t = \Theta_{q,C_M}\hat{C}_{M,t} + \Theta_{q,U}\hat{U}_t - \Theta_{q,\psi}\hat{\psi}_t - \Theta_{q,A}\hat{A}_t \tag{B.12}$$

where

$$\Theta_{q,C_M} = \frac{\phi_{mc,C_M} - \frac{\phi_{q,C_M}}{\phi_{q,mc}}}{\frac{\phi_{q,q}}{\phi_{q,mnc}} - \phi_{mc,q}}; \quad \Theta_{q,U} = \frac{\nu_M}{\frac{\phi_{q,q}}{\phi_{q,mnc}} - \phi_{mc,q}}; \quad \Theta_{q,\psi} = \frac{\phi_{mc,\psi} - \frac{\phi_{q,\psi}}{\phi_{q,mc}}}{\frac{\phi_{q,q}}{\phi_{q,mc}} - \phi_{mc,q}}; \quad \Theta_{q,A} = \frac{\phi_{mc,A}}{\frac{\phi_{q,q}}{\phi_{q,mnc}} - \phi_{mc,q}}$$

Composite parameters for the marginal utility function are given by

$$\begin{aligned}
\phi_{\mathbb{M},C_M} &= (-\sigma)\mathcal{U}\phi_{\mathbb{U},C_M} - \frac{\phi_{C_H}}{1-\phi_\epsilon} - \frac{\phi_\epsilon}{\phi_\epsilon}\left(\nu_S - (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M}\right); \quad \phi_{\mathbb{M},q} = (-\sigma)\mathcal{U}\mathbb{I}_{ghh}\phi_{\mathbb{U},q} + \frac{\phi_\epsilon}{1-\phi_\epsilon}\frac{1+\nu_S}{\phi_\gamma} \\
\phi_{\mathbb{M},\psi} &= (-\sigma)\mathcal{U}\mathbb{I}_{ghh}\phi_{\mathbb{U},\psi} + \frac{\phi_\epsilon}{1-\phi_\epsilon}(1+\nu_S)\frac{1+\phi_\gamma}{\phi_\gamma}; \quad \phi_{\mathbb{M},A} = (-\sigma)\mathcal{U}\mathbb{I}_{ghh}\phi_{\mathbb{U},A} \\
\mathcal{U} &= \left[1 - \mathbb{I}_{ghh}\left\{\frac{\phi_\epsilon\chi_{C_M}}{1+\nu_S} + \frac{(1-\alpha_H)\,\chi_{C_H}}{1+\nu_H} + \frac{(1-\alpha_M)\,\chi_{C_M}}{1+\nu_M}\frac{\epsilon_W - 1}{\epsilon_W}\left(\frac{\epsilon-1}{\epsilon} - (1+\mathbb{I}_{HS}\nu_S)\,\phi_\epsilon\right)\right\}\right]^{-1}
\end{aligned}$$

Composite parameters for the Phillips curve are given by

$$\begin{aligned}
\phi_{\pi,C_M} &= \frac{\epsilon-1}{\epsilon}\left[\phi_{C_H} + \nu_S - (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M}\right]; \quad \phi_{\pi,q} = \frac{\epsilon-1}{\epsilon}\frac{1}{\phi_\gamma}\left[1+\nu_S - \Gamma_S\right] \\
\phi_{\pi,\psi} &= \frac{\epsilon-1}{\epsilon}\frac{1}{\phi_\gamma}\left[(1+\nu_S)(1+\phi_\gamma) - \Gamma_S\right]
\end{aligned}$$

Composite parameters for the marginal cost function are given by

$$\begin{aligned}
\phi_{mc,C_M} &= \frac{\alpha_M + \nu_M}{1-\alpha_M} + (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M} + \frac{1}{1-\phi_\epsilon}\left[\phi_{C_H} + \phi_\epsilon\left(\nu_S - (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M}\right)\right] \\
\phi_{mc,q} &= \frac{\phi_\epsilon}{1-\phi_\epsilon}\frac{1+\nu_S}{\phi_\gamma} - \frac{1+\nu_M}{1-\alpha_M}; \quad \phi_{mc,\psi} = \frac{\phi_\epsilon}{1-\phi_\epsilon}(1+\nu_S)\frac{1+\phi_\gamma}{\phi_\gamma}; \quad \phi_{mc,A} = \frac{1+\nu_M}{1-\alpha_M}
\end{aligned}$$

Composite parameters for the capacity utilization function are given by

$$
\begin{aligned}
\phi_{q,mc} &= \frac{\epsilon-1}{\epsilon} - (1+\mathbb{I}_{HS}\nu_S)\,\phi_\epsilon \\
\phi_{q,C_M} &= \left[\frac{\phi_\epsilon}{1-\phi_\epsilon}\left(\frac{1}{\epsilon} - \mathbb{I}_{HS}\nu_S\phi_\epsilon\right)\left(\frac{1}{\phi_\gamma} - \mathbb{I}_{HS}\nu_S\frac{1+\phi_\gamma}{\phi_\gamma}\right) + \mathbb{I}_{HS}\nu_S\phi_\epsilon\right]\left(\nu_S - (1-\mathbb{I}_{ghh})\,\sigma\phi_{C_M}\right) \\
&\quad + \frac{\phi_{C_H}}{\epsilon}\left(1 - \frac{\frac{1}{\epsilon} - \mathbb{I}_{HS}\nu_S\phi_\epsilon}{1-\phi_\epsilon}\right) \\
\phi_{q,q} &= \left[\frac{\phi_\epsilon}{1-\phi_\epsilon}\left(\frac{1}{\epsilon} - \mathbb{I}_{HS}\nu_S\phi_\epsilon\right)\left(\frac{1}{\phi_\gamma} - \mathbb{I}_{HS}\nu_S\frac{1+\phi_\gamma}{\phi_\gamma}\right) + \mathbb{I}_{HS}\nu_S\phi_\epsilon\right]\frac{1+\nu_S}{\phi_\gamma} \\
&\quad - \frac{\frac{1}{\epsilon} - \mathbb{I}_{HS}\nu_S\phi_\epsilon}{1-\phi_\epsilon}\frac{\epsilon-1}{\epsilon}\frac{\Gamma_S}{\phi_\gamma} \\
\phi_{q,\psi} &= \left[\frac{\phi_\epsilon}{1-\phi_\epsilon}\left(\frac{1}{\epsilon} - \mathbb{I}_{HS}\nu_S\phi_\epsilon\right)\left(\frac{1}{\phi_\gamma} - \mathbb{I}_{HS}\nu_S\frac{1+\phi_\gamma}{\phi_\gamma}\right) + \mathbb{I}_{HS}\nu_S\phi_\epsilon\right](1+\nu_S)\,\frac{1+\phi_\gamma}{\phi_\gamma} \\
&\quad - \frac{\frac{1}{\epsilon} - \mathbb{I}_{HS}\nu_S\phi_\epsilon}{1-\phi_\epsilon}\frac{\epsilon-1}{\epsilon}\frac{\Gamma_S}{\phi_\gamma}
\end{aligned}
$$

Further composite parameters are given by

$$
\begin{aligned}
\phi_{\mathbb{U},C_M} &= \phi_{C_M} - \mathbb{I}_{ghh}\left[\phi_{H_S} + \frac{\phi_{H_H}}{1-\alpha_H}\frac{1-\Gamma_H - \sigma(1-\mathbb{I}_{ghh})}{\frac{1+\nu_H}{1-\alpha_H} - \Gamma_H}\phi_{C_M} + \frac{\phi_{H_M}}{1-\alpha_M}\right] \\
\phi_{\mathbb{U},q} &= \frac{\phi_{H_S}}{\phi_\gamma} - \frac{\phi_{H_M}}{1-\alpha_M}; \quad \phi_{\mathbb{U},\psi} = \phi_{H_S}\frac{1+\phi_\gamma}{\phi_\gamma}; \quad \phi_{\mathbb{U},A} = \frac{\phi_{H_M}}{1-\alpha_M} \\
\phi_\gamma &= \frac{\gamma_S x^{\Gamma_S}}{1-\gamma_S}; \quad \phi_\epsilon = \frac{1}{1-\mathbb{I}_{HS}\nu_S}\frac{\epsilon-1}{\epsilon}\frac{\phi_\gamma}{1+\phi_\gamma} \\
\phi_{C_M} &= \left[1 + \frac{\chi_{C_H}}{\frac{1+\nu_H}{1-\alpha_H} - \Gamma_H}\left((1-\mathbb{I}_{ghh})\,\sigma - (1-\Gamma_H)\right)\right]^{-1}\chi_{C_M}; \quad \phi_{C_H} = (1-\Gamma_H)(1-\phi_{C_M}) \\
\xi_{C_M} &= \chi_{C_M}\frac{C}{C_M}; \quad \xi_{C_H} = \chi_{C_H}\frac{C}{C_H}; \quad \chi_{C_M} = (1-\gamma_H)\left(\frac{C_M}{C}\right)^{\Gamma_H}; \quad \chi_{C_H} = \gamma_H\left(\frac{C_H}{C}\right)^{\Gamma_H} \\
\phi_{H_S} &= \chi_{C_M}\phi_\epsilon; \quad \phi_{H_H} = (1-\alpha_H)\,\chi_{C_H}; \quad \phi_{H_M} = (1-\alpha_M)\,\frac{\epsilon_W - 1}{\epsilon_W}\chi_{C_M}\left[\frac{\epsilon-1}{\epsilon} - (1+\mathbb{I}_{HS}\nu_S)\,\phi_\epsilon\right]
\end{aligned}
$$

Appendix B.4. Further Variables in the Model

Capacity utilization (data definition):

$$
cu_t = \frac{T_t}{A_t H_{M,t}^{1-\alpha_M} K_{M,t-1}^{\alpha_M}} \tag{B.13}
$$

$$
\Rightarrow \hat{cu}_t = \hat{T}_t - \left[\hat{A}_t + (1-\alpha_M)\,\hat{H}_{M,t} + \alpha_M \hat{K}_{M,t-1}\right] \tag{B.14}
$$

Short-run utilization of resources (firm perspective):

$$e_{T,t} = \frac{T_t}{Y_{M,t}} = \frac{T_t}{A_t H_{M,t}^{1-\alpha_M} \left(e_{M,t} K_{M,t-1}\right)^{\alpha_M}} \tag{B.15}$$

$$\Rightarrow \hat{e}_{T,t} = \hat{T}_t - \left[\hat{A}_t + (1-\alpha_M)\,\hat{H}_{M,t} + \alpha_M \left(\hat{e}_{M,t} + \hat{K}_{M,t-1}\right)\right] \tag{B.16}$$

Real marginal cost:

$$mc_t = \frac{mc_{Y,t}}{e_{T,t}} \tag{B.17}$$

$$\Rightarrow \hat{mc}_t = \hat{mc}_{Y,t} - \hat{e}_{T,t} \tag{B.18}$$

Labor share:

$$ls_t = \frac{w_t H_{M,t}}{T_t} = mc_{Y,t}\,(1-\alpha_M)\, A_t \left(\frac{K_{Me,t}}{H_{M,t}}\right)^{\alpha_M} \frac{H_{M,t}}{T_t} \tag{B.19}$$

$$= mc_{Y,t}\,(1-\alpha_M)\,\frac{Y_{M,t}}{T_t} = (1-\alpha_M)\,\frac{mc_{Y,t}}{cu_t} = (1-\alpha_M)\, mc_t \tag{B.20}$$

$$\Rightarrow \hat{ls}_t = \hat{mc}_t \tag{B.21}$$

Unemployment rate:

$$ue_t = \left[\frac{w_t}{\mu_M} \frac{muc_t}{\mathbb{I}_{ghh} \frac{\partial \mathbb{U}_t}{\partial C_t} + (1-\mathbb{I}_{ghh})}\right]^{\frac{1}{\nu_M}} \frac{1}{H_{M,t}} - 1 \tag{B.22}$$

Appendix B.5. Proofs of the Propositions

TO BE ADDED!

Proof of proposition 1.

Proof Proposition Euler Equation.

Proof Proposition Phillips Curve.

Appendix C. Calibration Strategy and Sources

Table C.3: Calibration Sources

Parameter	Value/Target	Description	Source
Households			
β	0.99	Period discount rate	US data - FRED: (FEDFUNDS)
σ	1.5	Household risk aversion	Smets and Wouters (2007)
μ_H	$\frac{\bar{H}_H}{\bar{H}_M} = 0.5393$	Home production labor disutility level	US Bureau of Labor Statistics ATUS data
ν_H	ν_M	Elasticity of home production labor supply	Gnocchi et al. (2016)
γ_H	0.55	Share of home goods (consumption)	Gnocchi et al. (2016)
Γ_H	0.5	Elasticity of substitution (consumption)	Gnocchi et al. (2016)
Goods Market			
μ_S	$\bar{x} = 1$	Household search disutility level	Normalization
ν_S	ν_M	Household search supply elasticity	Huo and Rios-Rull (2020)
ψ	$\bar{cu} = 0.86$	Goods matching efficiency	US data - FRED: (TCU)
γ_S	0.276	Search effort elasticity of goods matching	Qiu and Rios-Rull (2022)
Γ_S	-0.27	Matching input elasticity of substitution	Qiu and Rios-Rull (2022)
ϵ	$\bar{mc}^{-1} = 1.2$	Elasticity of substitution (diff. goods)	Christiano et al. (2010)
π	0	Steady-state inflation rate	Normalization
κ_P	Slope $= 0.047$	Price adjustment cost	Gali and Gertler (1999)
δ_T	0.25	Exogenous trade relationship separation	Mathä and Pierrard (2011)
δ_I	0.74	Goods inventory depreciation rate	Khan and Thomas (2007)
Labor Market			
μ_M	$\bar{H}_M = 1$	Labor disutility level	Normalization
ν_M	$\frac{1}{0.72}$	Frisch elasticity of labor supply	Heathcote et al. (2010)
ϵ_W	$\bar{u} = 0.043$	Elasticity of substitution (diff. labor)	US data - FRED: (UNRATE)
π_W	0	Steady-state wage inflation	Normalization
κ_W	$(-1)\frac{\epsilon_W - 1}{\kappa_W}\phi_u = -0.026$	Nominal wage adjustment cost	Gali and Gambetti (2019)
ϕ_{HM}	1.85	Market hours adjustment cost	Lechthaler and Snower (2013)
Capital Market			
α_M	$\bar{ls} = 0.64$	Capital elasticity of market production	US data - FRED: (LABSHPUSA156NRUG)
α_H	0.33	Capital elasticity of home production	Gnocchi et al. (2016)
δ_{M1}	0.025	Capital depreciation rate (market)	Christiano et al. (2010)
δ_{M2}	0.3	Capital utilization cost (market)	Christiano et al. (2010)
δ_{M3}	$\bar{e}_M = 1$	Capital utilization cost (market)	Normalization
δ_{H1}	δ_{M1}	Capital depreciation rate (home)	Gnocchi et al. (2016)
δ_{H2}	δ_{M2}	Capital utilization cost (home)	Gnocchi et al. (2016)
δ_{H3}	$\bar{e}_H = 1$	Capital utilization cost (home)	Normalization
κ_{MI}	4	Investment adjustment cost (market)	Christiano et al. (2010)
κ_{HI}	κ_{MI}	Investment adjustment cost (home)	Gnocchi et al. (2016)
Monetary Policy			
i_R	0.8	Interest rate persistence coefficient	Christiano et al. (2010)
i_π	1.7	Taylor coefficient wrt inflation	Christiano et al. (2010)
i_{Gap}	0.12	Taylor coefficient wrt output gap	Christiano et al. (2010)
Shock Processes			
σ_A	0.0064		
σ_M	0.001		
σ_P	0.1		
σ_T	0.0064		
ρ_A	0.9		
ρ_M	0.5		
ρ_P	0.8		
ρ_T	0.8		

Appendix D. Slopes of the Reduced-Form Model: Additional Results

Appendix E. IRFs of the Reduced-Form Model: Additional Results

Appendix F. Results for the Robustness Analysis