Home Production and Fiscal Policy*

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Abstract

This paper studies the impact of home production on the effectiveness of fiscal policy. We augment a New Keynesian sticky price model popular in monetary and fiscal policy research with a home production sector that employs an identical labor input to that of market labor. We find that the home production channel introduces significant substitution effects that increase the effectiveness of tax stimulus and have modest gains for stimulus spending. In response to tax innovations, the model is found to produce comparable multipliers, as well as similar dynamic responses, to those generated by several models popular in the fiscal policy literature. We find that factors which impact the substitution decision – such as the relative efficiency of market and home production and changes in the desired steady state home production hours – can have significant impacts on the effectiveness of fiscal policy.

JEL Codes: E30, E60, E62

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1 Introduction

Recent trends in the cost of health care, changing demographics, and a declining labor force participation rate all suggest that home production is becoming an increasingly important part of the average household’s time allocation. Indeed, recent editions of the American Time Use Survey suggest that households spend approximately 20 hours per week in non leisure home activities. These activities range from meal preparation to child and elder care, but account for necessary activities whose value does not otherwise contribute to traditional measures of economic activity. While recent work has considered the impact of home production on the effectiveness of government spending, the impact of home production on taxation in a policy relevant general equilibrium model has not been considered since the frictionless environment of McGrattan, Rogerson, and Wright (1997).

The goal of this article is to provide a theoretical underpinning for the relationship between home production and fiscal policy – as well as baseline multiplier estimates – in a policy relevant general equilibrium model. To do so, we augment a dynamic stochastic general equilibrium model with price and wage stickiness in the spirit of Gali (2003) and Erceg, Henderson, and Levin (2000) with an explicitly modeled home production sector and a fiscal authority that finances public spending and debt via lump sum and distortionary taxation. Home production requires an identical unit of labor to that supplied in conventional markets and produces a utility generating, non-storable, non-tradable consumption good. In explicitly accounting for this labor allocation of the household, we find that innovations in consumption and labor tax rates are as much as 50% more effective at stimulating output, while government spending stimulates output by an additional 6% over the baseline model.

The increasing effectiveness of fiscal policy owes to the additional substitution effect introduced with home production. In our baseline model with a concave utility function, changes in the labor market result in the household substituting leisure for labor, thus generating a higher marginal utility of leisure. However, the household’s distaste for large time reallocations restricts their labor response to price changes. In the presence of home production, however, the household reallocates time from each home activity (production and leisure) into the conventional labor market. The result is a smaller impact on household welfare and a larger substitution effect in response to a price change. Because it is not necessarily clear that market output is the correct measure of household well-being, we also include what we call home production multipliers and total production multipliers. We find that declines in the home production following policy innovations more than offset market production gains for each fiscal policy tool producing total multipliers that monotonically decline in the size of the home production sector.

Early contributions to the rich fiscal policy literature include the frictionless environments of Baxter and King (1993), McGrattan (1994), and Braun (1994). These, among others, explore the effects of government consumption, investment, and taxation in what have become canonical DSGE models. More recently, a rich empirical literature has emerged providing reduced form estimates of spending and tax multipliers; recent contributions include Blanchard and Perotti (2002), Romer and
government spending multipliers that range between 0.8 and 1.2 while Mertens and Ravn (2011,
2012), and others find tax multipliers that range from 0.5 to 3.0 depending on the anticipation, the
financing method, and the type of tax in question.

In addition to the standard fiscal policy literature, our work is closely related to a growing
literature that considers the dynamic effects of incorporating a home production sector into DSGE
models. Early contributions include Benhabib, Rogerson and Wright (1991), McGrattan, Rogerson
and Wright (1997), Gomme, Kydland, Rupert (2001), and others that examine the macroeconomic
implications of including a home production sector in a flexible price general equilibrium model.¹
Recent empirical contributions by Regan (2006), who argues that day care provided by government
can substitute home production, and Yoshida and Kenmochi (2015), who consider the impact of
public spending on elderly health care, demonstrate the empirical relevance of the home production
sector on fiscal policy. Similar to McGrattan, Rogerson, and Wright (1997), our work is focused
on providing a theoretical tie to the interaction of home production and fiscal policy while also
providing baseline multipliers which demonstrate the impact of home production on policy effi-
ciency. While we compare our results with those generated in their frictionless environment, our
baseline model features price and wage stickiness à la Calvo (1983), distortionary taxes to finance
government spending, and an explicitly modeled home production sector in the spirit of Benhabib,
Rogerson, and Wright (1991). Firms that are not able to adjust prices will increase their offered
wage resulting in wage increases and an ensuing shift from leisure to labor not found in a flexible
price environment. As documented by Fatas and Mihov (2001), Gali, Lopez-Salido, and Valles
(2007) Perotti (2007), and others, the wage response generated by flexible price models is very
much at odds with the data. Since changes in the relative value of market labor can have a signifi-
cant impact on the substitution effects at work in our model, we consider a variant of our baseline
model which removes the price and wage frictions in the hopes of comparing our work with the
aforementioned authors.

In an effort to better understand the impact of home production on fiscal policy, we employ
three alternative specifications of the baseline model used for their conceptual simplicity. These
specifications include the preference assumption of Greenwood, Hercowitz, and Huffman (1988), the
indivisible labor market introduced in Hansen (1985) and Rogerson (1988), and the addition of a
rule-of-thumb household employed in Campbell and Mankiw (1989). The preferences of Greenwood
et al. (1988) remove any impact of wealth from the household’s labor supply decision while the
indivisible labor market assumption of Hansen (1985) and Rogerson (1988) generate a flat labor
supply curve. Finally, the rule-of-thumb population introduced in Campbell and Mankiw (1989)
introduces a household without access to consumption smoothing vehicles and thus, generate an
amplified wealth effect. We find that our baseline model with home production represents a convex
combination of these models generating rich dynamics and amplified wealth and substitution effects.

¹Other contributions to the home production literature include Benhabib, Rogerson and Wright (1991), Green-
We conclude our analysis by considering the sensitivity of our baseline results to alternative home production preference parameters. As noted by Baldwin (2003), the efficiency of home production can differ substantially from market efficiency raising the question of whether drawing labor into market production is better for society. We therefore consider an extension of the model which creates a disparity between market and home productivity and find that increasing the steady state value of home productivity increases the substitution from home production into market production, and thus the efficiency of fiscal policy innovations. Market output multipliers for government spending range from 0.85 to 0.90 while market multipliers for consumption and labor taxes range from 1.1 to 1.5 and 0.4 to 0.5, respectively. Our second sensitivity exercise concerns the household’s steady state allocation of time to home production. Noting that home production hours have varied over the last several decades, we consider the impact of varying steady state hours between zero and approximately 20 hours per week. We find significant increases in both spending and tax multipliers, and significant decreases in the total multipliers as the negative impact on home production labor hours more than offsets the positive impact on market hours.

The remainder of this paper proceeds as follows. Section 2 presents our baseline model with price and wage rigidities and parameterizes the model; Section 3 presents our baseline results; Section 4 presents intuition via several alternative versions of the model popular in the fiscal policy literature; Section 5 presents results to our robustness exercises; Section 6 concludes.

2 Model

The model features a continuum of households with differentiated labor goods, a continuum of monopolistically competitive intermediate goods with a competitive output bundler, and a government. Where the model does not significantly differ from the literature, we direct the reader to Gali (2003).

2.1 Household

The model is populated by a continuum of \( h \in (0, 1] \) households who have separable, increasing and concave preferences for total consumption \( (C^T_t) \), leisure \( (\mathcal{J}_t) \), and public spending \( (G_t) \). Total consumption is given by the CES technology \( C^T_t = \left[ \zeta(C^M_t)^\theta + (1 - \zeta)(C^H_t)^\theta \right]^{\frac{1}{\theta}} \) where \( C^M_t \) is market consumption, \( C^H_t \) is home consumption, \( \zeta \) is a relative utility weight on market consumption, and \( \frac{1}{1 - \theta} \) is the elasticity of substitution. The household is endowed with \( T \) units of time each period, and faces a period \( t \) time constraint of \( T = \mathcal{J}_t(h) + N^M_t(h) + N^H_t(h) \) where we define \( N^M_t(h) \) to be market labor supply and \( N^H_t(h) \) to be home labor supply for household \( h \). As in Erceg, Henderson, and Levin (2000), we assume that the labor good each household \( h \) offers to the firm is unique allowing them the opportunity to choose a wage for their labor services. Following the arguments of Woodford (1996) and Erceg, Henderson, and Levin (2000), we note that households are homogeneous with respect to consumption and savings decisions and therefore suppress household notation in this portion of the household problem.
Labor allocated to home production is combined with a home production specific technology $A_t^H$ which is common to all households in the production of a non-storable, non-tradable consumption good $Y_t^H(h)$. When optimizing, the household fully consumes their home production each period. As each household has the potential to supply different market hours, it is also possible that each household $h$ could choose different home production hours. Lastly, we assume that the household faces distortionary taxes on their wage income ($\tau^N_t$) and market consumption ($\tau^C_t$). Suppressing household notation, the lifetime utility maximization problem of each household can be expressed as:

$$\max_{C_t^M, C_t^H} E_t \sum_{t=0}^{\infty} \beta^t (\ln C_t^T + \psi_n \ln \mathcal{F}_t + \psi_G \ln G_t)$$

$$C_t^H = A_t^H N_t^H(h)$$

$$T = N_t^M(h) + N_t^H(h) + \mathcal{F}(h)$$

$$(1 + \tau^C_t)C_t^M + \frac{B_t}{P_t} \leq (1 - \tau^N_t)W_t N_t^M(h) - T_t + \Pi_t + \frac{(1 + i_{t-1})B_{t-1}}{P_t}$$

Given the nature of their differentiated labor good, each household also has the opportunity choose their market wages and labor supply. Taking into consideration the probability $\theta_w \in (0, 1)$ that the household will be stuck with their present wage for several periods, the period labor supply and wage setting problem of the household appears as follows:

$$\max_{W_t(h), N_t(h)} E_t \sum_{t=0}^{\infty} (\beta \phi_w)^t \left[ \psi_n \ln(T - N_t^M(h) - N_t^H) \right]$$

subject to:

$$N_t^M(h) \geq \left( \frac{W_t(h)}{W_t} \right)^{-\epsilon_w} N_t$$

$$N_t^H = \frac{C_t^H}{A_t^H}$$

$$(1 + \tau^C_t)C_t^M + \frac{B_t}{P_t} \leq (1 - \tau^N_t)W_t(h) N_t^M(h) - T_t + \Pi_t + \frac{(1 + i_{t-1})B_{t-1}}{P_t}$$

### 2.2 Final and Intermediate Firms

The model features a continuum $j \in (0, 1]$ of monopolistically competitive intermediate good firms and a unique, perfectly competitive final good firm. Intermediate good firms combine labor bundled from the household with a productivity component that is common across all firms and sell their output to the final good firm. The final good firm takes prices as given and bundles the output of intermediate good firms via CES aggregator. The profit maximization problem of the final good
firm appears as follows:

$$\max_{Y_t(j)} \Pi_t = P_t Y_t - \int_0^1 P_t(j) Y_t(j) dj$$

subject to:

$$Y_t = \left( \int_0^1 Y_t(j)^{1-\epsilon_p} dj \right)^{\frac{1}{1-\epsilon_p}}$$

The result is a series of labor demand conditions for each intermediate good firm $j$:

$$Y_t(j) = \left( \frac{P_t(j)}{P_t} \right)^{-\epsilon_p} Y_t$$

The problem of the intermediate good firm is relatively standard employing labor from the household and choosing prices acknowledging the possibility of that price remaining in place for several periods. We employ a linear production function $Y_t(j) = A_t N_t(j)$ in an effort to study the supply and demand side effects of fiscal policy shocks with the convenience of a linear labor demand function. Period (real) profit can be written as:

$$\Pi_t(j) = \frac{P_t(j)}{P_t} Y_t(j) - W_t N_t(j)$$

The Calvo (1983) sticky price assumption presumes that firms can only update their price with some exogenously given probability; here, we presume that a fraction $(1-\phi)$ for $\phi \in [0, 1)$ of the population has the opportunity to update. The stochastic nature of the price updating results in forward looking inflation and ultimately, dispersion in prices and wages.

As noted, firms will discount profits by the probability of non-updated prices as well as the household’s stochastic discount factor. The profit maximization problem of an updating firm can be written:

$$\max_{P_t(j)} E_t \sum_{m=0}^{\infty} (\phi \beta)^m \frac{\mu_{t+m}}{\mu_t} \left( P_t(j)^{1-\epsilon_p} P_{t+m}^{\epsilon_p-1} Y_{t+m} - mc_{t+m} P_t(j)^{-\epsilon_p} P_{t+m}^{\epsilon_p} Y_{t+m} \right)$$

The optimizing conditions of the firm can be written:

$$P_t(j) = \frac{\epsilon_p}{\epsilon_p - 1} \frac{E_t \sum_{m=0}^{\infty} (\phi \beta)^m \frac{\mu_{t+m}}{\mu_t} m c_{t+m} P_{t+m}^{\epsilon_p} Y_{t+m}}{E_t \sum_{m=0}^{\infty} (\phi \beta)^m \frac{\mu_{t+m}}{\mu_t} P_{t+m}^{\epsilon_p-1} Y_{t+m}}$$

For a full derivation of the equilibrium conditions, as well as a stationarization of the model, we direct the reader to Gali (2003).
2.3 Government

We characterize our fiscal and monetary policy in a collection of policy rules. Monetary policy follows a relatively standard Taylor Rule which dictates that the interest rate respond to deviations of inflation from its target:

\[
i_t = (1 - \rho_i)i_{ss} + \rho_i i_{t-1} + (1 - \rho_i)\phi_i(\pi_t - \pi^*) + \sigma^i\varepsilon^i_t
\]

Public spending follows an autoregressive process with persistence and is financed via lump sum and distortionary taxes on market consumption and market labor that react to deviations of government debt from steady state.

\[
\ln G_t = (1 - \rho_G)\ln G_{ss} + \rho_G\ln G_{t-1} + \sigma^G\varepsilon^G_t
\]

\[
\ln T_t = (1 - \rho_T)\ln T_{ss} + \rho_T\ln T_{t-1} + \gamma^T_B(B_{t-1}^G - B_{ss}^G) + \sigma^T\varepsilon^T_t
\]

\[
\tau^C_t = (1 - \rho^C)\tau^C_{ss} + \rho^C\tau^C_{t-1} + \gamma^C_B(B_{t-1}^G - B_{ss}^G) + \sigma^C\varepsilon^C_t
\]

\[
\tau^N_t = (1 - \rho^N)\tau^N_{ss} + \rho^N\tau^N_{t-1} + \gamma^N_B(B_{t-1}^G - B_{ss}^G) + \sigma^N\varepsilon^N_t
\]

The parameters \(\gamma^i_B\) for \(i = T, C, N\) dictate the rate at which public debt is repaid. Any spending not financed by present tax revenue or past surpluses is financed via one period non-state contingent debt \(B_t^G\) according to the following period budget constraint:

\[
G_t + (B_{t+1}^G - B_t^G) = W_t\tau^M_t\tau^N_t + C_t\tau^C_t + i_t\tau^G_t
\]

2.4 Exogenous Processes and Market Clearing Conditions

We assume that home and market productivity follow independent first order autoregressive processes given as follows:

\[
\ln A^M_t = (1 - \rho^M)\ln A^M_{ss} + \rho^M\ln A^M_{t-1} + \sigma^{A^M}\varepsilon^A^M_t
\]

\[
\ln A^H_t = (1 - \rho^H)\ln A^H_{ss} + \rho^H\ln A^H_{t-1} + \sigma^{A^H}\varepsilon^A^H_t
\]

Aggregating the production of each intermediate good firm yields the following aggregate production function were we define \(\sigma^p_t\) to be price dispersion.

\[
\gamma^M_t = \frac{A_t N^M_t}{\sigma^p_t}
\]

\[
\sigma^p_t = (1 + \pi_t)^{\varepsilon_p}[(1 + \pi^#_t)^{-\varepsilon_p} + \theta_p u^p_{t-1}]
\]
Our market resource constraint can be derived by combining the budget constraints of the household, government and the profit definition of the firm.

\[ Y_t^M = C_t + G_t \]

We define total output to be the total output available for consumption to the household as:

\[ Y_t = Y_t^M + Y_t^H \]

### 2.5 Parameterization

In addition to the parameters governing our exogenous processes, the model is populated with the following parameters: \{\( \beta, \zeta, \theta, \phi_p, \phi_w, \epsilon_p, \epsilon_w, \pi, \psi_n, \psi_G \}\}. Using long run moments of the data, we calibrate each parameter of the model and find relatively standard values. We leave a full description of our parameter values to Table 1 and here, focus our attention on those parameter values which are critical to our study: \( \zeta, \theta, \) and \( \psi_G \). The value of \( \zeta \) is calibrated to match the steady state share of household labor supply. Recent editions of the American Time Use Survey suggest that home production occupies approximately 20% of the household’s weekly time endowment. Calibrating our model to this time allocation produces values largely in line with McGrattan, Rogerson and Wright (1997). In our robustness section, we consider different values of \( \zeta \) which can be interpreted as calibrating the model to possess different steady state values of home production and find qualitatively similar results that help develop our intuition. Likewise, \( \theta \) governs the household’s elasticity of substitution between market and home consumption. Following McGrattan, Rogerson, and Wright (1997), we calibrate an elasticity of 0.43. To identify the utility parameter on public spending, we assume the post war average spending of \( G_{ss}/Y_{ss} = 0.2 \) is welfare optimal. This allows us to discuss positive versus negative welfare effects, but, without taking an explicit stand on the relationship between public and private consumption, gives us little information concerning the magnitude of welfare. Finally, we choose debt response parameters equal to zero for distortionary taxes in our baseline exercise. This assumption gives the relatively clean Ricardian experiment in which all present stimulus is financed by future lump sum taxes and is in-line with the work of Baxter and King (1993).\(^2\)

### 3 Results

In this section, we consider the quantitative impact of home production in the model outlined and parameterized above. Section 3.1 provides multiplier definitions and Section 3.2 presents baseline results, as well as those generated in the frictionless environment employed in McGrattan et al. (1997).

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\(^2\)In results not included in this version of the paper, we consider an alternative specification in which fiscal shocks are financed via future distortionary taxes. We find that the results home productions are qualitatively robust to this alternative exercise.
3.1 Definitions

Multipliers are defined as follows:

\[ Y_{Mt}(q) = \frac{dY_t(q)}{dG_t} \mid \varepsilon^G_t = \sigma^G \]

\[ T_{Mt}(q) = \frac{dY_t(q)}{dTR_t} \mid \varepsilon^j_t = \sigma^j \text{ for } j = C, N \]

Here, \( Y_{Mt}(q) \) is defined to be the output multiplier at horizon \( q \) following a government spending shock at time \( t \) while \( T_{Mt}(q) \) is defined to be the tax multiplier at horizon \( q \) following an innovation to either consumption or labor tax changes at time \( t \). By using market, home, and total output responses to policy innovations, we generate what we call “Market”, “Home”, and “Total” Output Multipliers with these definitions.

3.2 Baseline Results

Table 2 presents market, home, and total output multipliers in response to innovations in government spending, consumption, and labor tax rates. We find that home production has a significant impact on tax market output multipliers increasing multipliers by approximately 50% while also increasing market multipliers in response to a government spending shock by over 6%. The consumption tax multiplier in the baseline model with home production is 1.60 relative to 1.07 without home production; the corresponding numbers for labor tax cuts and government consumption are 0.55 relative to 0.38, and 0.91 relative to 0.86, respectively. These market oriented multipliers are largely in-line with the literature outlined above. As will become clear in the next section, this increasing effectiveness of fiscal policy owes to the additional substitution channel introduced with home production. In the baseline model, changes in the labor market result in the household substituting leisure for labor. With a concave utility function, this substitution increases the household’s marginal utility of leisure until the household’s distaste for time reallocations restricts their labor response to price changes. In the presence of home production, however, the household reallocates time from each home activity (home production and leisure) into the conventional labor market. The result is a smaller impact on the marginal utility of leisure and the marginal cost of home production, and a large substitution into market production.

To compare our baseline model with that employed in McGrattan, Rogerson, and Wright (1997), we resolve the model without price and wage stickiness as well as without perfect competition. These results are presented alongside our baseline model in Table 2. The second and third panels of Table 2 display multipliers in response to consumption and labor tax innovations. In addition, Figure 1 displays the impulse response functions of output, consumption, and wages in response to each fiscal policy shock for each version of the model introduced. Each plot contains four distinct lines, each displaying the respective variable’s response to a policy innovation for a different specification of the baseline model. We find that home production also has a significant impact on the output multipliers in the model without nominal rigidities. Home production in the flexible price model.
results in approximately 49% increases in market output multipliers from 0.82 to 1.23. In response to a consumption tax shock, we find from row two of Figure 1 that the output and consumption impulse responses generate two distinct patterns which differ only in their magnitude. These distinct patterns are not defined by the presence of price stickiness, but rather by the presence of home production. At all horizons, the flexible price model with home production generates larger consumption and output responses than the baseline model with nominal rigidities. The model with price and wage rigidities increases the response further. This additional labor allocation also has lifetime wealth effects. We can see from the flexible and sticky price and wage models without home production that by approximately five quarters after impact, the response of output and consumption are identical in the two models. In the presence of home production however, the responses differ until approximately full twenty quarters after impact.

These patterns are also exhibited in response to a labor tax shock. The household’s distortionary tax burden has been reduced thus creating a positive wealth and substitution effect for labor supply. Consider the wealth effect first. As an identical unit of labor is now more valuable, the household feels richer and therefore increases consumption and leisure and decreases labor supply. This increase in consumption results in an increase in the firm’s demand for labor which, all else equal, would increase the wage. However, a change in the distortionary tax results in a change in the relative price of leisure which causes the household to substitute away from leisure and into labor. As can be seen from Figure 1, this increase in labor supply exceeds the firm’s increase in demand resulting in a decline in wages. Owing to these market frictions, the dynamic response of labor – and thus output and consumption – is different across the flexible and sticky price models for the first seven quarters owing to the monopolistic competition and wage rigidities in the New Keynesian framework. Similar to the consumption tax impulse response functions, we again find identical paths for the models without home production after the first seven quarters.

While market output multipliers realize significant increases in the presence of home production, the corresponding impact on home production is strictly negative. In response to spending, consumption tax, and labor tax innovations, home output multipliers realize declines of -0.32, -0.89, and -0.31, respectively. These negative effects are present in the model with and without nominal rigidities. The clear implication is an exodus of labor supply from home production to market production as more favorable market conditions entice the household lower the relative cost of consumption. The corresponding total output multipliers in response to each fiscal policy decline relative to their baseline values with falls ranging from 32 to 36%. As a result, the gains in market output are more than offset by the corresponding declines in home production. Concerning tax policy in particular, tax cuts which entice the household away from home production activities, which are not taxable, and into market production, which is taxable, significantly affect the tax base and therefore the magnitude of the tax revenue response. The tax base increases as households increase their market labor supply and the overall loss of revenue is mitigated making the tax cut

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3 Notice that, though the baseline model features linear production functions, home production and market production are not traded one for one following fiscal policy innovations. This follows from the wealth effects previously outlined that entice the household to increase their consumption of leisure.
particularly stimulative in periods where the tax base is otherwise small. In light of these smaller total multipliers, the policy implications of this more realistic modeling of the household’s labor supply decision is a bit muddied. If policy makers are expressly concerned with market output multipliers, the clear implication is that modeling home production results in more favorable view of fiscal policy as a stimulative tool. If, however, policy makers are concerned with the holistic impact on the household and take seriously the ‘unmeasurable value’ of meal preparation, home maintenance, elder care, and numerous other necessary, but not traditionally measured activities, then explicitly modeling home production casts a relatively lime light on the effectiveness of fiscal policy to benefit the household.

4 Intuition

To better understand the impact of home production in our model, we consider several alternative specifications of the household problem which enable us to isolate the wealth and substitution effects which follow a policy innovation. These alternative specifications include the preferences of Greenwood, Hercowitz, and Huffman (1988), the indivisible labor market introduced in Hansen (1985) and Rogerson (1988), and the addition of a rule-of-thumb household employed in Campbell and Mankiw (1989). Each of these alternative specifications enable us to compare our results to those generated by a model with relatively clean intuition so that we can gain a better understanding of the impact of home production on the baseline New Keynesian model.

4.1 GHH Preferences

We consider first the alternative preference specification introduced by Greenwood, Hercowitz, and Huffman (1988) (henceforth, GHH). This well known specification leads households to choose labor independent of changes in wealth. In contrasting our results with a baseline New Keynesian model with GHH preferences, we can better understand the amplified substitution effect introduced via home production.

We resolve the model without home production using GHH preferences as follow:

\[ U(C_t, N_t) = \frac{1}{1 - \gamma} \left[ \left( C_t - \frac{N_t^{1+\eta}}{1 + \eta} \right)^{1-\gamma} - 1 \right] \]

In this environment, \( 1/\eta = 1.7 \) is the intertemporal elasticity of substitution and \( \gamma = 2 \) is the coefficient of relative risk aversion. These values are chosen to match GHH (1988).

Multipliers generated in this alternative specification are presented in column two of Table 3. In response to a government spending increase, firms face an increased demand for their output. Those firms which cannot increase their price (due to nominal rigidities) respond by increasing their demand for labor. This labor demand shift out along the supply curve results in a raise in wage which causes the household to substitute away from leisure and into labor. Given the complementarity of leisure present in the GHH preference specification, the reduction in leisure
causes the household to consume more thus further increasing demand for firm output. This multiplication process results in large wage and consumption responses, and, in the absence of a negative wealth effect provided by the GHH preferences, we find multipliers far in excess of our baseline model.

Relative to the behavior for in the GHH preferences, the baseline model features a negative wealth shock which causes the household to consume less and supply more labor. This increase in labor supply has the effect of pushing wages down, but is met with an outward shift in demand for labor as firms, following the previously developed intuition, are faced with increased demand for their products. The result is a much smaller change in wages which muffles the positive substitution effect found on full display in the GHH model, but which still induces households to increase their labor supply in response. The magnitude of the wealth shock is therefore critical in determining the wage response and, ultimately, the substitution effect. Finally, the baseline preferences do not exhibit the complementarity between consumption and labor which is present in the GHH specification. This removes the multiplier channel clearly present in the first row of Table 3.

In response to a consumption tax decrease, households desire an increase in consumption and, therefore, income. To accomplish this, they substitute away from leisure and home production and into wage generating market labor. Firms that are not able to increase their price in response to the demand for their goods will increase their labor demand. However, this increase in labor demand is more than offset by the increased supply as shown by the real wage response of the GHH labor market in row two of Figure 2. In contrast to the GHH labor market response, the baseline model features an additional wealth effect on labor supply by which the household, now feeling richer, substitutes away from home and market production and into leisure. This positive wealth effect results in a dampening of the labor supply increase which resulted from the substitution effect and ultimately results in an increase in wages to clear the market. The positive wealth effect coupled with the substitution into market consumption comes at a tremendous cost to home production with a multiplier of -0.89, but generates a multiplier that is approximately 20% greater than the GHH consumption tax multiplier.

Finally, we consider the labor tax reduction. Households realize a relative increase in the price of leisure and home production and, as a result, substitute into market production. As the household retains relatively more of their wage, the consumption response, even before the increased labor supply, is positive and large. As previously noted, the GHH specification also features a complementarity between consumption and labor which, in this instance, results in a multiplier effect. The resulting GHH labor tax market multipliers are approximately 45% larger than our baseline model. In addition to the lack of complementarity in preferences, the wealth effect present in our baseline model encourages the household to supply less labor to home and market production and to allocate more time to leisure. As a result, the substitution into market labor supply is dampened (as shown by the smaller wage response) and the multiplier effect is reduced.
4.2 Indivisible Labor

We next consider indivisible labor in the spirit of Hansen (1985) and Rogerson (1988). In this framework, workers purchase insurance based on the probability of being fully employed for the period or fully unemployed for the period, but workers are unable to alter their labor supply on the intensive margin. In equilibrium, these labor supply lotteries result in a linear aggregate utility of the form $BN_t$, where $B = A \log(1 - h_0)/h_0$, $A$ is a disutility scaling parameter, and $h_0$ is steady state labor hours supplied by the full employment worker. In this new environment, the optimizing behavior of the household is characterized by the following conditions:

$$\mu_t = \beta \mu_{t+1} \frac{(1 + \tau_t^C)}{(1 + \tau_{t+1}^C)}$$

$$\psi_n = \mu_t W_t (1 - \tau_t^N)$$

Column three of Table 3 displays spending and tax multipliers under this model specification. We find that spending innovations generate a unit multiplier which is larger than our baseline home production model and significantly below the model with GHH households. As previously noted, the exogenous increase in public spending increases demand for firm output and thus, puts upward pressure on labor demand. As both labor demand and labor supply are perfectly inelastic in this framework, supply must increase one for one with demand in order for the market to clear. This increase in labor supply comes from the negative wealth effect experienced by the household. As government spending increases, forward looking households anticipate future lump sum taxes and, feeling poorer, increase their labor supply. In equilibrium, this increase perfectly matches the increased demand to clear markets. As a result, and in conjunction with the perfectly inelastic labor supply, wages remain constant and there is no further incentive for the household to reallocate labor hours. Relative to our baseline model with home production, we see that inelastic labor supply mutes the substitution effect which, in response to a government spending increase, leads the household to supply more labor. Elastic labor supply in the baseline model results in an increase in wages following the government spending increase and, as a result, incentives the household to further increase their labor supply. As a result, the model with home production generates an output multiplier which is similar in magnitude, but generates far richer wage dynamics in the process.

Following an exogenous decrease in the distortionary consumption tax, we find a positive wealth effect which encourages households to increase their consumption and leisure. Though perfectly inelastic demand and supply of labor results in a constant wage, it's important to note that a decline in the distortionary consumption tax results in a change in the relative price of consumption and leisure. Relatively cheaper consumption causes the household to substitute labor for leisure. This increase in labor supply is, in equilibrium, perfectly matched by an increase in labor demand by firms that are not able to increase their price. In contrast, our baseline model with elastic labor supply realizes an increasing wage and thus, a further substitution effect on consumption and
output. While the magnitudes of the consumption tax multiplier are approximately 30% larger in the baseline model with home production, it is important to note that the dynamic response of consumption is strikingly similar across the two versions of the model with the impact response driving the magnitude. The similarity in the dynamic responses is especially noteworthy given how very different the dynamic response of the GHH model was.

Lastly, we consider the impact of an exogenous decrease in the distortionary labor tax. Again, we find that a positive wealth effect encourages the household to increase their consumption and leisure. All else equal, this bids up the demand for firm output and leads firms which cannot increase their price to increase the labor demand. Though the household now possesses a linear labor supply curve, a change in the distortionary tax on labor changes the slope of this supply curve such that the labor market experiences a change in wages following the increased demand. However, we find from our impulse response functions that the households more than offset this increased demand for labor as wages decrease with the surge of households reallocating leisure into market labor hours. The net effect is a labor tax multiplier similar in both magnitude and dynamics to our baseline model. Indeed, the Indivisible Labor model generates output, consumption, and wage responses which are a better match to our baseline model than any other framework, though the model clearly misses the rich wage dynamics in response to spending and consumption tax decreases.

4.3 Rule-of-Thumb

We next contrast our baseline home production model with the rule-of-thumb specification of Campbell and Mankiw (1989). The rule-of-thumb specification introduces a fraction $\lambda \in (0, 1)$ of the household population which is restricted from dynamic optimization and thus, has no ability to smooth a resource change. The motivation for the rule-of-thumb population comes from the large and empirically relevant consumer population with little access to credit. The aggregate behavior introduced can be interpreted as hybrid response of the two household types (optimizing and non-optimizing) that demonstrates a muted wealth effect and an amplified substitution effect. More recently, numerous authors have exploited this modeling assumption in an attempt to generate government spending multipliers greater than one.

In this specification, the optimizing household’s behavior remains unchanged while the rule-of-thumb household’s behavior is governed by the following system of equations:

\[
(1 + \tau^C_t)C_t^{rot} = (1 - \tau^N_t)W_tN_t^{rot} - T_t^{rot}
\]

\[
(1 - \tau^N_t)W_t\mu_t = \psi_n \frac{1}{F_t^{rot}}
\]

\[
(1 + \tau^C_t)\mu_t = \frac{1}{C_t^{rot}}
\]

In addition, the presence of the rule-of-thumb consumer population gives rise to alternate def-
nitions for several aggregate variables. Noting the population sizes, we define aggregate labor and consumption as:

\[
\hat{N}_t = (1 - \lambda)N_t + \lambda N_t^{rot}
\]

\[
\hat{C}_t = (1 - \lambda)C_t + \lambda C_t^{rot}
\]

The corresponding aggregate production function and market clearing aggregate equation will incorporate \( \hat{N}_t \) and \( \hat{C}_t \) in their definitions. We choose \( \lambda = 0.5 \) to match the value employed in Campbell and Mankiw (1989).

In the presence of the rule-of-thumb consumer population, we find market spending multipliers largely in line with the literature. Column four of Table 3 reports a government spending multiplier of 1.16, significantly above the home production market spending multiplier of 0.91, but also significantly below the GHH multiplier of 2.14. In response to the spending innovation, the increase in demand for firm output leads firms that cannot adjust their price to increase their demand for labor. This increase in labor demand bids up the wage which, for households that cannot smooth the additional wage income, results in an increase in consumption. For optimizing households that anticipate a future tax increase however, the negative wealth effect leads them to decrease consumption, increase savings, and increase their labor supply. As a result, we find a wage and consumption response that is a convex combination of the GHH response without any wealth effect on household labor supply and our baseline model with home production. We can therefore interpret the home production model to have a larger wealth effect, but a smaller substitution effect than the rule-of-thumb model.\(^4\)

Following an unanticipated innovation in consumption taxes, we find market multipliers which are a full 21% higher than our baseline model with home production. In response to a surprise decline in the consumption tax rate, rule-of-thumb households which have no opportunity to smooth the increase in wealth will consume their entire income. In addition, optimizing households, responding to the positive wealth shock, increase their consumption and leisure. Firms that do not have the opportunity to increase prices must respond by increasing their labor demand and, as a result, bid up the wage. Responding to higher wages, both household types substitute away from leisure and into market labor creating a multiplier effect. Relative to the baseline model with home production, the rule-of-thumb model lacks the additional substitution effect by which the household is willing to reallocate labor hours from both home production and leisure and also presents a dampened wealth effect by which the household, feeling richer, would further increase consumption. Relative to the GHH model in which labor decisions are made independent of wealth and the indivisible labor model in which demand and supply curves are perfectly inelastic, the wage response in the rule-of-thumb model is positive and large suggesting that demand is not met one

\(^4\)It should be noted that tax multipliers presented in Table 3 are also dependent on the tax revenue response while the impulse response functions presented in Figure 2 are not. As a result, the multiplier ranking does not, in this case, correspond one to one with the output response ranking.
for one with supply. In this way, the home production model is most like the rule-of-thumb model, though the response is relatively tame generating a modestly positive wage response and a larger consumption response.

Finally, we consider also the impact of an unanticipated change in the labor tax. From Table 3, we find tax output multipliers which closely correspond to those generated in our baseline home production model as well as the model with indivisible labor. In addition, we find that the dynamic responses of output, consumption, and wages are similar in magnitude and form to those generated by these alternative specifications. In response to the positive wealth shock, optimizing households that have the opportunity to smooth additional income will do so while also consuming more and allocating more time to the consumption of leisure. However, the decline in this labor market wedge will make leisure relatively more expensive resulting in each household type increasing their labor supply. As shown by the negative response of wages in Figure 2, we note that the substitution effect dominates the wealth effect felt by the optimizing household; however, we also note that the rule-of-thumb model has the weakest wage response and therefore the weakest multiplier effect. Relative to our baseline home production model, the substitution effect seems to suggest that home production generates a stronger multiplier, but still much smaller than the GHH preference specification.

5 Extensions

In this final section, we consider the sensitivity of our baseline results changes to the steady state hours per week allocated to home production, as well as to the controversial assumption that home production is as productive as market production.

5.1 Steady State Hours

We begin by increasing the share of home production hours from zero (the standard NK model) to approximately 20 hours per week (our baseline model with home production). Steady state hours are targeted by re-calibrating the utility weight on home production such that the household chooses a welfare optimal time allocation.

We find that increasing the steady state labor hours results in a monotonic increase in market output multipliers. Market spending multipliers increase approximately one basis point per five hours while total output multipliers fall by up to five basis points per five hours. Figure 3 plots market, home, and total output multipliers for government spending, consumption taxes, and labor taxes at varying levels of steady state labor hours. Market multipliers grow monotonically in the steady state number of home production hours while home and total output multipliers decline monotonically. Red indicator marks are employed in the figure to identify multipliers based on our baseline calibration.

Intuition for these results follows from our baseline substitution effect. With a higher level of steady state hours, the household has the opportunity to reallocate a larger portion of the time into
market production following policy innovations without entirely depleting their utility generating home production. When steady state home production hours are low however, reallocating hours comes at a large utility cost. The increasing slope of total and home output multipliers suggests that the substitution effect, for each fiscal policy innovation, continues to grow as the household’s steady state allocation of labor to home production grows.

The implications of this new intuition are at least threefold. First, the magnitude of the error in overlooking the home production sector grows as the sector grows in significance; second, types of home production that do not crowd out market production, but rather complements it, can make fiscal policy innovations especially productive; third, policy designed to reduce steady state home production hours (which, from the perspective of this exercise would require changing a deep preference parameter) will mute the substitution effect introduced by home production and thus, reduce the efficiency of policy innovations.

5.2 Relative Productivity

Lastly, we consider a version of the model in which home and market production processes face differing steady state levels of productivity. This exercise follows recent debates concerning unconventional production avenues by which workers produce from home rather than in conventional markets. As noted by Baldwin (2003), the efficiency of home production can differ substantially from market efficiency raising the question of whether drawing labor into market production is better for society. We vary the relative efficiency of home production between the market level and 0, at which point all labor allocated to home production is wasted.

We find that market output multipliers monotonically increase in the relative efficiency of home production. The same is true for tax multipliers with the largest relative gains coming in the labor taxes. Market spending multipliers peak at 0.91 when home production is as efficient as market production. The same is true for consumption and labor tax multipliers with corresponding magnitudes of 1.60 and 0.55, respectively. As the relative efficiency of home production falls, so too does the negative impact on home production multipliers. These multipliers fall from -0.32, -0.89, and -0.30 for spending, consumption tax, and labor tax innovations down to -0.10, -0.29, and -0.10, respectively.

Intuition for these results again comes from the substitution effect. Because home production is a utility complement, the household’s distaste for low quantities of household production result in smaller substitution effects when home production technologies are relatively weak. When home production is more efficient however, the household is able to maintain a relatively large home production level without the same time endowment. As a result, the household will substitute more hours from home to market production without the large marginal utility losses incurred when home production efficiency is near zero.

The implications of this new intuition suggest that increases in home production efficiency increase the efficiency of fiscal policy. As home production is again modeled to be a complement, rather than substitute, to market output, higher levels of home production efficiency enable the
household to reallocate more time to market production without incurring large losses of home production. As a result, increasing home production efficiency increases the efficiency of fiscal policy interventions.

6 Conclusion and Future Work

Using a New Keynesian sticky price model augmented with an explicitly modeled home production sector, we consider the impact of home production on the effectiveness of fiscal policy. We find that home production results in a 6% increase in market spending multipliers over the baseline, but a 31% decline in the total output multiplier. Corresponding numbers for each tax shock are in excess of 50% and 34%. Contrasting our home production model with several frameworks which help us to isolate the dominant effects of fiscal policy, we find that these increases in policy effectiveness are the result of increased substitution effects generated by an additional labor reallocation channel.

We conclude that while this sector of the economy is difficult to measure, its impact on fiscal policy is quantitatively relevant. The labor reallocation generated by wealth and substitution effects result in households leaving both leisure and home production in favor of producing in conventional markets. Our results, while generated in a simplified environment, illustrate the need for future work considering the impact of fiscal policy on external aspects of the labor market. That is, engaging workers removed from conventional markets in a more direct way.
References


Table 1: Baseline Calibrated Parameters

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value or Target</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\beta$</td>
<td>0.995</td>
<td>Discount factor</td>
</tr>
<tr>
<td>$\xi$</td>
<td>$\lambda^M = 1/3$</td>
<td>Labor disutility</td>
</tr>
<tr>
<td>$\phi_p$</td>
<td>0.70</td>
<td>Price Stickiness</td>
</tr>
<tr>
<td>$\phi_w$</td>
<td>0.70</td>
<td>Wage Stickiness</td>
</tr>
<tr>
<td>$\epsilon_p$</td>
<td>11</td>
<td>Elasticity sub goods</td>
</tr>
<tr>
<td>$\epsilon_w$</td>
<td>11</td>
<td>Elasticity sub labor</td>
</tr>
<tr>
<td>$G$</td>
<td>$\frac{G^<em>}{Y^</em>} = 0.20$</td>
<td>Steady state gov. consumption</td>
</tr>
<tr>
<td>$B^G$</td>
<td>$\frac{B^G}{Y^*} = 0.50$</td>
<td>Steady State Public Debt</td>
</tr>
<tr>
<td>$\phi_G$</td>
<td>0.80</td>
<td>Utility weight on public spending</td>
</tr>
<tr>
<td>$\zeta$</td>
<td>$\lambda^H = 0.20$</td>
<td>Utility weight on market consumption</td>
</tr>
<tr>
<td>$\theta$</td>
<td>$\frac{1}{1+\theta} = 1.6$</td>
<td>Elasticity between market and home consumption</td>
</tr>
<tr>
<td>$\pi^*$</td>
<td>0.00</td>
<td>Steady State Inflation</td>
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<tr>
<td>$\phi_r$</td>
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</tr>
<tr>
<td>$\phi_y$</td>
<td>0.00</td>
<td>Policy Response to Output</td>
</tr>
<tr>
<td>$\gamma_B$</td>
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<td>Public Spending Response to Public Debt</td>
</tr>
<tr>
<td>$\gamma_T$</td>
<td>0.10</td>
<td>Lump Sum Tax Response to Public Debt</td>
</tr>
<tr>
<td>$\gamma_C$</td>
<td>0.00</td>
<td>Consumption Tax Response to Public Debt</td>
</tr>
<tr>
<td>$\gamma_N$</td>
<td>0.00</td>
<td>Labor Tax Response to Public Debt</td>
</tr>
<tr>
<td>$\rho^M$</td>
<td>0.90</td>
<td>Persistence in market productivity process</td>
</tr>
<tr>
<td>$\rho^H$</td>
<td>0.90</td>
<td>Persistence in home productivity process</td>
</tr>
<tr>
<td>$\rho^G$</td>
<td>0.90</td>
<td>Public Spending Process Persistence</td>
</tr>
<tr>
<td>$\rho_T$</td>
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<td>Lump Sum Tax Process Persistence</td>
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<tr>
<td>$\rho_C$</td>
<td>0.90</td>
<td>Consumption Tax Process Persistence</td>
</tr>
<tr>
<td>$\rho_N$</td>
<td>0.90</td>
<td>Labor Tax Process Persistence</td>
</tr>
<tr>
<td>$\sigma^M$</td>
<td>0.010</td>
<td>Standard deviation of market productivity shock</td>
</tr>
<tr>
<td>$\sigma^H$</td>
<td>0.010</td>
<td>Standard deviation of home productivity shock</td>
</tr>
<tr>
<td>$\sigma^G$</td>
<td>0.005</td>
<td>Public Spending Shock Std Dev</td>
</tr>
<tr>
<td>$\sigma_T$</td>
<td>0.005</td>
<td>Lump Sum Tax Shock Std Dev</td>
</tr>
<tr>
<td>$\sigma_C$</td>
<td>0.005</td>
<td>Consumption Tax Shock Std Dev</td>
</tr>
<tr>
<td>$\sigma_N$</td>
<td>0.005</td>
<td>Labor Tax Shock Std Dev</td>
</tr>
</tbody>
</table>

Notes: This table provides values of calibrated parameters or the target used in the calibration. Aggregate data series used include 1984:Q1-2007:Q4 and the American Time Use Surveys from 1965-2003. In addition to the parameters listed in this table, several parameters are introduced in the extension section of the paper. There values as well as the data used to calibrate their values are detailed in Section 3.2 - 3.4.
### Table 2: Baseline Model
Spending and Tax Output Multipliers

<table>
<thead>
<tr>
<th></th>
<th>Flexible Price</th>
<th>Flexible Price</th>
<th>New Keynesian</th>
<th>New Keynesian</th>
</tr>
</thead>
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<tr>
<td></td>
<td>Home Production</td>
<td></td>
<td>Home Production</td>
<td></td>
</tr>
<tr>
<td><strong>Spending</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Y</td>
<td>0.7174</td>
<td>0.7174</td>
<td>0.8588</td>
<td>0.9096</td>
</tr>
<tr>
<td>Home Y</td>
<td>0.0000</td>
<td>-0.1812</td>
<td>0.0000</td>
<td>-0.3215</td>
</tr>
<tr>
<td>Total Y</td>
<td>0.7174</td>
<td>0.5361</td>
<td>0.8588</td>
<td>0.5882</td>
</tr>
<tr>
<td><strong>Consumption Tax</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Y</td>
<td>0.8239</td>
<td>1.2266</td>
<td>1.0653</td>
<td>1.5961</td>
</tr>
<tr>
<td>Home Y</td>
<td>0.0000</td>
<td>-0.6108</td>
<td>0.0000</td>
<td>-0.8909</td>
</tr>
<tr>
<td>Total Y</td>
<td>0.8118</td>
<td>0.6158</td>
<td>1.0653</td>
<td>0.7052</td>
</tr>
<tr>
<td><strong>Labor Tax</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Y</td>
<td>0.8740</td>
<td>1.3079</td>
<td>0.3814</td>
<td>0.5484</td>
</tr>
<tr>
<td>Home Y</td>
<td>0.0000</td>
<td>-0.6513</td>
<td>0.0000</td>
<td>-0.3061</td>
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<tr>
<td>Total Y</td>
<td>0.8740</td>
<td>0.6566</td>
<td>0.3814</td>
<td>0.2423</td>
</tr>
</tbody>
</table>

Note: This table shows output multipliers for each potential fiscal policy tool in our model. We define three different types of output multipliers corresponding to the three measures of economic activity in the model. Note that all tax multipliers are multiplied by negative one for ease of comparison with spending multipliers. For the derivation of Flexible Price multipliers, the value of $\phi_p$ and $\phi_w$, the parameters governing price and wage stickiness, are set to 0.001 and the values of $\epsilon_p$ and $\epsilon_w$, the parameters governing monopolistic power, are set to 11 million giving a markup, functionally, of zero. All other parameter values and model equations remain unchanged.

### Table 3: Alternative Models
Spending and Tax Output Multipliers

<table>
<thead>
<tr>
<th></th>
<th>Baseline</th>
<th>GHH</th>
<th>Indivisible Labor</th>
<th>Rule-of-Thumb</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Spending</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Y</td>
<td>0.9096</td>
<td>2.1417</td>
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<td>1.1633</td>
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<td>Home Y</td>
<td>-0.3215</td>
<td>0.0000</td>
<td>0.0000</td>
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<tr>
<td>Total Y</td>
<td>0.5882</td>
<td>2.1417</td>
<td>1.0000</td>
<td>1.1633</td>
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<tr>
<td><strong>Consumption Tax</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Y</td>
<td>1.5961</td>
<td>1.3878</td>
<td>1.2222</td>
<td>1.9361</td>
</tr>
<tr>
<td>Home Y</td>
<td>-0.8909</td>
<td>0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
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<tr>
<td>Total Y</td>
<td>0.7052</td>
<td>1.3878</td>
<td>1.2222</td>
<td>1.9361</td>
</tr>
<tr>
<td><strong>Labor Tax</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Market Y</td>
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<td>0.4954</td>
<td>0.5086</td>
</tr>
<tr>
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<td>0.0000</td>
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<tr>
<td>Total Y</td>
<td>0.2423</td>
<td>0.7966</td>
<td>0.4954</td>
<td>0.5086</td>
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</table>

Note: This table shows output multipliers for each potential fiscal policy tool in our model. We define three different types of output multipliers corresponding to the three measures of economic activity in the model. Note that all tax multipliers are multiplied by negative one for ease of comparison with spending multipliers. Each version of the model is represented in a different row of the table. For each version of the model, the model is resolved and recalibrated in accordance with the new model specification. It should be noted that as labor elasticities vary across model regimes, so too will the tax revenue response to a fiscal policy innovation. As a result, readers should take care when considering the mapping between output impulse response functions in Figure 2 with the multiplier magnitudes in the present table.
Table 4: Alternative Parameterizations

<table>
<thead>
<tr>
<th>Spending and Tax Output Multipliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \zeta = 1.00 )</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Market Y</td>
</tr>
<tr>
<td>Home Y</td>
</tr>
<tr>
<td>Total Y</td>
</tr>
</tbody>
</table>

**Consumption Tax**

| Market Y                  | 1.0653                   | 1.1050                   | 1.2188                   | 1.4124    | 1.5961 |
| Home Y                    | 0.0000                   | -0.0612                  | -0.2403                  | -0.5609   | -0.8909 |
| Total Y                   | 1.0653                   | 1.0438                   | 0.9785                   | 0.8515    | 0.7052 |

**Labor Tax**

| Market Y                  | 0.3814                   | 0.3944                   | 0.4311                   | 0.4922    | 0.5484 |
| Home Y                    | 0.0000                   | -0.0218                  | -0.0850                  | -0.1955   | -0.3061 |
| Total Y                   | 0.3814                   | 0.3726                   | 0.3461                   | 0.2967    | 0.2423 |

Note: This table shows output multipliers for each potential fiscal policy tool in our model. We define three different types of output multipliers corresponding to the three measures of economic activity in the model. Note that all tax multipliers are multiplied by negative one for ease of comparison with spending multipliers. All parameters other than \( \zeta \) remain unchanged across columns of the table.

Table 5: Different Levels of Productivity

<table>
<thead>
<tr>
<th>Spending and Tax Output Multipliers</th>
</tr>
</thead>
<tbody>
<tr>
<td>( A_{ss}^H = A_{ss}^M )</td>
</tr>
<tr>
<td>--------------------------</td>
</tr>
<tr>
<td>Market Y</td>
</tr>
<tr>
<td>Home Y</td>
</tr>
<tr>
<td>Total Y</td>
</tr>
</tbody>
</table>

**Consumption Tax**

| Market Y                  | 1.5961                   | 1.5194                   | 1.4244 |
| Home Y                    | -0.8909                  | -0.5620                  | -0.2908 |
| Total Y                   | 0.7052                   | 0.9574                   | 1.1336 |

**Labor Tax**

| Market Y                  | 0.5484                   | 0.5251                   | 0.4959 |
| Home Y                    | -0.3061                  | -0.1942                  | -0.1012 |
| Total Y                   | 0.2423                   | 0.3309                   | 0.3946 |

Note: This table shows output multipliers for each potential fiscal policy tool in our model. We define three different types of output multipliers corresponding to the three measures of economic activity in the model. Note that all tax multipliers are multiplied by negative one for ease of comparison with spending multipliers. All parameters other than \( A_{ss}^M \) remain unchanged across columns of the table.
Figure 1: Baseline Model
Impulse Response Functions

Note: This figure plots 20 quarters of impulse response functions for output, consumption, and real wages in response to one standard deviation government spending, consumption, and labor tax innovations. Impulse response functions for four different models are presented; these models include a flexible price model with and without home production, and a sticky price model with and without home production.
Figure 2: Alternative Model Specifications
Impulse Response Functions

Note: This figure plots 20 quarters of impulse response functions for output, consumption, and real wages in response to one standard deviation government spending, consumption, and labor tax innovations. Impulse response functions for four different models are presented; these models include our baseline sticky price model with home production, the indivisible labor model, the GHH preference model, and the rule-of-thumb household model.
Figure 3: Alternative Preference Values
Output Multipliers

Note: This figure plots output multipliers for market output, total output, and home production output across different values of the preference parameter $\zeta$ and corresponding steady state supply of home production hours. Varying the value of $\zeta$ between 0.60 and 1 moves steady state home production hours from approximately 20, to zero. The red dots corresponds with our steady state level of $\zeta = 0.6285$ and, therefore, displays the corresponding steady state output multipliers.
Figure 4: Alternative $A^h_{ss}$ Value Output Multipliers

Note: This figure plots output multipliers for market output, total output, and home production output across different values of the home production productivity parameter $A^h_{ss}$ and corresponding steady state supply of home production hours. The red dots corresponds with our steady state level of $A^h_{ss} = A^H_{ss} = 1$ and, therefore, displays the corresponding steady state output multipliers.