



Are taxes a good predictor of time use patterns? Examining the role of some key elasticities



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ABSTRACT

A home-production model is used to explain the allocation of time between leisure, work and home production. We show that differences in taxes alone explain to a great extent the time use patterns in a set of OECD countries once several key elasticities — the elasticity of substitution between market- and home-produced goods, the Frisch elasticity of labor supply, and the relative risk aversion — are set according to empirical evidence. We also show that a realistic calibration of these key elasticities results to be more important than introducing government expenditures substitutive for home-produced goods in order to bring the model's time use predictions in line with data. This is true even for Scandinavian countries, which had posed a challenge in previous studies.

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1. Introduction

Taxes are a good predictor of time use patterns in many Organisation for Economic Co-operation and Development (OECD) countries. This is the conclusion drawn in an influential work by Prescott (2004), and confirmed in subsequent works (e.g., Ohanian et al., 2007, 2008). A notable exception, however, is Scandinavia, whose inhabitants work more in the market than Continental Europeans despite facing higher tax rates. Rogerson (2006) points out that the effect of taxes on work time depends on how the government spends the collected revenue. Thus, Rogerson (2007) shows that accounting for government expenditures on goods that substitute for home-produced goods, differences in taxes explain to a large extent the time use patterns in Scandinavian countries as well. Along the same line, Ragan (2013b) incorporates a home sector to the Prescott (2004) model, and introduces a subsidy to market goods used in home production. Her model distinguishes between home-produced goods whose market inputs are typically taxed (e.g., meal preparation) and home-produced goods whose market inputs are typically non-taxed or even subsidized (e.g., elder care). She shows

that taking into account the government subsidization of services that substitute for home work is important for bringing the model's time use predictions in line with data, specially for Scandinavian countries.¹

This literature mostly uses a utility function that is log-additively separable in consumption and leisure — so the relative risk aversion and the Frisch elasticity of labor supply are both unity — and, when there is a home-production sector in the model, a unitary elasticity of substitution between market- and home-produced goods in utility.² Empirical studies, however, reveal that other values of these elasticities are in better accordance with data. This raises the question on whether a more realistic choice of these elasticities can affect the power of the model to explain the link between taxes and time uses — in particular, for Scandinavian countries — and the role played by government expenditures to explain this link.

¹ Other studies examine the effect on time allocation of different factors as, e.g., regulation (Fang and Rogerson, 2011; Jacobsen and Kooreman, 2005), social security (Wallenius, 2013) or health status (Gimenez-Nadal and Molina, 2015), or analyze the time use in specific countries from a time series perspective (e.g., Aguiar et al., 2013; Chen et al., 2014; Üngör, 2014).

² Notable examples are, e.g., Prescott (2004), Rogerson (2006, 2007), Ohanian et al. (2007), McDaniel (2011), and Ragan (2013a,b).

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This paper examines the nexus between taxes and time uses in a home-production model. Our focus is, in particular, in the role played by several elasticities — namely, the elasticity of substitution between market- and home-produced goods, the Frisch elasticity of labor supply, and the relative risk aversion — to explain this relationship. To this end, we extend the Ragan (2013b) home-production model to introduce a more general utility function that allows for values of the relative risk aversion and the Frisch elasticity of labor supply different from unity, and a CES aggregator of market goods and home-produced goods that allows for elasticities of substitution different from unity. We first show that taxes alone — without taking into consideration how the government spends its revenue — are good predictors of time use patterns once these key elasticities are calibrated according to empirical evidence. This result holds to a large extent, in particular, for Scandinavian countries, which had posed a challenge in previous studies. Then, as suggested by previous literature (e.g., Ragan, 2013b; Rogerson, 2006, 2007), we analyze the effect of introducing government expenditures substitutive of home production into the model. To this end we consider a wide array of government expenditure policies which encompasses different considerations of public expenditure on goods such as day or elderly care. Our model nests the models in which public expenditure on day care and elder care is treated as a subsidy to market services used in home production (Ragan, 2013b), lump-sum transfers of market inputs used in home production (Rogerson, 2007), and transfers of market inputs in home production that are proportional to market sector labor supply (Ragan, 2013a). We find that the introduction of government expenditures substitutive of home production may improve the model's explanatory power, but to a much smaller extent than realistically calibrating the key elasticities of the model, and depending on how the government expenditures are modeled.

The rest of the paper is organized as follows. Section 2 presents the model. Section 3 derives the main results, and Section 4 concludes.

2. The model

This section extends the Ragan (2013b) model to consider a more general utility function, and to include a wider array of government expenditure policies.

2.1. Setup

The agent is endowed with a unit of time that can devote to market production, h_m , leisure, h_l , and home production. We distinguish between time devoted to home production of goods f whose market inputs are typically taxed (e.g., meal preparation), h_f , and time devoted to home production of goods s whose market inputs are subsidized or (partially) provided by the government (e.g., elder care or child care), h_s . The time constraint is

$$h_m + h_f + h_s + h_l = 1. \quad (1)$$

The agent derives utility from the consumption of a market-produced good, c , leisure time, h_l , and two home-produced goods, f and s , according to

$$U(c, s, f, h_l) = \frac{z^{1-\xi} - 1}{1-\xi} + \psi_l \frac{h_l^{1-\sigma} - 1}{1-\sigma}, \quad (2)$$

where

$$z = [(1 - \psi_s - \psi_f) c^\kappa + \psi_s s^\kappa + \psi_f f^\kappa]^{1/\kappa}. \quad (3)$$

Here, $1/(1 - \kappa)$ is the elasticity of substitution between the market-produced good c and the home-produced goods s and f . If $\xi = \sigma = 1$ and $\kappa = 0$, we get the additively-separable log-utility specification considered, e.g., in Ragan (2013b):

$$U(c, s, f, h_l) = (1 - \psi_s - \psi_f) \ln c + \psi_s \ln s + \psi_f \ln f + \psi_l \ln h_l.$$

There are three productive sectors in the economy. Market goods are produced using a technology linear in labor,

$$y = h_m.$$

Home goods are produced by combining market goods and time according to the CES production functions

$$f = [bn^\gamma + (1 - b)h_f^\gamma]^{1/\gamma}, \quad (4)$$

$$s = [a(m + g_l + \phi h_m)^\rho + (1 - a)h_s^\rho]^{1/\rho}. \quad (5)$$

Here, n and m are the market goods used as inputs, and γ and ρ determine the elasticities of substitution of market produced goods and home production time. Following Rogerson (2007), g_l is a lump-sum transfer from the government that substitutes for the market inputs used in the home-production of s . Alternatively, the input supplied by the government can be proportional to market work, ϕh_m , where ϕ denotes the transfer rate, as in Ragan (2013b).

Income is taxed at a rate τ_h , final consumption c and the market input n used in the production of f are taxed at a rate τ_c , and the market input m used in the production of s is subsidized at a rate v , as in Ragan (2013b). Hence, the agent's budget constraint is

$$(1 + \tau_c)(c + n) + (1 - v)m = (1 - \tau_h)y + T, \quad (6)$$

where T are lump-sum transfers from the government. The government budget constraint is

$$\tau_h h_m + \tau_c(c + n) = T + vm + g_l + \phi h_m, \quad (7)$$

which combined with Eq. (6) yields the resources' constraint

$$y = c + n + m + g_l + \phi h_m,$$

where $y = h_m$. The agent solves the problem

$$\begin{aligned} & \max_{\{c, m, n, h_m, h_f, h_s, h_l\}} U(c, s, f, h_l), \\ & \text{subject to:} \quad (1 + \tau_c)(c + n) + (1 - v)m = (1 - \tau_h)h_m + T, \\ & \quad \quad \quad h_m + h_f + h_s + h_l = 1, \end{aligned}$$

together with standard non-negativity constraints, where f and s are defined by Eqs. (4) and (5), respectively. The first-order Karush–Kuhn–Tucker conditions are³

$$\frac{\partial U}{\partial c} \geq (1 + \tau_c)\lambda, \quad c \geq 0, \quad c \left[\frac{\partial U}{\partial c} - (1 + \tau_c)\lambda \right] = 0, \quad (8)$$

$$\frac{\partial U}{\partial s} \frac{\partial s}{\partial m} \geq (1 - v)\lambda, \quad m \geq 0, \quad m \left[\frac{\partial U}{\partial s} \frac{\partial s}{\partial m} - (1 - v)\lambda \right] = 0, \quad (9)$$

³ In our simulations, the possibility that the non-negativity constraint for some variable is binding only happened in Models III and IV with a workfare policy and lump-sum transfers substitutive of inputs used in the home production sector s .

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