# Optimal taxation with home production

## Conny Olovsson *

*Sveriges Riksbank, SE-103 37 Stockholm, Sweden*

### ABSTRACT

Optimal taxes for Europe and the U.S. are derived in a realistically calibrated model in which agents buy consumption goods and services and use home capital and labor to produce household services. The optimal tax rate on services is substantially lower than the tax rate on goods. Specifically, the planner cannot tax home production directly and instead lowers the tax rate on market services to increase the relative price of home production. The optimal tax rate on the return to home capital is strictly positive and the welfare gains from switching to optimal taxes are large.

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## 1. Introduction

By now, it is quite well established that the amount of market work differs substantially across countries. For instance, people in the U.S. work between 30 and 50 percent more per person than people in European countries, such as France, Germany and Belgium.[1] One explanation that has been offered for these differences is that taxes distort the margin between labor and other activities.[2] Specifically, taxes not only distort the margin between market work and leisure, but also distort households' margin between buying market-produced services and home production. Several recent papers argue further that the high tax rates in Europe could be one reason for the failure of the European service sector to develop in the same way as in the U.S.[3] When faced with high taxes on labor, goods and services, Europeans work relatively fewer hours in the market and instead satisfy a larger share of their demand for services through home production.

Against this background, the objective of this paper is to analyze optimal tax policy in a fully dynamic setting in which a representative agent takes decisions on how to allocate her income between consumption goods, market services and savings, and how to allocate her time between market work, home production and leisure. Home-produced services are imperfect substitutes for market services and they are produced by combining labor and home capital (which comprises consumer durables and housing). This setup captures the fact that households can choose between going to restaurants or cooking at home, between painting their own house or paying someone else to do it, etc.[4]

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* Tel.: +46 8 787 04 33.
  E-mail address: conny.olovsson@riksbank.se

[1] The numbers are computed for people aged 15–64. The source is EU KLEMS (2009).
[2] See Prescott (2004), Rogerson (2008), Ragan (2005), and Olovsson (2009).
[3] Papers that argue along this dimension include Freeman and Schettkat (2002), Rogerson (2008), Ragan (2005), Ngai and Pissarides (2008) and Olovsson (2009).
[4] The same margin generally does not exist for consumption goods. Most people would not consider producing their own cars, computers or cell phones because they find the cost disproportionate.

The analysis follows Ramsey (1927), in that the social planner chooses an optimal tax structure in an economy with a representative agent when only distortionary taxes are available. For a given tax rate on consumption goods, the tax instruments that the planner has at his/her disposal are taxes on industrial capital, home capital, labor and market-produced services. Tax policy is restricted in that leisure and hours spent in home production cannot be taxed.

The findings show that it is important that the government takes home production into account when designing the tax system. In fact, there are large welfare gains from incorporating the margin between home and market-produced services into the analysis. The results also show that the optimal tax rate on market services is significantly lower than the tax rate on market goods, and that the optimal tax on home capital is strictly positive, even in the long-run steady state. For the U.S., the optimal tax on market services is close to zero and the optimal per period tax on the stock of home capital is 3.3 percent.

The intuition for these results starts with the well-known Atkinson–Stiglitz (A–S) separability theorem. The theorem states that commodity taxes should be uniform across goods and services if the utility function is weakly separable between leisure and all commodities.[5] In a setting where agents also engage in home production, this result must be slightly modified. Uniform commodity taxes then not only require weak separability between market production and leisure, but also between market production and home production. These specific conditions are, however, not supported by the data. In fact, several empirical studies show that home and market produced services are non-separable substitutes. As a result, the optimal tax on market-produced services should be set to a lower level than the tax set on goods.

Intuitively, if leisure and home hours cannot be taxed, the taxation of labor will distort the choice between labor versus leisure and home hours. To reduce this distortion, the Ramsey planner imposes a relatively lower tax rate on commodities that is substitutable with leisure and home production. Specifically, when home and market services are substitutes, a reduction in the tax rate on market services is equivalent to a tax on home production because it increases the relative price of home production. When the two types of services are instead complements, a tax on market services is equivalent to a tax on home production because the two types of services are then consumed together.[6]

There are two main arguments for a positive tax on home capital. First, if consumption goods are taxed and home capital is untaxed, agents have an incentive to evade the consumption tax by diverting capital into the home sector. This implies that too much home capital is accumulated. A positive tax on home capital is thus necessary to rule out the possibility of consumption tax evasion.

Second, the accumulation of home capital can also influence the representative agent's future choice between home and market activity. In fact, when home and market services are substitutes, a unit of home capital will increase the labor productivity in home production, but also reduce the demand for market services. Home capital thus increases the size of the untaxed sector relative to the taxed sector. This is undesirable from the planner's point of view and a positive tax on home capital is necessary to prevent it.

As in Chamley (1986) and Judd (1985), the optimal steady-state tax rate on industrial capital is zero. Therefore, untaxable home production does not change their results.

The model is calibrated to the U.S. and optimal tax rates are computed on capital, home capital, labor and market-produced services. Moreover, since the model provides good predictions of market and home hours for Europe when furnished with European tax rates, optimal tax rates are also computed for Europe. The results for the U.S. are stated above. For Europe, the optimal service tax is roughly five percentage points lower than the tax rate on goods, whereas the optimal tax on the stock of home capital is around 10 percent. In both Europe and the U.S., the optimal tax rates on home capital are higher than the current tax rates.

There are large welfare gains from implementing optimal taxes. In contrast to the findings in Chari et al. (1994), the welfare gains do not rely on a very large initial tax rate on capital. In fact, even under the restriction that the tax rate on industrial capital is not allowed to increase, the welfare gain is 1.63 percent of lifetime consumption for the U.S. and as large as 7 percent for Europe. The key assumptions are discussed at the end of the paper.

## 2. The model

This section sets up the model and characterizes the competitive and the Ramsey equilibrium.

### 2.1. The representative household

Consider a representative agent with the following well-behaved instantaneous utility function:

$$u_t = u(c_t, s_t, l_t, k_{n,t}), \tag{1}$$

where $c_t$ is consumption goods, $s_t$ is services, $l_t$ is leisure, and $k_{n,t}$ is home capital, which can be thought of as housing and consumer durables. Services are an aggregate of market-produced services $s_{m,t}$ and home-produced (non-market)

[5] See Atkinson and Stiglitz (1972, 1976).
[6] The result for the tax rate on market services is thus an extension of the results in Corlett and Hague (1953), Atkinson and Stiglitz (1976), Sandmo (1990), Kleven et al. (2000) and Kleven (2004).