TIME USE, COMPUTABLE GENERAL EQUILIBRIUM AND TAX POLICY ANALYSIS

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Abstract

The motivation behind this paper is to provide some guidance on how to apply a general equilibrium model with home production in a real world setting to analyze economy-wide tax policies. The story line is the model of Iorweth and Whalley (2002), which we write as a mixed complementarity problem to make it ready to easily accommodate more consumers, commodities and household production functions. The model evaluates the welfare impact of introducing VAT on food in a context in which households can produce home meals for own consumption that compete with meals served in restaurants. With this model at hand we proceed as follows: first, we replicate some of the IW results and confirm that they depend on the elasticity of substitution between food and time in the household production of meals. Secondly, we move to the Spanish data and simulate the effects on welfare of different fiscal experiments. Finally, we enlarge the number of consumers and tackle some distributional issues.

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1. Introduction

Simulation models have been extensively used over recent decades to analyze the effects of economy-wide tax policies. Two approaches can be distinguished: micro-simulation models within a partial equilibrium framework (see Bourguignon and Spadaro, 2005, for a discussion) and large scale computable general equilibrium (CGE) models within a general equilibrium framework (see Fullerton and Metcalf, 2002, and Shoven and Whalley, 1992). This paper focuses on the second approach. In a typical CGE exercise, many firms and households are characterized by means of a set of equations embodying optimal behaviour and their interaction determines prices and quantities that are, or would be, observed in the market. Most of the time, in this exercise, the role of the households is reduced to provide factors for market production and purchase goods and services in the market. However, households play an important role in economies not only as consumers but also as producers, although only a small part of that production goes through the market whereas a substantial amount (mainly services) is produced and consumed within the home.

The idea of households behaving as enterprises using time, services of capital and intermediate inputs to produce commodities for own consumption go back to Becker (1965) and Gronau (1977) and has influenced different areas of economic analysis (see Gronau, 1997 for a survey). In public finance, an accurate measure of household production in the economic structure is basic for tax policy analysis. Thus, the welfare impact of different taxes depends on how different households combine unpaid work, capital and intermediate goods to produce goods and services ready to be consumed. The empirical importance of household production for the theory of optimum tax policy has been discussed in previous studies, as those of Boskin (1975), Sandmo (1990) or more recently Kleven et al (2000), Anderberg and Balestrino (2000) and Kleven (2004), whereas numerical simulations quantifying the effects have been exploited by Piggott and Whalley (1996); Piggott and Whalley, (2001) and Iorwerth and Whalley (2002).

However, the bulk of the existing empirical literature that integrates taxes and household production focuses on pure efficiency aspects and a representative consumer, sidestepping distributional issues, or reducing them to the bare minimum; e.g Piggott and Whalley (1996) -households with and without children-; Anderberg and Balestrino (2000)– low ability and high ability- and Piggott and Whalley (2001) -rich and poor-. Despite the relevance of simulation models as a powerful tool for the analysis of public policies (Kehoe et al, 2005 and the contributions there are good examples), and the important dimension of household production, no previous attempt has been made to tie self supply to CGE models in order to quantify the economy-wide effects of tax policy. This paper aims to bridge this gap by illustrating the way in which CGE techniques can be applied to models in which household production is a key variable.

In the carrying out we go from an efficiency to an incidence analysis of tax policy, but for illustrative purposes we keep the model as stylized as possible. The story line is the model of Iorweth and Whalley (2002) – IW henceforth – which we write as a mixed complementarity problem because it makes the model suitable to easily accommodate more consumers, commodities and household production functions. This model evaluates the welfare impact of introducing VAT on food in a context in which households can produce home meals for own consumption. With the model in a mixed complementarity format we pursue three objectives. First, we replicate some of the IW results as a checkpoint. IW show that extending the sales tax to cover food leads to welfare gains in their model and that an optimal tax scheme involves a higher tax on food than on other goods. With one input good and one consumption good, Anderberg and Balestrino (2000) demonstrate that the input good should be taxed at a higher rate than general consumption if the degree of complementarity in household production is larger than the degree of complementarity in consumption. We confirm that the more general IW results also depend on the elasticity of substitution between food and time in the household production of meals, coming to be the opposite when the elasticity is high enough.

Secondly, we move to the Spanish data and simulate the effects on welfare of different fiscal experiments, maintaining the assumption of a representative consumer. The standard approach in applying large scale general equilibrium models (Shoven and Whalley, 1992) typically requires a set of equations calibrated with respect to a "reality" represented as a benchmark database called social accounting matrix (SAM). Thus, the calibration of a CGE model including household production would need a social accounting matrix extended to consider, in addition to the market economy, the production of services provided by households through unpaid work. Matching standard information from input-output tables and consumer expenditure surveys, among others, with time use surveys, Uriel et al. (2005) elaborate a social accounting matrix that for the first time implements the conceptual framework sketched by Pyatt (1990). This extended social accounting matrix (ESAM) integrates the portion of household production currently outside the boundaries of the SNA into the market flows of a more conventional social accounting matrix. This paper makes use of an abridged version of the ESAM to calibrate the model for the Spanish economy. The results on aggregate welfare for Spain are consistent with those obtained for Canada.

Finally, we enlarge the number of consumers to three groups and tackle a differential tax incidence analysis for the Spanish economy. The theory of taxation deals with the problem of levy taxes to enhance economic efficiency and to contribute to a fair distribution of resources. At this point we explore to what extent the government can improve welfare by enhancing both efficiency and fairness. In some sense, this last exercise can be considered as a first approximation towards a more elaborated CGE model with all the main ingredients considered here – taxes, household production, efficiency and equity. Thus, the extension to a fully represented economy, such as the one described in the ESAM is, to a great extent, a matter of scale.

The paper is organized as follows. In Section 2 the motivation of the illustrative fiscal experiment is set, the model's equations are presented in Section 3 and Section 4 introduces the data used for calibrating the models. In Section 5 the results of the different tax policy experiments are offered, including the replication of IW experiments, efficiency and optimal taxation for Spain and some tax incidence considerations. Finally, Section 6 summarizes the paper and suggests future follow-ups to this line of research.

2. The VAT on food and restaurants in Spain and the importance of household production

VAT in Spain was introduced in 1986 but the legislation has undergone several modifications since then, the last big reform taking place in 1995. As a consequence, at present VAT is levied at three rates in Spain: a general rate of 16%, a low rate of 7% (that affects, among others, restaurants) and a very low rate of 4% (that affects, among others, some kinds of food). Since the sixth directive in 1977 certain steps have been taken towards harmonizing value added tax in the European Union so that the future legislation in the member states related to VAT should conform to the different directives of the European institutions. In 1996, the European Commission proposed a programme to establish a definitive VAT system. In 2001, a Commission report provided possible guidelines to be followed in the medium term for the harmonization of reduced VAT rates. The proposal consists of establishing a minimum general rate of 15% and two reduced VAT rates to be applied to a set list of goods and services: one reduced rate around the 5% mark and another super-reduced rate that is not specified, for those goods and services which, for historical or economic reasons, require differential treatment. Restaurants did not appear in either list, although food was included. However, in 2003, a directive proposal included restaurants in list H, allowing member states to implement a reduced rate to restaurant services.

The illustrative example in this paper focuses on efficiency as well as equity considerations related to possible changes in VAT rates applied to restaurants and food. The model considers both the market production of meals by restaurants, as well as the preparation of food at home. Restaurant production -the meals served there- compete directly with the meals produced by households themselves, the VAT the latter pay on food being a significant part of production costs. Both households and restaurants use labor and food to produce meals, but the fiscal treatment of the two types of production is very different. In first place, restaurants can deduce the VAT levied on the food they purchase, while the household production of meals, as it is not a market activity, must bear the full amount of VAT that is levied on food. In second place, restaurants must include VAT in their invoices for the service offered, whereas the meals produced by households are exempt. Finally, households must pay a part of the revenue generated, in the form of income tax, through dedicating part of their available time to market activities. There are, therefore, two sources of distortion in the fiscal treatment of the production of meals that generate inefficiency. One type of distortion refers to the different fiscal treatment of goods of very similar characteristics: homemade meals and those produced by restaurants. Another distortion is due to the inputs required for the production of homemade meals (labor and food) receiving different fiscal consideration.

Under the equal yield premise by making food exempt from VAT, the distortion between inputs used in household production is eliminated, but the distortion between market and household production is widened. A decrease in the VAT charged by restaurants, on the other hand, reduces the distortion between market and non-market goods, but widens the gap between the fiscal treatment of food and labor in the household production of meals. In both cases, the theoretical effect on efficiency is ambiguous. IW simulations nevertheless suggest that an increase in VAT on food and a reduction in VAT on restaurants would improve the efficiency of the current tax system and would lead to gains in global well-being. As we show below, these results are very conditional to the elasticity of substitution between food and time in the household production of meals.

Generally speaking, an increase in the VAT levied on food and a reduction in the VAT applied to restaurants could have adverse effects in terms of redistribution, as those households that are economically most disadvantaged would be penalized, due to the fact that they have more meals at home than in restaurants. By writing the equations as a mixed complementarity problem, as in this paper, extending the demand side of the model to deal with the economic incidence of a tax is an issue that depends on the information contained in the extended social accounting matrix. Below, in this paper, we divide the consumers into three groups according to their income level.

3. The model

3.1 A simple model with household production

To provide an intuition as to how household production can be incorporated into a general equilibrium framework let us first borrow the specific model structure of Kleven et al. (2000). In this model there are three categories of goods. The first category consists of all goods and services provided exclusively by the market (referred to as "market goods" from now onwards), which will take the letter *M*. The second group is made up of services that can be produced by both the market and also the household. Home production of meals and the elaboration of meals in restaurants were chosen from among all of these products, in accordance with our objective[1]. The goods that are included in this category will be denoted by *S* and the meals produced by restaurants and in the household will be represented by the letters *R* and *H*. Finally, a representative consumer can also obtain utility from leisure L_0. Let us assume at this stage that the utility function is weakly separable into three blocks and that the labor time is the only relevant input for production. Let L_H be the time devoted to household production, $L_N = L_M + L_R$ the time used for market production (*M* and *R*) and $\overline{L}$ the total labor endowment. Self-supplied services are produced by means

[1] There are other examples, such as caring for children or old people, the production of clothing and accommodation that are not considered in this analysis.

of a household production function $R=R(L_H)$. The representative consumer has a utility function defined over those goods exclusively produced by the market (M) meals - $S(R, H)$ - and leisure (L_0), and thus we can write the model as a non-linear programming problem in the following way:

$$\max \quad U = U(M, S(R,H), L_0)$$

s.t.

(1) $$M = M(L_M)$$

(2) $$R = R(L_R)$$

(3) $$H = H(L_H)$$

(4) $$L_0 = \bar{L} - L_H - L_N$$

(5) $$L_N = L_M + L_R$$

(6) $$P_L L_N = P_M M + P_R R$$

Note that using (4), substituting for L_N into (6) and adding $P_H H(L_H)$ to each side of the equation the budget constraint may be rewritten as:

(7) $$P_M M + P_R R + P_H H + P_L L_0 = P_L \bar{L} + P_H H - P_L L_H$$

where P with a subscript represents a price, P_R standing for the shadow price of domestic production. Thus, this problem defines a utility function over a set of goods and services, including self-supplied services, and a budget constraint in which total income is given by the value of the total endowment of time augmented by the shadow profits derived from the household production activity. The consumers take that income and "buy" goods and services provided by the market and services produced at home.

An important feature of expression (7) is that in order to define the competitive equilibrium we need to add to the system of equations an additional activity *H* acting in the same way as the other but whose profits flow directly to the consumer income. As Sandmo (1990) wrote "it is in fact as if a household production department maximized household profit".

The previous simple model can be extended in the same way as Iorweth and Whalley (2002). Thus, we can add a new good "food" (*A*) which can be considered an input exchanged on the market, used together with labor in the production of *R* (L_R, A_R) and *H* (L_H, A_H). Additionally, the representative consumer has a set quantity of total resources, *G**, which he or she can convert into food, *A*, or into units of effective labor, *L*, by means of a transformation frontier. With these changes the previous model can be rewritten in the Iorweth and Whalley form as:

$$\max \quad U = U(M, S(R,H), L_0)$$

(8) $$L_0 = L - L_H - L_M - L_R$$

(9) $$M = M(L_M)$$

(10) $$R = R(L_R, A_R)$$

(11) $$H = H(L_H, A_H)$$

(12) $$\bar{G} = G\left(L, A\right)$$

(13) $$A = A_H + A_R$$

(14) $$P_M M + P_R R + P_H H + P_L L_0 = P_L L + P_A A + \left(P_H H - P_L L_H - P_A A_H\right)$$

Where (12) represents the transformation frontier by means of which total resources $\bar{G}$ yields different combinations of labor and food. The right hand side of the expression (14) is the total income (including any profit from the household activity) whereas the left hand side reflects the use of the income.

3.2 The household production model as a mixed complementarity problem

In this subsection we write the household production model as a mixed complementarity problem (MCP) taking into account the different taxes considered in the simulations. Mathiesen (1985) demonstrated that an Arrow-Debreu type general equilibrium model could be efficiently formulated and solved through a mixed complementarity problem with three categories of variables: (a) a non-negative vector of commodities' prices, including final goods, intermediate goods and production factors; (b) a non-negative vector of activity levels for the sectors that use technologies of constant returns to scale; and (c) a vector of income levels for each type of "institution" in the model, including households and the government.

Equilibrium in these three categories should satisfy a system that responds to the optimal behaviour of economic agents, with three classes of nonlinear inequalities. These inequalities indicate that: (a) the level of activity in each productive process implies the condition of zero profit; (b) the market for each commodity is cleared; and (c) consumer income coincides with the revenue generated by his or her available resources. The solution to this problem is the general equilibrium of the economy.

What follows is a presentation of the model used in the simulations as a mixed complementarity problem, which first tackles consumer and producer optimization problems that give rise to cost and expenditure functions. As far as restaurant and household meals are concerned, we will assume that technology is represented by a production function with constant elasticity of substitution (CES). Producers minimize costs for a certain volume of output, obtaining the conditional factor demand and the corresponding cost function. For example, restaurants will solve the following optimization problem:

Min $\quad P_L L + P_A A$

s.a $\quad \overline{R} = \phi_R \left[\delta_R L^{(\sigma_R - 1)/\sigma_R} + (1 - \delta_R) A^{(\sigma_R - 1)/\sigma_R} \right]^{\sigma_R/(\sigma_R - 1)}$

where σ_R is the elasticity of substitution between labor and food in restaurants' meals production technology. The demand functions conditioned to $\overline{R}$ are:

(15) $$L_{\mathrm{R}} = \phi_{\mathrm{R}}^{-1}\left[\delta_{\mathrm{R}} + \left(1-\delta_{\mathrm{R}}\right)\left(\frac{\delta_{\mathrm{R}} P_A}{\left(1-\delta_{\mathrm{R}}\right)P_L}\right)^{1-\sigma_{\mathrm{R}}}\right]^{\sigma_{\mathrm{R}}/\left(1-\sigma_{\mathrm{R}}\right)} \overline{\mathrm{R}}$$

(16) $$A_{\mathrm{R}} = \phi_{\mathrm{R}}^{-1}\left[\delta_{\mathrm{R}}\left(\frac{\left(1-\delta_{\mathrm{R}}\right)P_L}{\delta_{\mathrm{R}} P_A}\right)^{1-\sigma_{\mathrm{R}}} + \left(1-\delta_{\mathrm{R}}\right)\right]^{\sigma_{\mathrm{R}}/\left(1-\sigma_{\mathrm{R}}\right)} \overline{\mathrm{R}}$$

If $\overline{\mathrm{R}} = 1$ and factor demand is replaced in the objective function in the above optimization problem, the cost function for restaurants' per unit of output is obtained:

(17) $$C_{\mathrm{R}}\left(P_L, P_A\right) = \phi_{\mathrm{R}}^{-1}\left[\left(\frac{P_L}{\delta_{\mathrm{R}}}\right)^{1-\sigma_{\mathrm{R}}} + \left(\frac{P_A}{\left(1-\delta_{\mathrm{R}}\right)}\right)^{1-\sigma_{\mathrm{R}}}\right]^{1/\left(1-\sigma_{\mathrm{R}}\right)}$$

Shephard's lemma affirms that the derivative of the previous cost function with respect to the price is the quantity of factor demanded per unit of output. In particular:

(18) $$\frac{\partial C_{\mathrm{R}}\left(P_L, P_A\right)}{\partial P_L} = \frac{L_{\mathrm{R}}}{\mathrm{R}}$$

(19) $$\frac{\partial C_{\mathrm{R}}\left(P_L, P_A\right)}{\partial P_A} = \frac{A_{\mathrm{R}}}{\mathrm{R}}$$

The cost function for household production of meals can be defined in the same way $C_H\left(P_L, P_A\right)$ from which we can obtain the optimal quantity of food and labor employed in preparing meals at home. However, we must now consider the VAT on food, which raises the purchasing price of food for home production of meals, so the quantities L_H and A_H will differ from those obtained when the tax is not applied.

(20) $$\frac{\partial C_H\left(P_L, P_A\left(1+IVA_A\right)\right)}{\partial P_L} = \frac{L_H}{H}$$

(21) $$\frac{\partial C_H\left(P_L, P_A\left(1+IVA_A\right)\right)}{\partial\left(P_A\left(1+IVA_A\right)\right)} = \frac{A_H}{H}$$

Moreover, we will assume that market goods are produced solely by means of labor $M = M(L_M)$, resulting in producers minimizing factor costs (in this case, only labor) subject to a production function that depends only on labor. If furthermore, constant returns to scale are assumed to exist, the problem of minimizing costs for "market good" producers would be expressed as:

$$\begin{array}{ll} \text{Min} & P_L L \\ \text{s.a} & M = L \end{array}$$

from where the trivial unit cost function $C_M = C_M(P_L) = P_L$ is obtained and, therefore:

(10) $$\frac{\partial C_M(P_L)}{\partial P_L} = \frac{L_M}{M} = 1$$

There is also a fictitious sector that uses those goods consumed by households as inputs and produces "welfare" as output. In the MCP approach, this sector is nothing more than the utility function of the representative household whose arguments are the consumption of "market goods", meals and leisure. Meals can be both homemade and from restaurants, and these two inputs are not necessarily perfect substitutes. The utility function of a household is therefore expressed as:

(22) $$U\left(M,\ S\left(R,H\right),L_o\right)$$

separability is taken into account in preferences, insofar as the consumer firstly chooses between leisure or consuming goods and services. A second choice would be between consuming "market goods" and meals. Finally, the consumer chooses optimal consumption of restaurant meals and homemade meals. Let P_S be the price of the composite basket of meals produced in restaurants and inside the home, and let P_B be the price of the composite basket of "market goods" and meals[2]. The unit cost function for this "welfare" sector is what the literature calls the expenditure function, and it provides the minimum necessary cost, given the price of the goods, to obtain a unit of utility or welfare:

[2] P_S is a function of P_R and P_H whereas P_B is a function of P_S and P_M.

(23) $$C_U = C_U\left(P_{L_o}, P_B\right)$$

where:

(24) $$P_B = C_B = C_B\left(P_M\left(1+IVA_M\right), P_S\right)$$

and:

(25) $$P_S = C_S = C_S\left(P_R\left(1+IVA_R\right), P_H\right)$$

with IVA_M representing the average VAT rate applied to "market goods" and IVA_R the tax on value added charged by restaurants. As seen above, all the cost functions are derived from a optimization problem assuming CES functions for the technology.

In our approximation an additional activity is introduced called *TL* which transforms leisure (whose price is given by P_{L_o}) into labor supply, at a price of P_L: $TL = TL(L_o)$. This artifice enables us to identify the reaction of labor supply in the different experiments. The cost function of this activity is represented by:

(26) $$P_L(1-TING) = C_{TL}(P_{L_o}) = P_{L_o}$$

Therefore, the deviation between the value of leisure and the market wage is caused by the tax levied on income derived from labor (*TING*). Note that *IVA* is a tax-exclusive rate, that is, the rate is expressed as a fraction of the price excluding tax, whereas *TING* is a tax-inclusive rate.

By applying Shephard's lemma to expressions (23), (24) and (25) we obtain the amount of leisure, "market goods" and meals demanded by the representative consumer:

(27) $$\frac{\partial C_U\left(P_{L_o}, P_B\right)}{\partial P_{L_o}} = \frac{L_o}{U}$$

(28) $$\frac{\partial C_B\left(P_M\left(1+IVA_M\right), P_S\right)}{\partial\left(P_M\left(1+IVA_M\right)\right)} = \frac{M}{B}$$

(29) $$\frac{\partial C_S\left(P_R\left(1+IVA_R\right), P_H\right)}{\partial\left(P_R\left(1+IVA_R\right)\right)} = \frac{R}{S}$$

(30) $$\frac{\partial C_S\left(P_R, P_H\right)}{\partial P_H} = \frac{H}{S}$$

The representative household transforms total available resources $\bar{G}$ into a composite basket V of food and labor (that may or may not be offered to the market) by means of the trivial production function $V = V(G)$ meaning that:

(31) $$C_V(P_G) = P_G$$

At the same time, V transforms resource units into food or units of effective labor, following a constant elasticity of transformation (CET) function.

(32) $$\bar{G} = \xi\left(\tau \quad L^{\frac{\varepsilon+1}{\varepsilon}} + (1-\tau) \quad A^{\frac{\varepsilon+1}{\varepsilon}}\right)^{\frac{\varepsilon}{\varepsilon+1}}$$

whereby ε is the transformation elasticity. The household maximizes income $P_{Lo}L + P_A A$ in light of condition (32). This function is concave both in L and A and this allows us to obtain an upward sloping supply curve for food and for units of effective labor. The price of the composite good can be obtained by a nonlinear combination of P_{L_O} and P_A:

$$P_V = \xi^{-1}\left(\tau^{-\varepsilon} P_{L_O}{}^{1+\varepsilon} + (1-\tau)^{-\varepsilon} P_A{}^{1+\varepsilon}\right)^{1/(1+\varepsilon)}$$

Once the cost functions that incorporate agents' optimizing behavior are established, the mixed complementarity problem, whose solution guarantees the existence of overall equilibrium in the economy, can be written in the following way:

(33) $$C_R(P_L, P_A) \geq P_R \qquad \perp \mathrm{R}$$

(34) $$C_H\left(P_{L_O}, P_A(1+IVA_A)\right) \geq P_H \qquad \perp H$$

(35) $$C_M\left(P_L\right) \geq P_M \qquad \perp M$$

(36) $$C_V(P_G) \geq P_V \qquad \perp V$$

(37) $$C_U\left(P_{L_o}, P_B\right) \geq P_U \qquad \perp U$$

(38) $$C_{TL}(P_{L_O}) \geq P_L(1 - TING) \qquad \perp TL$$

(39) $$M \geq \frac{\partial C_B\left(P_M(1+IVA_M), P_S\right)}{\partial\left(P_M(1+IVA_M)\right)} B \qquad \perp P_M$$

(40) $$R \geq \frac{\partial C_S\left(P_R(1+IVA_R), P_H\right)}{\partial\left(P_R(1+IVA_R)\right)} S \qquad \perp P_R$$

(41) $$H \geq \frac{\partial C_S\left(P_R(1+IVA_R), P_H\right)}{\partial\left(P_H(1+IVA_R)\right)} S \qquad \perp P_H$$

(42) $$L \geq \frac{\partial C_{TL}(P_{L_O})}{\partial P_{L_O}} TL + \frac{\partial C_U\left(P_{L_O}, P_B\right)}{\partial P_{L_O}} U + \frac{\partial C_H\left(P_{L_O}, P_A(1+IVA_A)\right)}{\partial\left(P_{L_O}(1+IVA_A)\right)} H \qquad \perp P_{LO}$$

(43) $$TL \geq \frac{\partial C_R\left(P_L, P_A\right)}{\partial P_L} R + \frac{\partial C_M\left(P_L\right)}{\partial P_L} M \qquad \perp P_L$$

(44) $$A \geq \frac{\partial C_H\left(P_{L_O}, P_A\left(1+IVA_A\right)\right)}{\partial\left(P_A\left(1+IVA_A\right)\right)} + \frac{\partial C_R\left(P_L, P_A\right)}{\partial P_A} \qquad \perp P_A$$

(45) $$U \geq I / P_U \qquad \perp P_U$$

(46) $$G \geq \frac{\partial C_V(P_G)}{\partial P_G} \qquad \perp P_G$$

(47) $$I = P_G G + IVA_A P_A H + IVA_R P_R R + IVA_M P_M M + TING\ P_L\ TL \qquad \perp I$$

In the above expressions the symbol $\perp$ represents complementarity. Expressions (33) to (38) are the zero-profit conditions. If any of the equations is maintained as a strict inequality, then costs exceed income, which would make the corresponding level of activity zero. Therefore, the complementary variable tied to the zero-profit condition is an amount (the level of activity in the corresponding sector). Expressions (39) to (46) are the conditions of market clearing. The supply of each good is to the left of the inequality and the total demand for the good can be found to the right. If any of the conditions emerge as a strict inequality, supply will exceed demand, meaning that the commodity is free and the price will be zero. Therefore, the complementary variable in conditions of market clearing is the price of the corresponding commodity. The last expression (47) captures the revenue equilibrium condition. The representative consumer's total income (I) is the sum of the market value of total resource endowment plus revenue obtained by collecting different taxes. It is important to note that although the dimension of the problem would be different, the structure of the equations remains the same in a model with more activities, factors and households.

4. The data

The starting point for calibrating a general equilibrium model should be a microeconomically consistent data set, which in reality means that it is consistent with the mixed complementarity problem specified in the previous section. Therefore, our data base for calibration must satisfy the condition of zero profit, market clearing and income equilibrium.

The consideration of the household production of meals is a focal point of our study. The estimate of time spent on preparing meals at home, as well as the food inputs used in this production is information that is available in the extended social accounting matrix (ESAM-95) for the Spanish economy in 1995. The core of the market side of this data set is the last available Input-Output Framework (IOF-95) of National Accounts for Spain. However, in order to establish the correspondence between the income of factors and the different types of households, information from the European household panel survey (ECHP) has been used, whereas the distribution of consumption by household type is obtained from the Spanish household expenditure survey. To estimate the working time at home we use data from a survey on the use of time provided by the Spanish Women's Institute (see Uriel et al, 2005, for more details).

The complete matrix distinguishes ten groups of economic activities and four types of household production functions. Both, household activities and market activities use labor, capital and a complete set of intermediate inputs to produce. The labor factor, in turn, is disaggregated according to educational level and gender (both, at the household and at the market level), and the households are classified by level of income. The classification for labor, together with the detail for households offers a rich representation of the distribution of the full income in the economy. This information, nevertheless, requires some adjustments to adapt it to the simplified model presented in this paper. The resulting data set, when no detail in the home account is carried out, can be consulted in Table 1, which is a very abridged form of a SAM that we have titled "Basic Social Accounting Matrix 1995". This matrix captures the income flows that interest us in a standard way in accordance with the SAM notation.

{Insert Table 1}

The rows represent "income" and the columns "expenditure". For example, the first column ventures that Spanish households spent more than six trillion pesetas in restaurants and prepared meals at home worth 18 trillion. Leisure worth more than 125 trillion pesetas was also consumed. Furthermore, nearly seven trillion pesetas worth of food and almost 12 trillion pesetas worth of household labor were used in the home production of meals. The total for each row coincides with the total for each column, which is a requisite of the equilibrium.

The effective tax rates corresponding to the initial information (which can be deduced from the SAM) are as follows[3]: $TING$ = 0.1275; IVA_A = 0.0652; IVA_R = 0.0713; IVA_M = 0.1091.

The same information in Table 1 can also be presented in a more adequate format to calibrate the general equilibrium model by means of a rectangular matrix that will be called "micro-consistent matrix" (MCM). In the mixed complementarity problem approached earlier in this paper, six levels of activity and eight prices appear among the complementarity variables, which means that our model has six sectors and eight "commodities" (in the broad sense of the term, as some of them capture the result of household production). In Table 2 the MCM used in our model is presented, with six sectors, eight goods and one representative consumer. There are two types of columns corresponding to the production of the various activities and to the aggregate consumer (CONS). There are also two types of rows. The first type correspond to the different markets, while the second type capture tax collection (VAT and Income Tax). In the MCM there are positive and negative inflows. A positive result is an income (a sale in a private market or a factor supplied by a consumer). A negative result is an expense (an input purchase in a market or a consumer demand). If we read further down the columns, the

[3] These rates are "effective" in the sense that they are deduced from aggregated information. For instance, not every kind of food is subject to the same rate. We have preferred to let the data speak for itself rather than imposing a set of nominal tax rates.

entire set of transactions linked to an activity can be found. The sum of each column must be equal to zero to meet the condition of zero profit. In the same way, the sum of each row must be zero to meet the condition of market clearing (the sales of a commodity must be the same as the total purchases of that good). The sum of the consumer's column equal to zero indicates the condition of balanced revenue.

{Insert Table 2}

The figures of the MCM represent values (prices multiplied by quantities). The way these figures are divided up into prices and amounts is arbitrary, provided consistency is maintained. It is common practice to choose units so that the greatest number of variables possible are equal to one in the base equilibrium, captured by the MCM. For this reason, wherever possible, prices and levels of activity have been normalized to one. This is why, for example, the figures in Table 2 can be understood as the quantities involved in the production of an activity that operates at a unitary level. Obviously, where taxes are involved, not all prices can be normalized to one. For example, the existence of income tax implies that if the normalization P_{LO}=1 is used, then P_L will be greater than one.

However, as a touchstone for checking the performance of the written model we first replicate the base case simulations of Iorwerth and Whalley (2002) for Canada, so we have recovered from the information in their paper the implicit MCM that we can use to calibrate their model. The matrix containing the data for Canada can be found in Table 3. The Canadian base case equilibrium includes a pre-existing tax on market goods of 15% but, unlike the Spanish data, there is no tax levied on food for home use. Neither does it include a pre-existing income tax.

{Insert Table 3}

Table 4 provides some degree of detail in the demand, so the model calibrated with respect to these data can tackle equity issues in addition to efficiency. In particular, households are disaggregated into three groups according to tercile breaks of income, with Tercile 1 representing the families at the bottom of the income distribution and Tercile 3 the families in the upper side of the income distribution. As can be seen from the first three columns, there is a positive relationship between market consumption and income that disappears as soon as home production is involved.

{Insert Table 4}

5. Numerical simulations

Having specified the model and supplied the information for the benchmark equilibrium, the first step towards obtaining numerical results consists of obtaining the value of the parameters involved in the mixed complementarity problem. In order to do this, the model is calibrated in such a way that its very solution, for a parameter vector, coincides with the benchmark equilibrium, in other words, with the MCM. As all the functions used are of constant elasticity of substitution type, the only parameter that needs to be specified with information not contained within the MCM is the elasticity of substitution. In Table 5 the initial elasticities of substitution used for the different levels of production and utility functions in the different experiments are presented. These elasticities are borrowed from IW.

{Insert Table 5}

A high transformation elasticity is chosen to make certain that the food supply curve has a high price elasticity. The substitution difficulties between labor and food in the household production of meals and in restaurants are supposed to be identical, and this fact is captured by a very low elasticity. A reduced wage elasticity is also assumed for the market labor supply, while the substitution possibilities in consumption between meals and other market goods are slightly lower than if a Cobb-Douglas type utility function were used.

5.1 Replicating the IW results

We first replicate the base case experiment of IW by means of the mixed complementarity problem calibrated with the information provided by Table 3. The experiment consists of raising an equal yield VAT rate on food, when the Canadian economy initially has no tax levied on food for home use. A comparison of our results with those offered by IW is shown in Table 6[4]. Both sets of results are essentially the same[5]. However, we do not know

[4] The programme used was GAMS/MPSGE. See Rutherford (1999)

[5] There are, in fact, two main differences. According to IW the change in gross price of food is –0.8% and the change in net price of restaurants is –1.8% (they do not offer information on the net price of food and the gross price of restaurants). But according to our results what they call gross price of food is in reality the “net of tax price of food” and what they call net price of restaurants is the “gross of tax price of restaurants”. We attribute this to a typo in the IW paper that is already corrected in Table 6.

the exact deflator used by IW in the equal yield rule so we have taken the expenditure function as the reference and this may be the cause of the very small differences detected.

{Insert Table 6}

The results suggest a small welfare gain when the food exemption is terminated. The restaurant meals consumption increases and the home meal provision decreases. Both the food price and the restaurant meals price fall. The equal yield tax rate also falls to 13.4%, as compared to 15% in the food exemption base case. The optimal rate on food is much larger than the general rate, because it compensates for the fact that home meals are free of sales tax. A key argument for these results to hold is that the elasticities between food and time in household production (σ_H) and market production (σ_R) are identical and very low, to reflect the difficulty of substituting between food and time, relative to that between home and restaurant meals. This reflects the intuition that complements of time use should be more heavily taxed (Sandmo, 1990; Anderberg and Balestrino, 2000). The sensitivity results for (σ_H) confirm that as the value of the elasticity goes up, the welfare gains disappear and the optimal tax rate on food, although positive, can be lower than the average tax rate on market goods.

5.2 Efficiency results for the Spanish tax system

Now we switch from Canadian to Spanish data as represented in Tables 1 and 2. In contrast to the previous Canadian results a pre-existing income tax has now been included that creates an additional channel of distortions. Another difference is the existence of three VAT rates in the benchmark because the VAT rate on restaurants is distinguished from the VAT rate on the rest of market goods and services. With all this information we calibrate the MCP and perform a set of sensible fiscal experiments, with special focus on efficiency. In all the experiments, tax revenue remained constant in real terms. The constant revenue rule used was included in the model through the following restriction:

$$(48) \qquad IVA_A P_A H + IVA_R P_R R + \vartheta\left(IVA_M P_M M\right) + TING\, P_L TL = \overline{RTAX} \quad P_U$$

where *RTAX* is the constant that represents tax revenue in the base year, ϑ is an endogenous variable that captures changes in indirect tax pressure and P_U is the deflator used. The way the rule (48) is written is suitable for doing experiments related with exogenous variation in different tax rates that are offset by endogenous variations in the VAT rate on market goods and services other than restaurants. In some experiments, however, ϑ could multiply some taxes but not others, depending on which taxes we want to fit endogenously in order to keep revenue constant.

Table 7 displays the results in the variables of interest for the different tax policy experiments. The motivation of the exercise is to quantify on the basis of data some of the results previously addressed in the literature. One striking point is that any sensible departure from the present tax scheme would only provoke slight welfare effects, as measured as equivalent variations between two utility curves, indicating a tight design of the tax structure in this simple version of the Spanish economy.

The first column deals with the food exemption case. This experiment is based on the experience of other countries whose fiscal system does not levy tax on food, as is the case of most of the US states, Canada, the United Kingdom and Mexico. The exercise throws some light on the debate over the convenience of introducing the exemption on food in Spain. The results show that the exemption of VAT on food in Spain would reduce aggregate well-being by an equivalent of approximately 26 billion pesetas. As a result of the change in taxation, household production of meals would increase by 1.9% and home time by 1.2%, but restaurant production of meals would drop by 1.6% and the total time allocated to market production would also fall.

{Insert Table 7}

In the second experiment, effective VAT rates on food and restaurants are equalled to a super reduced rate of 4%. In view of the fact that both rates in the benchmark are close to the one simulated, the effects detected are minimal, although a slight decrease in efficiency does seem to be confirmed. In this case both restaurant and home meals increase, but labor for home and market production is reduced due to a substitution of food for labor, and also, for the market case, to a lower demand of "other market goods and services".

In third place, we set to zero the VAT rate on restaurant meals. In this case the well being also falls although the effect is even tinier. The labor supplied to the market increases slightly at the expense of a bigger fall in time devoted to home production.

In the column (D), the simulation sets a uniform VAT rate for all goods and services. The equal yield flat VAT rate for this simple version of the Spanish economy is shown to be about 10%. As a result of changes in prices, well-being increases by an equivalent of 7 billion pesetas with respect to the base case. While there is practically no effect on household production, the production of meals in restaurants falls by 2.4%, while the production of other market goods rises by 0.5 percentage points.

The last experiment from Table 4 captures the effects of a 13% income tax cut, offset by an increase in effective VAT rates. A cut of 13% was considered because this is the estimated decrease, according to the *Instituto de Estudios Fiscales* (Institute for Fiscal Studies in Spain), in the average effective rate as a result of the last income tax reform bill. Results show that this measure is neutral in efficiency. The main beneficiaries of this measure are the restaurants that reduce their prices and increase their production.

5.3 Optimal analysis

The above results are a consequence of isolated experiments that are reflected by the unique changes in certain exogenous parameters of the model related to taxes. However, it is also of interest, with the model at hand, to tackle the issue of optimal taxation. Table 8 displays the results for two optimal exercises. In column (F) we keep the VAT rate on restaurant meals fixed, change the rate on food and offset by an equal yield VAT on "other market goods and services" to obtain the combination that maximizes welfare with respect to the initial situation. For this to be achieved, the general equilibrium corresponding to the different VAT rates has been obtained and the response of aggregate well-being has been analyzed. Results indicate an optimal VAT rate on food of 0.35, much higher than the average tax rate on market goods. In column (G) we perform a similar experiment for the income tax rate. It is shown that, starting at current levels, lowering the tax on income and increasing the VAT on market goods would be optimal, although the effects on welfare would be almost negligible.

{Insert Table 8}

5.4 Tax incidence analysis

Tax analysis when household production is present has mainly focused in the simple case of a representative consumer. However, a government may wish to sacrifice some efficiency in exchange for a more equitable distribution of income. Therefore an important question for tax policy making is the measure of the incidence of the tax, that is, the distribution of the welfare effects within a population. In fact, distributional and efficiency reasons work sometimes in opposite directions (see Auerbach and Hines, 2002). A distributional theoretical framework when households can substitute away from market expenditures towards time spent in home production was sketched by Sandmo (1990) but has not found conclusive empirical support in general equilibrium computational techniques. Kleven *et al* (2000) emphasize the ambiguous implications that heterogeneity across households could have for the optimal taxation of services, due in part to the different weight of household production in high-income and low-income households.

In Table 9 we introduce household heterogeneity to illuminate the distributional fairness of the fiscal experiments above when the representative consumer of this very simple version of the Spanish economy is split up into three different groups according to terciles of income, with the first tercile representing the lowest income group. The elasticities of substitution of the three groups are set equal to the ones of the representative consumer, the difference being in the factor endowment different and preferences yielding different combinations between leisure, market consumption and household production[6].

The results show that all the fiscal experiments affect primarily the low and top end of the income distribution, and more importantly, in almost all the cases the sign of the efficiency effect is compensated by an opposite sign in equity. The only exception occurs when the VAT on restaurants is set at zero, in this case both efficiency and equity are penalized meaning that, according to this simple model, there is no argument whatsoever for a restaurant exemption to be carried out. Conversely, the food exemption, although it brings down global welfare, implies a positive redistribution of the tax burden, whereas the optimal taxation on food heavily affects in a negative way fairness.

{Insert Table 9}

[6] We maintain the assumption of an identical household production technology for each household.

A sensitivity analysis (Table 10) confirms that the distributional impact of the food exemption does not depend on the elasticity of substitution between time and food in household production and the trade-off between efficiency and equity tend to disappear the higher the value of the elasticity is. Thus, as the value of this parameter goes up, the reasons against food exemption become more tenuous. This result points (as always) to the importance of reliable econometric estimations of some key parameters.

{Insert Table 10}

6. Conclusions

Measuring the potential effects of fiscal reforms in the real-world with heterogeneity in the population and a variety of pre-existing distortions have been a recurrent subject in public finance. The numerical simulation techniques and, particularly, computable general equilibrium models, have contributed to bridging the gap between economic theory and real-world policy analysis. Household production theory has provided many interesting applications to the theory of taxation, but the implementation of the household production approach has not been addressed in a CGE model, due in part to the important statistical requirements implied, that can be condensed into the so-called social accounting matrices.

Recently we have been witnessing in Europe a renewed interest in social accounting matrices. One example is the *Leadership Group on Social Accounting Matrices* (SAM-LEG), which was born under the statistical requirements for the implementation of the third phase of the European Monetary Union and has prepared the guidelines for the construction of social accounting matrices (see SAM-LEG, 2003). Another example is the first estimation of Tjeerd *et al* (2004) of a SAM for the euro zone.

The contribution of this paper has been twofold: there is a methodological contribution and there are some applications. In terms of methodology we illustrate how augmenting standard social accounting matrices to include household production increases the information available to the government and widens the room for maneuver in economy-wide tax policy analysis. In the applications, we take as the story line the model of Iorwerth and Whalley (2002) replicating some of their results and confirming the key importance of the elasticity of substitution between time and food in the elaboration of meals at home. Then we take Spanish data and perform different tax policy experiments that underpin IW results. Lastly we enlarge the number of consumers to establish some distributional results.

We show that in most of the cases efficiency and fairness act in opposite directions, and that for the food exemption case, an increase in the key parameter reduces the efficiency loses but does not change the positive distributional effects. Although the representation of the economy has been kept in a very stylized way, the paper aims to transmit the usefulness of extending the standard social accounting matrix framework to include the large amount of the household production of goods and services for own final use.

Some suggested follow-ups to this research are straightforward and aim at a more realistic representation of the economy, by means of the incorporation of capital and different intermediate inputs, both in the market and in the household production, the enlargement in the number of consumers, and the consideration of different household production functions with different technologies across households. The distribution of home-production skills across households has been pointed out by Anderberg and Balestrino (2000) as possible extensions of their framework. Also Kleven (2004) highlights the importance of combining consumption expenditures and time allocation to implement its inverse factor share rule. Extending social accounting matrices to include household production lays the foundations for all those issues to be feasible.

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TABLES

Table 1. Basic Social Accounting Matrix with household production for Spain

	Home	M. prod	Restaur	H. meals	Food	M. labor	H. labor	Labor	Leisure	F. endow	VAT	Inc. tax
Home										186,611	5,492	5,830
M. prod	47,195											
Restaur	6,420											
H. meals	18,612											
Food			2,803	6,860								
M. labor		42,551	3,189									
H. labor				11,752								
Labor						39,910	11,752					
Leisure	125,706											
F. endow					9,243			51,662	125,706			
VAT		4,644	428		420							
TING						5,830						

Billions of pesetas

Table 2. Matrix micro-consistent with the mixed complementarity problem for Spain

	M	R	H	U	TL	V	CONS
P_M	42,551			-42,551			
P_R		5,292		-5,992			
P_H			18,612	-18,612			
P_{LO}			-11,752	-125,706	-39,910	177,386	
P_L	-42,551	-3,189			45,740		
P_A		-2,803	-6,440			9,243	
P_U				197,933			-197,933
P_G						-186,611	186,611
VAT			-0,420	-5,072			5,492
TING					-5,830		5,830

Billions of Pesetas

Table 3. Matrix micro-consistent with the mixed complementarity problem for Canada

	M	R	H	U	V	CONS
P_M	335			-335		
P_R		15		-15		
P_H			125	-125		
P_L	-335	-10	-86	-625	1056	
P_A		-5	-39		44	
P_U				1152.5		-1152.5
P_G					-1100	1100
VAT				-52.5		52.5

Billions of dollars

Table 4. Basic social accounting matrix with household labour and household details for Spain

		Home			M. prod	Restaur	H.meals	Food	M. labor	H. labor	Labor	Leisure	F. endow	VAT	TING
		Tercile 1	Tercile 2	Tercile 3											
Home	Tercil 1												51,138	666	392
	Tercil 2												60,660	1,505	1.197
	Tercil 3												74,813	3,321	4.241
M. prod		6,115	13,046	28,034											
Restaur		593	1,658	4,169											
H. meals		6,262	5,456	6,894											
Food						2,803	6,860								
M. labor					42,551	3,189									
H. labor							11,752								
Labor									39,910	11,752					
Leisure		39,226	43,202	43,278											
F. endow								9,243			51,662	125,706			
VAT					4,644	428		420							
TING									5,830						

Billions of pesetas

M. prod: "market goods"; Restaur: restaurant meals; H. meals: Home meals; M. labour: Market labour; H. labour: Home labour; F. endow.: Factorial endowment; VAT: Revenue from VAT; Inc.tax: Revenue from income tax

Table 5. Substitution elasticities used in the calibration

Elasticity	*Value*
Transformation elasticity between food and units of effective labor (ε)	5.0
Substitution elasticity between food and labor in restaurant production (σ_R)	0.3
Substitution elasticity between food and labor in home production (σ_H)	0.3
Substitution elasticity between restaurant meals and homemade meals in consumption (σ_S)	1.5
Substitution elasticity between leisure and consumption (σ_L)	0.2
Substitution elasticity between meals and "market goods" (σ_M)	0.6

Table 6. Simulation results compared with I-W

	Model results	Iorweth-Whalley (1)	σ_H=0.15	σ_H=3	σ_H=5	σ_H=10
Welfare gain (Hicksian EV in 1992 $bill)	0.15	0.15	0.16	-0.04	-0.13	-0.24
Optimal tax rate	23.0%	23.0%	28.3%	5.2%	3.6%	2.4%
Equal yield tax rate on food	13.4%	13.3%				
% Increase in restaurant meals	5.39%	5.59%				
% Increase in home meals	-2.87%	-2.86%				
% Change in net of tax price food	-0.84%	-0.8%				
% Change in gross of tax price food	12.48%	NA				
% Change in net of tax price of restaurants	-0.28%	NA				
% Change in gross of tax price of restaurants	-1.63%	-1.8%				
% Change in time allocated to home production	-1.76%	-1.76%				

(1) Iorwerth and Whalley (2002). Table 2 page 174
NA: Non available

Table 7. Numerical Results of Different Fiscal Policy Experiments

	(A)	(B)	(C)	(D)	(E)
Welfare gain (Hicksian EV bill.pesetas)	-26	-9	-4	7	0.008
% Increase in restaurant meals	-1.599	3.166	9.029	-2.399	1.279
% Increase in home meals	1.893	0.014	-1.637	-0.343	-0.234
% Increase in other market goods and services	-0.597	-0.456	-0.553	0.502	-0.076
% Change in time allocated to home production	1.231	-0.222	-1.602	-0.022	-0.231
% Change in time allocated to market production	-0.663	-0.200	0.118	0.297	0.037
% Change in gross of tax price food	-5.818	-2.125	0.306	2.949	0.026
% Change in net of tax price food	0.322	0.246	0.306	-0.267	0.026
% Change in gross of tax price of restaurants	0.141	-2.817	-6.530	2.516	-0.982
% Change in net of tax price of restaurants	0.141	0.108	0.134	-0.117	-0.982
% Change in gross of tax price of market goods	1.049	0.792	0.957	-0.847	0.135
% Change in net of tax price of market goods	-0.019	-0.014	-0.016	0.014	-1.865
Equal yield tax rate on "market goods"	12.095	11.804	11.990		13.170
Homogenous equal yield tax rates				9.954	

(A): Exemption from VAT payments on food; (B) Setting VAT on food and VAT on restaurants at the same rate=0.04; (C) Setting VAT on restaurants to zero; (D) Uniform VAT rates; (E) 13% income tax cut.

In all experiments, tax revenue remains constant in accordance with rule (48), except in experiment (D) where the rule $\vartheta\left(IVA\, P_A H + IVA\, P_R R + IVA\, P_M M\right) + TING\, P_L TL = \overline{RTAX} \quad P_U$ has been used.

Table 8. Optimal tax rates

	(F)	(G)
Optimal tax rate	0.370	0.077
Welfare gain (Hicksian EV bill.pesetas)	44	0.667
Equal yield tax rate on "market goods"	0.063	0.177

(F) Optimal VAT rate on food compensated by variations in the VAT rate of "other market goods and services"; (G) Optimal income tax rate compensated by variations in the VAT rate of "other market goods and services"

Table 9. Tax incidence

	(A)	(B)	(C)	(D)	(E)	(F)	(G)
Welfare gain tercile 1 (Hicksian EV bill.pesetas)	20	6	-4	-9	-0.6	-91	-2
Welfare gain tercile 2 (Hicksian EV bill.pesetas)	-4	-2	-3	1	-0.4	0.2	-0.9
Welfare gain tercile 3 (Hicksian EV bill.pesetas)	-66	-20	7	25	2	235	5
Efficiency	(-)	(-)	(-)	(+)	(+)	(+)	(+)
Equity	(+)	(+)	(-)	(-)	(-)	(-)	(-)

(A): Exemption from VAT payments on food; (B) Setting VAT on food and VAT on restaurants at the same rate=0.04; (C) Setting VAT on restaurants to zero; (D) Uniform VAT rates; (E) 13% income tax cut; (F) Optimal VAT rate on food compensated by variations in the VAT rate of "other market goods and services"; (G) Optimal income tax rate compensated by variations in the VAT rate of "other market goods and services" In all experiments, tax revenue remains constant in accordance with rule (48), except in experiment (D) where the rule $\vartheta\left(IVA\,P_A H + IVA\,P_R R + IVA\,P_M M\right) + TING\,P_L\,TL = \overline{RTAX}\quad P_U$ has been used.

Table 10. Sensitivity analysis for food exemption in Spain

	σ_H=0.3	σ_H=0.15	σ_H=3	σ_H=5	σ_H=10
Aggregate welfare (Hicksian EV bill.pesetas)	-26	-26	-18	-13	-6
Welfare gain tercile 1 (Hicksian EV bill.pesetas)	20	19	21	22	24
Welfare gain tercile 2 (Hicksian EV bill.pesetas)	-4	-4	0	2	5
Welfare gain tercile 3 (Hicksian EV bill.pesetas)	-66	-66	-64	-63	-61