Welfare Policy and the Sectoral Distribution of Employment

L. Rachel Ngai and Christopher A Pissarides
Centre for Economic Performance
London School of Economics

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Abstract

We examine the distribution of hours of work across industrial sectors in OECD countries. We find large disparities when sectors are disaggregated into those that produce goods without home substitutes, those that produce goods with home substitutes and health and social work. We attribute the disparities to tax and transfer policies in the presence of home production. High taxation reduces hours in sectors with close home substitutes by more than elsewhere. Health and social subsidies increase hours in that sector. We quantify these effects using sectoral data and time use surveys for nineteen OECD countries.

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There are large differences in the kind of jobs that people do across the industrial countries of the Organisation for Economic Cooperation and Development (OECD). Table 1 divides the two-digit industrial sectors into three groups, and gives the percentage distribution of hours of work in three countries with different social support programs: the United States, Italy and Sweden.[1] The choice of industrial groups is governed by whether or not the output of a sector has close substitutes in home production. Sector 1 comprises agriculture, manufacturing, business services and other services of a specialized nature, which are activities that have no counterpart in home production, as reported in time use surveys. Sector 2 is the health and social

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[1] A discussion of social support programs and their differences is contained in the text. For more information see Esping-Andersen (1990, 1999).

Table 1:
Percentage Distribution of Hours of Market Work in Three Countries

Sector	United States	Italy	Sweden
1	69	67	68
2	8	6	14
3	23	28	18

The full definition of sectors is given in Table 2. Sector 1 is mainly manufacturing and business services, sector 2 is health and social work and sector 3 mainly unskilled or semi-skilled services.

work sector, which has home counterparts, especially in childcare. Sector 3 consists of all other sectors, which produce less specialized services which also have close substitutes in home production, such as retailing (a substitute for shopping time) and catering (a substitute for cooking time).

The share of sector 1 is very similar across the three countries, taking up about two thirds of market work. In contrast, there are large differences in the shares of the other two sectors. Sweden has a relatively larger health and social work sector, whereas Italy has the largest share in sector 3, exceeding the Swedish share of this sector by more than ten percentage points.[2] Why these large differences in the distribution of work?

One possible cause of these differences is related to past total factor productivity (TFP) growth. In our earlier work (Ngai and Pissarides, 2007, 2008) we showed that if final outputs are poor consumption substitutes for each other, employment shares grow faster in sectors characterized by lower rate of TFP growth. So if historically Swedish TFP growth in health and social work was much below growth in the United States and Italy, there could be a TFP explanation for the large share of this sector in Sweden. Similarly for unskilled services in Italy.

But this cannot be the main explanation for the type of cross-country differences shown in Table 1. The cross-country differences shown are in *shares*, i.e., in the ratio of hours in one sector to the sum of hours in the other sectors. Such differences need to be explained by differences in *relative* TFP levels. So if TFP is to explain the larger health and social care sector in Sweden, the ratio of TFP in sectors 1 and 3 to TFP in health and social work needs to be much larger in Sweden than in Italy or the United States. Moreover, if TFP were the reason for the differences in time allocations, the substitutions would not be exclusively between sectors 2 and 3 but they

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[2]Similar differences exist in the absolute number of hours worked in each sector. We define the data more precisely and discuss the experience of all countries in section 2.

would affect all sectors. We compute the differences in TFP ratios required to explain the different allocations shown in Table 1 for all countries in our sample, and conclude that they are implausible.[3]

We argue that the key reason for the large differences in the cross-country allocation of hours is policy and the home-market substitution. Sweden taxes market economic activity more heavily than either the United States or Italy do, and uses large parts of the revenue to subsidize the provision of social care in the market. Rational individuals withdraw labor from other activities and work more in social care. We study the policy differences across several OECD countries and quantify their impact on the sectoral allocation of work. The data requirements for this work are large and they are the main limiting factor in our choice of countries and time period.

Taxes can have distortionary effects on the sectoral allocation of work for two reasons. First, not all types of work are equally taxed. We find that all countries subsidize health and social care, but Sweden and other Scandinavian countries subsidize it much more than other countries do. The tax differentials between social care on the one hand, and all other economic activity on the other, vary a lot across countries, and this explains some of the sectoral distortions.

But the observed tax differentials and the implied substitution of final consumption goods across market sectors are not enough to explain the large distortions in the allocation of work that we find. They are significant and work in the right direction, but quantitatively the policy impact is not big enough to explain the data. For example, when an accountant's services are taxed and a childminder's services subsidized a family may hire an accountant for fewer hours and take the child to a childcare center, but the elasticity of substitution across these services is not big enough to give taxation the scope for a large quantitative impact.

We argue that a main factor behind the large distortions across sectors is the substitution between market and home production. We use data on home production to show that the market-home substitution explains most of the distortions that we see in the allocation of market work. We also investigate the extent to which the market-home substitution is influenced by policy. Intuitively the influence is obvious. When market goods and services are taxed households turn to producing some of those goods in the home, where work is untaxed. Similarly, when market-provided social care is subsidized,

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[3]Another possible cause of the observed differences in the distribution of work are differences in tastes. We do not model the origin of tastes, so we cannot properly evaluate such an explanation. But we still find this explanation implausible because the differences in tastes required to explain the data are very large and they are about market goods, e.g., that Swedes like health and social care much more than Italians do.

less of it is done at home and there is more take-up of social services in the market.

We find support for this intuitive argument: policy is an important factor behind the cross-country differences in the allocation of working time to the market and the home, but it is not the only one, especially in social care. Our model identifies the ratio of market to home technology and differences in tastes over home and market production as additional influences on the market-to-home substitution and further work is needed here to test whether the reasons for the differences in home production not explained by taxation are due to differences in tastes or technology, or to other factors.[4]

Market-home substitutions distort sectoral allocations in the market even when taxation is uniform, because they are a cause of differences in the elasticity of labor supply to different sectors. We argue that the elasticity of substitution between home and market production is zero for some goods, mainly manufacturing and specialized services, and positive for social work and for other semi-skilled or unskilled services, such as shopping and cooking. These substitutions, when combined with the differential tax treatment of social care and other services, drive our results, as they explain why differences in taxes and home production across countries have a differential impact on the distribution of economic activity.

We are not the first ones to study the impact of market-home substitutions on market economic activity, although we believe we are the first ones to distinguish between different sectors in an equilibrium model, and derive the distribution of market work across sectors. Freeman and Schettkat (1995) study micro time use data for a small number of countries and conclude that there is virtually one-for-one substitution between home and market activities across individuals, a claim that was disputed by Burda, Hamermesh and Weill (2008). Kelly Ragan (2006) looks at policy effects on the choice between home and market, with direct reference to home production time using various time use surveys, so in this respect her study is close to ours. But unlike us she studies total hours of work in a small sample of countries, using a variant of the model of Rosen (1997), one of the pioneers in this area of research. Total hours of work (in Sweden and how they compare with the Unites States) is also the focus of studies by Rogerson (2007) and Olovsson (2009), whereas Prescott (2004) and Rogerson (2006) compare taxation burdens and employment outcomes for several countries. Davis and Henrekson (2005) study questions similar to ours in a partial equilibrium

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[4]Several writers have written about the differences in the way that OECD citizens view the role of social care and family-related work in the home and the market. See for example, Esping-Andersen (1990, 1999), and Algan and Cahuc (2009), where questions related to religious beliefs and culture are investigated.

task-assignment model, and estimate the impact of taxation on employment in three sectors of economic activity, eating and drinking establishments, lodging and retail trade.[5] Their estimation results are consistent with the results of our model.

We construct an equilibrium and quantifiable model with the smallest number of sectors needed to capture the distortionary impact of uniform and biased taxation. As in the example of Table 1, we distinguish between three market sectors. One that includes all sectors that produce output that is not subsidized and has no close home substitutes; one with health and social work that has close home substitutes and is subsidized;[6] and one that includes all other sectors that have close home substitutes and are not subsidized (a full listing of two-digit sectors is given later in this paper, in Table 2). Corresponding to the three market sectors and given the assumptions that we are making, there are two types of home-produced goods, which we also call sectors for easier reference. One home sector produces goods that are close substitutes to health and social care (essentially, and because of data limitations, childcare) and the other produces goods that are close substitutes to all other services.[7]

Our model has simple linear production functions with no capital, which we believe is a useful restriction for the points that we want to make. The key to the model are two elasticities of substitution, the one between market goods and the one between market and home production. We show that general taxation has a greater impact on sector 3 than on sector 1, because neither sector is subsidized and sector 3 loses more hours of work to the untaxed home sector. But market hours in sector 2 respond to both the elasticity of substitution with home production and the subsidy given to market activities, so its relative size depends on the relative magnitude of each.

In order to confront our predictions to data we need three different types of data. First, we need to know the hours of work allocated to different sectors, which are available for a fairly large number of countries at the two-

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[5] They deliberately omit child care because of difficulties in constructing comparable subsidy rates across the countries in their sample, one of the challenges that we take up in this paper. Their sample of countries for the employment regressions varies between 9 and 14 countries, depending on data availability.

[6] Unfortunately, it is not possible to distinguish between high-skill health care, e.g., hospital treatment, and social work, such as childcare centers or elderly care. Ideally, our sector 2 should exclude high-skill health care which has no home substitutes.

[7] In Ngai and Pissarides (2008) we discuss in detail the kind of activities spent in home production and review their historical development. The sector allocations that we are adopting here are consisetent with that evidence. See also Robinson and Godbey (1997) for the US and Burda, Hamermesh and Weil (2008) for cross-country comparisons.

digit level through the data set KLEMS. Second, we need the size of social expenditure on child care, which can be obtained from the OECD Social Expenditure database SOCX. We compare the implied subsidy by combining the social expenditure data with sectoral data on gross output from KLEMS.[8] Finally, we need to know the hours allocated to different activities at home, which we obtain from time use surveys. We constructed comparable data sets for 19 OECD countries and we focus on cross-country differences around the time of the time use surveys, circa 2000. These countries include the United States and Canada, Australia and New Zealand, Japan and Korea, and several European countries from Scandinavia to the Mediterranean, so we have a good mixture of welfare states and policy regimes.

Section 1 outlines our model of three market and two home sectors. We derive equilibrium allocations as functions of three sets of parameters, preferences, technology and policy. In section 2 we describe the relevant data for the 19 countries in our sample and summarize their main features. In section 3 we discuss the model predictions for the cross-country differences in the distribution of hours of work, beginning with cross-market substitutions (section 4) and following up with substitutions between market and home production (sections 5 and 6). The role of policy in influencing the marketization of time is more fully discussed in section 7.

1   The model

Consumer allocations. We solve the time allocations for a representative agent who has a static CES utility function defined over consumption goods produced at home and in the market, and over leisure. She is a price and wage taker in the market, conditional on taxes and transfers chosen by the government, and chooses home production conditional on linear production functions. There is no capital in the model so it can be solved as a static resource allocation problem, with linear production functions for market goods as well and market clearing throughout. There are no profits in equilibrium and all income is in the form of wages. The government balances its budget with lump-sum transfers.

Government plays a complex role in this economy. It taxes wage income at rate τ and each market good at a net rate t_i (the gross tax rate less any subsidy). It also taxes or subsidizes employment, to be specified later. It makes lump-sum transfers T to the representative agent, which are a component of its social policy and include an item for balancing the budget. It

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[8]For KLEMS see http://www.euklems.net/index.html, and for SOCX, http://www.oecd.org/document/9/0,3343,en_2649_34637_38141385_1_1_1_1,00.html

employs labor to produce and supply goods to consumers. Government goods might be of many different kinds, but because our interest is in the distribution of hours, we can follow Prescott (2002) and simplify the formal model by assuming that all goods are perfect substitutes for private consumption.[9]

The representative agent's utility function is

$$U\left(c, l_m, l_h\right) = \ln c + v(1 - l_m - l_h), \tag{1}$$

where c is a consumption aggregate, l_m is market work (private and government), and l_h is home work. $v(.)$ is an increasing concave function. Aggregate consumption is a CES aggregate of three types of goods, denoted by $\tilde{c}_i$,

$$c = \left[\sum_{i=1}^{3} \omega_i \tilde{c}_i^{(\varepsilon-1)/\varepsilon}\right]^{\varepsilon/(\varepsilon-1)}, \tag{2}$$

where $\varepsilon \geq 0$ is the constant elasticity of substitution and $\omega_i > 0$, $\Sigma\omega_i = 1$. Each $\tilde{c}_i$ is a composite of market-produced and home-produced goods in sector i. Sector 1 is comprised of all goods that have no home-produced substitutes, so $\tilde{c}_1$ is the market good c_1. In sectors 2 and 3, $\tilde{c}_i$ is a CES aggregate of market and home produced goods,

$$\tilde{c}_i = \left[\psi_i c_i^{(\sigma_i-1)/\sigma_i} + (1 - \psi_i)c_{ih}^{(\sigma_i-1)/\sigma_i}\right]^{\sigma_i/(\sigma_i-1)} \qquad i = 2, 3, \tag{3}$$

where c_i is market-produced consumption, c_{ih} is consumption of goods produced at home, $\sigma_i \geq 0$ is the elasticity of substitution between home and market consumption for each good i and $\psi_i \in (0, 1)$.

The disutility from work is independent of sector or location. Because of perfect labor mobility, the wage rate is the same in all sectors, so the budget constraint for market goods is,

$$\sum_{i=1}^{3}(1 + t_i)p_i c_i \leq (1 - \tau)wl_m + T. \tag{4}$$

Government employment is included in l_m, and the value of all goods and services supplied by the government are in T.

It is important that government goods are rationed, either by the government or by some external physical constraint. For example, free education stops after a certain level, and before then it is rationed by the availability

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[9]The assumptions made about the substitution possibilities between government-supplied goods and goods bought privately influence only the size of the implicit lump-sum transfer from the government to the representative agent, which plays no role in our analysis.

of time (i.e., the consumer cannot demand an infinite amount). We assume that all handouts of government goods are less than the quantity that is demanded privately, so the consumer tops up the government handout, and market clearing is at the competitive level.

The government also subsidizes consumers when they buy some private goods, or it may produce these goods and hand them out at a reduced price. For these goods we assume that the consumer has unlimited choice to buy as much quantity as she wants at the subsidized price, so we enter the goods in c_i and deduct the subsidy from t_i.

The home production constraints for sectors 2 and 3 are,

$$c_{jh} \leq A_{jh}l_{jh}, \quad j = 2, 3, \tag{5}$$

where l_{jh} is the time allocated at home to each activity j and A_{jh} is labor productivity in each activity.

In order to solve the problem it is convenient to define a new budget constraint for total work $l \equiv l_m + l_h$, that incorporates the production constraints (5). Define "total" after-tax income by $(1 - \tau)wl$, and re-write (4) as

$$\sum_{i=1}^{3}(1 + t_i)p_ic_i \leq (1 - \tau)wl - (1 - \tau)w(l_{2h} + l_{3h}) + T. \tag{6}$$

Next, substitute l_{jh} from (5) into (6), to obtain,

$$\sum_{i=1}^{3}(1 + t_i)p_ic_i + \sum_{j=2}^{3} p_{jh}c_{jh} \leq (1 - \tau)wl + T, \tag{7}$$

where $p_{jh} = (1 - \tau)w/A_{jh}$ is a net implicit price for home-produced goods. The numerator is the net wage that the household could get by supplying one unit of labor to the market, and the denominator is the number of units of the home good that she could get by supplying the same unit to home production.

The consumer problem is the maximization of (1)-(3) subject to the single constraint (7). The first-order conditions for market goods, home goods, and time are, respectively,

$$\frac{1}{c}\frac{\partial c}{\partial c_i} - \lambda(1 + t_i)p_i = 0, \quad i = 1, 2, 3 \tag{8}$$

$$\frac{1}{c}\frac{\partial c}{\partial c_{jh}} - \lambda p_{jh} = 0, \quad j = 2, 3 \tag{9}$$

$$-v'(1 - l) + \lambda(1 - \tau)w = 0. \tag{10}$$

λ is the undefined multiplier for the budget constraint. From these we derive some key results.

Total work hours. From (8), (9) and (7) we obtain

$$\lambda = \frac{1}{(1-\tau)wl + T},\tag{11}$$

and so (10) gives the condition for total work hours, l :

$$\frac{1}{v'(1-l)} - l = \frac{T}{(1-\tau)w}.\tag{12}$$

In the absence of lump-sum transfers, total work depends only on preference parameters, because of the logarithmic utility of aggregate consumption. The supply of hours to the market then varies only to the extent that there are substitutions between home and market production (which we call, following Freeman and Schettkat, 2005, "marketization"). In Ngai and Pissarides (2008) we showed that such substitutions can give non-trivial labor supply dynamics, driven by the dynamics of technology, which mimic some key long-run dynamics of hours of work in the United States. We show below how marketization can vary with technology and policy parameters in this model.

If $T > 0$, both the dynamics and cross-sectional properties of the supply of labor become richer, because now there are two substitution margins, the one for overall leisure and marketization. Focusing on the former, higher transfers or taxes imply lower overall hours of work and more leisure, whereas higher wages imply more work.

Marketization. The composite good $\tilde{c}_j$ can be acquired by buying some c_j from the market at price p_j, or by producing it at home as c_{jh} at a (shadow) unit cost p_{jh}. We define "marketization" as the substitution of one unit of c_j for c_{jh}. The extent of marketization is obtained by dividing condition (9) by (8), for good j and jh respectively:

$$\frac{c_{jh}}{c_j} = \left(\frac{\psi_j}{1-\psi_j} \frac{p_{jh}}{(1+t_j)p_j} \right)^{\sigma_j} \quad j = 2, 3.\tag{13}$$

Recalling that $p_{jh} = (1-\tau)w/A_{jh}$, it follows that consumers marketize more of good j if they have higher net wages, if the market good is cheaper or if labour productivity in home production is lower. The impact of these parameters depends on the elasticity of substitution between market and home goods. In the limit, as $\sigma_j \to 0$, the two types of goods are consumed in fixed proportions. But for $\sigma_j > 0$ there can be a lot of differences in the marketization of home production across individuals, countries or over time, depending on the values taken by taxes and market prices.

Relative demand for market goods. We next solve for the ratio of real demand for market goods 2 and 3, which have home substitutes, to the demand for good 1. The objective is to obtain from these ratios the employment

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shares in each sector of market activity. Dividing condition (8) for good j by the one for good 1, we obtain,

$$\frac{c_j}{c_1} = \left(\frac{\omega_j \psi_j}{\omega_1}\right)^\varepsilon \left(\frac{(1+t_j)p_j}{(1+t_1)p_1}\right)^{-\varepsilon} \left(\frac{c_j}{\tilde{c}_j}\right)^{1-\varepsilon/\sigma_j}, \tag{14}$$

We note that $c_j/\tilde{c}_j$ is the share of good j that is marketized. It follows that the relative market demand for good j is a decreasing function of its relative price and, under the plausible restriction $\varepsilon \le \sigma_j$, an increasing function of the extent of its marketization. This is an important channel through which policy influences relative market shares. Higher and uniform taxes on all goods (i.e., $t_j = t_1$) do not affect relative consumption shares for given marketization, but they imply less marketization for good j and so a lower market share for this good.

The sectoral allocation of time. In order to derive the market employment shares we make use of market clearing and the production functions for each market good. Let the production functions be

$$c_i \le A_i l_i, \quad i = 1, 2, 3. \tag{15}$$

The notation parallels that for home production, with A_i standing for the (market) labor productivity of good i and l_i for the number of hours allocated to it.

The revenue from the sale of good i is $p_i A_i l_i$, and is used to pay for wages and employment taxes net of subsidies. Denote the net employment tax rate by t_e. Free mobility of labour implies that wages are the same in all market sectors, so relative market prices are given by the ratio of the technology parameters:

$$(1+t_e)w l_i = p_i A_i l_i \implies \frac{p_i}{p_j} = \frac{A_j}{A_i}. \tag{16}$$

The relative price of the market good to the implicit price of the home good is also obtained from (16), by substituting w from it into the condition $p_{jh} = (1-\tau)w/A_{jh}$,

$$\frac{(1+t_j)p_j}{p_{jh}} = \frac{(1+t_j)(1+t_e)A_{jh}}{(1-\tau)A_j}. \tag{17}$$

We define the "tax wedge" that applies to sector j, denoted t_{wj}, by[10]

$$t_{wj} = 1 - \frac{1-\tau}{(1+t_j)(1+t_e)}. \tag{18}$$

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[10]For small tax rates this is approximately equal to the tax wedge used in econometric studies, $t_{wj} = \tau + t_j + t_e$, but taxes in our sample of countries are not small and the approximation is not good.

Relative prices for all goods then are,

$$\frac{p_i}{p_j} = \frac{A_j}{A_i} \tag{19}$$

$$\frac{(1+t_j)p_j}{p_{jh}} = \frac{A_{jh}}{(1-t_{wj})A_j} \tag{20}$$

$$i = 1, 2, 3 \qquad j = 2, 3.$$

Given now the linear production functions, the marketization condition (13) translates into the following condition for the marketization of time in sector j :

$$\frac{l_j}{l_{jh}} = \left(\frac{1}{\psi_j} - 1\right)^{-\sigma_j} \left(\frac{A_j}{A_{jh}}\right)^{\sigma_j - 1} (1 - t_{wj})^{\sigma_j} \quad j = 2, 3. \tag{21}$$

The marketization of time is driven by three sets of variables, preferences, productivity, and taxes. For $\sigma_j > 1$, more is marketized when market productivity is higher than home productivity.[11] More importantly for our present objectives, the impact of policy is summarized in a single composite, the tax wedge. Higher tax wedge leads to less marketization and the impact is bigger when the elasticity σ_j is bigger.

Turning now to market sectors, we derive the employment ratios of sectors from (14) and the linear production functions:

$$\frac{l_j}{l_1} = \left(\frac{\omega_j \psi_j}{\omega_1}\right)^{\varepsilon} \left(\frac{A_1}{A_j}\right)^{1-\varepsilon} \left(\frac{1+t_j}{1+t_1}\right)^{-\varepsilon} \left(\frac{c_j}{\tilde{c}_j}\right)^{1-\varepsilon/\sigma_j}. \tag{22}$$

Calculating $c_j/\tilde{c}_j$ from (3), (13) and (20), we obtain

$$\frac{c_j}{\tilde{c}_j} = \psi_j^{-\sigma_j/(\sigma_j-1)} \left[1 + \left(\frac{1}{\psi_j} - 1\right)^{\sigma_j} \left(\frac{A_{jh}}{A_j(1-t_{wj})}\right)^{\sigma_j-1}\right]^{-\sigma_j/(\sigma_j-1)}. \tag{23}$$

(22) is a key equation for the model because it gives the dependence of market sectors on policy. For given taxes and subsidies, employment shares are driven by technology. Under the plausible restriction $\varepsilon < 1$, technologically less advanced sectors attract bigger shares (Ngai and Pissarides, 2008). Policy influences employment shares in two ways. If two sectors are equally

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[11]To see the intuition, suppose the goods are perfect substitutes, then $\sigma_j \to \infty$ and all production moves to the more productive location. If $\sigma_j = 0$ the goods are produced and consumed in fixed proportions, and so more labor moves to the less productive location to compensate.

taxed, policy influences their relative size only because of the substitutions between home and market production. Intuitively, the elasticity of the supply of labor to a sector is higher when the sector produces goods that have close substitutes in home production ($\sigma_j > 1$). But not all sectors are equally taxed, because of social subsidies. If $t_j < t_1$, as would be the case if sector j is subsidized and sector 1 is not, the relative employment of sector j is higher because the demand for its final output is higher.

The model makes strong predictions about two features of sectoral allocations that can be confronted with data. first, the relative employment shares in (22) can be obtained for a large number of countries from industry employment data, and second the marketization equation (21) can be tested against data that combine time use surveys with industry employment data.

2   Data derivation and description

Time use surveys have proliferated recently but with very minor exceptions they are still mainly one-off surveys that follow similar principles across countries and over time. The United States began an annual survey in 2003 and the European Union is in the process of setting up Europe-wide standards for regular surveys across the European Union. However, for the purposes of this study we are restricted to a small number of surveys; we selected one survey for as many countries of the OECD as we could find, undertaken as close to the turn of the millennium as possible. For most countries this was the only available information.

Time use surveys record "market work" as the aggregate of the number of hours spent at the place of work, time taken to travel to work and any other activities related to market work, such as working at home in evenings or weekends, job search, reading literature connected with the job etc. For this reason market work reported in time use surveys exceeds hours of work reported in household or employer surveys. In the countries of our sample the mean log difference between market work reported in time use surveys and the total hours reported by employers over a comparable period of time is 27.3, with standard deviation 4.7, so differences across countries are of a comparable order of magnitude.

Time use surveys, however, do not report the occupational or industrial breakdown of market hours. The only source of the industrial breakdown of hours of work that is comparable across countries is the OECD KLEMS database, which is employer-based. We use this survey to get the percentage distribution of total market hours across the model's three sectors but either the same data set or the time use surveys for two different sources of total

The three sectors of market work

production and business services		health	other services
agriculture and allied	wholesale trade	health and social work	sale, motor repairs retail trade
mining and quarrying	air transport, post and telecom		hotels and restaurants
manufacturing	finance, insurance, real estate and business services		inland transport water transport aux. transport
gas, electricity, water	education		refuse disposal recreational, other personal
construction	membership organizations, media activities		
	public admin. and defence, soc. security		

All economic sectors in KLEMS are included except for the sector "private households with employed persons", which is excluded from the analysis because of apparent inconsistencies in the data.

hours of work.

Consider first the distribution of aggregate hours of market and home work in the nineteen countries in our sample.[12] Figure 1 shows a clear negative relation between market and home hours. Both home and market hours are from the same time use surveys. A regression line through the points has slope -0.55 with an $R^2 = 0.56$, indicating that for every extra hour of market work, home work falls on average by about 33 minutes. With regard to levels, market and home work are about the same on average but there are variations across countries, with the two Asian countries at one extreme in favor of market work over home production, and the continental European countries at the other extreme of more home hours relative to market.

We obtained the rest of our data mainly from two large OECD databases, KLEMS and SOCX. KLEMS gives hours of work for two-digit sectors with very few gaps for most countries, and covers all countries in the sample except for Canada, Norway, and New Zealand.[13] We grouped the two-digit sectors into the model's three sectors according to the classifications in Table 2. The market activities in the sub-sectors included in sector 3 broadly correspond to the home-production activities reported in time use surveys, e.g., hours of work in the retail sector correspond to time spent shopping in time use

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[12]Full definitions, year of the survey and source are given in the data Appendix.

[13]For Canada and Norway we used KLEM's predecessor, STAN, and for New Zealand we used country sources on employment shares and total hours to get sectoral hours.

surveys, restaurants match time spent cooking, etc. For sector 2, all time use surveys report hours of childcare, which is a close substitute for market-based childcare, and some report a much smaller number for care of other dependents. Given this information, ideally we would have wanted to split the sector into two, one for health services such as hospital treatment, which has no home substitutes, and one for caring services, with home substitutes. However, this is not possible with the available data sets, so we treat the aggregate of health and social care as the market activity with childcare as its close home substitute.

The average shares of each of our three sectors for the last ten years of the sample are shown in Figure 2. Sector 1 is the biggest sector in all countries, but the most interesting fact that emerges from this figure is that despite its size, the cross-sectional variation in the share of sector 1 is less than that in the other sectors. This is consistent with our model, to the extent that the two asymmetric influences on hours of market work, the subsidization of some activities and the market-home production substitution, impact directly on the other two sectors.

The largest shares of sector 2 hours are in the four Scandinavian countries, and the smallest in the two Mediterranean and two Asian countries covered by the sample. Although naturally no country is exactly the same as another in its treatment of welfare, there are country clusters with broadly similar policies that correspond to the rankings in Figure 2 (see Esping-Andersen 1990, 1999). The Scandinavian countries have the highest levels of overall taxation but they use a large part of the revenue to subsidize market-based social services. They have the largest sector 2 share. Next come the continental European countries, which also have high taxation and subsidize heavily social services but not to the extent of the Scandinavian countries. Anglo-Saxon countries have generally lower taxation and welfare transfers, so they have relatively larger sectors 1 and 3, and correspondingly smaller sector 2 share. Finally, southern European countries do not give support to market-based social care and have the smallest relative size for sector 2. Japan and Korea are in line with southern European countries with no subsidy to market-based social care.

Policy is characterized by three types of instruments, taxes, health and social care subsidies and lump sum transfers. We focus on employment shares and marketization, which are independent of lump sum transfers, so we do not attempt a calculation of them. The tax rates on labor income, consumer spending and employment are given in OECD publications (see the Appendix). For each country we also calculate the employment subsidy rate as the ratio of total spending on "active employment measures" to the wage bill. The combination of these taxes net of the employment subsidy gives the tax

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wedge for sectors 1 and 3.

For the health and social work sector, different countries follow different subsidization policies, and detailed case by case modeling for each country is not feasible. We follow a common approach to defining the subsidy rate, which captures the extent of subsidization of this sector. We calculate two alternative subsidy rates, one applying to social care only and one including health subsidies.

The main substitution between market and home is in social care, which is primarily childcare. Our first subsidy measure includes the value of "benefits in kind" in social care, reported in SOCX, which is the money governments spent in subsidizing day care centers.[14] The second subsidy adds to this health spending on benefits in kind. Health spending is on average much larger than social care spending but it encompasses both medical services and drugs and medical equipment, which are not part of the output of the health sector. Health expenditure data for the United States shows that about half the health spending is on drugs and equipment and the other half on medical services.[15] We applied this fraction to all countries and so divided by 2 the total health subsidy reported in SOCX. Adding the result to social care spending yields our second health and social care subsidy.

The subsidy rate on health and social care is defined as the ratio of each subsidy amount calculated as in the preceding paragraph to the gross output of the health and social work sector. As the value-added of private health and social care services is not taxed, the subsidy rate calculated for each country is the net expenditure tax on the model's sector 2. The simple correlation coefficient between the two calculated subsidy rates is 0.87, so countries that subsidize social care heavily (as a rule, the Scandinavian countries) also subsidize health more generously. Figure 3 shows the calculated tax wedge on all sectors except for health and social care and the tax wedge calculated for sector 2 with the broader subsidy that includes health. Countries are sorted according to the differential between the two rates. The Scandinavian countries have the biggest differential between the two tax rates and the southern European and North American countries the smallest, with the correlation coefficient between the two wedges equal to -0.41.

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[14]There are two types of residential care (for old age and incapacity-related) and one of family day care. In addition, all three types have some other benefits in kind associated with them.

[15]reference?

3 Explaining country differences

We are interested in making quantitative predictions of the percentage distribution of hours of work across the model's three sectors, roughly corresponding to manufacturing and business services, health and social work and unskilled services. Given the structure of the model, it is convenient to derive these predictions from the model's predictions of the ratios l_2/l_1 and l_3/l_1, by making use of the relation linking the percentage hours distribution with the ratios of hours,

$$
\begin{aligned}
s_j &= 100 \frac{l_j/l_1}{\Sigma_{i=1}^3 l_i/l_1} \qquad j = 1, 2 \\
s_1 &= 100 - (s_2 + s_3).
\end{aligned}
\tag{24}
$$

The key equations used in the predictions of the ratios are (21), (22) and (23). Equation (22) shows that the impact of the parameters on the ratio of hours can be divided into the impact of the substitution across the three market goods and the impact of the substitution between market and home production. We approach the problem by first investigating the strength of the substitution across the three goods and then introduce the market-home substitution. We investigate how much the model contributes to the explanation of country differences compared with a "naive" prediction that all percentage distributions are equal to the sample means except for random terms.

In order to make the predictions we need values of the two substitution parameters, ε and σ_j for $j = 2, 3$.[16] Previous estimates of the parameters give the plausible values of the elasticity of substitution between manufacturing and services in the range $0.0-0.3$. Given that in our model ε is the elasticity of substitution between a component of service consumption and other services, a value in the upper bound of this range seems more plausible, so we choose $\varepsilon = 0.3$ as our benchmark. The value of the elasticity of substitution between home production and all market goods is in the range $1.5-2.3$. Again, because in our model σ_j is the elasticity of substitution between market and home goods in sub-sectors of the economy with higher substitution possibilities, a value in the upper range of the aggregate estimates is more appropriate. We choose $\sigma_j = 2.3$ as our benchmark, although even higher values might be appropriate.

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[16] For estimates of the elasticity of substitution between home production and all market goods see Rupert, Rogerson and Wright 1995, McGrattan, Rogerson and Wright 1997 and Chang and Schorfheide 2003. The elasticity ε is further discussed in Ngai and Pissarides (2008).

4 Substitutions across market goods

If we shut down the market-home substitution margin (e.g., by evaluating the model solutions at $\psi_j = 1$), the cross-country hours distribution could differ for two reasons: different tax rules across sectors or different productivity ratios. For $\psi_j = 1$ equations (22) and (23) yield,

$$\frac{l_j}{l_1} = \left(\frac{\omega_j}{\omega_1}\right)^{\varepsilon} \left(\frac{A_j}{A_1}\right)^{-(1-\varepsilon)} \left(\frac{1+t_j}{1+t_1}\right)^{-\varepsilon}. \tag{25}$$

For sector 2, $t_2 < t_1$ in all countries in the sample, but for sector 3, $t_3 = t_1$. Taxes therefore cannot predict differences in the ratio l_3/l_1, but they could predict differences in the ratio l_2/l_1. These differences are measured by the last term in (25). In deviations from log means we obtain,

$$\ln \frac{l_{2k}}{l_{1k}} - E \ln \frac{l_2}{l_1} = -\varepsilon \left(\ln \frac{1+t_{jk}}{1+t_{1k}} - E \ln \frac{1+t_j}{1+t_1}\right) \tag{26}$$

where k denotes the country index and E in front of the log denotes the sample mean. We use (26) to obtain a prediction for the ratio l_2/l_1 for each country. Using this prediction in (24) along with the actual l_3/l_1 we obtain a prediction for the share of market hours in sector 2.

Figure 4 reports the results of these calculations. Panel a (figure 4a) reports the results for $\varepsilon = 0.3$, which we consider the most reasonable value at this level of aggregation. The predictions are highly correlated with the data ($\rho = 0.87$), which shows that the impact of taxes and subsidies on sector 2 share is significant. But the quantitative impact of the calculated tax rates when only market substitutions are considered is too small to explain the data. The predicted series in figure 4a does better than the naive prediction that equates each country's share to the sample mean, but has much less variation than the data series, as the deviations about the 45^0 line show. The root of the mean squared error (rmse) under the naive prediction is 3.33 and under the model's prediction 2.81, showing a clear improvement.

The predictions in Figure 4a were derived with the tax rate obtained when only social work subsidies are taken into account. The predictions with the broader measure of subsidies that includes also half of health spending by the government are very similar and not reported. The correlation coefficient of these predictions with the data is $\rho = 0.85$ and the rmse of the prediction is 2.71. This similarity is implied by the correlation between the two tax series and the fact that the predictions are obtained by comparing deviations form sample means (the countries that subsidize social work more heavily than the mean also subsidize health care more heavily than the mean).

The substitution margin that drives the results in Figure 4a is across market sectors only. It requires that as health and social care are subsidized, and the other sectors taxed, consumers switch their consumption from the other goods to health and social care. Our finding is that such a switch takes place, but there is no evidence that health and social care goods are sufficiently close substitutes to these other goods to justify large substitutions, even when there are large subsidies to health and social care. It is natural to conclude from this that had there been more substitution possibilities the model would have performed better. Indeed, a log-linear regression of the ratio of hours in sectors 2 to 1, to their tax ratio yields a coefficient estimate of 1.57. Figure 4b shows the predicted series for the hours share for $\varepsilon = 1.57$. A regression line through the points virtually coincides with the 45^0 line, and gives a good fit ($R^2 = 0.72$), which shows that the best-fitting specification explains a large part of the variation in the employment share of health and social care. The rmse of this prediction goes down to 1.80. Korea is the only outlier, which is not surprising given its very small employment share in this sector. However, the caveat remains that the value of the elasticity required to give this fit is far off the range of plausible values estimated in a number of studies.

The cross-country differences predicted for sector 2 influence the shares of the other two sectors symmetrically, because the denominator in (24) is common and the numerator is unchanged for both sectors. This goes against the evidence shown in Figure 2, where there is more variation in the share of sector 3 and its share is better (negatively) correlated with the share of sector 2 than is the share of sector 1. Computing the implied share of sector 3 for $\varepsilon = 0.3$ and $\varepsilon = 1.4$ improves the prediction of the sector 3 share over the naive one, but only marginally. The rmse for the naive specification (all countries have the same share 3 sector as the sample mean) is 3.42, for $\varepsilon = 0.3$ it is 3.34 and for the best fitting $\varepsilon = 1.57$ it is 2.97. This is further evidence that although taxation contributes to the cross-country variation in employment shares it is not the only (or even main) explanation of such differentials.

Of course, it is possible that the part of the variation not explained by tax differentials can be explained by productivity differences across countries. To investigate the contribution of productivity differences we require data for the productivity ratios in sectors 2 and 3, A_j/A_1. Given the difficulty of obtaining good estimates of relative productivity differentials, which are also comparable across countries, we approach the problem in reverse. We calculate the productivity differences required if market productivity is to explain the observed differentials in the cross-country hours distributions, given the observed tax differentials for sector 2.

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From (25) we obtain the following equation for the productivity ratios:

$$\frac{A_j}{A_1} = \left[\left(\frac{\omega_j}{\omega_1} \right)^{-\varepsilon} \left(\frac{l_j}{l_1} \right) \left(\frac{1+t_j}{1+t_1} \right)^{\varepsilon} \right]^{-1/(1-\varepsilon)}. \qquad (27)$$

As with the tax predictions, we take logs and compute the difference from the log mean required to match the tax predictions with the data. We normalize the mean to 1 for both sectors 2 and 3 and report the results in Figure 5.

The required productivity ratios in most cases are implausibly large. The best way to see the intuition behind these results, given that they are ratios of ratios, is to conjecture that because tradeables are concentrated mainly in sector 1, productivity differences across the open economies of the OECD should be less for sector 1 than for the other sectors. Suppose for the sake of the intuitive argument that sector 1 productivities are the same in all countries. Figure 5 then shows that in order to explain the larger relative employment in health and social care in Denmark, hourly productivity in that country in health and social care has to be half of the sample mean. Similar results hold for the other Scandinavian countries. Similarly, in order to explain the smaller size of this sector in Spain, hourly productivity in that country has to be 65% more than the average hourly productivity in the OECD sample. The most extreme case is Korea, where the health and social sector is so small that productivity in that sector needs to be nearly 8 times as high as the mean to explain it.[17] The differentials required for the allocations in sector 3 are of a similar order of magnitude.

Such differences in relative productivities are implausible, given measured productivity differences. But we find even more implausible the requirement that the productivity differences in sector 2 and 3 should be negatively correlated. The simple correlation coefficient of the points shown in Figure 4 is -0.35, and if Portugal and Korea are excluded it rises to -0.70. Thus, if productivity differences are to explain the observed differences in hours, the countries that are more efficient than the average in sector 2 have to be less efficient in sector 3. There is no reason for such a ranking in productivities. Of course, the reason that the model requires this negative correlation is that the countries that have large social sectors, like the Scandinavians, are also the countries that have small unskilled sectors, so the required productivities have to go in opposite directions.

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[17]Korea is an outlier not shown in figure 5. Undoubtedly, trade and its more recent development plays a role in explaining the large manufacturing sector in that country. Nevertheless, the required productivity difference required to explain its relative sector 3 size is not an outlier, so the feature that drives the very high productivity requirement in the health and social sector is the very small size of that sector.

5 Substitutions between market and home production

Our main argument is that because there are strong substitution possibilities between market and home goods, home production can explain both the bigger impact of policy on the hours distribution across countries and the asymmetric response of sectors 1 and 3 to it. We investigate first the impact of home production on the hours distribution whatever the source of differences in home production across countries. By doing this we are allowing for the possibility that our model of home production does not capture all the influences on home production, in particular on activities such as childcare, which might be influenced by cultural attitudes.[18] We follow this analysis by investigating the impact of policy on cross-country differences in home production.

Formally, in this section we are fixing the home production time l_{jh} for sectors 2 and 3 at the observed values in all countries, and derive the optimal allocations between the three market goods. So home production plays a role in market choices through the substitution between market and home goods in final consumption, but the equation for the optimal allocation of time to the market and the home, (21), is not imposed. The outcome for the market allocations is (22), with the consumption levels replaced by their production functions:

$$
\begin{aligned}
\frac{c_i}{\tilde{c}_i} &= \left[\psi_i + (1 - \psi_i) \left(\frac{c_i}{c_{ih}} \right)^{-(\sigma_i - 1)/\sigma_i} \right]^{-\sigma_i/(\sigma_i - 1)} \\
&= \psi_i^{-\sigma_i/(\sigma_i - 1)} \left[1 + (\frac{1}{\psi_i} - 1) \left(\frac{A_i}{A_{ih}} \right)^{-(\sigma_i - 1)/\sigma_i} \left(\frac{l_i}{l_{ih}} \right)^{-(\sigma_i - 1)/\sigma_i} \right]^{-\sigma_i/(\sigma_i - 1)} \quad (28)
\end{aligned}
$$

Substitution of (28) into (22) yields

$$
\begin{aligned}
\ln \frac{l_j}{l_1} &= \varepsilon \ln \frac{\omega_j}{\omega_1} + \frac{\sigma_j(1 - \varepsilon)}{\sigma_j - 1} \ln \psi_j - (1 - \varepsilon) \ln \frac{A_1}{A_j} \quad (29) \\
&\quad - \varepsilon \ln \left(\frac{1 + t_j}{1 + t_1} \right) - \frac{\sigma_j - \varepsilon}{\sigma_j - 1} \ln \left(1 + x_j \left(\frac{l_j}{l_{jh}} \right)^{-(\sigma_j - 1)/\sigma_j} \right)
\end{aligned}
$$

where $x_j \equiv (1/\psi_j - 1) (A_j/A_{jh})^{-(\sigma_j - 1)/\sigma_j}$ is a function of preference and productivity parameters. Taking a log-linear approximation to the last term

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[18] See the references in footnote 4.

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of (29) about the sample mean we obtain,

$$\ln\left(1 + x_j \left(\frac{l_j}{l_{jh}}\right)^{-(\sigma_j-1)/\sigma_j}\right) \tag{30}$$

$$= \ln\left(1 + x_j e^{\bar{z}_j}\right) + \frac{x_j e^{\bar{z}_j}}{1 + x_j e^{\bar{z}_j}} \frac{\sigma_j - 1}{\sigma_j}\left(\ln\left(\frac{l_j}{l_{jh}}\right) - E\ln\left(\frac{l_j}{l_{jh}}\right)\right) \tag{31}$$

where $z_j = \ln\left(l_j/l_{jh}\right)^{-(\sigma_j-1)/\sigma_j}$. The prediction in deviations from the log mean for sector 2 is therefore the sum of two terms, the tax terms in (26) and a second home production term, which, noting the coefficients in (29) becomes

$$\frac{x_j e^{\bar{z}_j}}{1 + x_j e^{\bar{z}_j}} \frac{\sigma_j - \varepsilon}{\sigma_j}\left(\ln\left(\frac{l_j}{l_{jh}}\right) - E\ln\left(\frac{l_j}{l_{jh}}\right)\right). \tag{32}$$

For sector 3 the only term in the prediction is (32) for $j = 3$, as there are no tax terms.

The first coefficient in front of (32) is a number between 0 and 1 but we have no information on its value, being a combination of preference and technology parameters over market and home consumption. If this coefficient is 0 home production plays no role in the allocation of market work, so it is obviously important for our results. However, it turns out that the results are robust to a large range of values for this coefficient, once it exceeds a value such as 0.2 or 0.3. We followed the following approach to finding a value for it. $\bar{z}_j$ can be calculated directly from the data on home and market production. To get a value for x_j we assume that the productivity ratio A_j/A_{jh} is 1 in both sectors and that the preference ratio $(1 - \psi_j)/\psi_j$ is equal to the average ratio of the shares of market to home production. These targets hold exactly for $\sigma_j = 1$ but we do not impose this restriction on σ_j in any of the other calculations. The outcome for each sector is,[19]

$$\frac{x_2 e^{\bar{z}_2}}{1 + x_2 e^{\bar{z}_2}} \frac{\sigma_2 - \varepsilon}{\sigma_2} = 0.61 \tag{33}$$

$$\frac{x_3 e^{\bar{z}_3}}{1 + x_3 e^{\bar{z}_3}} \frac{\sigma_3 - \varepsilon}{\sigma_3} = 0.80. \tag{34}$$

The model predictions with these values are shown in Figures 6a and 6b. The model fits the data well except for one outlier in sector 3, Korea. The

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[19] A log linear regression estimate of (29) and (32) over the cross section of 19 countries fits the data well and gives the following estimates for this coefficient: 0.67 for sector 2, with p value 0.0003, and 0.34 for sector 3, with p value 0.0007. The regression for sector 2 also gives a new value for ε but still one that we would regard to be too high, 0.77, with p value 0.03.

rmse for sector 2 is reduced from 2.81 when only the impact of taxes is taken into account, to 1.66, and for sector 3, when Korea is excluded, from 3.34 to 2.49.[20]

6   Full model predictions

We now come to the predictions with the full two-equation model, shown in (21) and (22). Noting that the consumption ratio in (22) can be written as in (28), we make use of (21) to substitute out the unobserved productivity and taste parameters to arrive at an expression that contains only observed variables and a very small number of parameters with known values:

$$
\frac{l_j}{l_1} = \left(\frac{\omega_j \psi_j}{\omega_1} \right)^{\varepsilon} \psi_j^{-\frac{\sigma_j - \varepsilon}{\sigma_j - 1}} \left(\frac{A_j}{A_1} \right)^{-(1-\varepsilon)} \left(\frac{1+t_j}{1+t_1} \right)^{-\varepsilon} \left[1 + \left(\frac{l_j}{l_{jh}} \right)^{-1} (1 - t_{wj}) \right]^{-\frac{\sigma_j - \varepsilon}{\sigma_j - 1}} .
$$

(35)

Taking logs and assuming that preference and productivity parameters are common across the countries of our sample, we obtain predictions for the deviations from log means in terms of the marketization ratio, tax rates and the two preference elasticities. The result of these predictions is shown in Figures 7a and 7b. We emphasize the main difference between these predictions and the ones shown in Figures 6a and 6b: whereas in Figures 6a and 6b home production is assumed to be exogenous, in the predictions in Figures 7a and 7b it is assumed that it satisfies (21). However, the predictions in Figures 7a and 7b do not impose equality of productivity of home production, i.e., the ratios A_j/A_{jh} can differ across countries.

Imposing the restrictions in (21) should be expected to increase the prediction error of the equations but the fact that these equations can predict the market shares without imposing equality of the home productivity ratios or use any approximations is an advantage. It turns out that the predictions with the full model are slightly worse than the ones when home production is exogenous, but they still track the cross-country data well. In Figure 7a the rmse is 2.40, compared with 2.81 when only expenditure taxes and market substitutions are taken into account and 1.66 when home production time is exogenous and the log-linear approximation used. In Figure 7b Korea is still a large outlier, essentially because the very small number of hours of

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[20]The calibrated value of the coefficient on home production in sector 2 is very close to the regression coefficient, which by definition gives the best fit. In sector 3, although the calibrated value is 0.80 and the regression coefficient 0.34, the predictions for the shares are very close to each other. A value of 0.34 in the predictions gives a rmse, excluding Korea, of 2.14 instead of 2.49.

home production reported in the time use survey combined with the low tax predict a very large market share for this sector. Excluding Korea the rmse of the prediction is 3.26, compared with 3.34 when only expenditure taxes are taken into account and 2.49 when home production time is exogenous.[21]

7 Can taxes and subsidies explain marketization?

In the predictions with the full model we imposed equation (21), which makes the marketization of time a log-linear function of preference parameters, productivity parameters and the tax wedge. We now look deeper into that equation and investigate the extent to which taxes explain the variation in the marketization rates across the countries in our sample. Figures 8a and 8b show the results with the elasticities of substitution previously used, 2.3 in both sectors.[22] The model picks up well the difference between the Scandinavian countries and the rest of the sample in the marketization of child care, but the elasticity used (or the specification, which assumes common technologies and preferences) cannot distinguish between the other countries on the basis of the tax wedge alone.

In contrast, the marketization of other services is explained well by the different tax rates, with the exception of Korea, which is an outlier. As before, the problem with this country is that its time use survey reports extremely low levels of home production when compared with the other OECD countries, which cannot be explained by policy.

8 Conclusions

We summarize the main findings as showing that the large differences in the allocation of market work across the countries of the OECD can be attributed to the differences in taxation, the subsidization of social work and the market-home production substitution. Taxes and subsidies alone without the market-home substitution explain some of the differences in the allocation of time but not enough. Moreover, there are facts that they cannot explain at all, such as the fact that the main differences in the allocation of hours of work across countries are in two types of sectors, health and social work and

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[21] The tax data for Korea is likely to be measured with error because of the different sources used.

[22] Simple log-linear regressions of equation (21) with the 19 observations for sectors 2 and 3 give respectively $\sigma_2 = 1.3$ ($p = 0.057$) and $\sigma_3 = 2.2$ ($p = 0.0005$).

unskilled services. When the market-home substitution is included in the model both the larger response of market hours to taxes can be explained and the fact that the main impact of taxes is on health and social care and unskilled services, which have close home-produced substitutes.

The key mechanism of the model is two-fold. Taxes and subsidies cause substitutions across market goods, with consumers switching from taxed goods to subsidized ones. The elasticities involved here, however, are too small to explain the differences that we see in the data. But the taxation of market work makes people substitute home production for market production, and this margin is powerful enough to explain larger responses of market work to policy in sectors that produce goods that can also be produced at home. In addition, we found by using data on home production form time use surveys that although taxation explains a large part of the differences that we see in home production time across the OECD, there are also unexplained differences, especially in childcare. These unexplained differences, which may be due to differences in tastes or technology, also contribute to the explanation of the differences in the allocation of market work across the countries in our sample.

9 Data appendix

to come

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Figure 1. Weekly hours of market and home work, population 15+, time use surveys circa 2000

$y = -0.5448x + 37.721$

$R^2 = 0.562$
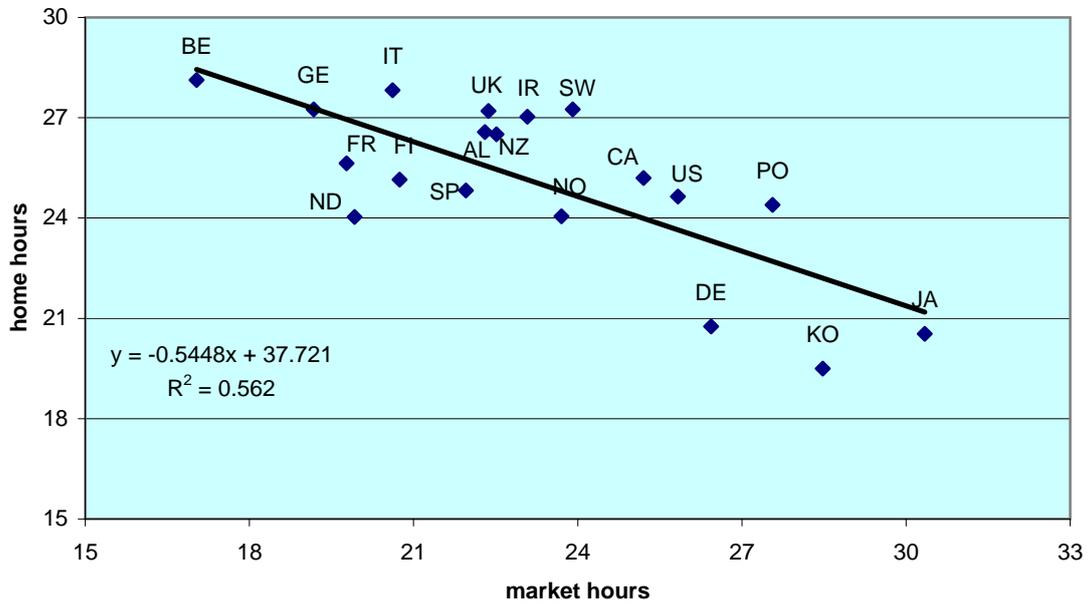
Figure 2. Percentage distribution of hours of work, 1994-2003, sorted according to sector 2 size
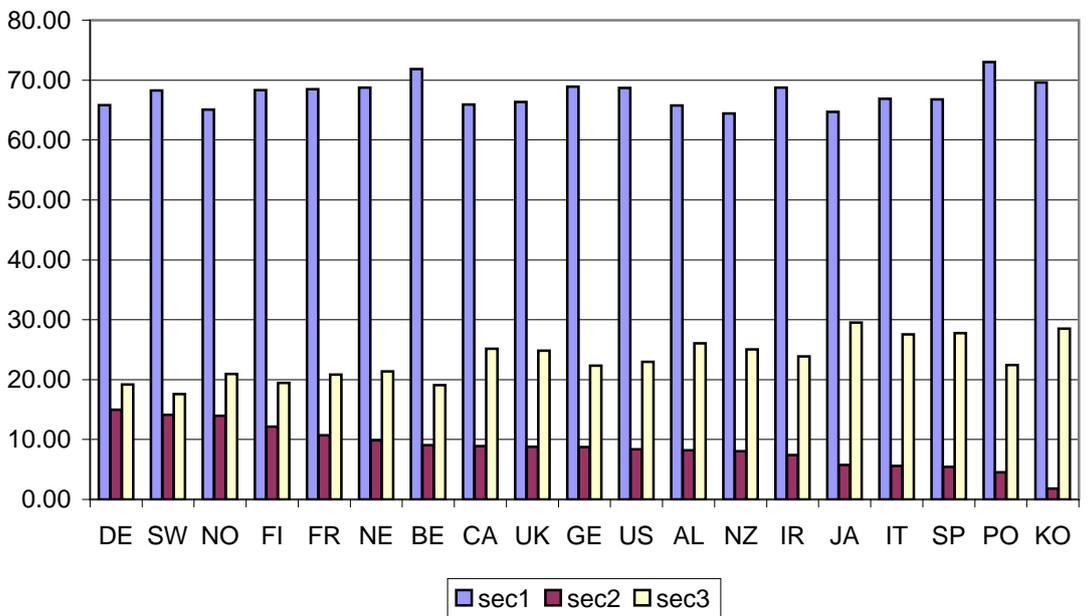
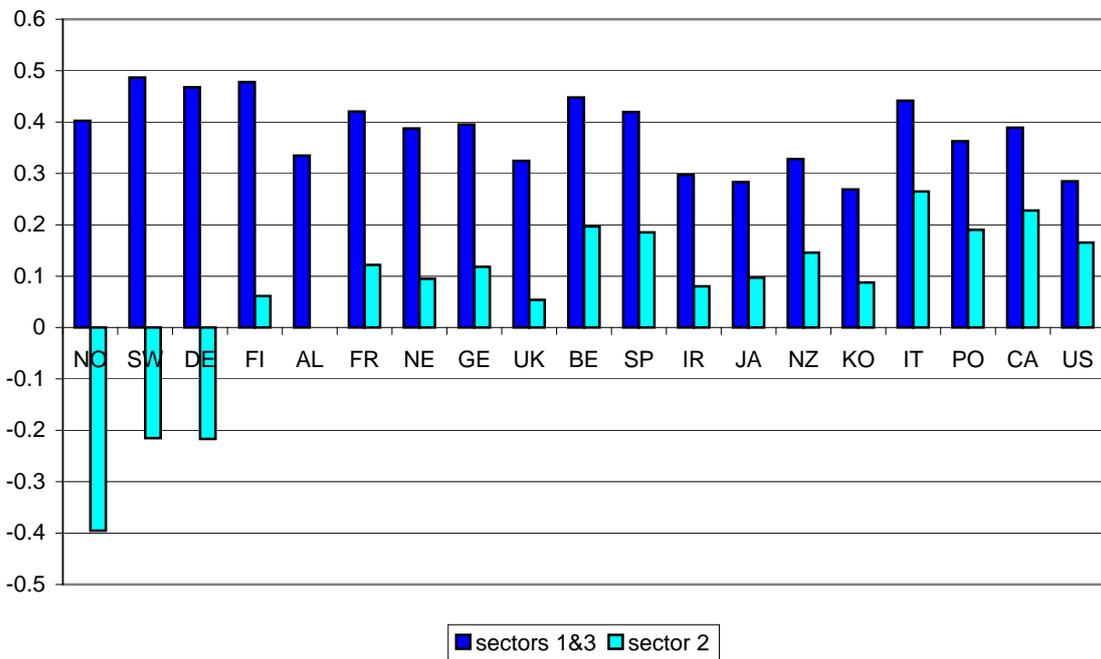Figure 3. The calculated tax wedge, 1994-2003 (social subsidies only)

sectors 1&3   sector 2

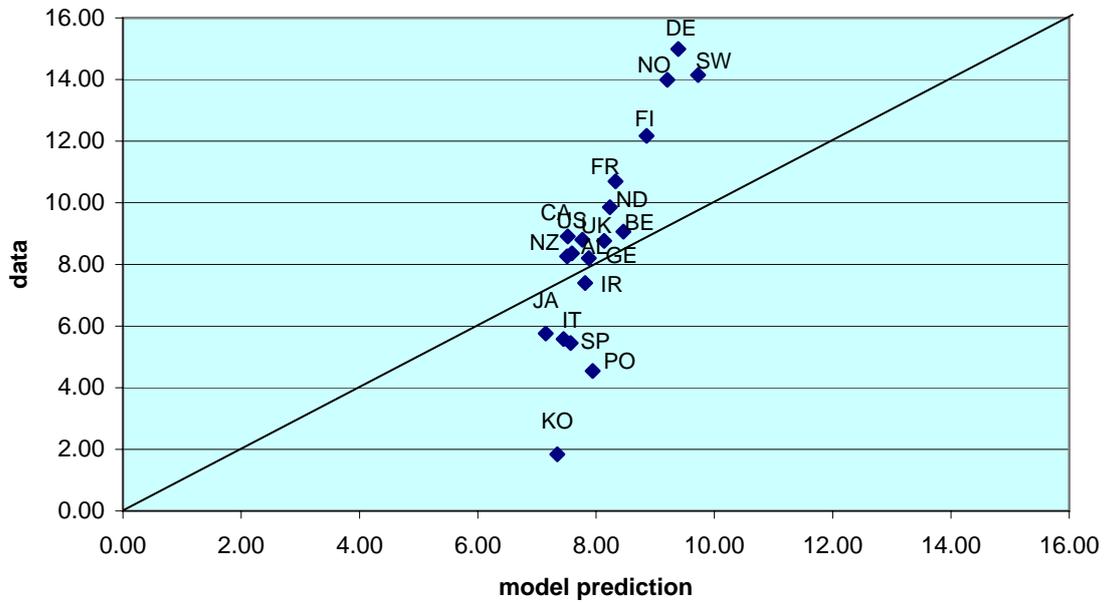Figure 4a. Predicted impact of taxation, share of health and social care sector

Figure 4b. Predicted impact of taxation, share of health and social care sector, epsilon=1.57
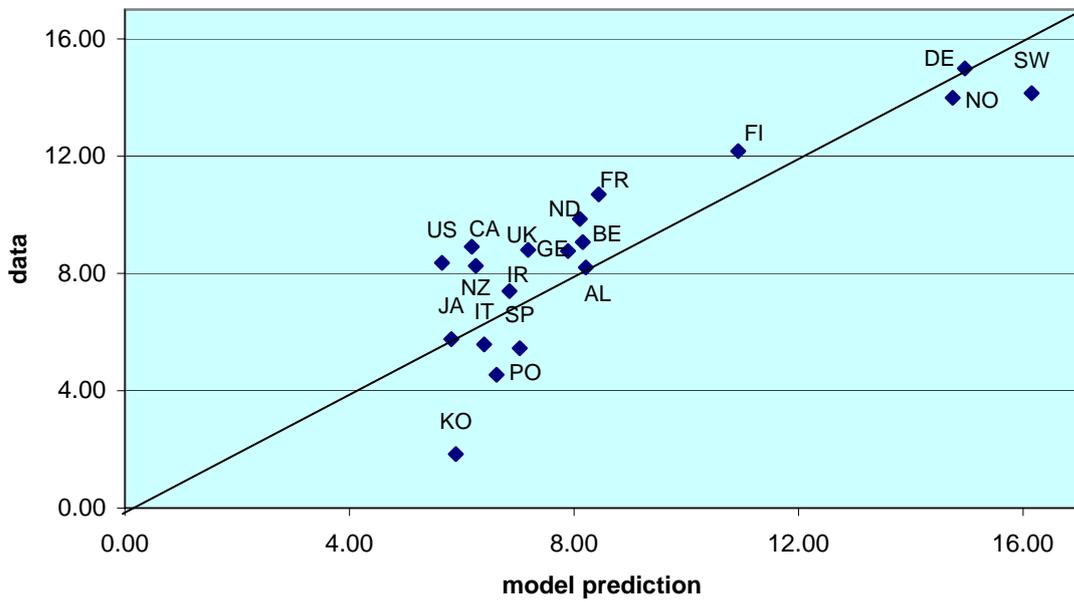
Figure 5. Required productivity ratio to match relative hours, deviations from log mean (mean=1)
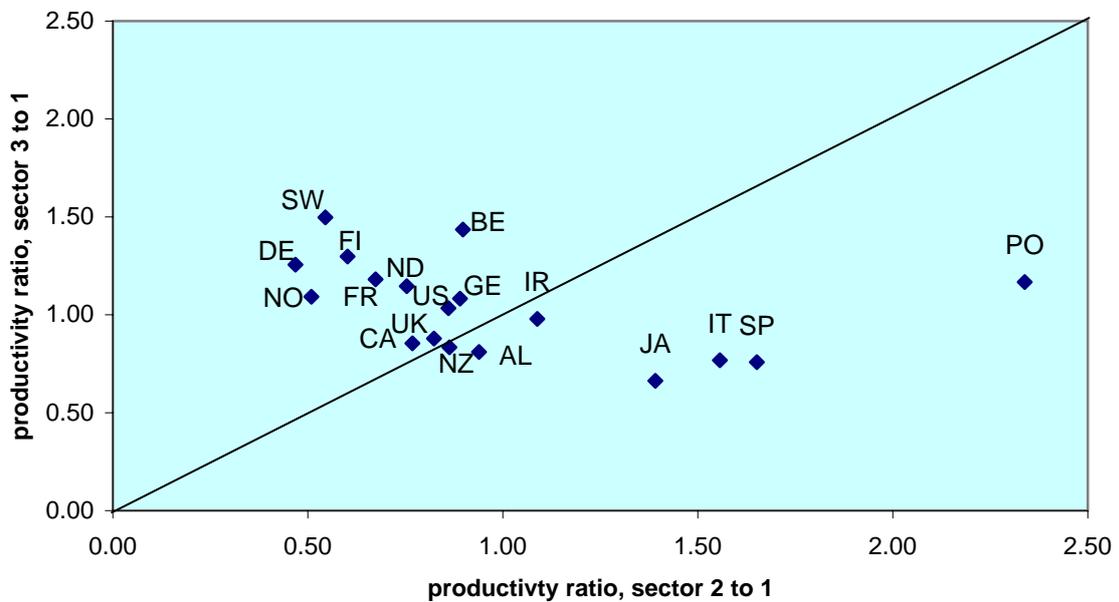
Figure 6a. Predicted sector 2 share, home production exogenous
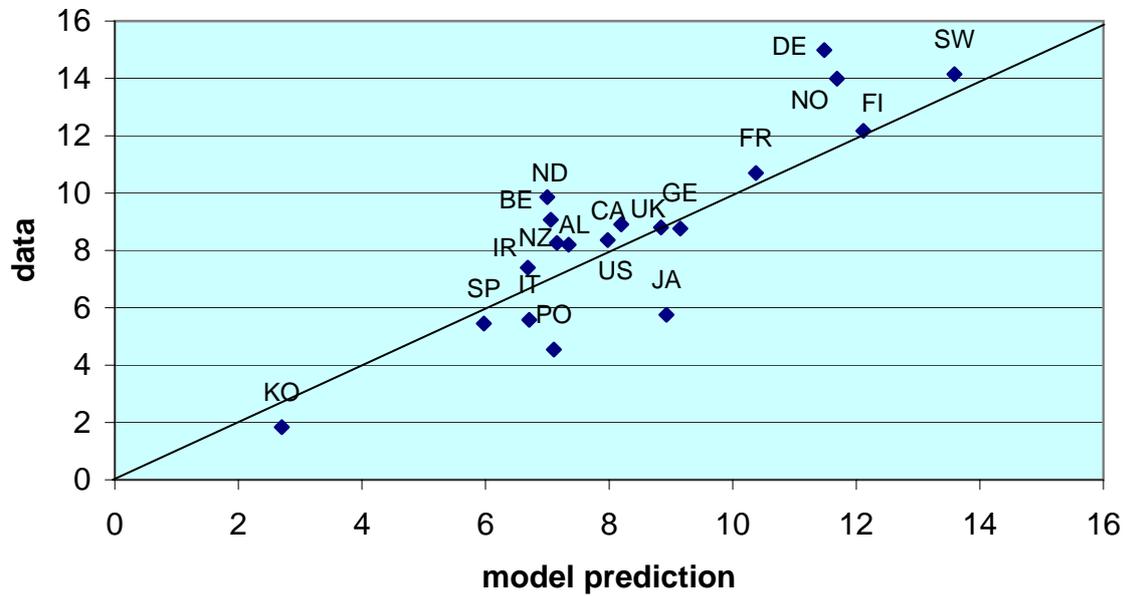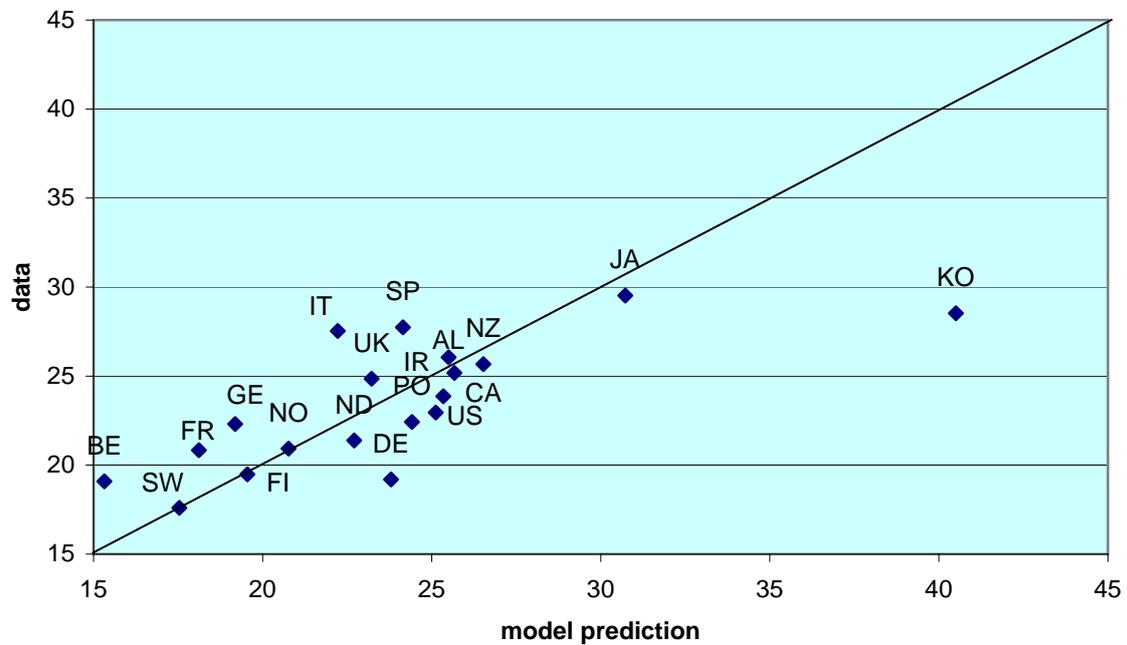

Figure 6b. Predicted sector 3 share, home production exogenous

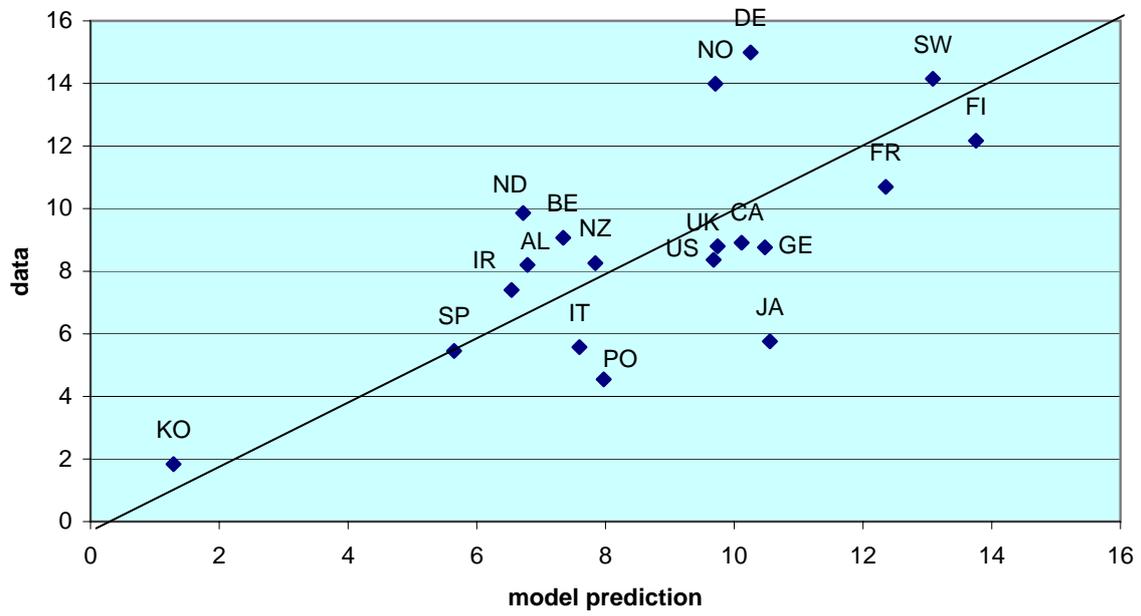Figure 7a. Actual and predicted share of health and social care, full model

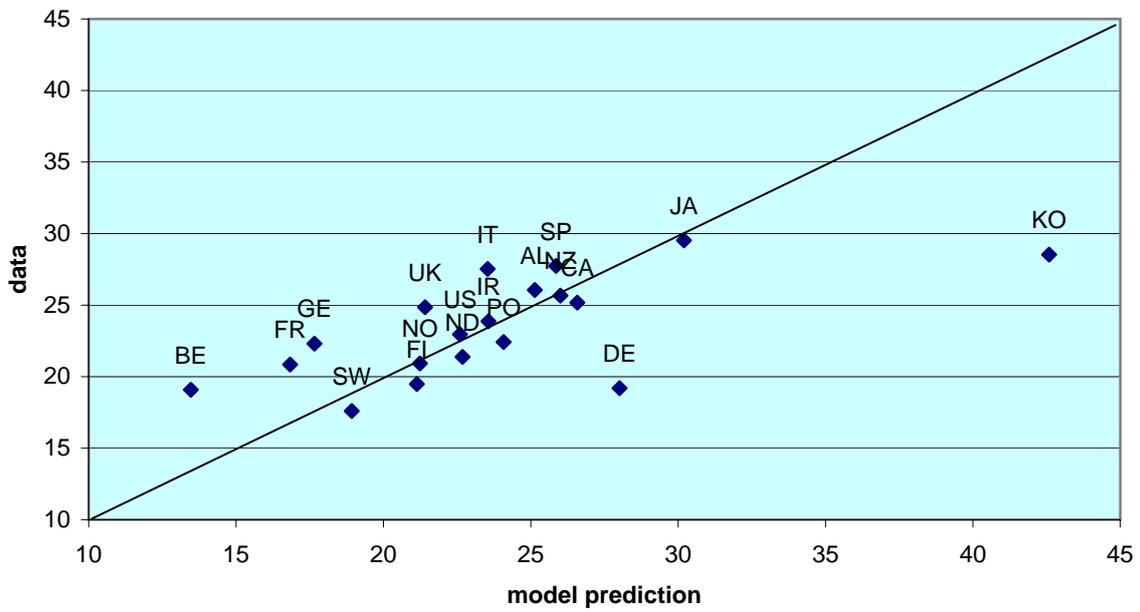Figured 7b. Actual and predicted share of other services sector, full model

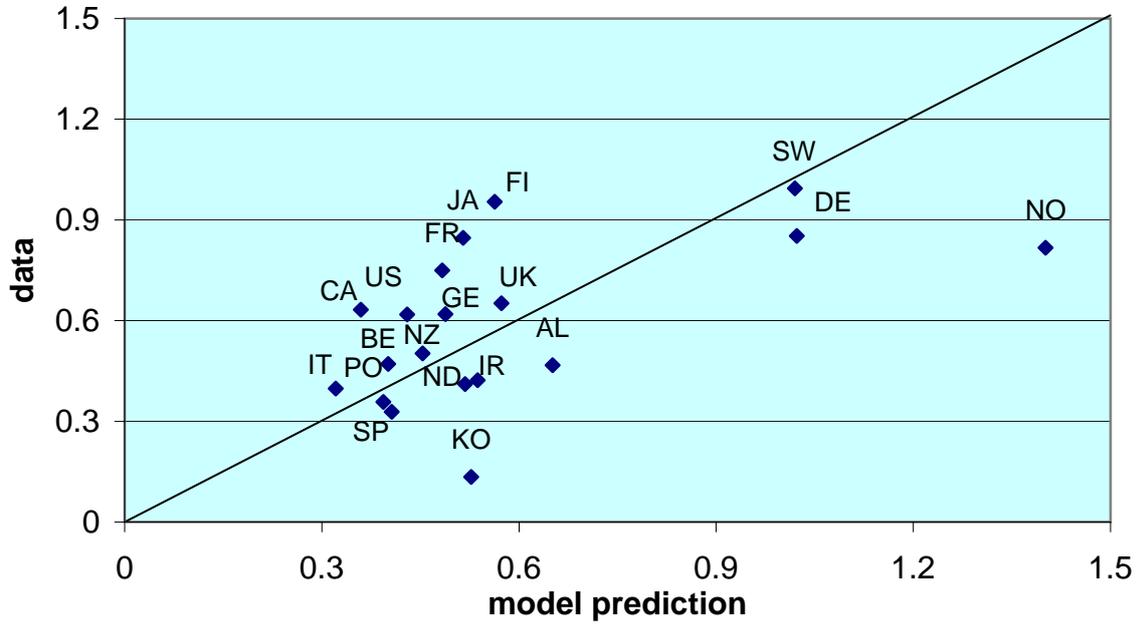Figure 8a. Actual and predicted marketization in health and social work

Figure 8b. Actual and predicted marketization in other services