The Policy Determinants of Hours Worked Across OECD Countries

by

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Introduction

"Are Europeans lazy or Americans crazy?" This was the provocative question debated at a recent conference of a number of influential economists from the two sides of the Atlantic (Fondazione Rodolfo de Benedetti, 2006). Indeed, gaps in incomes per capita between the United States and European countries are mostly accounted for by low labour utilisation, measured by hours worked per person (OECD, 2007). However, this reflects two distinct features of labour utilisation: employment and participation — or the extensive margin – and hours worked by employed individuals — or the intensive margin. While there is abundant literature on the policy determinants of participation and employment rates,[1] the policy determinants of hours worked among the employed have been less studied.

The purpose of this paper is to fill in this gap by investigating the policy determinants of the intensive margin of labour utilisation among OECD countries. This work focuses on the impact of taxation, working-time regulations, and other labour and product market policies on working hours of employed individuals. It attempts to incorporate some of the key features of the microeconomic approach to labour supply in a cross-country context. Indeed, the microeconomic literature has extensively documented the heterogeneous labour supply behaviour of specific groups of the labour force, depending on gender, socio-economic status and education level. The analysis undertaken here investigates the factors underlying cross-country differences in hours worked — in line with previous aggregate approaches – while at the same time looking more closely at labour force heterogeneity — in the vein of microeconomic labour supply models.

The paper shows that policies and institutions have a differential impact on working hours of different groups in the labour force. Firstly, while high marginal taxes create a disincentive to work longer hours for women, their impact on hours worked by men is almost insignificant. Secondly, working-time regulations have a significant impact on hours worked by men, and this impact differs across education categories. Thirdly, other labour and product market policies, in particular stringent employment protection of workers on regular contracts and anticompetitive product market policies have a negative impact on hours worked by men, over and beyond their impact on employment levels. Despite the finding of the importance of policies and institutions for understanding differences in hours worked among OECD countries, the empirical analysis shows that an important proportion of the observed differences remains unexplained and pertains to country-specific features. Understanding the nature of these specificities, and, in particular, the role of societal preferences, remains a topic for future research.

The paper is organised as follows. The first section sets up the theoretical and empirical contexts on which the analysis builds by reviewing the relevant cross-country and microeconomic literature. Against this background, the following section presents the contributions and limitations of the present approach, relying on semi-aggregated labour force data for different socio-economic groups. The third section is devoted to the core

analysis of this paper, namely that of the impact of taxes, labour market regulations, and other labour and product market policies, on differences in hours worked among OECD countries for specific sub-groups of employed individuals. The fourth section analyses the role of the country-fixed effects and their possible interpretation in the context of the empirical model. The last section concludes.[2]

Background and motivation

Cross-country analysis of average hours worked[3]

A voluminous recent literature uses aggregate data to explore the impact of tax policies and labour market institutions on average hours worked in OECD countries. The main result from these analyses is that differences in tax rates appear to go a long way in explaining differences in average hours worked in OECD countries. A large number of these contributions have employed time-series cross-country econometric methodology, while others, less numerous but nevertheless influential, have adopted a calibration approach by simulating the response of aggregate labour supply to labour taxation in computable general equilibrium models.[4] Most of these papers have focused on hours worked per capita or per working-age population, thus conflating the intensive and the extensive margins of the labour supply.[5]

In a recent article, Prescott (2004) argues that "virtually all of the large differences between US labour supply and those in Germany and France are due to differences in tax systems". This result is obtained by calibrating a general equilibrium model of investment and labour supply on the populations of major advanced industrial countries over the periods 1970-1974 and 1993-1996. Given the differences in hours worked and tax rates among rich countries, and in particular given the differences between the United States and European countries, the policy implications are clear: by modifying tax systems, and for instance by decreasing marginal tax rates, Europe would go a long way in increasing labour utilisation to US levels.

In a similar vein, Ohanian *et al.* (2006) also use a calibrated model to assess the role of taxation in explaining cross-country trend changes in hours worked per person at working age. Their results suggest that taxes – on consumption and income – can account for much of the variation in hours worked, both over time and across countries.

Recent work by Rogerson (2005) supports Prescott's hypothesis by proposing an alternative interpretation. The author suggests that reconciling this thesis with the Scandinavian model of high taxes and high total hours worked (*i.e.* employment rates times average hours worked) requires analysing the composition of government spending. Rogerson (2006) then shows that it matters whether tax proceeds are returned to household as a lump-sum transfer, or whether the size of the transfer is affected by the amount of labour supplied. For example, if high taxes are used to subsidise child care for individuals who work, then the effect on hours worked will be less than under a lump-sum transfer case. The author shows that by holding the tax rate constant, these compositional changes can have important quantitative effects. This argument, however, does not apply to the intensive margin of labour supply, but rather to the comparison of employment levels among continental and Northern European countries.

A number of empirical papers have supported the view that taxes play an important role in explaining differences in labour utilisation across countries. Davis and Henrekson (2004) find some evidence of a negative relationship between the average tax wedge

(including consumption taxes) on hours worked both per adult person and per worker. This result is confirmed by Dew-Becker and Gordon (2006) by using hours worked per capita in a wider sample of OECD countries covering a longer time span. Faggio and Nickell (2007) use panel-data techniques and find a negative impact of the average tax wedge on hours worked per employed individual.

It is important to note, however, that the negative relationship between tax rates and hours worked per employed individual has been found to be much stronger, or statistically significant, when the regression specification omits country-fixed effects. This result is acknowledged in Davis and Henrekson (2004) and confirmed in Alesina *et al*. (2005). The omission of country-fixed effects creates well-known biases in cross-country estimates; importantly, country-specific omitted factors, correlated with both taxes and hours worked, could be driving the negative relationship. Some studies, such as Faggio and Nickell (2007), however, have established a negative significant relationship despite the presence of country-fixed effects, suggesting that the literature has not converged on any consensual result on the relationship between aggregate data on taxes and hours worked.[6] The new empirical results presented in the fourth section show that tax rate effects can be more effectively distinguished from other country-specific factors by going beyond average aggregate labour supply to look at the heterogeneous behaviour of specific groups composing the labour force. When implementing this semi-aggregated approach, it will be shown that it is also critical to provide a more detailed representation of the tax structure.

Despite tax rates being found to be important in explaining working-time differences across OECD countries, alternative explanations are as numerous as they are diverse. While also finding mild support for the role of average tax rates, Alesina *et al*. (2005) uncover a negative relationship between union density and hours worked per working-age person. These authors argue that European labour market regulations, advocated by unions in declining industries who actively supported work-sharing arrangements, explain the bulk of the differences in working hours between the United States and Europe. These policies, it is claimed, had a society-wide influence on leisure patterns because of a social multiplier where the returns to leisure increase as more people take longer vacations. This view is empirically supported by Hubermann and Minns (2005) using a longer time period and controlling for a number of other possible determinants.

Contrary to the above results, Bowles and Park (2005) provide some evidence of a positive relationship between union density and average hours worked per employed person. This result is also found in Faggio and Nickell (2007) and is supported by Causa (2008).

Cross-country time-series models of hours worked have also been estimated in the political science field by Burgoon and Baxandaal (2004) to study the influence of different political coalitions on working-time. Controlling for ruling governments (*i.e.* countries' political leadership), the study finds that union density has a positive impact on hours worked per employed worker. According to the study, one possible reason could be that unions have traditionally opposed the introduction of part-time contracts. However, this might have changed over time with rising employment (and union membership) of younger female cohorts which arguably have a higher preference for part-time work. Indeed, the study shows that the interaction of union density with female participation rates has a negative impact on average working hours.

Other views have been offered as potential explanations of the differences in working hours across developed countries. One argument stresses the importance of inequality. Bell and Freeman (2001) attribute the trend toward longer hours in the United States compared with Germany to rising inequality, arguing that those who work longer move up in the wage distribution at the workplace, and the gains for working hard are greater, the more unequal the wage distribution. In a recent novel contribution, Michelacci and Pijoan-Mas (2007) provide a model in which they specify the channel whereby wage inequality affects the return to working longer hours. A rise in the dispersion of job offers, which translates into higher within-skill wage inequality, raises the gains from obtaining better jobs and gives workers greater incentives to work longer hours; the effect is stronger as the labour market becomes tighter. Michelacci and Pijoan-Mas quantify the role of labour market conditions in accounting for the diverging evolution of working time in the United States and the European Union by calibrating a labour market search model with frictions and find that differences in labour market conditions, in particular differences in within-skill wage inequality, can account for differences in the trend evolution of hours worked across the two sides of the Atlantic over the past 30 years.

It is, however, difficult to disentangle the separate influences of incentives, institutions and policy, and to separate these factors from cultural and other fixed factors. Wage inequality may well be affected by local institutional environment, or the result of weaker unionisation rates. These forces may in turn be a product of deeper longstanding work ethic or the basic drive to emulate some reference group (Bowles and Park, 2004). Hence, while the idea that aggregate labour market conditions can have important effects on aggregate hours worked through their effect on hours per worker has several interesting implications, it raises the issue of identifying the policies and institutions that might actually shape the evolution of labour market conditions.

Other researchers have noted that Europeans took a good portion of their secular increase in productivity in reduced work intensity while Americans have instead taken it in more consumption. In a recent influential contribution, Blanchard (2004) argues that differences between American and Europeans hours worked are due to different preferences over consumption/leisure choices. If there are such differences in societal preferences, they are very likely to manifest themselves in working time regulations, making it difficult to identify a causal relationship.

Table 1 reviews some recent empirical findings based on panel-data techniques.[7] More broadly, three main points emerge from the cross-country-time series literature on hours worked:

- The most striking result from the cross-country literature is the negative relationship between average hours worked and average tax rates. However, cross-sectional time-series evidence on the relationship between hours worked and taxation, at the aggregate level, is weaker than the pure cross-sectional evidence, once allowance is made for country fixed effects.[8]

- This empirical finding at the aggregate level is not directly related to the theoretical framework underlying the relationship between taxes and market work. More specifically, microeconomic theory itself is ambiguous on the predicted impact of taxes on individual labour supply. Besides, the empirical and theoretical mechanisms through which aggregation over individual supply curves occur is ignored. Thus, somehow paradoxically, the taxes hypothesis remains unclear from a theoretical perspective.

Table 1. **Cross-country literature on average hours worked: main findings**

Study	Sample and estimation period	Dependent variable and source	Regressors – institutions	Regressors – others	Estimation method	Estimated elasticity of hours worked with respect to the tax rate[1]
Alesina, Glaeser and Sacerdote (2005)	18 OECD countries, 1960-95	Annual work hours per person 15-64, OECD	Average tax rate [-]; union density rate [—]; EPL [—; only one regression]		OLS with and without country and year fixed effects	−0.50 (Annual hours worked per person, without controlling for country fixed effects);-018 (*) (Annual hours worked per person, controlling for country fixed effects)
Altonji and Oldham (2003)	9 OECD countries, years: 1979, 1982, 1984, 1995 and 1999	Average annual hours actually worked per person in employment, OECD	Number of weeks of paid vacations mandated by law [—]		OLS with and without country and year fixed effects	
Bowles and Park (2005)	10 OECD countries, 1963-98	Ln(average annual work hours of employed persons), OECD	Union density rate [+]	Inequality indicator [+++]; Ln(real wage) [-]; Ln(real GDP per capita) [—]; unemployment rate [—]; female share in employment [—]	OLS with country and year fixed effects	
Burgon and Baxandall (2004)	18 OECD countries, not reported	A) annual hours per employee, University of Groeningen; B) annual hours per working age person, University of Groeningen and OECD	Union density rate lagged 5 [A] +++. B) +++]; wage centralisation lagged 5 [A] -; B) -]; union density X female labour force participation lagged 5 [A] —; only one regression. B) —; only one regression]; Ln(social expenditure/GDP) lagged 1 [A) No. B); Income tax /GDP [A) No. B) —]	Hours worked lagged 1 [A] +++; only one regression. B) +++; only one regression]; share of Christian Democratic government portfolio lagged 5 [A) No. B) —]; share of Liberal government portfolio lagged 5 [A0 no; B) no]; share of Social Democratic government portfolio	FGLS (assuming heteroskedasticity across countries) with and without country fixed effects	−0.28 (***) (Annual hours worked per employee, without controlling for country fixed effects);-0.05 (Annual hours worked per employee, controlling for country fixed effects, lagged dependent variable, and the interaction between union density and female labour force participation)
Causa (2008)	21 OECD, countries, 1996-2003	Annual average hours worked per person on employment, *OECD Employment Outlook*	Average marginal tax wedge on second earner [A]—, B)—; (Taxes and social contributions + indirect taxes)/GDP [A] -, B)+++] ; Union density rate [B] +]	Output gap [A)no, B) no]; Per Capita income [A]—, B) no]; employment rate [A]—, B)—]	IV with year fixed effects [A]; IV with year and country fixed effects [B]	Average marginal tax wedge on second earner: −0.469 (***), (Taxes and social contributions + indirect taxes)/ GDP: −0.173 (ns) [A]; Average marginal tax wedge on second earner: −0.145 (*), (Taxes and social contributions + indirect taxes)/ GDP: 0.321 (***) [B]
Davis and Henrekson (2004)	13 OECD countries, years: 1977, 1983, 1990 and 1995	A) annual work hours per adult, OECD; B) annual work hours per employed adult, OECD	Sum of average tax rates on income, payrolls and consumption [A] -. B) -]		OLS with and without country and year fixed effects	−0.51 (***) (Annual hours worked per person, without controlling for country fixed effects);-0.12 (Annual hours worked per person, controlling for country fixed effects)
Dew-Becker and Gordon (2006)	16 OECD countries, 1960-2004	Annual work hours per total population, University of Groningen	Average tax wedge [—]		OLS with country fixed effects	−0.40 (***) (Annual hours worked per person, controlling for country fixed effects)

Table 1. **Cross-country literature on average hours worked: main findings** *(cont.)*

Study	Sample and estimation period	Dependent variable and source	Regressors – institutions	Regressors – others	Estimation method	Estimated elasticity of hours worked with respect to the tax rate[1]
Faggio and Nickell (2007)	17 OECD countries, 1981-1999	Average Annual Hours Worked per person in employment, OECD Labour Market Statistics	Union density ((++]), EPL [—]), Marginal tax rate, spouse (100APW, 0APW) ([++]), Marginal tax rate, spouse (100APW, 67APW) ([—]), Average Tax wedge ([—]), Marginal rate single (100APW) ([+]))	Business sector labour producivity ([+++]), male unemployment ([++]), Ln(50p/10p) ([+++]), Ln(90p/50p) ([++])	OLS with country and year fixed effects	Marginal tax rate, spouse (100APW, 0APW): 0.086 (**), Marginal tax rate, spouse (100APW, 67APW): –0.072 (***), Average Tax wedge: –0.16 (***), Marginal rate single (100APW): 0.055 (**) (Annual Hours worked per employed, controlling for country fixed effects)
Huberman and Minns (2005)	14 OECD, countries, 1950-2000	Average annual work hours of total workers, University of Groeningen	Union density rate [—]	Ln(GDP per capita) [—]; "New World" dummy [+++; only one regression]; dependency ratio [+++]; unemployment rate [no]; % Protestant in 1870 [-]; primary enrolment in 1870 [+]; Ln(urban area per capita in 1870) [+++]	OLS with year fixed effects	

1. This estimate is approximated in cases where the results presented and data make it possible to compute it. It is defined as the estimated elasticity of hours worked with respect to the considered tax rate measure. When several taxation measures are used in a single estimation, the table presents the corresponding elasticities for each of them. This elasticity is the coefficient estimate obtained when regressing the log of hours worked on the tax rate. When the regression is defined in levels for the dependent variable, it can be approximated by dividing the slope coefficient by average hours worked in the data used for estimation.

Key:
* p<.1, ** p<.05, *** p<.01.
[no]: never significant in the main specifications or changing signs.
[+] or [-]: positively or negatively significant in a minority or half of the main specifications.
[++] or [—]: positively or negatively significant in most of the main specifications.
[+++] or [—-]: positively or negatively significant in all main specifications.

● Alternative views on the causes of differences in hours worked do not result in any convincing story. The diversity of the proposed arguments seem to suggest, on the contrary, that countries' societal preferences, whether or not driven by a "multiplier" effect, go a long way towards explaining differences in rates of labour utilisation.

Microeconomic analysis of individual hours worked: main findings

The idea that taxes discourage individuals from market work is not an unambiguous prediction of economic theory. This section briefly summarises the findings from the voluminous microeconomic literature on labour supply in the presence of taxes which are most important for the analysis that follows. Causa (2008) provides a more detailed review of microeconomic labour supply models.[9]

The main findings of the microeconomic literature on individual labour supply in the presence of taxes can be summarised as follows:

● The labour participation decision is more responsive to wage and income variation than the decision about hours of work.[10] This finding arises from the distinction between choices at the extensive margin and choices at the intensive margin (see Heckman, 1983, for a very illuminating representation of this distinction). Participation appears to be the key margin of adjustment, in particular for poor women, for whom participation elasticities are very high.[11]

● The estimated wage elasticity for women is positive, but there is a very wide range of dispersion among estimates (Blundell and MaCurdy, 1999, Cahuc and Zylberberg, 2003, Evers *et al.* 2006). According to a recent meta-analysis covering 239 elasticities (Evers *et al.* 2006), most of them incorporating both the extensive and the intensive margins, the range of variation for elasticities for women is from –0.19 to 2.79, with a mean value of 0.41 and a median value of 0.28. Estimated elasticities of annual hours of work with respect to the wage rate are close to one. Estimates are lower when weekly hours are considered, because on an annual basis individuals have more margins of adjustment than on a weekly basis. Estimates of income elasticities depend on the various ways of measuring unearned income. Despite this, the range of estimates is not very wide, from –0.1 to –0.3.

● The estimated wage and income elasticities for men are very low and cluster around zero. A variety of methods and datasets have been used and there is a clear consensus that the sensitivity of hours of work among men is extremely limited (see Pencavel, 1986).

● Wage elasticities are declining with household income (see Aaberge *et al.* 1990, 1995, 1999). Thus, the aggregate impact of tax reform depends on the distribution of household earnings. Weak wage effects among middle-and high-income earners can dampen the impact of tax reform on poor households' labour supply.

Important extensions to the individual approach to labour supply include the development of a collective framework for the study of family labour supply and the introduction of household production (see Blundell and MaCurdy, 1999, for a discussion of this approach). These extensions can be particularly relevant when studying the impact of taxes:

● Taking into account joint labour supply decisions allows explicitly modelling the impact of an individual's earnings on the labour supply decision of another member of the family. Although the results from the empirical literature do not differ greatly from those delivered by the individual approach, taxation is likely to play a significant role in work sharing among first and second earners. Furthermore, the existence of strong cross-

elasticities, in particular for married women, might induce a relatively modest impact of tax changes on aggregate labour supply.[12]

● Introducing household production is based on the idea that market work and home work are relatively substitutable. The important intuition of household production models is that households with lower opportunity costs of time in the market will engage in more home production for goods and services (*e.g.* meal preparation, laundry, child care) All else being equal, higher tax rates are associated with a higher proportion of time devoted to household production relative to market work (see Burda *et al.*, 2006, for an in-depth analysis of its implications for understanding working-hours differences).

Labour supply theory establishes the amount of working hours a person desires to offer to the market at different wage rates and most of the cross-country literature on working hours focuses on labour supply factors. In particular, the impact of policies is interpreted in terms of labour supply behaviour.[13] The impact of other institutions, such as unionisation, is also interpreted in the literature through the lenses of a labour supply model in which it is implicitly assumed that the firm does not face any decision at the intensive margin. However, the microeconomic literature has shown that labour demand may also play a role in determining average hours per worker (and not just total labour hours worked). The main mechanisms at stake can be summarised as follows:

● There are many reasons for supposing that the composition of total hours worked between the number of workers and average hours per worker – and the nature of the work schedule more generally – is important for the firm: the existence of complementarities among workers and the relationship between productivity and hours worked have been the most widely studied.[14]

● Increases in the quasi-fixed costs of employment (*e.g.* stricter employment protection legislation) relative to the variable costs of higher hours per worker (*e.g.* hourly wages) raise the optimal level of hours per worker for firms.[15]

● Other institutional settings, such as the degree of product market competition, and union bargaining power might influence how labour supply and demand interact to determine equilibrium hours per worker.[16]

Contributions and limitations of the present analysis

The issue: analyse the determinants of the intensive margin of labour supply

The goal of this paper is to provide improved estimates of the impacts of taxes, working-time regulations, and other labour and product market institutions on working hours, conditional on employment, for several groups of workers with different weights in the aggregate labour force. In this context, the central question raised by this work can be summarised as follows: are structural policies important for explaining cross-country differences in hours worked, *over and beyond* their importance for explaining cross-country differences in employment rates?

This choice is motivated by the fact that the impact of the policies on the extensive margin of labour supply has been the object of a voluminous empirical literature, which has delivered a number of strong policy implications. This is true both at the cross-country level (see *e.g.* Bassanini and Duval, 2006, Jaumotte, 2003), but also, as mentioned in the previous section, in the microeconomic literature (Aaberge *et al.* 1999, Arrufat and Zabalza, 1986, Pencavel, 1998, Brewer and Browne, 2006, for women; Aaberge *et al.* 1999, Ransom, 1987, for men).

The present analysis is close to prior cross-country analysis in spirit to the extent that it investigates the impact of differences in policies and institutions in causing hours worked to differ among OECD countries. It, however, departs from this literature in several respects, and attempts incorporating some of the key features of the microeconomic approach to labour supply:

- The present work explicitly disentangles the impact of policies on the intensive *versus* extensive margin of labour supply, contrary to the bulk of the cross-country literature.

- The empirical analysis tackles the endogeneity of the employment rate with respect to hours worked. In terms of labour supply, the participation decision cannot be considered independently from the decision on the number of hours supplied in the labour market (or, most probably, from the decision to work part-time or full-time). In terms of labour demand, the analysis considers the possibility that employers allocate total labour utilisation across extensive (hiring and firing) and intensive (hours worked of employed individuals) margins.

- By adopting a semi-aggregated approach, the empirical work allows to look more closely at the behaviour of different groups of the labour force among OECD countries.

There is now an emerging consensus in the theoretical literature on the rationale beyond the divergence between micro and macro estimates of the tax elasticity of hours worked. Two explanations are given for understanding this divergence. First, as discussed above, the elasticity of hours worked with regard to tax rates is very much dependent on how tax revenues are spent, as discussed above, (see discussion in Alesina *et al.*, 2005, and Rogerson, 2006). Rogerson (2006) shows that if higher taxes subsidise day care for individuals who work, then the effect on hours of work will be less than under a lump-sum transfer case in which the size of the transfer is unaffected by the amount of labour supplied. This pattern of government spending would explain why while tax rates are high in Scandinavia, hours worked are higher than in continental Europe. Note, however, that this only operates through the extensive margin of the labour supply. Second, recent general equilibrium models show that the slope of the aggregate labour supply curve can significantly depart from the micro elasticity. This is the case in Chang and Kim (2005), in an economy where individuals are subject to idiosyncratic shocks to wages and labour is indivisible. This finding is most relevant in Rogerson and Wallenius (2007), who develop a general equilibrium life-cycle model of labour supply that incorporates both the intensive and extensive margin of labour supply. The authors find that micro and macro elasticities are virtually unrelated and that macro elasticities are large.

Despite the existence of an emerging consensus in theory, empirical divergences between microeconomic and macroeconomic findings are highly controversial. Indeed, while microeconomic estimates of individual labour supply deliver quite modest responsiveness of hours of work to taxation, macroeconomic estimates of "aggregate" labour supply elasticities imply a significant disincentive effect of taxation on labour supply. The estimates presented below extend the standard macroeconomic approach using a number of relevant insights from the microeconomic literature on labour supply. This is done by opting for an intermediate or semi-aggregated framework, which allows overcoming some of the limitations attached to macroeconomic and microeconomic approaches:

- Macroeconomic estimates suffer from aggregation and measurement error bias, both for hours worked, and, importantly, for aggregate measures of taxation.

- Microeconomic estimates are based on behavioural models but mostly rely on data for a single country.[17]

- The impact of working-time regulations and labour and product market institutions is not investigated in microeconomic studies (partly due to their country-specific nature). It is rarely analysed in cross-country empirical work on average hours worked; even when it is done, however, the impact is not disentangled between intensive and extensive margins.[18]

The approach: from aggregate to semi-aggregate data

This study enriches the macroeconomic approaches by developing semi-aggregated specifications that capture, at least to some extent, several of the key factors influencing labour supply behaviour that have been identified in the literature. On the one hand, labour force surveys allow analysing the behaviour of different segments of the labour force, characterised by specific socio-economic characteristics and heterogeneous behaviour. The delimitation of these specific sub-groups is dictated both by data constraints and by results of the microeconomic literature, as summarised above. Gender, marital status and education are considered as basic building blocks of the disaggregate analysis. In turn, these groups have a different weight in the aggregate labour force, allowing to control for the compositional effects reflected in cross-country aggregate analyses.

On the other hand, disaggregated taxation models allow the building of group-specific taxation indicators. This methodology is far from the microeconomics tradition, as it is not able to draw individual budget constraints. However, it departs from the previous cross-country work insofar as it allows inference to be based not only on cross-country variation in taxes and hours worked, but also on cross-country and cross-group variation in hours worked. Importantly, and contrary to most of the previous literature, this work relies on marginal, as opposed to average, tax rates, thus reflecting the relevant theoretical underpinnings of labour supply decisions.

Finally, cross-country panel data allow analysing the impact of time-varying policy settings (taxes, working-time regulations, labour and product market policies) on patterns of working hours. While these policies do not vary across groups, their impact is likely to be heterogeneous, based on individual characteristics and behaviour on the labour market. This approach is rarely used in the cross-country literature;[19] it is practically absent in the cross-country literature on hours worked.

Frontiers and limitations of the analysis

While the semi-aggregated approach aims at countering the bias raised by cross-country estimates of average hours worked, it suffers from a number of limitations. The first and most important is that this analysis is not intended to estimate a structural labour supply model. This comes from the adoption of a cross-country approach, but it is also a consequence of the nature of the data:

- This analysis relies on semi-aggregated data computed from labour force surveys, as opposed to household or individual data, on which empirical labour supply models are based.

- There is no information on wages nor on unearned income in the labour force survey data used here, making it impossible to estimate income and substitution effects.

- This analysis estimates the impact of taxes on individuals who work, conditional on the impact of taxes on participation. While it addresses the simultaneity bias between

employment and hours worked across the different segments of the labour force, it does not address the potential selection bias arising within each segment of the labour force. The use of instrumental variable techniques to tackle the endogeneity of the employment rate with respect to hours worked allows reducing selection bias based on observable variables (education, socio-economic, demographic variables). It cannot address the potential bias arising from unobservable variables driving both the intensive and the extensive margin, the size and direction of which would be difficult to predict.

Working hours are identified with market work in the present empirical work. It will thus not be possible to investigate the determinants of the allocation of work between market and home production. Recent literature (Burda *et al.*, 2007, Burda *et al.*, 2006, Schettkat, 2003) makes use of time-use surveys to document differences across countries in the distribution of market *versus* household work. One important finding revealed by time-use surveys is that countries in continental Europe have a higher share of home production in total work compared with the United States. Labour taxation can potentially play a role in explaining cross-country differences in this division, and some recent descriptive evidence goes in that direction (Burda *et al.*, 2006). Time-use surveys are only available for a few countries and on a cross-section basis, precluding their use in the econometric approach. Nevertheless, this limitation of the following analysis has to be kept in mind when interpreting the results.

The potential bias induced by the endogeneity of institutions is another limitation of the present analysis, arising from its cross-country nature. As recalled above, Blanchard (2004) influentially argued that differences between US and Europeans hours worked are due to different preferences over consumption/leisure choices. If there are such differences in societal preferences, they are very likely to manifest themselves in working time regulations. Because it is not possible to properly solve the endogeneity issue in the empirics, the problem has to be kept in mind when interpreting cross-country estimates.[20]

Finally, the present empirical analysis will not be able to disentangle labour demand from labour supply effects; it will, however, provide an intuition on the potential for labour demand effects to explain some of the econometric findings. This is particularly relevant for the impact of labour and product market policies, which have been rarely analysed in the context of the hours worked literature and are likely to influence the demand for working hours, notably through their impact on the proportion of part-time contracts.

Assessing the role of taxes and other policies on hours worked: a semi-aggregate analysis

Empirical approach

The goal of this section is the identification of the impact of taxes, working-time regulations, and other labour and product market institutions on working hours, conditional on employment, for several groups of workers with different weights in the aggregate labour force. The approach is based on disaggregated information on hours and employment provided in labour force surveys for OECD countries, and disaggregated information on taxation computed from OECD tax models.

Data sources and definitions

The dependent variable in the econometric model is usual weekly hours worked by employed individuals, for labour force groups defined by gender, family situation and

educational attainment. The analysis is performed using European Labour Force Survey (ELFS) data for twenty European countries (Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg,[21] the Netherlands, Norway, Poland, Portugal, Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom), and Current Population Survey (CPS) data for the United States, over the period 1995-2005.

Due to data limitations, the disaggregated analysis uses usual weekly hours worked as the dependent variable instead of annual hours worked. The choice of weekly instead of annual hours worked has non-trivial implications that should be kept in mind when interpreting the results. Moving from aggregate annual hours worked to aggregate usually weekly hours removes approximately one-half of the cross-country variation in labour supply differences along the intensive margin (see Chapter 3 in OECD, 2008). It purges part of the variation that is likely to be affected by working time regulations, such as those mandating minimum entitlements to annual leave, public holidays and sick leave. This implies that the impact of taxation and, mostly, regulatory policies, could be underestimated compared with corresponding estimates using annual hours worked as the dependent variable. Accordingly, the following estimates may be considered as *lower-bounds* parameters.

Group-specific taxation variables — average and marginal tax wedges – are mapped into the socio-economic groups defined by the LFS data. These tax-rate measures are calculated using OECD tax models, as detailed in the *Taxing Wages* series. The procedure can be summarised as follows (see Causa, 2008, for details):

- Marginal (defined at the individual level) and average (defined at the household level) tax wedges are calculated for each per cent of gross earnings from 33% to 200% of the APW wage for first and second earners in the different household categories.

- This information needs to be "semi-aggregated" in order to be used in statistical analysis. This is done by calculating simple averages of marginal and average tax wedges for first and second earners across the different household categories.[22]

- The data are mapped in the socio-economic groups identified in the LFS. At this stage, a number of assumptions are required, and they are discussed in detail in Causa (2008).

Due to data limitations, the taxation indicators used here present two important caveats which have to be acknowledged upfront:[23]

1. The analysis does not incorporate marginal effective tax rates (METR). Social benefits, in particular housing benefits and social assistance, are not embedded in the tax models used here. However, the impact of in-work benefits conditional on working a minimum of hours is embedded in the empirical work done here to the extent that those benefits take the form of tax credits; this is the case of the most relevant "hours dependent" benefits programmes (such as the Working Families Tax Credit in the United Kingdom).

2. The data do not include the cost of childcare. Childcare-related tax reductions and cash benefits have been shown to be important determinants of women labour supply (Immervoll and Barber, 2005). However, the indicators considered here take into account tax relief and family cash transfers universally paid in respect of dependent children between five and 12 years of age who are attending school (see *Taxing Wages*, OECD, 2005a).[24]

The last section of the paper attempts to assess the potential for these factors to explain differences in working hours between countries.

The empirical work makes use of an indicator measuring the strictness of regulations governing weekly normal and overtime hours.[25] More specifically, the working-time

indicator used in the regressions is defined as the average of: *i)* weekly normal hours; and *ii)* maximum allowable weekly hours (*i.e.* the sum of weekly normal hours and maximum allowable overtime hours). In most countries, normal working hours are mandated by law (*e.g.* statutory regulations). In countries where this is not the case, the analysis relies on normal hours as established by collective agreements. Normal weekly hours set a limit beyond which any additional hours worked are accounted as overtime. In some countries, these overtime hours are subject to a minimum overtime premium. In addition, there are upper limits to the amount of overtime hours, albeit in many cases, yearly limits. The definition of overtime work corresponds to the maximum allowable overtime hours stipulated by regulatory standards, expressed on a weekly basis.

The other policy variables used in this analysis include those that the labour market literature has identified as having a major impact on employment and participation patterns, but rarely analysed in the context of the intensive margin of labour supply: employment protection legislation (EPL) on regular contracts and the stringency of product market regulation.[26] The role of union density on the determination of working hours is also investigated, in line with previous literature, but with a disaggregated approach, which allows to examine the differential impact of unionisation on specific labour market groups.[27]

The approach

The analysis focuses on the impact of taxes, working-time regulations, and other labour and product market institutions on hours worked, conditional on employment, for several groups of workers, each having a different weight in the aggregate labour force.

In a nutshell, the question asked by the empirical analysis can be summarised as follows: can policies increase or decrease hours worked by employed individuals? The answer to this question schematically draws on two analytical pillars of the present work:

- Group-specific responsiveness of working hours, conditional on employment, with respect to marginal taxation and other policies.
- The composition of the labour force within countries: if high responsiveness is limited to groups that have a low weight in the labour force, the aggregate impact will be small.

Sample selection and groups definition

The point of departure of the analysis is the prime-age labour force (*i.e.* 25-54 year-olds). Concentrating on prime-aged individuals allows discarding atypical working schedules for young and old individuals. The focus is on employees. This selection can be justified along several lines, the main reason being that the taxation variables used in this work, based on OECD *Taxing Wages* models, only refer to employees in the definition of the reference worker.

The analysis is undertaken separately for males and females, as the literature has extensively documented the important gender differences in labour market supply behaviour. For each gender, the national labour market is divided into six segments (or groups), corresponding to marital status crossed by educational attainment (distinguishing three levels of skills).

The impact of children: data issues and sample definition

A further sub-division is considered as an extension, defined by the presence of children in the household. Data limitations prevent using this sub-division along the entire

set of estimations, as would seem more appropriate for the purpose of this work. Acknowledging the shortcomings associated with this approach, the baseline analysis attempts to include the effects associated with the presence of children through specific assumptions embedded in the computation of the taxation indicators (see Causa, 2008). The estimates, thus, will be presented according to the following order:

- Baseline estimates of the impact of taxation on working hours, without specifically controlling for the presence of children in the household. This ensures a wide cross-country coverage.

- Baseline estimates of the impact of taxation on working hours, specifically controlling for the presence of children in the household. This ensures minimising measurement error in both the dependent variable and the explanatory taxation variables (as child-related taxation is included in the indicators). However, this refinement comes at the cost of a considerable reduction in the country sample, notably for the Northern European countries. In particular, the following countries are excluded from this analysis: Finland, Sweden, Netherlands, Denmark, Norway, Ireland and Switzerland.

- Estimates of the impact of working-time regulations and other labour and product market policies, based on the wider cross-country coverage, omitting to control for the presence of children in the household. This choice is motivated by the simple argument that those policy settings do not vary across groups, contrary to taxation indicators; it is therefore important, for identification purposes, to rely on a wide – and representative – cross-country sample.

Model specification and identification strategy

The econometric specification aims at identifying the impact of taxation, working-time regulations, and other labour and product market policies on hours worked by specific sub-groups of the labour market, conditional on employment. The following baseline specification is adopted per each gender:[28]

$$\ln H_{cem}(t) = \alpha + \lambda Er_{cem}(t) + \delta mtw_{cm}(t) + \phi atw_{cm}(t) + \left[\omega M \cdot atw_{cm}(t) + \chi E \cdot atw_{cm}(t)\right] + E + T + C + u_{cem}(t)$$

Subscript c refers to country, subscript e to education level, and subscript m to marital status, and jointly define a labour force sub-group, whereas t refers to time. Er is the group-specific employment rate, computed as a proportion of employed persons in the group-specific active and inactive population, thus encompassing both participation (hence labour supply) and (un)employment (hence labour demand) effects. atw and mtw stand respectively for household average tax wedge and individual marginal tax wedge. E, M, C and T represent fixed-effects for educational attainment, marital status, country and time, respectively. The two interaction variables, $M.atw$ and $E.atw$, capture, respectively, marital status and education-level-specific effects of average taxation, the interpretation of which will be discussed below. This equation is then augmented by a vector of regulations/institutions (Pol with corresponding parameters β) and associated interaction terms with education levels ($Pol.E$). These elements are entered either one at a time or jointly. The specification follows:

$$\ln H_{cem}(t) = \alpha + \lambda Er_{cem}(t) + \beta Pol_c(t) + \delta mtw_{cm}(t) + \phi atw_{cm}(t) + \left[\omega M \cdot atw_{cm}(t) + \chi E \cdot atw_{cm}(t) + \rho E \cdot Pol_c(t)\right] + E + T + C + u_{cem}(t)$$

The parameters of interest are δ and β. The first parameter is interpreted as a semi-elasticity of the intensive margin of labour supply with respect to the marginal tax rate, conditional on the extensive margin. The microeconomic literature suggests that the parameter to be significantly negative, in particular for women. The second parameter is interpreted as the impact of other regulations and policies on hours worked, conditional on employment.

The baseline equation includes the average tax wedge, defined at the household level, along with its interactions with education level and marital status. This variable is associated with two effects:

- A "traditional" positive income effect; if leisure is a normal good, an increase in the average level of taxation holding the marginal level of taxation unchanged, is expected to increase individual hours worked.

- Because it is defined at the household level, this variable may capture joint labour supply behaviour between spouses. Consistent with this approach, when the analysis is extended to control for the presence of children in the household, the average tax wedge is interacted with the binary variable associated with an indicator of the presence of children.

Because of multicollinearity between tax indicators in *levels*, it is not possible to interact both variables with country and time-invariant controls such as education and marital status. In this context, whereas the interacted average tax wedges are used as control variables, the marginal tax wedge is not interacted with education and marital status variables in order to maximise group variability for identification purposes. To summarise, the average tax wedge is a control variable and the focus for policy analysis is on the impact of the marginal tax wedge, closer to the traditional labour supply literature – which focuses on *marginal* wages.

The heterogeneity across groups is used both as a source of identification for policies that vary across groups (taxes) and, for policy analysis, as an aggregation device allowing to control for compositional effects arising when policies have differential impact on specific segments of the labour market. The panel structure of the data (where the individual is defined by the intersection of the *country x group* dimension, *e.g.* C x E x M) is taken into account by a robust cluster estimate of the variance-covariance matrix, allowing for arbitrary intra-group correlation of the error structure. This procedure yields conservative estimates of the standard errors. Regressions are weighted by the labour force of each segment in order to avoid segments with few individuals having a disproportionate impact on the estimated effect for the average worker. The reference individual in the estimation is a single employee with upper-secondary level of education.

The endogeneity of the employment rate is tackled though the use of an instrumental variable estimator, where the instruments cover both group-specific cross fixed effects whose impact on working hours occurs through the channel of the employment/participation decision, as well as policy instruments that the literature has identified as having a major impact on labour market outcomes.[29] The instruments used in the baseline estimates are listed below:[30]

- Regression for hours worked by men: i) interaction of education level with marital status; ii) interaction of education level with the lagged average replacement rate of unemployment benefits. When the presence of children is considered, the instruments also include iii) an interaction of marital status with the presence of children.

● Regression for hours worked by women: *i*) interaction of education level with marital status; *ii*) interaction of education level with lagged employment protection legislation concerning regular contracts. When the presence of children is considered, the instruments also include *iii*) an interaction of education level with the presence of children.

The results: the differential impact of taxes and policies by gender

This section presents estimates of the impact of taxation, working-time regulations, and other labour and product market policies on working hours of different groups of the labour force, conditional on employment.

Taxes matter! (for women…)

As discussed earlier, the literature has stressed the higher responsiveness of labour supply at low earnings levels.[31] This is supported by the patterns displayed in Figure 1: the relationship between marginal taxation and hours worked is flatter for higher educated women than for medium and lower educated women.[32]

The following table (Table 2) displays estimates of the baseline model obtained for the two samples: *i*) the sample in which the presence of children in the household is not taken into account, displaying complete cross-country coverage; *ii*) the sample in which it is possible to identify households with children, and conversely, include the corresponding tax indicators; in this case, however, the country coverage is narrow, and, notably, excludes Northern European countries.

In this context, it is important, for interpretation purposes, to analyse the advantages and limitations attached to each of the estimations:

● The first estimation is based on a larger sample of countries and exhibits wider dispersion in terms of both hours worked and taxation. However, the taxation variables suffer from measurement error because assumptions have to be made in the aggregation procedure in order to map the tax indicators – differentiated by the presence of children – into working hours data from labour force surveys.

● The second estimation is closer to the microeconomic approach because the data are defined at a more disaggregated level. Measurement error in the taxation variables is reduced, as the tax indicators have a finer mapping into the population groups defined by the labour force surveys.

As mentioned above, the focus is on the estimated δ, proxying for a semi-elasticity of hours worked, conditional on employment, with respect to marginal taxation. Estimates of the baseline model confirm the higher responsiveness of women to taxation. Indeed, the estimated parameter is approximately seven times higher for women than for men in the sample without children. This parameter is statistically negative and significant for both men and women in this larger sample. It is, however, extremely low and even insignificant for men in the sample in which it is possible to control for the presence of children. This confirms the importance of the disincentive effects attached to marginal taxation for women, who are most often second earners.

For women, the tax-rate elasticity is robustly estimated to be of the same order of magnitude across samples, between –0.7 and –0.8. The impact can be quantified as follows: a decrease in the marginal tax wedge of 1 percentage point, everything else being equal, implies a 0.7-0.8% increase in hours worked, conditional on employment. This estimate is

Figure 1. **Weekly hours worked among employees and average marginal tax wedges – Women**
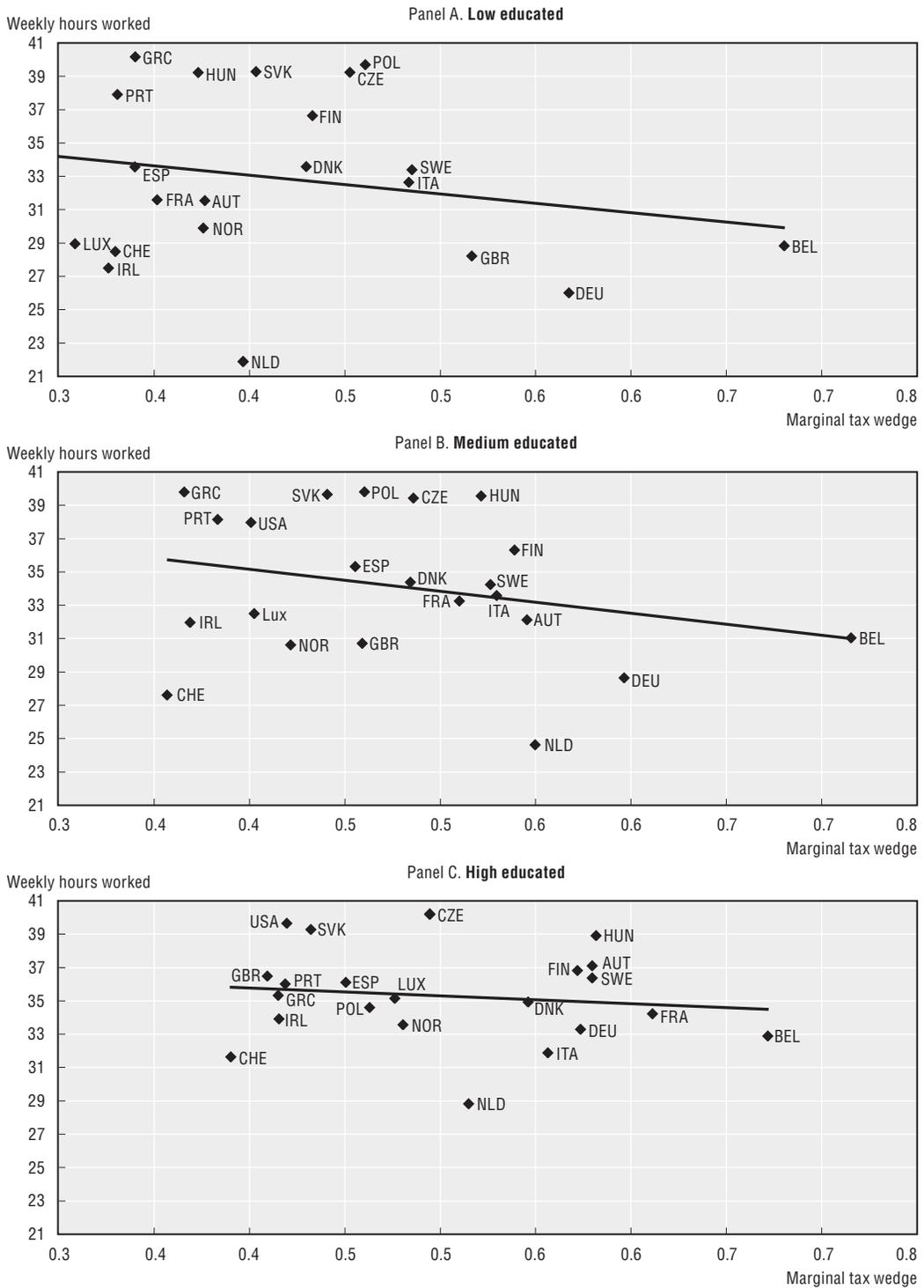
Note: Prime-age labour force (25-54). See text and Causa (2008) for details on the computation of taxation indicators. Data refer to 2005.

Source: European Labor Force Survey, US Current Population Survey and OECD Taxing Wages Database.

Table 2. **Econometric estimates – Taxes (1995-2005)**

	Without taking account of the existence of children		Taking account of the existence of children	
	Men	Women	Men	Women
	1	2	3	4
Employment rate	0.001	−0.001	0.000	0.001
	[0.002]	[0.005]	[0.001]	[0.002]
Low education	−0.043	−0.103	−0.035*	−0.087
	[0.027]	[0.108]	[0.019]	[0.079]
High education	0.054***	0.095*	0.049***	0.065
	[0.015]	[0.057]	[0.011]	[0.044]
Married	0.072***	−0.138	0.057***	−0.112**
	[0.015]	[0.084]	[0.010]	[0.053]
With children			0.007	−0.061
			[0.014]	[0.052]
Average tax wedge	0.08	−0.703***	0.004	0.088
	[0.083]	[0.268]	[0.068]	[0.201]
Marginal tax wedge	−0.136**	−0.730***	−0.084	−0.812***
	[0.060]	[0.224]	[0.055]	[0.215]
Interaction married x average tax wedge	−0.151**	0.089	−0.101**	0.127
	[0.068]	[0.149]	[0.046]	[0.126]
Interaction low education x average tax wedge	0.136*	0.119	0.108**	0.181
	[0.070]	[0.194]	[0.051]	[0.187]
Interaction high education x average tax wedge	−0.111*	−0.154	−0.087*	−0.159
	[0.059]	[0.166]	[0.048]	[0.139]
Interaction children x average tax wedge			−0.028	−0.084
			[0.032]	[0.151]
Observations	984	1 164	1 236	1 512
Sargan test (p-value)	0.47	0.52	0.59	0.30
N_clusters	132	126	180	168

Notes:
* p<.1, ** p<.05, *** p<.01.
Each equation includes country and year dummies. Weighted estimation. Standard errors in brackets are clustered by country x marital status x education (x children in columns 3 and 4). The employment rate is instrumented as follows: Equations for men: Instruments are marital status interacted with education level and lagged average replacement rate interacted with education level.In the equation controlling for the presence of children, additional instruments are interactions of marital status and presence of children. Equations for women: Instruments are marital status interacted with education level and lagged EPL on regular contracts interacted with education level. In the equation controlling for the presence of children, additional instruments are interactions of education level with the presence of children. The countries included in the panel are: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom and the United States. Differences in the number of observations between men and women estimates are due to the absence of Luxembourg in equations for women. This absence is caused by the lack of data on EPL, used as an instrument for the employment rate in equations for women.
Source: European Labor Force Survey, US Current Population Survey, Bassanini and Duval (2006), OECD Taxing Wages; Conway, De Rosa, Nicoletti and Steiner (2006) and Secretariat calculations.

slightly lower than average findings. This lower estimate reflects the fact that the empirical approach undertaken here disentangles the intensive margin from the extensive margin of labour supply and in this context focuses on conditional responses at the intensive margin.

The impact of the average tax wedge is negative and significant in the first sample and positive, although not significant, in the sample in which it is possible to control for the presence of children. The interpretation given here is as follows. In the second sample, the estimation can be considered closer to the microeconomic approach, and might actually

capture an expected positive income effect, by reducing measurement error in the taxation variables. This interpretation is consistent with the empirical finding that estimating the specifications presented in the first two columns of the above table (*i.e.* without children) on a restricted sample does not substantially alter the results. This suggests that it is not the sample size *per se*, but rather the aggregation procedure that might induce measurement error as well as increase the influence of potential multicollinearity problems among the marginal and average tax wedges.[33]

The interactions between the average tax wedge and the categorical variables (education level, marital status) are estimated to be statistically similar across the samples. The interactions are only significant in the equations for men. The sign of these interactions — negative for high-educated individuals and married individuals – can be interpreted as evidence of negative income effects, as suggested above, although this is difficult to assess in the empirical framework developed here. In both samples, the sign of the estimated parameters on the interaction between marital status and the average tax wedge is reversed across sexes, suggesting the possibility of joint labour supply decisions and household division of work time. Unfortunately it is not possible to go further in that direction, the data being semi-aggregated and therefore precluding identifying spouses in the sample.[34] The interaction between the average tax wedge and the presence of children is negative both for women and men, although not significant. This result contradicts previous findings from the literature of important income effects for women with children (see Blundell *et al.*, 1998), although one possible interpretation is that the income effect mostly occurs through the participation decision.

The impact of the employment rate is insignificant, at this level of disaggregation, suggesting that the negative significant effect found at the aggregate level mostly reflects compositional effects arising through women's participation and employment. This intuition is confirmed by the negative sign estimated on the corresponding parameter in women' equations – though it is statistically insignificant – suggesting higher employment rates for women have corresponded to a higher proportion of part-time female employment.

The following analysis on working-time regulations and other labour and product market policies makes use of the sample where it is not possible to identify the presence of children, due to the narrow country coverage of the alternative, more disaggregated, sample. Despite the differences that have emerged for the impact of the average tax wedge across the two samples, the interpretations which have been discussed before, it is important to signal that all of the following results on institutional variables are robust to the change of the sample size.

Working-time regulations matter! (for men…)

The literature on the impact of working-time regulations has focused on the consequences, within countries, of domestic reforms in the relevant legislation.[35] One important finding is that the effect of regulations on employees' working time schedules are extremely heterogeneous – and even opposite – across genders, occupations, firm sizes, and sectors (see Skuterud, 2007, for a convincing natural-experience estimation in Quebec; Afsa and Biscourp, 2004, on France). Figure 2 displays a cross-country scatterplot of weekly hours worked *versus* weekly hours regulation, for men and women respectively. This scatterplot indicates the heterogeneous impact of working-time regulations. Indeed, whereas there seems to be a positive relationship between the regulatory indicator of weekly hours worked (a higher value implying less restriction) and actual hours worked for

Figure 2. **Weekly hours worked among employees and working time regulations**

Panel A. **Men**

Panel B. **Women**
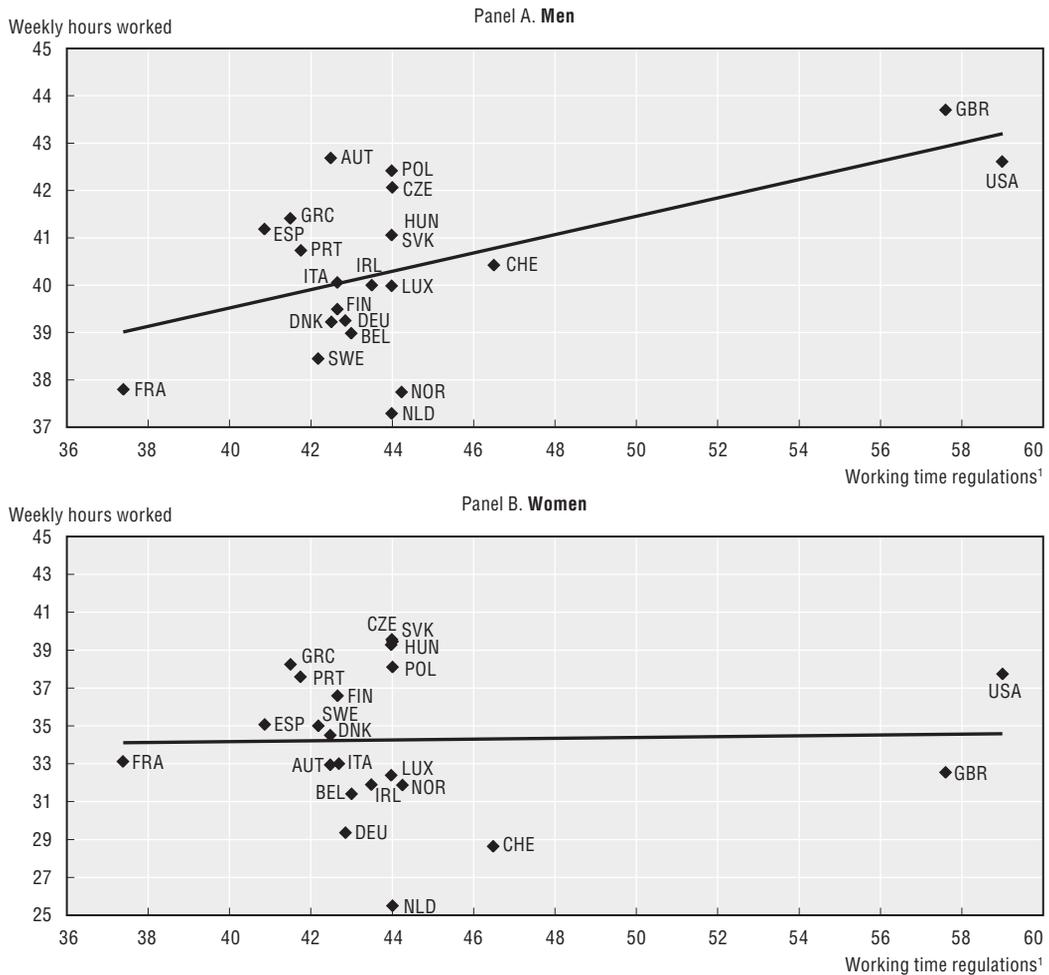
Note: Prime-age labour force (25-54). Data refer to 2005.
1. Average of weekly normal hours and of weekly normal hours and overtime.
Source: European Labor Force Survey, US Current Population Survey and OECD calculations.

male employees, this relationship does not hold for female employees.[36] The following empirical analysis investigates this topic more formally.

The estimates presented here are built on the baseline specification, as presented in the last section. The policy variable is introduced both in levels and interacted with education levels. The indicators used refer to standard normal weekly hours, and an average of regulated normal plus maximum overtime hours. Three results emerge from these estimates (Table 3):

● Flexible working-time regulations are found to have a significant positive impact on men, and a slightly significant impact on women. This result is in line with the literature (see Skuterud, 2007). An important part of the explanation is that women, in particular low-skilled women, are likely to have weaker attachment to the labour market, and, importantly, work fewer hours than men, so that the impact of maximum workweek regulations is less pronounced for them.[37] This is consistent with the finding that the significant impact of working-time regulations is found only in the case of high-skilled women, who have stronger attachment to the labour market and typically work longer hours than their low-skilled counterparts.

Table 3. **Econometric estimates – Working time regulations (1995-2005)**

	Men	Women	Men	Women	Men
	1	2	3	4	5
Employment rate	0.001	−0.002	−0.004*	−0.002	0.001
	[0.002]	[0.004]	[0.002]	[0.005]	[0.002]
Low education	−0.230*	−0.546	0.153**	0.087	−0.042
	[0.128]	[0.344]	[0.070]	[0.230]	[0.027]
High education	0.247*	1.082***	−0.171**	0.179	0.054***
	[0.131]	[0.380]	[0.067]	[0.216]	[0.015]
Married	0.071***	−0.152**	0.076***	−0.161*	0.072***
	[0.015]	[0.070]	[0.017]	[0.089]	[0.015]
Average tax wedge	0.083	−0.626***	0.08	−0.603**	0.078
	[0.076]	[0.227]	[0.093]	[0.284]	[0.085]
Marginal tax wedge	−0.125*	−0.775***	−0.033	−0.767***	−0.106*
	[0.066]	[0.212]	[0.077]	[0.242]	[0.063]
Interaction married x average tax wedge	−0.152**	0.11	−0.021	0.119	−0.146**
	[0.065]	[0.127]	[0.074]	[0.156]	[0.069]
Interaction low education x average tax wedge	0.144*	0.119	−0.115	−0.078	0.133*
	[0.078]	[0.144]	[0.092]	[0.302]	[0.071]
Interaction high education x average tax wedge	−0.137**	−0.256**	0.187*	−0.209	−0.108*
	[0.060]	[0.130]	[0.098]	[0.276]	[0.059]
Weekly normal hours	0.005**	0.005			
	[0.002]	[0.005]			
Interaction low education x weekly normal hours	0.005	0.011			
	[0.003]	[0.009]			
Interaction high education x weekly normal hours	−0.005	−0.024**			
	[0.003]	[0.009]			
Average of weekly normal hours and of weekly normal hours and overtime			0.006***	0.002	0.116**
			[0.002]	[0.002]	[0.058]
Interaction low education x average of weekly normal hours and of weekly normal hours and overtime			−0.003***	−0.003	
			[0.001]	[0.004]	
Interaction high education x average of weekly normal hours and of weekly normal hours and overtime			0.003***	−0.001	
			[0.001]	[0.002]	
Average of weekly normal hours and of weekly normal hours and overtime squared					−0.001*
					[0.001]
Observations	984	1 164	984	1 164	984
Sargan test (p-value)	0.30	0.65	0.31	0.11	0.29
N_clusters	132	126	132	126	132

Notes:
* p<.1, ** p<.05, *** p<.01. Each equation includes country and year dummies.
Weighted estimation. Standard errors in brackets are clustered by country x marital status x education. The employment rate is instrumented as follows: Equations for men: Instruments are marital status interacted with education level and lagged average replacement rate interacted with education level. Equations for women: Instruments are marital status interacted with education level and lagged EPL on regular contracts interacted with education level. The countries included in the panel are: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom and the United States. Differences in the number of observations between estimates for men and women are due to the absence of Luxembourg in equations for men. This absence is caused by the lack of data on EPL on regular contracts, used as instrument for the employment rate in equations for women.
Source: European Labor Force Survey, *US Current Population Survey*, Bassanini and Duval (2006), OECD *Taxing Wages*, Conway, De Rosa, Nicoletti and Steiner (2006), and Secretariat calculations.

● The impact of working-time regulations governing weekly normal hours decreases with education levels, suggesting that limitations are not binding for workers at the high end of the earnings/education distribution (for example managers and academics), but are important for low and medium-educated employees. The negative impact on high-skilled workers implies that tighter working hours regulation increase actual hours worked for certain managing occupations, possibly because they have to "compensate" for the lower working-hours of workers for whom the legislation is binding. Indeed, country-specific studies show that working-time reductions increase the prevalence of irregular working hours for managers and/or in big firms (see Afsa and Biscourp, 2004).[38] This is also suggested by the use of a synthetic indicator, covering both weekly normal hours and overtime. Indeed, in this case, the results indicate a positive effect on actual hours worked by men, increasing in the education level.

● Finally, the third column of Table 3 exhibits a negative significant coefficient on the employment rate in influencing hours worked by men — contrary to the other specifications – when working-time regulations are controlled for. Though the significance level is weak, this result could suggest some "work sharing" effects of working-time arrangements.

While working time regulations are found to influence actual hours worked for men in general, their impact is likely to be particularly strong in countries with relatively strict regulations. In countries where normal hours are relatively long, actual hours worked will not be constrained, as few workers will be directly affected. However, when normal hours are relatively short, the statutory length of the work week is likely to be much more binding. This is confirmed by econometric analysis. The results of the last column of Table 3 show that weekly hours working-time regulations have a non-linear impact on hours worked.[39] This suggests that the binding effect of regulation is stronger in countries where the ceiling on hours is comparatively low.[40]

Finally, it is important to note that the introduction of working-time regulations reduces the impact of the marginal tax wedge on working hours of men to statistical insignificance, supporting the view of labour supply of men being unresponsive to taxes, at least for the range of earnings considered in the present analysis.

Other labour and product market policies also matter…

This section investigates the impact of labour and product market policies on hours worked of different groups in the labour force, conditional on employment. While the literature has produced an important amount of research on the relationship between taxes and hours worked, it has been rather silent on the impact of other labour market policies, as mentioned earlier. The exception to this pattern is the debate on the role of unionisation to understand cross-country evolution of hours worked.

The estimates presented here are built on the same specification as those presented in the previous section. The policy variable is introduced both in levels and in interaction with the education of the employee, per each gender. The identification of an heterogeneous impact of institutional settings on labour market outcomes, depending on workers' characteristics, is a recent feature of the cross-country literature, mostly based on the heterogeneity of labour supply parameters, but also on its interactions with labour demand considerations. The estimates presented here (Table 4) show in turn the separate impacts of EPL on regular contracts, product market regulation and union density.[41]

Table 4. **Econometric estimates – Product and labour market policies (1995-2005)**

	Men	Women	Men	Men	Women	Men	Men	Women	Men[1]	Women[1]
	1	2	3	4	5	6	7	8	9	10
Employment rate	−0.002	−0.004	−0.002	−0.002	−0.002	−0.002	0.001	−0.001	0.000	−0.001
	[0.002]	[0.006]	[0.002]	[0.002]	[0.005]	[0.002]	[0.002]	[0.004]	[0.002]	[0.005]
Low education	−0.050***	−0.146	−0.049***	−0.049***	−0.133	−0.049***	−0.047**	−0.115	−0.045*	−0.113
	[0.014]	[0.135]	[0.015]	[0.018]	[0.105]	[0.018]	[0.024]	[0.098]	[0.025]	[0.116]
High education	0.017	0.172**	0.016	0.046***	0.08	0.046***	0.056***	0.101**	0.055***	0.091
	[0.018]	[0.075]	[0.018]	[0.014]	[0.061]	[0.014]	[0.013]	[0.049]	[0.015]	[0.059]
Married	0.068***	−0.186*	0.069***	0.071***	−0.162*	0.071***	0.072***	−0.155*	0.070***	−0.148
	[0.015]	[0.107]	[0.016]	[0.013]	[0.090]	[0.013]	[0.014]	[0.080]	[0.015]	[0.092]
Average tax wedge	0.012	−0.502*	0.019	0.064	−0.735***	0.068	0.081	−0.588**	0.085	−0.639**
	[0.080]	[0.281]	[0.082]	[0.077]	[0.254]	[0.078]	[0.084]	[0.234]	[0.085]	[0.255]
Marginal tax wedge	−0.049	−0.797***	−0.034	−0.113*	−0.805***	−0.089	−0.141**	−0.791***	−0.106	−0.757***
	[0.062]	[0.262]	[0.064]	[0.066]	[0.250]	[0.067]	[0.059]	[0.232]	[0.071]	[0.254]
Interaction married x average tax wedge	−0.063	0.149	−0.06	−0.074	0.115	−0.07	−0.138**	0.13	−0.127*	0.105
	[0.067]	[0.176]	[0.067]	[0.070]	[0.148]	[0.071]	[0.064]	[0.143]	[0.072]	[0.158]
Interaction low education x average tax wedge	0.034	−0.01	0.03	0.041	−0.015	0.039	0.126**	0.104	0.134**	0.149
	[0.063]	[0.233]	[0.064]	[0.058]	[0.210]	[0.057]	[0.061]	[0.185]	[0.064]	[0.188]
Interaction high education x average tax wedge	0.085	−0.408*	0.090	0.072	0.271*	0.073	−0.087	−0.279	−0.107*	−0.133
	[0.080]	[0.235]	[0.080]	[0.061]	[0.143]	[0.061]	[0.059]	[0.179]	[0.060]	[0.159]
EPL (regular)	−0.057***	−0.026	−0.042***							
	[0.013]	[0.037]	[0.010]							
Interaction low education x EPL (regular)	0.012***	0.015	0.012***							
	[0.004]	[0.025]	[0.004]							
Interaction high education x EPL (regular)	−0.014***	0.030*	−0.014***							
	[0.004]	[0.018]	[0.004]							
Average of weekly normal hours and of weekly normal hours and overtime			0.004***			0.006***				
			[0.001]			[0.001]				

Table 4. **Econometric estimates – Product and labour market policies (1995-2005)** *(cont.)*

	Men	Women	Men	Men	Women	Men	Men	Women	Men[1]	Women[1]
	1	2	3	4	5	6	7	8	9	10
PMR				−0.006	0.011	−0.009**			−0.012***	0.004
				[0.004]	[0.023]	[0.004]			[0.002]	[0.016]
Interaction low education x PMR				0.008*	0.02	0.008*				
				[0.004]	[0.016]	[0.004]				
Interaction high education x PMR				−0.021***	−0.051***	−0.020***				
				[0.007]	[0.014]	[0.006]				
Union density							−0.101	0.261***	−0.017	0.544***
							[0.069]	[0.089]	[0.088]	[0.172]
Interaction low education x union density							0.022	0.057		
							[0.027]	[0.068]		
Interaction high education x union density							−0.040*	0.161**		
							[0.023]	[0.065]		
Interaction PMR x union density									−0.068***	−0.024
									[0.016]	[0.030]
Observations	965	1 164	965	792	792	792	858	930	780	780
Sargan test (p-value)	0.68	0.54	0.58	0.20	0.08	0.35	0.31	0.67	0.08	0.50
N_clusters	126	126	126	102	102	102	126	126	102	102

Notes:
* p<.1, ** p<.05, *** p<.01. Each equation includes country and year dummies.
Weighted estimation. Standard errors in brackets are clustered by country x marital status x education.The employment rate is instrumented as follows: Equations for men: Instruments are marital status interacted with education level and lagged average replacement rate interacted with education level. Equations for women: Instruments are marital status interacted with education level and lagged EPL on regular contracts interacted with education level. The countries included in the panel are: Austria, Belgium, the Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Spain, Sweden, Switzerland, the United Kingdom and the United States. Differences in the number of observations between estimates for men and women are due to the absence of Luxembourg in equations for women. This absence is caused by the lack of data on EPL on regular contracts, used as instrument for the employment rate in equations for women.
1. The interaction between union density and product market regulation is computed with demeaned policy variables.
Source: European Labor Force Survey, *US Current Population Survey*, Bassanini and Duval (2006), OECD *Taxing Wages*, Conway, De Rosa, Nicoletti and Steiner (2006), and Secretariat calculations.

The results show that the strictness of EPL for workers on regular contracts has a negative impact on hours worked by men, and that this impact increases with the level of education. The impact on women's hours worked, conditional on employment, is insignificant (columns 1 and 2). These findings can be interpreted in different ways:

- This suggests that protected workers in regulated markets can benefit from lower working hours, eventually at the cost of raising unemployment for marginal workers. This is supported by the interaction of EPL with the education level in the regression analysis, which is positive and significant for low-skilled men and negative for high-skilled men.

- This result is also consistent with findings in Bassanini and Duval (2006), who argue that the stringency of EPL may encourage the use of part-time work so as to circumvent the legislation affecting full-time jobs and show that high EPL on regular contracts is associated with a substitution of part-time for full-time work for females.[42]

- Another interpretation in line with this finding is that in countries with low EPL, higher hours worked might be a signal of greater work effort in an asymmetric information setting (see Faggio and Nickell, 2007).

- This finding is in line with the predictions of the Michelacci and Pijoan-Mas (2007) labour market search model, in which labour market tightness increases the incentives to work longer hours by increasing the intertemporal return to hours worked.

It is important to note that the result is, however, far from being unambiguous from a theoretical perspective. In a model in which the intensive and extensive margins are substitutes, any policy that acts directly on one of these margins is likely to lead to adjustments costs on the two margins going in opposite directions. In this context, firing costs have a direct effect of making it more costly to use the extensive margin and as a result lead to opposing effects on the intensive margin.[43]

Finally, as for working-time regulations, introducing an indicator of EPL on regular contracts makes the impact of marginal taxation on men's working hours insignificant, reinforcing the argument that while taxes have an important impact of women's working hours, working-time regulations and employment protection legislation have greater effects on hours of work supplied by men.

The impact of the stringency of product market regulation is similar to the one found for EPL (columns 4 and 5). Product market regulation has a negative impact on working hours for men, conditional on employment, and this impact is strongest at high levels of education. Among women, only hours worked by high-educated women are affected, negatively, as men, by the stringency of product market regulation. This result can arise from a sectoral effect, whereby workers in protected sectors can benefit from the monopoly power of firms by negotiating lower working hours. It is also consistent with other more specific models:

- In a simple right-to-manage bargaining model, such as that presented in Cahuc *et al*. (2006), it can be shown that the negotiated number of hours (between the trade union and the firm) is a function of a number of institutional features, among which the elasticity of the revenue function of the firm with respect to the services of labour (positive impact). This elasticity can reflect the monopsony power of the firm in the labour market and is low when the firm has strong market power. This implies that economies with less competition in the product market should have lower working hours.

- If regulations take the form of nominal payments and these payments are rebated to households, as modelled in Fang and Rogerson (2007), then higher regulation is associated with less time devoted to market work. This is simply a negative income effect. The key driving force is the size of the implied transfer payments relative to total labour income.

Finally, columns 3 and 6 show that the impact of EPL and product market regulation on working hours of men are robust to the inclusion of working-time regulations, confirming the idea that these policies operate through distinct channels on labour market outcomes among OECD countries.

Unionisation, measured by union density, is the last institutional setting that is analysed in this framework and is not new to the literature.[44] Estimates suggest a significant and opposite effect on hours of work of men and women, conditional on employment: while high union density is associated with lower working hours for men, it is associated with higher working hours for women.[45] These results support findings reported in the literature on the role of unions in the bargaining process:

- Alesina *et al.* (2005), as mentioned before, show that unions can restrict labour supply in order to increase wages. This effect can be also obtained through a simple right-to-manage model in which the union can bargain a higher utility level for its members (see Cahuc *et al.* 2006). Insofar as men are most likely to have a heavier weight in unions' objective function, this prediction is consistent with the estimates of hours of work supplied by men.

- Trade unions have generally fought against part-time work, seen as a threat to full-time standards (see Houseman, 2001 for econometric evidence). To the extent that women are over-represented in part-time jobs, the results of estimates of women hours of work is consistent with the idea that high union density reduces the proportion of part-time jobs and therefore raises average hours worked by employed women.

- These results are also consistent with the finding in Bassanini and Duval (2006) of a positive and significant effect of union density on female full-time employment and a negative impact on part-time work, suggesting unions' objectives to promote full-time as opposed to part-time opportunities.

Differences between estimates for men and women in the impact of unionisation are notable. Indeed, while the negative impact of union density on working hours for men is weak and confined to high skilled workers, the positive impact found on working hours of women is high and significant. This suggests that the role of trade unions in shaping differences in weekly hours worked among OECD countries mostly occurs through its influence on the proportion of part-time work in the labour force.

The analysis can be extended to study potential interactions among unionisation and product market regulation. As column 9 shows, the negative impact of union density on working hours of men increases in the stringency of product market regulation. This result is consistent with recent literature findings. A number of studies have investigated the impact of product market deregulation across different labour market settings.[46] Fiori *et al.* (2007) show that employment gains from product market deregulation are largest in situations in which labour market settings provide strong bargaining power to workers. When both product market regulation and unions' bargaining power are high, workers — in particular insiders – can extract a higher proportion of the rents generated by market power. In this context, the negative correlation between unionisation and hours worked by employed individuals is expected to increase with product market regulation. This result is

confirmed in the present analysis for working hours of men; by contrast, the same interaction is estimated to be insignificant in women' estimates (column 10), consistent with the different role of unions in the shaping of women's working patterns. This finding, associated with the weaker direct estimated impact of unions on working hours of men than of women, suggests that the level of product market regulation is an important channel through which unions allow insiders to benefit from market power.

Country-fixed effects and omitted variables

The measure of our ignorance: the importance of country-fixed effects

The empirical estimates presented in this work suggest that taxation, working-time regulations, and labour and product market institutions are significant explanatory variables of differences in hours worked across countries and over time. It seems, however, that policies, at least as they are measured here, are not sufficient to fully account for observed differences in hours worked. Indeed, country-fixed effects included in the model play a non-negligible role in the estimation. These effects can be dubbed as the measure of ignorance. One way of presenting the explanatory power of country-fixed effects is by simulating the model while setting the country-fixed effects to zero, and compare the simulated working hours with that predicted by the model. This is done below for men and women separately, and is shown graphically in Figure 3.[47] The reference country is the United States.

These results can be summarised as follows:

- The importance of country-fixed effects in the model has a gender-specific pattern. The country-fixed effects in the regression for women are statistically significant only in the case of three countries (France, United Kingdom and Ireland) whereas they are statistically significant for slightly more than half of the countries in the case of men. However, the explanatory power of country-fixed effects within the model is much higher in the case of women than in the case of men.

- While country-fixed effects are always found to be positive for men, their sign varies for women. Marginal taxation, even in countries where it is comparatively high, such as Northern European countries, does not appear as a sufficient explanation of differences in working hours for women. While major discrepancies occur in the case of the Netherlands and Switzerland, the case of Ireland and the United Kingdom is also interesting. Indeed, despite low levels of marginal taxation, women's average working hours in Ireland and the United Kingdom are very low compared with other OECD countries. At the same time, working-time regulations do not seem either to fully explain men's hours worked. France is a good example where estimates for both men and women display significant positive country-fixed effects, despite high levels of marginal taxation and restrictive working-time regulations.

What factors could stand behind the country-fixed effects? One obvious hypothesis is that of omitted variables.

Industrial structure differences among OECD countries can induce important compositional effects in semi-aggregate labour force data. Indeed, there are systematic differences in working hours across industries. However, the empirical estimates on which Figure 3 relies do not include, due to data limitations on institutional variables, the countries that are most likely to differ in terms of labour allocation, notably Eastern European countries. Unreported country-fixed effects, when these countries are included in the sample, suggest that some of them, notably the Czech Republic and Hungary, exhibit

important positive fixed effects, in particular for men, in concomitance with a still important proportion of the labour force in the agricultural sector, where hours of work tend to be particularly long. Despite the potential for this compositional effect to impact the estimates, it can be argued that the industrial allocation of labour (be it through demand or supply effects) is partly an endogenous response to countries' policies and institutions, and, in this context, should not be controlled for.

In terms of factors affecting labour supply, the model presented here lacks two important dimensions, namely childcare-related costs and benefits, as well as other social benefits excluded from the indicators used in the present analysis. The potential role of these factors is outlined below.[48]

Figure 3. **Hours impact of country fixed effects, men and women**
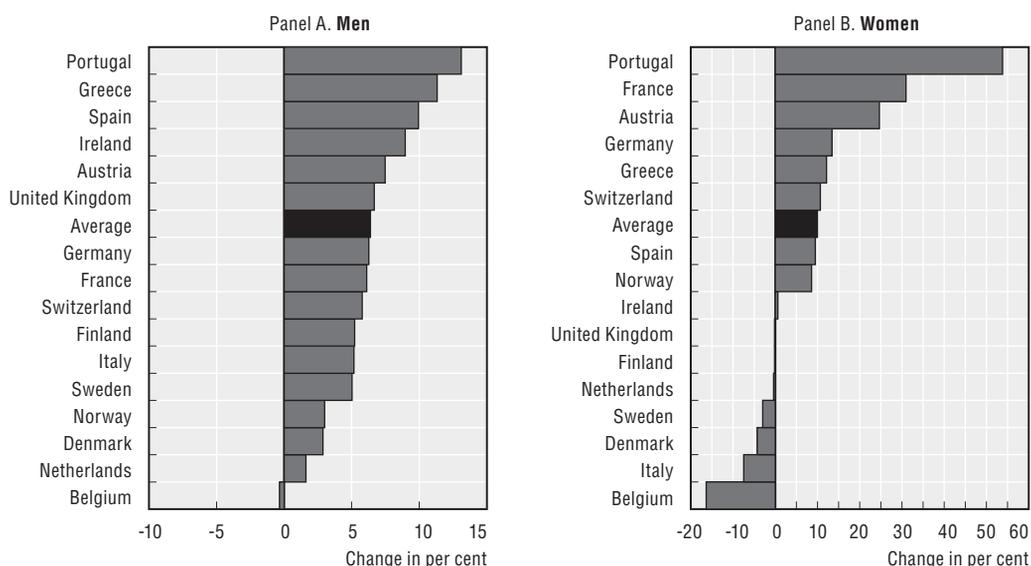
Notes: Statistical significance of the country fixed effects: * p<.1, ** p<.05, *** p<.01. Data refer to 2002. The average for OECD is weighted by employment levels.
*Source:* OECD calculations (see text).

Omitted variables: Childcare costs and benefits

The model presented in this study includes, in the taxation indicators, tax relief and family cash transfers universally paid in respect of dependent children between five and twelve years of age who are attending school. However, this information is only partial and does not allow uncovering the very different institutional setups or welfare state regimes shaping financial work incentives for parents. In particular, it is not possible to incorporate in the estimation the fees charged by childcare centres, childcare benefits, as well as other child-related benefits.

Comprehensive work by Immervoll and Barber (2005) has shown that there can be important adverse work incentives for parents in situations where childcare costs are high.[49] In this respect, it is suggestive to note that the authors cite Switzerland and Ireland as two countries where high childcare costs create adverse work incentives for parents. However, while the impact of childcare on employment incentives has been established to be important, little is known about the relative incentives on the intensive margin of labour supply.[50,51]

Figure 4 provides illustrative evidence of the potential for childcare costs to partly explain the variation of country-fixed effects. Total child-related costs are negatively associated with country-fixed effects in the regressions for women (Panel A), while they are slightly positively associated with country-fixed effects in the regression for men (Panel B). This opposite gender-specific pattern suggests the existence of family labour supply decisions, or household allocation of work, as outlined above. Investigating the potential positive and negative effects of childcare costs on labour supply decisions is an important issue for future research.

Figure 4. **Childcare costs[1] and country-fixed effects**
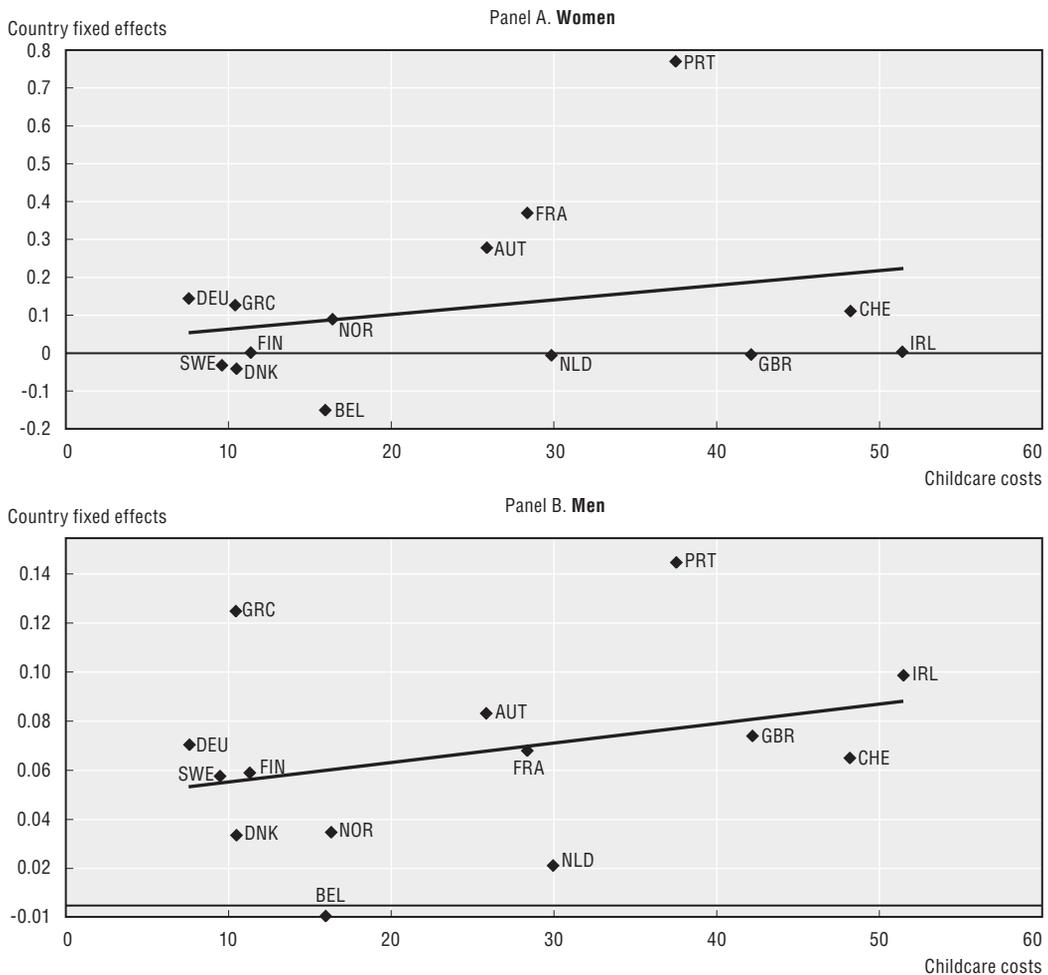
Notes: Statistical significance of the country fixed effects: * p<.1, ** p<.05, *** p<.01. Data refer to 2002.
1. Costs are reported for a two earner couple with two children with full-time earnings at 200 (100+ 100)% of APW. Some countries are missing due to missing data on childcare costs.
*Source:* Immervoll and Baber (2005).

Omitted variables: Income-tested or hours-dependent benefits

A combination of tax increases and benefit withdrawal can reduce the financial incentives for increasing work effort. Marginal effective tax rates can be used to measure these disincentives, but it is not possible to use these data in the empirical analysis presented here.[52] While the tax indicators used in this work incorporate a number of in-

work benefits, notably those that take the form of non-wastable tax credits (such as the Working Families Tax Credit in the United Kingdom, or the US Earned Income Tax Credit), other benefits, potentially interfering with hours of work, are excluded. This is the case of housing benefits, family benefits, or social assistance. While the withdrawal of some of these benefits, in conjunction with higher taxes, might make additional work not-rewarding in the short run, these disincentives effects are likely to be of second-order compared with those already incorporated in this analysis (notably in-work benefits), at least for the range of earnings considered here.[53] Figure 5 plots country-fixed effects from the regression for women against a measure of the so-called "low-wage trap", namely marginal effective tax rates — hence including both tax increases and benefit withdrawals – associated to the transition form part-time to full-time work. As can be seen from this figure, there is a slightly significant negative association between country-fixed effects (in the regression for women) and marginal effective tax rates on part-time employees. This suggests that part of the cross-country unexplained differences in working hours might be driven by the (dis)incentive effects of benefits withdrawal when increasing hours of work, at least in some cases, such as the United Kingdom, Ireland, Switzerland and the Netherlands.

Figure 5. **Country fixed effects in the regression for women and marginal effective tax rates for part-time employees**[1]
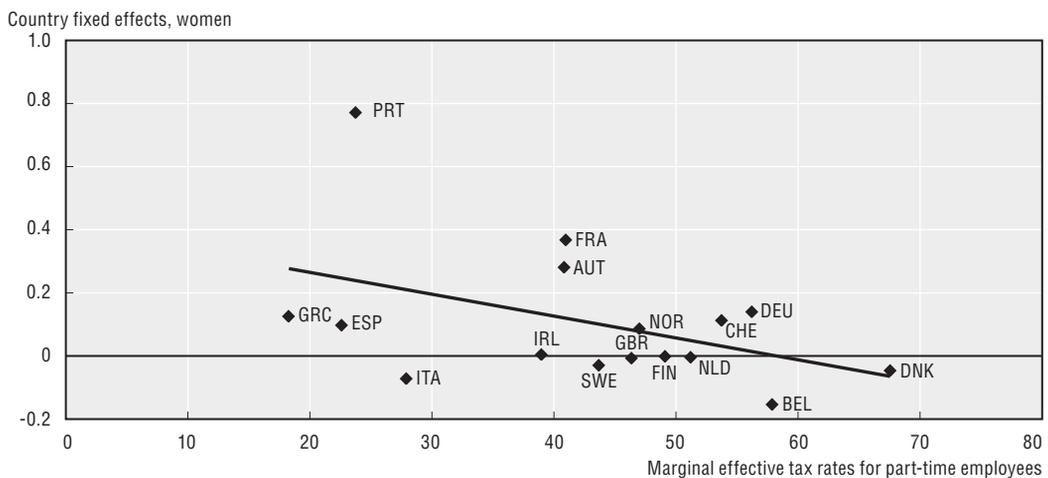
Notes: Statistical significance of the country fixed effects: * p<.1, ** p<.05, *** p<.01. Data refer to 2002.
1. Marginal effective tax rates for part-time employees for doubling of working hours from one-third to two-thirds of full-time hours. Average over different family situations (single with and without children, two family earners with and without children).
Source: OECD Tax-Benefits models.

Policies or preferences? (Still) an open debate?

        Country-fixed effects could also be interpreted as a measure of cultural differences, or, in the vein of Blanchard (2004), a measure of differences in preferences for leisure. Some authors have attempted investigating the strength of preferences through the use of public opinion surveys. One example is Cahuc *et al.* (2006) who compare public opinion surveys on the view of marriage and childcare across the Netherlands, Germany, France, Denmark, and Sweden, and find huge discrepancies in attitudes towards family life. Different sources of opinion surveys suggest that Dutch values are still much more geared towards women

taking care of the family than in other European countries, notably the Scandinavian countries.[54] The authors suggest that it is precisely these preferences, along with their evolution over time, that have favoured the emergence of institutional incentives promoting part-time work among women. This argument indicates the difficulty of disentangling the impact of policies from that of societal preferences, along with the potential interdependencies among the two. While the distinction can be made in principle, endogeneity issues make it very difficult to identify in the data.

Conclusion

This paper shows that policies and institutions do play a role in explaining differences in working hours among employed individuals across OECD countries. In particular, high marginal tax rates on second earners, most often married or cohabiting women, have a significant disincentive effect on the intensive margin of labour supply. Labour supply of men is found to be insensitive to own taxation, as in earlier studies. Whereas working hours of women are responsive to taxation, working hours of men are found to be sensitive to working-time regulations, as well other product and labour market policies. Indeed, legislation regulating the length of working-time is found to be important for men, and in particular the low-skilled.

Employment protection legislation and anticompetitive product market policies are found to reduce hours worked by men, over and beyond their impact on employment rates. Unionisation has an opposite impact across genders, whereby it is associated with lower hours worked among men, and higher hours worked among women. These results are consistent with the idea that in highly regulated and unionised markets, insiders are able to negotiate shorter working hours, while outsiders, or marginal workers, exhibiting lower labour market attachment, are more sensitive to the financial (dis)incentives embedded in taxation systems. The complexity of these patterns suggest that the impact of policies and institutions on hours worked cannot be modelled adequately by focusing exclusively on the labour supply choices of a single representative household. By incorporating labour force heterogeneity and labour demand factors into the analysis, a more satisfactory account can be provided of cross-country and over time variation in working hours.

While uncovering a role for policies and institutions in explaining differences in hours worked among OECD countries, the empirical work undertaken in this paper shows that an important proportion of the cross-country variation remains country specific and unexplained. Thus, the debate on "policies or preferences", remains to a large extent unresolved. As is suggested above, however, this controversy to a large extent hinges upon the idea that it would be possible to properly disentangle the impact of institutional choices from that of societal preferences.

This work indicates a number of important issues for future research. From a theoretical point of view, it suggests the need for a comprehensive framework reconciling microeconomic and macroeconomic models of labour supply. More work is also needed to model and estimate the inter-dependencies among intensive and extensive labour supply decisions, as well the adoption of a more general equilibrium framework, in which both labour supply and labour demand would be considered along the two margins. Finally, availability of time-use data on a cross-country and time-series basis would be of great value to study the impact of policies, notably of taxation, along with social norms and potential complementarities in the allocation of market work across family members.

Notes

1. See, *inter alia,* Bassanini and Duval, 2006, Nunziata, 2005, Calmfors and Driffil, 1988, Nickell and Layard, 1999.

2. A more detailed presentation of the analysis presented here can be found in Causa (2008). The paper can be downloaded at the following address: *www.oecd.org/dataoecd/49/29/40284939.pdf,* No. 596.

3. This section does not present an important strand of the literature that stresses the role of technological change in understanding the cross-country and time-series variation in hours worked. This literature, though relevant, is not reviewed here because it mostly focuses on the convergence process of European countries towards US standards in the period from the end of World War II towards the mid-1990s. There are two main reasons why this hypothesis is not explored in the present work: the first is that the technology approach is a long-run one, whereas the present work exploits recent cross-country data over a short period of time (1996-2005). The second related reason is the homogeneity of the countries used in this study over the sample period in terms of technological development. For a global long-run view on the respective role of taxes and technological change in accounting for the differences in hours worked across the past four decades, see Rogerson (2005).

4. As in the canonical real business cycle models, upon which they are based, aggregate hours worked is determined from the interplay of the optimal labour-leisure choices of a representative household and the total hours of labour services demanded by a representative, profit-maximising firm.

5. Exceptions in this respect are Davis and Henrekson (2004), and Faggio and Nickell (2007), as discussed below.

6. Note, however, that Faggio and Nickell (2007) use a more complex specification, where they introduce the marginal tax rates of the second earner at zero wage, the marginal tax rate of the second earner at 67% average production wage, the marginal tax rate of singles at average production wage, and the average tax wedge. The negative significant sign is found on the marginal tax rate on the second earner at 67% average production wage, as well as on the average tax wedge. The marginal tax rate on single individuals at average production wages exhibits a counter-intuitive positive sign; the marginal tax rate on non-working second earners displays a positive sign, that the authors interpret as an indication of the disincentives to work low hours when spouses face high marginal tax rates at zero hours, although it can be questioned whether this is the right indicator to measure fiscal disincentives to work part-time for second earners.

7. Table 1 entries for Causa (2008) refer to aggregate regressions which are not otherwise discussed in this paper.

8. See the last column of Table 1, in which an attempt is made to compute, based on the reviewed articles, the implied elasticity of average hours worked with respect to the tax rate, in specifications including and excluding country-fixed effects, when the article makes this computation possible. This exercise has to be taken with care. Differences in data, samples, estimation techniques, and included regressors in the results presented make it extremely difficult to compare the implied elasticities across studies. The figures are only presented to convey a rough order of magnitude of the parameter(s) of interest.

9. For an extensive survey of the literature, see *Handbook of Labour Economics*, Volume IIIA, Chapter 27. For a meta-analysis, see Evers *et al.* (2006).

10. For empirical evidence on this, see Mroz (1987), Arrufat and Zabalza (1986) and Aaberge *et al.* (1999).

11. Analysis of the impact of government welfare programmes (*e.g.* the working families tax credit in the United Kingdom) supports this idea (Brewer and Browne, 2006).

12. Aaberge *et al.* (1999) estimate a joint labour supply model with Italian data and find important cross elasticities of women's labour supply with respect to spouse's wage, in particular for the participation decision. This effect, combines with the rather inelastic labour supply among men and individuals with middle and high incomes, causes policy simulations to deliver a moderate aggregate impact on total labour supply.

13. For instance, it is implicitly supposed that variations in labour taxes paid by employees and by employers are shifted into lower net wages, thus causing a labour supply reaction (see, *interalia*, Daveri and Tabellini, 2000).

14. See Rosen (1978).

15. See Hamermesh (1993), Fang and Rogerson (2007).

16. Cahuc *et al.* (2006) extend a standard collective bargaining model to incorporate working time regulations. The model predicts that increases in union's bargaining power lead to lower working hours, and that increases in product market competition lead to higher working hours.

17. There are few available cross-country analyses, though. Immervoll *et al.*, 2007 use micro-simulation techniques to study the behavioural impact of taxation reform; Geiner and Steiner (2007) use cross-country microeconomic data on female employment and working hours from the ECHP for four European countries which they identify as featuring distinct "institutional regimes". The latter study is closer to the present approach but does not directly test the impact of differences in "institutional regimes" on differences in hours worked across those countries.

18. Some exceptions are worth mentioning. Buddelmeyer *et al.*, (2004) analyse the determinants of part-time work in EU countries, and in this context, investigate the impact of labour and product market regulations. Faggio and Nickell (2007) also report some panel regressions on the impact of labour market institutions on average hours worked by employed individuals. The authors, however, do not focus on these issues in their paper. Fang and Rogerson (2007) provide a different approach by deriving the expected impact of taxes and other policies on the extensive *versus* the intensive margin of labour supply. The approach is purely theoretical, however, and the model is not confronted with cross-country data.

19. For an assessment of the differential impact of policies by gender and age, see Bertola *et al.*, (2002), Bassanini and Duval (2006), and Jimeno *et al.*, (2002); for an assessment of the differential impact of policies by migration status, see Causa and Jean (2007).

20. Convincing instruments are extremely different to find at the cross-country level.

21. Luxembourg is absent from estimates for women due to data limitations.

22. One potential limitation induced by the aggregation procedure is that averaging marginal tax wedges over a wide range of earnings levels does not account for discontinuities in the budget line, which are important drivers of marginal tax wedges. As a robustness check, marginal tax wedges used in the empirical work are compared to alternative measures, both across and within groups. The alternative measures are calculated for discrete "moves" along the earnings distribution, from 33% to 200% of the APW wage. Average tax wedges at 33% and 200% of the APW wage are used for estimating alternative measures of average marginal tax wedges for different categories of households. The pairwise correlations between these alternative estimates and the marginal tax wedges used in the paper range between 0.97 and 0.99, both within and across groups. These correlations suggest the robustness of the empirical analysis with respect to the limitation mentioned above. Results are available from the author upon request.

23. A third limitation can be mentioned, pertaining to the exclusion of indirect taxes from the tax wedges used in the disaggregate analysis. Though indirect taxes are also likely to influence the supply of hours worked – despite the fact that they are largely absent from most microeconometric analysis of labour supply – their impact is excluded due to lack of data on indirect tax rates applicable to different population groups.

24. Not only the cost of childcare, but also a number of policies pertaining to the structure of the childcare system, such as school hours, are likely to play a role (see OECD, 2004b). Unfortunately, no cross-country, time-series dataset quantifying those structural features is available.

25. Burniaux (2008), on which these data are based, provides a comprehensive review of working time regulations in OECD countries.

26. It is important to stress that part-time contracts are mostly regulated by the legislation on permanent contracts, hence justifying the use of this indicator as opposed to the indicator of EPL on temporary contracts (see Buddelmeyer *et al.*, 2004).

27. Once again, childcare and school related indicators would have been useful here. They could not be included for data unavailability in a panel context.

28. This equation does not include a specific subscript allowing identification of the presence of children in the household, as most of the empirical analysis cannot rely on this information. When the information on the presence of children is available, this criterion is used to redefine the groups along a further dimension. In this case, the number of groups is multiplied by a factor of two (depending on the presence of children).

29. In this case, the argument would mostly be *demand* driven. See, *interalia*, Bassanini and Duval (2006).

30. The source of the policy variables is Bassanini and Duval (2006).

31. A recent strand of the literature for the United States has shown that very high income earners might be much more responsive to tax rates than middle or middle-high income earners (see Saez, 2003). However, this phenomenon is concentrated at the very top of the distribution and thus for the purposes of this work, this high income elasticity should not affect the overall intensive elasticity used for high-educated individuals.

32. Education is here considered as a proxy for earnings.

33. However, multicollinearity should not be a serious concern here: taxation variables are measured in levels, because of the use of a within-estimator across countries and groups. Hence, the residual correlation among the two variables is essentially within countries and groups across time. Multicollinearity tests suggest that the issue is not severe here.

34. An attempt was made to estimate the model by three-stage least squares, thus taking into account correlation among male and female labour supply equations; the results for the elasticity of hours with respect to taxation were essentially unchanged.

35. The most cited examples are Hunt (1999) for Germany, and Crépon and Kramarz (2002) for France. For a complete assessment, see Cahuc *et al*. (2006).

36. Note that the impact is even reversed for women when excluding the United States from the scatterplot.

37. The results are also consistent with the intuition based on an insider/outsider setting, in which, in unionised and regulated markets, insiders are able to bargain for shorter work time, eventually at the cost of higher unemployment for outsiders. This intuition is confirmed in the first stage of the present regression, although the framework does not allow formally testing assumptions on the impact of a working-time regulations reform. See Cahuc *et al*. (2006), for a model of the impact of workweek reduction in a unionised environment.

38. This result is also consistent with a model in which, when the hourly wage is taken as given, reductions in standard hours are expected to increase working hours by causing the number of overtime hours to rise. This occurs if the level of standard hours is low relatively to what the firm needs. In this case, a reduction in standard working-time has the effect of increasing actual hours worked and reducing employment (see Calmfors and Hoel, 1988; Cahuc *et al*., 2006 and Skuterud, 2007).

39. Only regressions for men are presented, due to the very low statistical significance found in estimates for women. The interaction with the education level is not taken into account because it is not relevant to the assumption tested here while potentially introducing multicollinearity in the estimation.

40. Some caution is, however, needed when extrapolating these results. Indeed, the impact of working-time regulations is identified though policy changes within countries over the sample period (1996-2005) – by definition of a within country estimator. Hence, the estimates are likely to depend on the limited number of countries having undertaken significant reforms over the decade (the most important reform being the French 35-hours week). However, they remain robust to the exclusion of influential data points.

41. Structural policies generally exhibit little time variance and strong multi-collinearity with each other. This is why policies are mostly considered here one at a time. There is no straightforward way to correct for multi-collinearity. Looking at policies separately prevents the influence of one policy from being blurred by collinearity with another. However, as long as hours worked are jointly influenced by several policies, analysing them separately generates a problem of omitted variables. This implies that the results must be interpreted with care.

42. Although not significant, the negative effect found in the equations for women, decreasing with the education level, is suggestive of this interpretation, insofar as the over-representation of women in part- time jobs is probably lower for highly skilled workers.

43. See Fang and Rogerson (2007).

44. Note that while union coverage, *i.e.* the share of employees covered by collective contracts, would have been a better measure for the purpose of this work, it is not possible to use this variable in a panel context because data are not available on a time-series basis.

45. Note that in the case of men, the impact is significant only for high levels of skills.

46. See Nicoletti and Scarpetta (2005), Griffith *et al*.(2006), Amable *et al*. (2006) and Fiori *et al*. (2007).

47. For the purpose of this simulation, country-fixed effects are first re-estimated in a specification that includes taxes, working-time regulations (using the indicator covering normal and overtime hours) and other labour and product market regulations. In so doing, they correspond to a residual component that remains unexplained by other institutional variables. The sample is reduced in this case because of lack of coverage for some countries on product market regulation data. These country-fixed effects are set equal to zero and weekly hours worked are recalculated using this modified equation. The impacts reported in the figure are calculated by making the difference between the predicted data on weekly hours worked and weekly hours worked estimated with the modified equations where country-fixed effects are set to zero. This difference corresponds to the contribution of the country-fixed effect in the empirical model. In this way, a positive impact in Figure 3 corresponds to a positive country-fixed effect.

48. Another omitted variable that could be driving part of the country-fixed effects is the presence of regulations affecting part-time work other than that embedded in taxation systems. Hence, the negative country fixed effect in the Netherlands may reflect the existence of regulations favouring part-time work that are not taken into account in the rudimentary index of working-time regulations used in the estimates. In the same vein, the United Kingdom presents some form of exemptions from the national insurance payment for workers working less than 16-hours week, mainly mothers.

49. See also OECD (2007) for recent estimates of childcare costs.

50. See Geyner and Steiner (2007), Haan and Myck (2006), Rammohan and Whelan (2007).

51. While some countries encourage flexible working-time arrangements, reflected in high incidence of part-time work among mothers, it is not clear whether a movement towards shorter hours is good or bad for women. On the one hand, it may reflect a desire on the part of women to work less to allow more time for family care. On the other hand, part-time work often pays less well and is argued to have a lower status and less career prospects than full-time work. Part-time work can reflect a constrained choice due to the absence of subsidised childcare, as seems the case in the United Kingdom, in particular for low-income families (see Geyner and Steiner, 2007).

52. See Causa (2008).

53. For an assessment of the so called "low-wage trap", see OECD (2005b, Chapter 3).

54. For another piece of evidence on the Dutch experience, see Bevelander and Groenveld (2007).

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