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Subsidies on Low-skilled Workers' Social Security Contributions: The Case of Belgium

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Abstract In recent decades, many "Making Work Pay" policies have been implemented in OECD countries. These policies aim at improving the financial incentives for work while maintaining high levels of social protection. Examples include the Earned Income Tax Credit in the USA and the Working Family Tax Credit in the UK. While these policies are proven to be quite effective with respect to poverty alleviation, many worry that they may discourage labor supply on the intensive margin. We consider an alternative measure implemented in Belgium: the Workbonus, which subsidizes social security contributions for low-skilled workers. This program differs from other measures in that the eligibility and the level of the subsidy are based on full-time equivalent earnings. The instrument therefore distinguishes between low skill and low effort and avoids the above-mentioned disincentive effect. We assess the effects of the Workbonus on labor supply using a particular discrete-choice labor supply model in which individuals are assumed to choose among jobs belonging to individual-specific latent choice sets. In particular, we compare the Workbonus with a tax credit system temporarily implemented in Belgium in 2001–2004. Results show that both measures have a positive impact on labor supply. However, the Workbonus is more efficient in terms of cost per additional full-time equivalent position created and avoids the "part-time trap" implicit in the tax credit system.

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1 Introduction

In the framework of the Lisbon strategy, Belgium faces the challenge of increasing its employment rates. The overall employment rate in Belgium (62.4%) is significantly lower than the average level for the entire European Union (65.9%). Particularly striking is the gap in Belgium between the employment rates of the less-educated and the medium- and highly educated population.[1]

From a labor supply perspective, the tax and benefit system has an important impact on the financial incentives offered to households to enter the labor market. It is often argued that the high level of taxation on labor income coupled with generous income support when out of employment is one of the main causes of persistent lower employment levels amongst the low-skilled population. Whereas income support for the unemployed is not particularly high in Belgium, the tax burden tends to be comparatively high.[2]

The European countries, characterized by high taxes and high-benefits systems, have implemented several instruments aimed at improving the financial incentives for labor supply amongst the low-skilled population, while maintaining high levels of social protection. Possible instruments include, for example, generalized reductions of personal income tax, tax credits on low earnings, subsidies on social security contributions and/or in-work benefits. An overall reduction of the tax burden was at the heart of policy reforms in the UK and later in the US, starting from the end of the 1970s when the Thatcher and Reagan administrations introduced extensive tax cuts. More important for the low-skilled workers were, however, the Earned Income Tax Credit (EITC) and the Family Credit (FC), eventually replaced by the Working Family Tax Credit (WFTC). Both policy instruments were specifically designed to encourage employment amongst the low-skilled population, by increasing the revenue of poor households where one or both parents are engaged in paid work.

Despite the relative consensus on the need for such targeted instruments, concerns arise about their optimal design. Policies that are means-tested on household rather than individual income, such as the EITC or the WFTC, are better targeted at households in need, such as lone mothers, but may also discourage second-earners' labor supply, married women's in particular. Several studies point at these contrastive effects, using both "ex ante" and "ex post" methodologies: see Eissa and Liebman (1996), Bingley and Walker (1997), Eissa and Hoynes (2004), Duncan and Giles

[1] The employment rate of the low-skilled population aged between 25 and 64 years was only 39.7% in 2008, as opposed to an average of 48.1% for EU-27, and 51.2% for EU-15. In contrast, the employment rate of the highly skilled population is 83.0% in Belgium, i.e., in line with the EU-15 average of 83.8%. For the medium-skilled population, the gap with respect to the EU-15 is in the order of five percentage points.

[2] According to EUROSTAT in 2008, the tax burden on low earnings (2/3 of average earnings) was in the order of 50.3% in Belgium, i.e., the highest of all EU-27. In the same year, the EU-27 and EU-15 averages were 40.7% and 40.8%, respectively.

(1996), and Blundell et al. (2000). Bargain and Orsini (2006) have simulated the WFTC for Germany and France and found that the measure would have an overall negative impact on labor supply, because it offered such strong disincentives to married women to supply labor. In addition, measures that are phased out as earnings increase may create incentives for lower effort and lower hours of work and lead to a negative impact on the labor supply at the intensive margin.

In 2000, Belgium introduced an innovative “Making Work Pay” (MWP) instrument called the Workbonus, which incorporates a substantial reduction of the social security contributions paid by low-skilled workers. Differing from other measures, the eligibility for the Workbonus and the level of reduction is based on full-time equivalent earnings. This instrument therefore distinguishes between low skill and low effort and avoids the disincentive effect on labor supply at the intensive margin. From 2005, an extended Workbonus system replaced an individual earnings tax credit on low earnings for wage earners.

The purpose of this paper is to provide an assessment of the impact of the Workbonus on labor supply. This requires a structural labor supply model that can simulate the potential behavioral adjustments as the tax and benefits policy changes. Unfortunately, there is no general agreement on which approach is best to this end. An important generalization of the conventional textbook model to accommodate nonconvex budget sets was made by Hausman and others (see, for example, Hausman and Ruud (1984) and the references therein). However, the so-called Hausman approach has turned out to be impractical because of complicated nonlinear budget constraints (see Bloemen and Kapteyn (2008) for a discussion of this topic). Van Soest (1995) proposed a discrete-choice approach to labor supply modeling. The advantage of this approach is that it is much more practical than the conventional continuous choice approach in the presence of complicated budget constraints. Neither the Hausman model nor the conventional discrete-choice model can, however, easily deal with the typical feature of the distribution of hours of work, that there are substantial peaks at full-time and possibly at part-time hours of work.

In our analysis, we have applied an alternative modeling approach based on the model developed by Dagsvik and Strøm (2006) and Dagsvik and Jia (2006). Like the models of Van Soest (1995), this approach is also developed within a discrete-choice framework. Theoretically, however, it differs in that labor supply behavior is viewed as an outcome of agents’ choices from a set of feasible jobs, each of which is characterized by offered hours of work and nonpecuniary (qualitative) attributes. Moreover, the set of available job opportunities varies amongst the agents, allowing for a rationing effect that is neglected in conventional modeling approaches. This approach thus allows us to capture the peaks in hours of work.

Based on the model, we find that the Workbonus increases labor supply on both the intensive and extensive margins. Compared with the Belgian tax credit, the Workbonus is much more efficient in terms of cost per additional full-time equivalent unit[3] and avoids the “part-time” trap generated by the tax credit system. This could be of great interest for continental European countries with labor markets and an institutional setting similar to the Belgian one.

[3]One full-time equivalent unit is defined as a position with 38 hours per week.

The structure of the paper is as follows: Section 2 discusses the different MWP policies and describes the recent policies implemented in Belgium, Section 3 presents the data, Section 4 describes in detail the labor supply models used, Section 5 discusses the empirical results, Section 6 analyzes the impact of the Workbonus, and Section 7 concludes the paper.

2 The Belgian “Making Work Pay” policies

Following the terminology of Nelissen et al (2005), the low participation of low-skilled workers is often attributed to the so-called productivity trap and the poverty trap. The productivity trap is defined as a situation in which “a person’s productivity is too low compared with the wage to be paid by an employer”, whereas the poverty trap refers to the case where “a person has insufficient incentives to do paid labor.” Accordingly, the public policies that aim to stimulate employment among the low-skilled can be categorized into demand-side measures, which reduce the wage cost for employers, and supply-side measures, which increase the financial incentives for workers to work.

Traditionally, employment policies in Belgium have focused on demand-side measures. This is probably because of the high level of structural unemployment, mainly linked to the heavy industrial restructuring process. The reduction of employers’ Social Security Contributions (SSC) for low-paid workers was promoted as early as 1988, as a means to increase low-skilled employment. At that time, the proposed reduction was in the order of 22,500 BEF per year, i.e., approximately 65 EUR per month in current values. Since 1994, however, the reduction of SSC has been generalized to all low-paid workers. It is estimated that the reduction in the tax wedge will bring about an increase in the employment rate of one percentage point.

After decades of demand-side policies, policy makers in Belgium have recently implemented supply-side policies aimed at reducing unemployment and inactivity by decreasing the tax burden on labor income, especially for the low-skilled. Indeed, Belgium is the EU country in which the taxation on low earnings is the highest. As is the case in most Bismarckian welfare states, the high tax burden on low earnings is driven by the flat-rate contribution rates of the compulsory insurance system.

Starting from 1999, the federal government has taken major steps to reduce the tax burden on labor. One important measure was the introduction of substantial reductions in employees’ SSC for low-paid workers, which have been in place since 2000, later known as the Workbonus. In addition, a reform of personal income taxes became effective in 2001. This reform included, among other things, an individual earnings tax credit on low earnings that was intended to have a positive effect on labor supply. In 2004, a year before the full implementation of the tax reform, a second reform amended some aspects of the tax regime. In particular, the newly introduced tax credit for wage earners was replaced by an extended Workbonus system.

An important argument for replacing the tax credit with the Workbonus system is that the latter screens out workers with low earnings from low effort (labor supply), so the subsidy avoids the well-known inconvenience built in to most income- or earnings-tested instruments, that individuals reduce labor supply at the intensive margin, finding compensation in the subsidy. From a practical point of view, the Workbonus also has an immediate effect, whereas the tax credit only becomes fully effective when final taxes are computed, which may be two years after the income has been earned. In the following, we describe briefly the two policies.

2.1 The Workbonus system

The Workbonus system entails a reduction of employees' social security contributions for the low-skilled. In Belgium, social security contributions are collected directly via a withholding tax applied when wages are paid by the employer. The reduction of the contribution therefore is automatic for eligible workers and no application is required to obtain this reduction.[4]

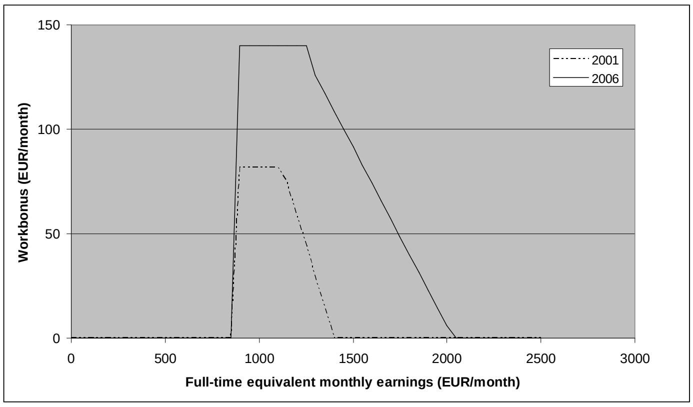

Fig. 1 Subsidies of low-skilled workers' social security contributions

Figure 1 shows the level of the reduction in 2001 and 2006 expressed in prices of the given contribution years. As shown in the figure, not only has the level of the subsidy increased significantly over time, but eligibility has been progressively extended to medium–low earnings. In the 2001 system, according to the National Office for Social Security, fewer than 260,000 persons were eligible, as compared to over a million in 2006.

The design of the bonus is fairly simple: individuals with Full-Time Equivalent (FTE) earnings up to a threshold of 1103.13 EUR per month in 2001 (1258.88 EUR per month in 2006) and above a minimum level are eligible for the full amount of the

[4]This implies that workers should have quite good knowledge of the Workbonus system and will respond accordingly. However, this may not be true for "potential workers", who may fail to take advantage of this opportunity. This leads to the so-called awareness problem, see, for example, studies by Maag (2005). In this sense, we may overestimate the effect of the Workbonus. Unfortunately, we do not have any data available to deal with this issue.

benefit, 81.8 EUR per month (140 EUR per month in 2006). For a full- time worker with the minimum wage, the full benefit amounts to around 7.2% (11.1% in 2006) of the monthly wage income. As FTE earnings exceed the threshold, the SSC reduction is tapered away at a rate of 0.38 (0.1712 in 2006) until it reaches zero.[5]

One of the peculiarities of the Workbonus is that eligibility and the level of benefit are directly related to the individual's earning potential, rather than to actual earnings. That is, to define eligibility, current earnings are transformed into full-time equivalent earnings. Consequently, medium- or high-skilled workers only working part time or a marginal number of hours are not entitled to the benefit. Moreover, the amount of the benefit is computed pro rata with respect to working time, so that workers working part time at the minimum wage only receive 50% of the benefit. This feature distinguishes the Belgian subsidy from similar measures implemented in the UK, Germany, and The Netherlands.[6]

However, employers may behave illegally by eluding the legislation, or, alternatively, they will be able in the longer term to retain the benefits of employees by, for example, declaring more contractual hours than those actually worked. If this is proven to be the case in practice, the Workbonus should be considered as, at least, a policy that works on both the demand and supply sides of the labor market. Thus, our analysis below may not correctly reflect the "real" effect of the Workbonus, because we assume that it is purely a supply-side policy. Nevertheless, some ex post analysis in the following years should allow researchers to verify to what extent employers have benefited from the Workbonus, including through illegal behavior. Unfortunately, we are not able to proceed along this line here and this is left for future research.

2.2 The individual tax credit on low earnings

The tax credit is administrated by the ministry of finance and it is refunded or deducted from tax due in the second year following the year in which the income was earned. The tax credit (in contrast to similar measures implemented in the Anglo-Saxon countries) is fully individualized, that is, it is not means-tested on household income, nor does it depend on the family situation of the beneficiaries. Similarly to the Anglo-Saxon measures, however, it is refundable.

Other characteristics of the tax credit closely match the characteristics of the instruments that already exist in other countries. The benefit is phased in and phased out with a relatively low taper rate. Eligibility starts when net earned income (i.e. gross earned income net of SSCs and imputed professional expenses) is above EUR

[5]Note that the minimum level of earnings is redundant because labor market legislation sets the minimum wage above the minimum threshold. The only cases in which the minimum level becomes relevant is for apprenticeships, for which the minimum wage may be lower. In 2004 the minimum threshold was therefore removed altogether. Note also that the levels of maximum benefits cited above are those for white-collar workers. Blue-collar workers enjoy slightly higher amounts because their contribution rate is slightly higher.

[6]The French Prime Pour l'Emploi (PPE) shares similar features, but the amount of the benefit is also a function of the family situation, and the scaling with respect to working time is not linear, so that the benefit still delivers a part-time premium.

3,960. Between this lower threshold and EUR 5,287 the credit will be phased in very sharply at a rate of 40 % (i.e. the credit increases by EUR 40 for every EUR 100 earned between EUR 3,960 and EUR 5,287). Between EUR 5,287 and EUR 13,226 the credit is equal to EUR 532 and between EUR 13,226 and EUR 17,186 the credit is phased out at a rate of 13 %, meaning that EUR 13 of credit are lost for every additional EUR 100 earned.

3 Data

The analysis relies on a sample of administrative data constructed in a two- step procedure. First a random sample of 100,000 individuals was drawn from the set of all individuals who, according to the National Register, are known to have had their main place of residence in Belgium on January 1, 2002. Individuals in this random sample could be either living in private or collective households (e.g., retirement homes or prisons). In a second step, the sample was extended with all household members of those individuals drawn in the first step and living in private households. The final sample comprises a set of 305,019 individuals. Sample weights have been constructed to inflate the sample to the 2001 total population level and to correct for the overrepresentation of larger households caused by the sampling method. For this sample, a data set with microdata from various administrative sources was constructed. Apart from some household characteristics taken from the National Register (age, sex, relationship between household members, region and population density in the residence area), the data set consists of variables taken from the "Datawarehouse labor market and social protection". The data set we employ contains: i) labor market income and a number of labor market characteristics for wage earners in either the private or public sector; ii) some labor market characteristics and incomes of the self-employed; and iii) information on various social benefits such as unemployment benefits, sickness and disability benefits and pensions. All variables in our data set contain registrations for the tax benefit year 2001.

To analyze the labor supply we selected a subsample of households from the data set described above. The subsample is made of individuals at working age (18–65) available for the labor market, i.e., neither (pre)retired, nor sick or disabled. We also excluded the self-employed in modeling labor supply, because of lack of information on the hours worked. This does not seem to be very harmful for the current analysis because the Workbonus only affects employees. Couples with mixed labor market status, for example, a self-employed husband with an employed wife or vice versa, were not modeled. Individuals under the age of 25 who are not employees, self-employed or registered as unemployed were assumed to be in full-time education and not available for the labor market. Individuals over 25 with undefined professional status, on the other hand, are assumed to be nonparticipants and thus potentially available for the labor market. This assumption allows us to neglect simultaneity issues of educational investment and labor supply.

Besides the "standard" cases of singles and couples[7], there is a residual group of households that contain different types of families and forms of cohabitation: this

[7] Couples include both married and cohabiting couples.

includes homosexual couples or cohabiting flatmates, brothers and sisters or other relatives sharing housing, and mainly couples with grown-up children also available for the labor market. From the labor supply perspective, this group tends to be rather heterogenous, and the degree of "unity" of the household (i.e., the extent to which the income of one member influences the decisions of the other members) is unknown and/or difficult to deduce. In other words, it is not possible to determine whether labor supply should be modeled as an individual or joint decision. We therefore followed the bulk of the literature on ex ante evaluations and decided not to model these households.

Following the selection, we are able to estimate a labor supply model based on information about 32,521 couples, 14,710 single men and 13,574 single women. Table 1 provides descriptive statistics of the modeled samples.

Table 1 Descriptive statistics (modeled subsample)

	Singles		Couples	
	Men	Women	Men	Women
Demographics				
Household size	1.05	1.45	3.14	
Children under 3	0.00	0.05	0.19	
Children from 3 to 6	0.01	0.07	0.19	
Children from 6 to 12	0.02	0.15	0.37	
Children from 12 to 23	0.03	0.15	0.38	
Age of man (head)	35.05	-	40.82	
Age of woman (head/spouse)	-	37.18	38.68	
Living in Wallonia	0.33	0.34	0.31	
Living in Flanders	0.53	0.50	0.62	
Living in medium cities	0.53	0.52	0.60	
Living in big cities	0.35	0.36	0.25	
Labor Supply				
Hours worked (whole population)	25.26	20.35	30.29	18.77
Hours worked (population in employment)	33.99	32.34	35.67	29.67
Hourly Wages				
Hourly wage (whole population)	11.77	10.69	14.34	10.93
Hourly wage (population in employment)	12.73	12.14	15.12	12.46

Relying on administrative data has some clear advantages, typically the high quality of the income information—at least as far as replacement incomes and earned incomes in the formal economy are concerned. On the other hand, there are also some disadvantages. The most prominent one is the lack of relevant information such as education level. In addition, data on financial income are missing. Because the incomes for most wage earners are primarily wage income, this would not represent a substantial measurement error. Data from a Belgian household budget survey in 2004 suggest that the average level of financial income in the Belgian population of wage earners is of the order of about 0.4% of their disposable income.

Another important limitation is the definition of the labor market status of individuals. This definition relies entirely on the source of incomes. Individuals who do not receive pension benefits, unemployment benefits or sickness and invalidity benefits and who are currently not earning any income from labor are automatically classified as non-participants and are supposed to be available for the labor market. It is, however, likely that some of these individuals are working in the shadow economy, while others are not available for the labor market because of a "discouraged worker" effect. This and other differences should be kept in mind when comparing both the characteristics of the underlying population and the labor supply model estimates.

A key variable in the labor supply model is the gross wage. For the individuals active in the labor market, we determined the gross wage by dividing gross labor income during the fourth quarter by the number of contractual hours, two variables that are registered by the Datawarehouse. For the unemployed and non-participating people, we first tried to reconstruct their gross hourly wage by retrieving the last recorded hourly wage for those who had been active in the labor market before as wage earners. If both current and past labor market information were lacking, we assumed the individual could at least obtain the minimum hourly wage (6.92 EUR in 2001).[8] Overall the average gross hourly wage (either registered or reconstructed) amounts to 13.00 EUR (in 2001 prices).

4 Modeling labor supply: an alternative methodology

With the standard discrete-choice approach, the researcher can straightforwardly apply quite general specifications of the utility function and budget constraint defined on a preselected discrete set of points on the individual's or the household's budget constraint. This approach is convenient because no marginal calculation is required. However, it fails to replicate the peaks in full-time and part-time hours that typically characterize the distribution of working hours (especially in continental Europe). Fixed costs of hiring workers, increasing returns to scale of the worker's production and the prevalence of standard employment contracts may explain the relative scarcity of some working time alternatives, especially in the Belgian and other highly unionized labor markets. More importantly, however, the overall number of working opportunities varies between individuals: highly educated professionals are typically confronted with several job opportunities, whereas low-skilled workers are constrained to choose among few jobs or may have no job offer at all.

We follow an alternative approach, based on Dagsvik and Jia (2006) and Dagsvik and Strøm (2006): labor supply behavior is viewed as an outcome of agents choosing from a set of job "packages", each of which is characterized by an offered wage rate, offered hours of work and nonpecuniary (qualitative) attributes describing the nature of the job-specific tasks to be performed. Thus, the hours of work of a given job are assumed fixed. In a modeling context where the job type can be a decision variable,

[8] We are aware that the standard procedure to impute missing wages is to estimate a wage equation (either a linear regression or a Heckman two-stage wage equation). However, because one of the crucial explanatory variables of the wage equation, level of education, is missing we could not fall back on this technique. The imputation is relatively marginal for single men and married men(less than 7% of the sample). For single women the imputation concerns about 15% of the sample and for married women about 24% of the sample.

workers may face additional constraints because the set of available jobs may be constrained. The individual-specific sets of feasible jobs are endogenous in the sense that they are determined by market equilibrium conditions and/or by negotiations between unions and employers. However, to the individual agent, the set of job opportunities may be viewed as given, although it is latent to the researcher. We believe that this framework represents a powerful modeling strategy because it leads to an empirical model that is flexible and practical to apply. We suggest that the model is consistent with crucial features of the "true" choice setting. In particular, unlike standard models, this approach has the great advantage of allowing the researcher to accommodate latent choice restrictions in a convenient and practical way.

4.1 Single-individual households

Let $U(C,H,z)$ denote the utility function of the household, where H is weekly hours of work, which takes its value from a finite set of possible values D. We assume that hourly wages are individual specific and do not vary across the possible working hours, which range from 0 to 55 hours, in steps of 5 hours.[9] Let C denote the household disposable income. The budget constraint facing the household is given by:

$$C = C(H) \equiv wH + I - t(wH, I),$$

where w is the wage rate, I is the household nonlabor income, which includes all types of social security transfers and financial income, and $t(.)$ is the tax function. All the details of the tax/social security rules are taken into account in this function by using a microsimulation model for the Belgian social security and personal income tax system based on administrative datasets (MIMOSIS).[10]

The utility function of the household is assumed to be represented as:

$$U(C,H,z) = v(C,H) + \varepsilon(z), \tag{1}$$

where $v(.)$ is a positive deterministic function and $\{\varepsilon(z)\}$ are positive random taste shifters. These are assumed to account for unobservable individual characteristics and nonpecuniary job attributes that affect utility, and hence will vary across both households and job opportunities. The random errors $\varepsilon(z)$, $z = 0, 1, 2, \ldots$, are assumed to be $i.i.d.$ across job combinations and households with c.d.f. $exp(-exp(-x))$, for real x. For a given job opportunity z, associated hours of work are assumed fixed. Let $B(H)$ denote the (latent) set of feasible job opportunities with hours of work H.

[9] The introduction of possible labor supply above the legal maximum of 38 hours a week for a single full-time job reflects the possibility of a combination of multiple part-time jobs. That people in practice do combine multiple jobs on the Belgian labor market is illustrated in Vermandere and Stevens (2002).

[10] MIMOSIS stands for **MI**crosimulation **MO**del for Belgian **S**ocial **I**nsurance **S**ystems. The current version of MIMOSIS aims to cover seven policy domains: a) social security contributions; b) unemployment benefits; c) sickness and disability benefits; d) family benefits; e) social assistance benefits; f) welfare adaptations of pensions; and g) personal income taxes. However, MIMOSIS is a static microsimulation model and does not include any tax-induced behavior effects. This is quite different from the Dutch MIMOSA model, which includes many different aspects of the economy. See Nelissen et al (2005) for a detailed introduction to the MIMOSA project and its application.

In this setting, the working time requirements do not unequivocally characterize the choice set. For each value of working time requirements there will be a set of alternative opportunities, each being characterized by unobservable nonpecuniary characteristics. Moreover, the size of the choice sets of job opportunities the households are facing are unknown to researchers. Let $M(H)$ be the number of jobs in $B(H)$.

By well known results from the theory of discrete choice, it follows readily that the probability of a household choosing a *particular* job z with hours of work H, is given by:

$$
\begin{aligned}
P(U(C,H,z) = \max_{x\in D, q\in B(x)}(U(C,x,q)) &= \frac{\exp(v(C(H),H)}{\sum\limits_{x\in D}\sum\limits_{q\in B(x)} \exp(v(C(x),x))} \qquad (2)\\
&= \frac{\psi(H)}{\sum\limits_{x\in D}\sum\limits_{q\in B(x)} \psi(x)} = \frac{\psi(H)}{\sum\limits_{x\in D} M(x)\psi(x)},
\end{aligned}
$$

where $\psi(H) = \exp(v(C(H),H))$. The last equality in (2) follows because the structural part of the utility is not affected by the unobserved nonpecuniary characteristics of the jobs.

The probability of choosing *any* job with hours of work H, $\varphi(H)$, is simply the sum of the probabilities of all jobs having H hours as working time requirements. Thus:

$$
\varphi(H) = \frac{\psi(H)M(H)}{\sum\limits_{x\in D} \psi(x)M(x)}. \qquad (3)
$$

Unfortunately, we do not have external information on the number of available job opportunities, nor do we know the number of nonworking opportunities. With no loss of generality we can normalize such that the number of nonworking opportunities is 1, that is, $M(0) = 1$.

To allow for a more convenient interpretation we shall now introduce a reparameterized version of the model. For $H > 0$, we can write $M(H) = \theta g(H)$, where $\theta = \sum_{x\in D\setminus\{0\}} M(x)$. The term θ can be interpreted as a measure of the relative size of the market opportunity set with respect to the nonworking opportunities, whereas $g(H)$ is the share of available jobs at the given working hours H, which is defined as:

$$
g(H) = M(H)/\sum\nolimits_{x\in D\setminus\{0\}} M(H).
$$

The terms $g(H)$, $H > 0$ are called *opportunity densities*.

For $H > 0$, the probability equation (3) can then be rewritten as:

$$
\varphi(H) = \frac{\theta\psi(H)g(H)}{\psi(0) + \theta \sum\limits_{x\in D\setminus\{0\}} \psi(x)g(x)}. \qquad (4)
$$

For $H = 0$, the corresponding choice probability is obtained by replacing the numerators in (4) by $\psi(0)$.

Dagsvik and Strøm (2004) showed that the model is identified under the restriction that $g(.)$ is a distribution function over the possible positive hours of work.

4.2 Comparison with the conventional discrete-choice approach

We now compare our model with a version of the standard discrete-choice labor supply model (Van Soest 1995). Under the analogous assumption to (1), the choice probability of supplying H hours of work that corresponds to (3) takes the form:

$$\varphi(H) = \frac{\psi(H)}{\sum_{x\in D}\psi(x)}, \tag{5}$$

which can be viewed as a special case that follows from (3) when $M(H) = 1$. As discussed earlier, this specification fails to reproduce the observed distribution of working hours. Some authors, such as Van Soest (1995), propose an ad hoc adjustment, by introducing alternative specific disutility elements. The latter take the form of alternative specific dummies, represented below by $d(H)$:

$$U(C,H) = v(C,H) + d(H) + \varepsilon(H). \tag{6}$$

These authors suggest that the dummies may be interpreted as the higher search costs of relatively scarce job opportunities. This interpretation seems nevertheless to be of a rather ad hoc nature since it clearly does not rest upon an explicit structural argument. Under the assumption in (6), the probability that a household chooses the hours of work H is in this case given by:

$$\varphi(H) = \frac{\psi(H)\exp(d(H))}{\sum\limits_{x\in D}\psi(x)\exp(d(x))}. \tag{7}$$

This ad hoc correction with alternative specific "disutilities" can be viewed as a reformulation of our framework (3) with $M(x) = \exp(d(x))$. In other words, our framework offers a theoretical rationale for a structural interpretation of this practice.

4.3 Married couples

Taking the unitary model as a point of departure, the model of joint labor supply for married couples is similar to the model for single individuals. Let $U(C,H_f,H_m,z)$ denote the utility function of the household, where H_f and H_m are hours of work for the wife and the husband in the household, respectively. $z = (z_f, z_m)$ indexes the combination of jobs for members of households. Similarly to single-individual households, we assume that $U(C,H_f,H_m,z) = v(C(H_f,H_m),H_f,H_m) + \varepsilon(z)$. The budget constraint in this case can be written as:

$$C(H_f,H_m) = w_m H_m + w_f H_f + I - t(w_m H_m, w_f H_f, I),$$

where w_r, $r = m, f$ is the wage rate for gender r, and I is the household nonlabor income. The derivation of the probability that the household chooses the hours of work combination (H_f, H_m) is entirely similar to the case of single-individual households, and the probability is given by:

$$\varphi(H_f, H_m) = \frac{\psi(H_f, H_m)M(H_f, H_m)}{\sum_{x,y \in D} \psi(x,y)M(x,y)}, \tag{8}$$

where $M(H_f, H_m)$ is the total number of job alternatives available to the household that require H_f and H_m hours of work.

We assume further that the choices of sets of jobs offered to the wife and the husband are independent. Given this independence assumption, we have:

$$M(H_f, H_m) = M_f(H_f)M_m(H_m),$$

where $M_r(H_r)$ denotes the number of feasible job opportunities with hours of work H_r for gender r. Similarly to the treatment of single- individual households, we can rewrite $M_r(H_r) = \theta_r g_r(H_r)$, where $\theta_r = \sum_{x \in D \setminus \{0\}} M_r(x)$.

For $H_f > 0, H_m > 0$, the probability equation (8) can then be rewritten as:

$$\varphi(H_f, H_m) = \frac{\psi(H_f, H_m)\theta_f \theta_m g_f(H_f) g_m(H_m)}{\Delta}, \tag{9}$$

where

$$\begin{aligned}\Delta = \psi(0,0) &+ \sum_{x \in D \setminus \{0\}} \psi(x,0)\theta_f g_f(x) + \sum_{y \in D \setminus \{0\}} \psi(0,y)\theta_m g_m(y) \\ &+ \sum_{x,y \in D \setminus \{0\}} \psi(x,y)\theta_f \theta_m g_f(x) g_m(y).\end{aligned}$$

When $H_f > 0$ and $H_m = 0$, we have:

$$\varphi(H_f, 0) = \frac{\psi(H_f, 0)\theta_f g_f(H_f)}{\Delta}. \tag{10}$$

The expressions for $\varphi(0, H_m)$ and $\varphi(0,0)$ are similar.

4.4 Specification of the model

The modeling framework (3) offers a very general and flexible approach to labor supply modeling. In our model, the observed hours of work is a result of both the preference (utility function) and job offer distribution (the opportunity measure). However, it is so far of limited interest, unless additional assumptions are imposed.

4.4.1 Functional forms of the utility representation

We now consider functional specifications of the structural term of the utility function. One popular choice is polynomial specifications. For example, Blundell et al (2000) applied a second-degree polynomial specification, given as:

$$\begin{aligned} v(C, H_f, H_m) = {} & \alpha_c C^2 + \beta_c C + \alpha_f L_f^2 + \beta_f L_f + \alpha_m L_m^2 \\ & + \beta_m L_m + \beta_{cf} C L_f + \beta_{cm} C L_m + \beta_{fm} L_f L_m, \end{aligned} \tag{11}$$

where α_c, α_f and α_m are negative and where L_f, L_m represent weekly female and male leisure.

This specification has the advantage of being flexible and easy to estimate because it is linear in parameters. Therefore it has been applied extensively, see Bargain and Orsini (2006) and Bonin et al (2002). Van Soest et al (2002) applied an even more general polynomial specification (up to the fifth degree).

In the empirical analysis, the parameters associated with consumption and leisure in the utility function are typically specified as linear functions of individual and household characteristics. It is reasonable to require that the structural term of the utility function, which represents the average preferences in the population, should be concave.[11] However, the polynomial functional form is not globally monotone in consumption, and one must therefore check if the estimated function in fact is monotone for the admissible values of consumption.

Dagsvik and Strøm (2006) argued that implications from the theory of meaningfulness and dimensional invariance may be used to restrict the functional form of the utility function. Their assumptions lead to a type of generalized Box-Cox utility function given by:

$$\begin{aligned} V(C,H_f,H_m) = \beta_c \frac{(C^{\alpha_c}-1)}{\alpha_c} + \beta_f \frac{({L_f}^{\alpha_f}-1)}{\alpha_f} \\ + \beta_m \frac{({L_m}^{\alpha_m}-1)}{\alpha_m} + \beta_{fm} \frac{({L_f}^{\alpha_f}-1)({L_m}^{\alpha_m}-1)}{\alpha_f \alpha_m}, \end{aligned} \tag{12}$$

where it is understood that possible subsistence levels have been subtracted from disposable income C, and possibly from the male and female leisure L_m and L_f. The result in (12) is proved by Dagsvik and Røine Hoff (2009). If $\alpha_c < 1, \alpha_f < 1, \alpha_m < 1$, β_c, β_f and β_m are positive and suitable restrictions are imposed on β_{fm}, then utility is increasing and concave in (C, L_f, L_m).

The specifications for single men and women are similar to the above relations, although the structural part of the utility function only contains one leisure term.

4.4.2 The specification of the opportunity measure

In the discrete labor supply literature, researchers often specify directly alternative specific dummies to "calibrate" the model on the observed peaks in the distribution of working hours, see amongst others Van Soest (1995), Haan (2006), Bonin et al (2002). As we discussed earlier, this can be viewed as a special case of our setting. However, these dummies typically do not depend on individual or household characteristics, which implicitly assumes that hours restrictions (alternative specific disutilities) are homogeneous across the labor market.

In our setting, the hours restriction is represented by $g(H)$ and the term θ. In this setting, θ is allowed to be individual specific to allow for heterogeneity in the

[11] Recall that since the utility function is assumed separable in the random term and the systematic term, the utility is cardinal and only invariant under affine transformations. It is therefore not evident that the systematic utility term should be quasi-concave. However, it may seem reasonable to require that the systematic term should be concave.

opportunity measure, while $g(H)$ is assumed to be the same across the population. We assume that $g(H)$ is constant apart from peaks at part time hours- and full time hours of work.

As discussed by Dagsvik and Jia (2008), the parameter theta can be interpreted as also representing fixed cost of working and the disutility of working, in addition to being a measure of job opportunities. However, in this case, we will not be able to identify the disutility of working from the working opportunities measure θ given the labor supply data typically available. Stated preference data such as self-reported desired hours of work can be useful in this respect. For example, Bloemen (2008) uses subjective information on desired weekly working hours as a source of information in addition to observed working hours to separate preferences from job offer distributions in a job search model.

5 Estimation results and wage elasticities

5.1 Estimation results

The labor supply is estimated separately for couples, single men and single women. For couples, we use the model of equation (9), in conjunction with the Box-Cox utility function defined in (12). For singles we use equation (4) and also a Box-Cox utility.

The "subsistence" level of income is set at 4000 EUR/year for a single- person household.[12] We multiply the subsistence level by $\sqrt{N}$, where N is the number of persons in the household, to account for economies of scale in consumption in households with more than one person. The leisure function is defined as $L_r = 1 - h_r/T$, where T denotes the total time endowment, which is set at 80 hours per week.

The opportunity density is assumed to be uniform for nonstandard working time requirements with a part-time peak and a full-time peak. The measure of the size of potential opportunities θ_m and θ_f are also allowed to depend on individual characteristics such as productivity (for which the wage rate is a proxy), age and regional dummies.

Similarly, the parameters that represent the value of leisure, namely β_f and β_m, are specified as a linear combination of observed individual and household characteristics, such as age, number of dependent children and regional dummies.

The model fits the data well, as seen in Figures 2 and 3. The estimates of this model are presented in Table 2. The value of the estimated parameters on consumption and leisure imply that the utility function is globally concave for all household groups with respect to both income and leisure.

The motivation for including regional-specific variation in the size of potential opportunities θ_m and θ_f is that there are considerable differences in the labor market in different regions. The local labor markets are very different in the north and in the south of the country and again in the Brussels capital area. Unemployment rates

[12] We also tried a model with an unknown level of "subsistence" income, but this failed to converge. The "subsistence" income corresponds to approximately 2/3 of the yearly minimum income guarantee in 2001.

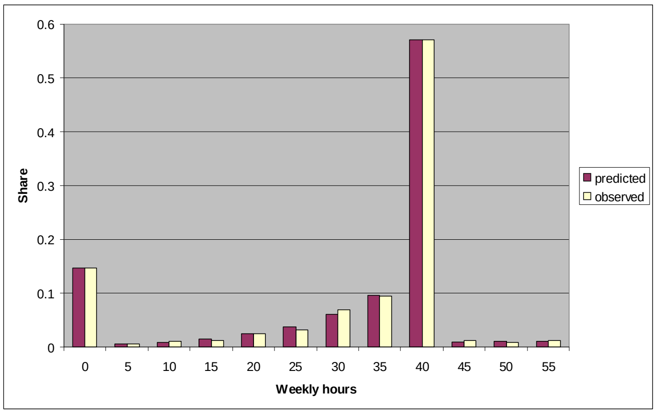

Fig. 2 Observed and predicted shares (married men)

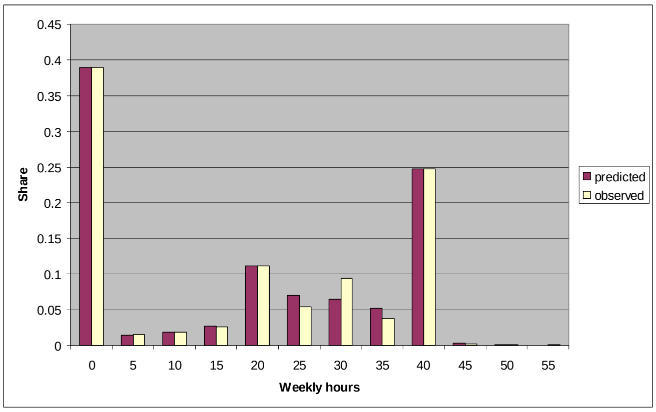

Fig. 3 Observed and predicted shares (married women)

in certain Flemish regions are close to the frictional level, while in Wallonia these rates are generally higher, among other things because Wallonia has gone through a prolonged phase of industrial decline linked to the phasing out of heavy industry. Our estimates suggest that there are significantly more opportunities (measured with θ_j) in Flanders than in the Walloon area, while the lowest opportunities are in the Brussels capital area, which faces a problem of demand-supply mismatch, with the labor demand for highly qualified people being relatively sustained, whereas much of the population, especially immigrants, often have low qualifications.

Table 2 Model estimates

	Couples		Single Men		Single Women	
	Est	St. E	Est	St. E	Est	St.E
Consumption	3.7371	0.0943	1.2043	0.0718	0.6574	0.0755
Exponent	0.2622	0.0260	-0.4017	0.0483	-0.6517	0.1031
Leisure of male						
Age of male	-0.2937	0.0591	-0.1308	0.0282		
Age of male squared	0.0275	0.0068	0.0152	0.0034		
No. of children < 3	0.0038	0.0105	-0.0061	0.0118		
No. of children 3 to 6	0.0000	0.0097	0.0923	0.0297		
No. of children 6 to 12	0.0031	0.0063	-0.0107	0.0059		
No. of children 12 to 18	-0.0141	0.0065	0.0130	0.0073		
Live in medium city	0.0199	0.0128	0.0043	0.0045		
Live in big city	0.0570	0.0153	0.0276	0.0073		
Live in Wallonia	0.1025	0.0216	0.0211	0.0074		
Live in Flanders	0.0880	0.0199	0.0070	0.0058		
Constant	1.0847	0.1421				
Exponent	-2.9721	0.1012	-5.0807	0.2151		
Leisure of female						
Age of female	-0.2557	0.0370			-0.2428	0.0454
Age of female squared	0.0443	0.0049			0.0327	0.0060
No. of children < 3	0.1972	0.0114			0.3681	0.0453
No. of children 3 to 6	0.0936	0.0077			0.1733	0.0279
No. of children 6 to 12	0.0899	0.0062			0.1568	0.0195
No. of children 12 to 18	0.0660	0.0057			0.0840	0.0140
Live in medium city	-0.0044	0.0089			0.0141	0.0166
Live in big city	-0.0045	0.0100			0.0490	0.0184
Live in Wallonia	0.0259	0.0132			0.1001	0.0219
Live in Flanders	0.0695	0.0130			0.0355	0.0166
Constant	0.5283	0.0721			0.4882	0.0908
Exponent	-4.3151	0.0705			-3.8578	0.1511
Cross leisure term	0.0280	0.0034				
1/theta (men)						
Wage	-0.2179	0.0043	-0.2977	0.0065		
Age	-0.3033	0.2034	0.6913	0.1877		
Age squared	0.1260	0.0242	-0.0023	0.0253		
Region w	-0.5045	0.0693	-0.3756	0.0788		
Region f	-1.1516	0.0670	-1.1596	0.0775		
Constant	4.2762	0.4258	3.3208	0.3434		
Part-time peak	-0.0995	0.0390	0.0728	0.0478		
Full-time peak	2.4627	0.0191	2.3340	0.0303		
1/theta (women)						
Wage	-0.3205	0.0038			-0.4233	0.0069
Age	0.1321	0.0360			1.1137	0.1788
Age squared	0.0409	0.0042			-0.0683	0.0237
Region w	-0.3301	0.0660			-0.3154	0.0819
Region f	-0.7934	0.0632			-0.9164	0.0779
Constant	4.8960	0.1062			3.9222	0.3308
Part-time peak	1.0192	0.0217			0.8216	0.0391
Full-time peak	2.1787	0.0285			2.8132	0.0362
Log likelihood	-97,290.1544		-23,602.4726		-19,674.9552	

5.2 Wage elasticities

Recall that in contrast to traditional labor supply models, our model is not formulated in terms of an explicit individual labor supply function. Instead it is based on a direct representation of the distribution of labor supply, conditional on individual characteristics. This feature is not a drawback because the model can conveniently be used to calculate wage elasticities and more generally, to simulate behavioral responses to policy reforms. For each household, we simulate the change in the choice probabilities of working and the expected hours of work in response to a 1% increase of wage income. We then aggregate over the sample to obtain the corresponding change in the mean probability of working and the mean expected hours of work. To obtain labor supply elasticities, we multiply these figures by 100 and divide by the respective mean probability of working and the mean expected hours of work. This measure, sometimes called the aggregate wage elasticity in the literature, depends on the distribution of the initial wage rate and individuals' characteristics, as well as the tax and benefit system. The estimated labor supply elasticities are reported in Table 3. We see that the elasticities are around 0.31 for married men, 0.13 for single women and 0.20 for single men, whereas for married women, the elasticity is estimated at 0.44. The result is consistent with several studies surveyed in Blundell and MaCurdy (1999) that showed that men tend to have lower labor supply elasticities than secondary earners, i.e., married women. Overall, the estimated elasticities are slightly higher than recent estimates for other countries: Bonin et al (2002) and Haan and Steiner (2005) have estimates of around 0.20 and up to 0.35 for German married men and women.

Table 3 Wage elasticities

	Hour	Participation
Married men	0.31	0.18
Married women	0.44	0.21
Single men	0.20	0.11
Single women	0.13	0.07

The fact that single women have the lowest labor supply elasticities is at odds with the experience of other countries, in particular the UK. It should be noted, nevertheless, that in Belgium, means-tested aid for single parents, i.e., mostly single mothers, is rather limited. Contrary to other countries, single mothers do not receive significantly higher income support. At the same time their unemployment benefits tend to be lower because of weaker labor market attachment. It is therefore likely that a relatively higher share of unemployed single women are affected by rationing on the labor market.

6 Results from policy simulations

6.1 The effect of different policies

As mentioned in Section 2, an important argument for replacing the means-tested individual tax credit with the extended Workbonus is that the Workbonus avoids a possible negative impact on the intensive margin. In this respect, we expect that the Workbonus may affect the hours of work more strongly than the tax credit, for budgetary costs of similar size. To shed more light on this issue, we performed three policy simulations based on the estimated model: i) abolishing the Workbonus; ii) extending the Workbonus to the 2006 system, and iii) introducing a tax credit system at the would-be level of 2006. We use the Workbonus system actually implemented in 2001 as the baseline. In the simulation we neglect the progressive phase-in, and focus on what could have realistically happened if the reform were to be implemented over one night. We made no allowance for the difference that the Workbonus is delivered at the end of each month while the tax credit is only delivered as a lump sum transfer or reduction of tax in the following year. Assuming low inflation and interest rates, the difference may be negligible.

The effect of these four different benefit schemes can be presented by comparing the different budget sets. Figure 4 gives the budget lines for a single-breadwinner household of two adults and two dependent children. The picture shows the disposable income as a function of working hours from 0 to 40 hours per week. The hourly wage is 6.92 Euro, which correspond to the 2001 minimum wage. Figure 5 shows the budget lines for the same household when the hourly wage is 13 Euro, which was the median wage in 2001.

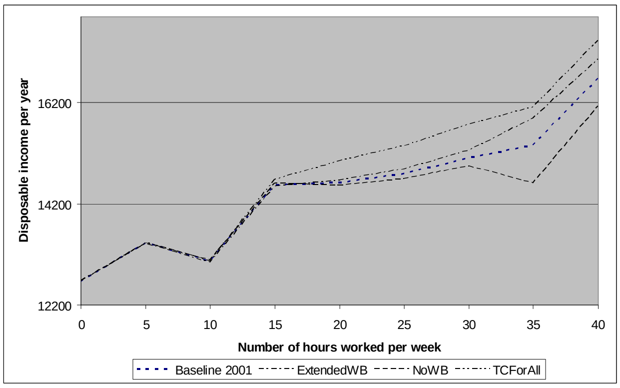

Fig. 4 Annual disposable household income per year for a married couple with two children and one person working at minimum wage

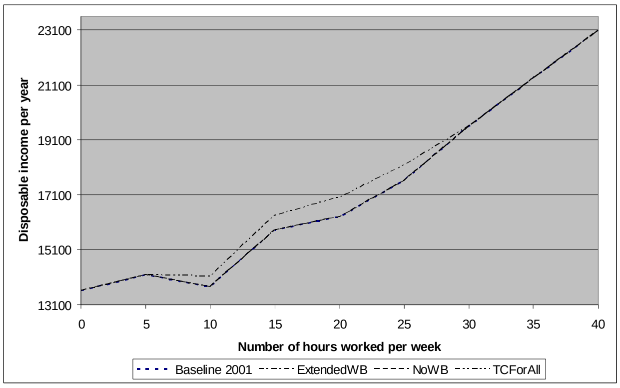

Fig. 5 Annual disposable household income per year for a married couple with two children and one person working at median wage

As we can see from Figure 4, there are several kinks in the disposable income profiles over hours of work. Consider first the case where there is no Workbonus. Between 0 and 15 hours the individual receives mainly a reference unemployment benefit. However, once labor income becomes high enough, the unemployment benefit is reduced. Because labor income is taxed at a higher rate than unemployment income[13], we see a drop of disposable income from working 5 to 10 hours. From 12 hours on (basically 1/3 of full time, which is 38 hours in Belgium), the legislation that combines the unemployment and labor income keeps disposable income more or less constant up to 30 hours of work a week. After that point, the unemployment benefit is reduced to zero. In the absence of the Workbonus, the loss of the unemployment benefit is so high that it is not compensated by the additional income from working. We therefore see another drop of disposable income at 35 hours of work. This pattern clearly illustrates some of the financial disincentives created by the tax and social benefit system for low-skilled workers.

It may also be noted that there is almost no difference in disposable income profiles in the range of 0 to 15 hours under the different policies. To be eligible for the tax credit, a minimum earning is required. A worker with the minimum wage will not qualify for the tax credit while working less than 20 hours a week. Although there is no such requirement for the Workbonus, the unemployment benefit is topped off more with the Workbonus. The reduction in unemployment somehow dampens the effect of the Workbonus in the interval of 0 to 15 hours.

Comparing these two graphs, we notice that the Workbonus (both the 2001 and extended versions) has an effect for people working at the minimum wage, but not for those with a median wage. This is because of the particular way this Workbonus

[13] It should be noted, however, that the system from just above 0 hours to just below 13 hours of work a week is an invented system, because the legislators only foresaw a common system to combine unemployment benefits with part-time work from 1/3 of a full-time onwards.

Table 4 Expected effects of different policy reforms

	Hours of work (FTE)	Relative change	Participation	Relative change
No Workbonus	-3,513	-0.24%	-2,802	-0.17%
2006 Workbonus	7,190	0.50%	6,489	0.40%
Tax Credit	5,276	0.37%	11,980	0.73%

system is designed, i.e., as a function of FTE income and not as a function of "real" income. In fact, the extended Workbonus is effective up to an hourly wage of 11 to 12 euro. The system with the tax credit for all low incomes has, on the other hand, an effect for both households, because this tax credit is granted as a function of the labor income earned, independent of the hourly wage that could be earned.

Table 4 shows the estimated impact of the changes in the tax and social security policies. The effects are divided into an aggregate change in labor supply (i.e., change in hours, although expressed in full-time equivalent, FTE) and change in the number of participants. To give some idea of the magnitude of these numbers, we also report relative changes with respect to the baseline level. To be precise, the relative change in FTE is defined as the aggregate change in FTE divided by the total FTE under the 2001 baseline. Let us consider first the abolition of the 2001 Workbonus system. Should the subsidy be removed, labor supply would, according to our model, drop by 3513 FTE units, whereas participation would decrease by 2802 units. When we look at the effect of the extension of the Workbonus to its 2006 level, the model predicts a change in labor supply of about 7190 FTE. Note that the estimates of our model are not too far from those of Orsini (2006a): in that paper the estimated labor supply effect for couples ranges from 5200 to 8800 FTE units.

Compared to the extended Workbonus, the tax credit would have had a much higher participation effect, but a smaller impact on aggregated labor supply. This is consistent with the findings of Orsini (2006a) using a different specification of the labor supply model and different data. The tax credit increases not only the incentives to take up work for the low-skilled, but also incentives for the medium-skilled to work part time. Medium-skilled workers in employment would reduce labor supply, finding partial compensation from the tax credit. Because the Workbonus is conditional on hourly wage, this negative effect at the intensive margin is avoided. Figure 6 shows the change in the predicted distribution for married women over different hours of work under the three reforms. We see from Figure 6 that both the Workbonus and tax credit increase labor participation, which is represented by a large drop of the share of nonworking people. The Workbonus mainly shifts workers from nonworking and lower working hours to full-time work, whereas the tax credit seems to shift workers from full time to part time instead. This effect is sometimes called the "part-time trap", a problem that has already been denounced by De Callatass (2002).

Figure 7 shows the percentage change in participation and in aggregate labor supply by income decile according to the model. In particular, the left axis shows the relative change in aggregate labor supply, whereas the right axis shows the relative change in participation. The relative change is expressed with respect to total participation and total labor supply in each income decile. The figure clearly shows that the Workbonus increases participation in the first 4 to 5 income deciles. Redistributive

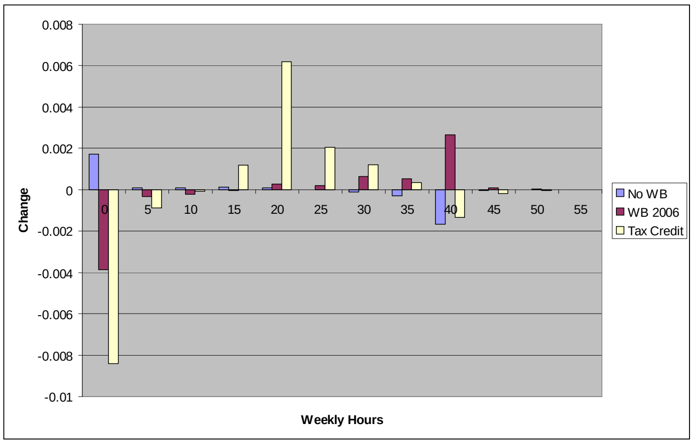

Fig. 6 Predicted change of hours of work distributions for married women, under three reforms (compared with the baseline)

and incentive effects are therefore mainly directed to the bottom part of the income distribution. For the tax credit, similar to the Workbonus, the aggregate effects are strong and positive in the lower income deciles. However, more workers shift from full time to part time than from low hours to part time, so the overall effects in the higher income deciles are actually negative.

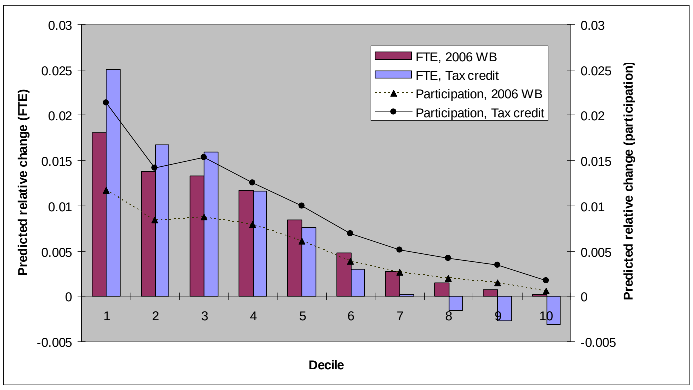

Fig. 7 Predicted change in labor supply by equivalent income decile

Table 5 presents some efficiency measures of the three reforms: the cost per additional FTE unit and per additional participant. The results suggest that the 2006 workbonus is much more efficient than the tax credit system in terms of cost per additional FTE units: around 46,000 EUR per year for the 2006 workbonus vs around

Table 5 Cost per additional participant and FTE unit (EUR/year)

	Per additional FTE position	Per additional participant
No Workbonus	-12,073	-5,172
2006 Workbonus	45,565	27,339
Tax Credit	109,756	14,197

110,000 EUR per year for the tax credit. These figures may be compared with estimates obtained for similar activation measures implemented in other EU countries. Orsini (2006b) reviews a series of evaluations of “Making Work Pay” and finds that estimates of the cost of activation range from about 250,000 EUR per year for the WFTC to about 120,000 EUR per year for the French PPE.[14] Moreover, it should be noted that some activation measures, such as the German mini job reform, despite having a positive effect on participation, tend to have an overall negative effect on labor supply in terms of FTE. The explanation is that the subsidies are targeted on some household income concept rather than on individual earnings or the wage rate.

6.2 A simple robustness check of the model specification

As discussed in section 4.4, specific functional form assumptions on both the utility function and the job offer opportunity measures are required to identify and estimate the model. As a consequence, our results may be sensitive to the specified parametric structure. We have investigated briefly the robustness of our results by estimating versions of the discrete-choice labor supply model with alternative empirical specifications.

In the first alternative (model I), we replace the Box-Cox utility function by a second-order polynomial utility function as in (11) but keep the specification of the opportunity measure unchanged. In the second alternative (model II), we keep the Box-Cox utility function, remove the opportunity measures θ and $g(h)$ and introduce instead five alternative specific dummies: working marginal part time (5–15 hours), part time, 3/4 full time (25–35 hours), full time and overtime (45–55 hours). In the third alternative (model III), we introduce both changes at the same time.

All the models fit the data quite well. Thus, it is difficult to use goodness of fit as a criterion to discriminate between these models. With the quadratic utility, we do find some households with negative marginal utility w.r.t. consumption at the observed hours of work. For example, the estimates of model III suggest that for around 10% of single men, the utility actually falls with consumption. This obviously will cause problems for a structural interpretation. In contrast, the estimated Box-Cox functions in our preferred model and model II are globally increasing and concave in both income and leisure.

[14] Of course, the above figures are also affected by the underlying modeling framework and sample selection. Moreover, the costs also reflect differences in the preference structure and institutional settings. Nevertheless, the figures give an order of magnitude of the “efficiency” of similar MWP measures implemented in EU countries.

Table 6 Selected results from the alternative models

	Model I	Model II	Model III	Preferred model
Aggregated hours elasticity				
Married women	0.25	0.65	0.63	0.44
Married men	0.19	0.40	0.41	0.31
Work bonus 2006				
Labor supply effects (increased FTE units)	4,809	11,750	11,941	7,190
Cost per additional FTE position (EUR/year)	76,560	27,161	25,936	45,565
Tax credit				
Labor supply effects (increased FTE units)	4,462	13,379	14,510	5,276
Cost per additional FTE position (EUR/year)	128,638	36,780	31,099	109,756

In addition, our setting allows for a theoretical justification of introducing hours of work restrictions through the opportunity measure and furthermore our specification yields individual variation in the opportunity constraint, whereas the modification of the utility functions in model II and III are purely ad hoc. Based on the fact that typical labor markets in many cases only allow for full time and part time hours of work, it makes good sense to employ the specification we have postulated and estimated in this paper.

As we expect, the elasticities and thus the predicted labor supply responses under different reforms vary over the alternative specifications (Table 6). [15] Despite of these differences, all three alternative specifications yield similar qualitative results as our preferred model. They all predict that both the Workbonus and the tax credit have positive effects on labor participation and hours of work and imply a similar qualitative pattern of change of the hours of work distribution displayed by Figure 6. They do predict different sizes of the labor supply effects, as a result of the different labor supply elasticity estimates. In contrast to our results presented in Table 4, two of the alternative models, model II and III, suggest that a tax credit would not only have had a higher participation effect, but also a higher impact on aggregate labor supply than the Workbonus. However, when we compare the efficiencies of the reforms in terms of the cost per additional FTE position, all the alternative models imply that the Workbonus is more efficient than the tax credit. So our main conclusion of the paper is not sensitive to which empirical specification we choose.

7 Conclusions

In this paper, we have applied a particular labor supply model to assess the behavioral effects of the Belgian Workbonus, which is a subsidy for social security contributions

[15]Models with the alternative specific dummies (model II, III) imply higher aggregate labor supply elasticities, irrespective of what utility functions we use. We believe that this is related to the fact that our specification of opportunity measure allows for individual variation on the labor market restrictions while the alternative specification does not. Although we were not able to show theoretically that when we introduce heterogeneity on hours restrictions, the estimated labor supply elasticities will decrease, there are similar empirical findings in the literature, see for example Van Soest (1995).

of employees. The aim of the program is to support the employment of low-skilled workers. The Belgian Workbonus remains so far a unique case of individualized subsidy based on the wage rate rather than on earnings. This allows the policy to target low-skilled workers and screen out individuals with a higher preference for leisure. At the same time, workers with higher wage rates cannot reduce their working time to attract the benefit.

The labor supply model was estimated using a sample of administrative data. We used the estimated model to simulate policy reforms. We found that the 2006 increase in the Workbonus is likely to have increased labor supply by around 7200 FTE units. Having computed the budgetary cost of the reform, it is possible to derive an efficiency measure of the Workbonus. In particular, the cost per additional FTE unit was estimated to be in the order of 46,000 EUR per year. This number is far below the estimated cost of policy instruments such as the British WFTC (over 200,000 EUR per year) or the French PPE (around 120,000 EUR per year). The abolished tax credit on low earnings for wage earners, on the other hand, is less efficient and has an estimated cost of over 100,000 EUR per year. Given these results, we believe that the Workbonus is a better alternative to the standard means-tested tax credit system widely used in the OECD countries. It is also interesting to explore to what extent other elements of the tax and benefit system could be refocused on the wage rate rather than on earned income. The Belgian experience therefore deserves greater attention from policy makers in European countries that share institutional and labor market characteristics comparable with the Belgian ones.

A political discussion on the further extension of the Workbonus calls for an improved understanding of the benefits of increased employment, including the effects on the income distribution and the possible positive externalities stemming from the mainstreaming of marginalized groups. Economists, in particular, should devote more attention to the benefit side in the evaluation of policies aimed at making work pay. At the same time, an *assessment* of a particular reform and not just an *estimate* of its potential impact on the labor force, would be easier in a balanced budget context. Unfortunately, the public debate is often silent over the way a specific measure is financed and subsidies and tax cuts tend to be presented as “manna from heaven”.

It should nevertheless be stressed that the Workbonus is particularly suited to the Belgian economic and institutional framework: the presence of the minimum wage coupled with highly centralized wage-bargaining procedures should reduce the risk that employers retain the benefit of the reform by offering lower gross earnings to Workbonus workers. Another possibility is that firms misreport the number of hours worked. By declaring more contractual hours than those actually worked, an employer could effectively offer a lower wage. We hope that with more recent data it will be possible to verify the extent to which employers have benefited from the Workbonus, possibly also through illegal behavior. Additional measures to fight such behavior are certainly important in this respect. However, this possibility of abuse is not unique to the Workbonus. Other MWP policies suffer from similar problems, such as misreporting. For example, it is estimated that around 27% to 31% of EITC payments went to taxpayers who were not eligible (Hotz and Scholz 2008).

Note that the above considerations are based exclusively on the results of the ex ante evaluation. It would be interesting to validate the results with an ex post evaluation similar to the study on the French PPE carried out by Stancanelli (2008), especially when we cannot exclude the probability that the Workbonus may work also as a demand-side policy as discussed above and in Section 2. Unfortunately, no data are yet available for estimating the effect on employment based on a difference-in-difference approach. The data will probably be available in the near future. Nevertheless, it seems difficult to think of a valid comparison group for the evaluation of the Workbonus. In a difference-in-difference methodology, the comparison group should share the same characteristics as the treated group, apart of course from the eligibility for the subsidy. This implies that the two groups may be considered to be equally affected by changes in economic circumstances—a hypothesis that seems quite unlikely given that the two groups are in two different segments of the wage distribution.

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