KATHOLIEKE UNIVERSITEIT
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Faculty of Economics and
Applied Economics

Department of Economics

In-work tax credits in Belgium: an analysis of the *Jobkorting* using a discrete labour supply model

by

Pieter VANLEENHOVE

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DISCUSSION
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In-work tax credits in Belgium: An analysis of the *Jobkorting* using a discrete labour supply model.

Pieter Vanleenhove*

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Abstract

In line with the Earned Income Tax Credit in the United States and the Working Family Tax Credit in the United Kingdom, the Flemish government implemented in 2007 a similar in-work tax credit in order to increase the employment rate and to make working financially more attractive. This paper investigates how total labour supply changes and checks if the cost reductions due to these behavioural reactions are large enough to defend such expensive policies. It appears that married women alter their labour supply decision the most. However, due to the small tax credit, total labour supply effects are of minor size and hardly offset the large costs. Only a more generous tax credit leads to a higher activation of unemployed, however the budgetary cost is huge.

Keywords:Public economics, Taxation, Labour supply, Discrete choice

JEL classification:H31, J22, C25

*Center for Economic Studies (CES), Katholieke Universiteit Leuven

Contents

1 Introduction

The aim of this paper is twofold. First, present an updated discrete labour supply model for Belgium and secondly, use this model to analyse potential labour supply effects of the implementation of a tax credit in the Belgian tax benefit system. In 2007, the Flemish government introduced an in-work tax credit, the *Jobkorting*, to create incentives for the inactive population to enter the labour market. In literature, two other studies can be found that model the Belgian labour supply and analyse the changes in labour supply caused by several policy reforms. Orsini (2006) investigates the effects of the implementation of the Workbonus and Decoster et al. (2010) analyse the potential labour supply effects of three different proposals of labour market policy reforms in Belgium. The work presented in this paper can be seen as another contribution to this literature.

In order to evaluate the potential effects of labour market reforms, a proper labour supply model needs to be developed. Two alternative ways can be followed. The first method that is frequently used is ex-post, meaning that the effects of the tax reform can only be estimated once the reform has taken place. In some cases, it is possible to set up an experiment to asses the effects of a specific reform. Examples are the New Jersey Negative Income Tax Experiment in the US (Killingsworth, 1976) and the Self Sufficiency Program in Canada (Card and Robins, 1996). Target groups were randomly extracted from the population and were treated with the new tax-benefit system. The effect of the reform is estimated as the difference between the 'treated' group and the 'non-treated' group. However, for policymakers it is often convenient to have an idea of the potential effects of a reform before it is actually implemented. Therefore, ex-ante evaluation models have grown in popularity and the model developed in this paper also relies on this framework.

Up to the nineties, the traditional way of ex-ante labour supply modelling was in a continuous way, see Hausman and Ruud (1986) and Arrufat and Zabalza (1986), where the household chooses from a continuous set of hours. The household selects the best combination of labour supply and consumption so as to maximize its utility function, given a time and budgetconstraint. However, this way of modelling labour supply has some problems. First, assuming a continuous set of hours implies that one has to derive the full budgetconstraint of each household, i.e. the net disposable income at each hours point. In such models, very small intervals of labour supply hours are needed for each household, say for example 1 or 5 minute intervals. Combining this with a large sample of around 1000 observations and a standard amount of time of 80 hours a week leads to very time-consuming work. Second, the maximisation problem is very complex because the tax function is often nonlinear which leads to non-convex budgetsets.

Major approvements in estimating labour supply have been obtained by considering labour supply choice as a discrete one. In this methodology, the household's hours choices can be approximated by a discretised set instead of a continuous one. These types of models are inspired by the random utility models initiated by Daniel McFadden (MCFadden, 1974).[1] Due to the influential work of Van Soest (Soest, 1995), these discrete choice models are used in the context of labour supply choice. These models are structural in a sense that

[1] McFadden applied these discrete choice models to several transport and occupational choices.

there is no reduced form labour supply function which depends on wages but that the structural parameters for the preference for consumption and leisure are identified out of an a priori functional form of the utility function. Note that this method is only possible due to the assumption of a discretised set of hours because it must be possible to evaluate the utility at each hours point, which is not possible or computationally cumbersome in a continuous setting. This method of discrete choice will be used in this paper and will be explained in more detail below.

The paper is structured as follows. Section 2 discusses three different forms of the *Jobkorting*, the tax credit for all workers in the Flemish region, and analyses how these affect the budgetconstraint of the households. Section 3 discusses the data and the microsimulation model that is used and presents the discrete labour supply model and the results of estimation. Section 4 employs this model to analyse the labour supply effects of the implementation of the *Jobkorting* and investigates whether this policy reform is actually self financing, as many policymakers claim. The last section concludes.

2 In-work tax credit: the *Jobkorting*

For many countries, the tax wedge is very high which often leads to an unemployment trap where inactive people don't have strong financial incentives to enter the labour market.[2] The financial difference between working and being unemployed is so small that they lack the incentive to participate in the labour market and much unemployment persistence occurs. In order to reduce these traps, several countries created 'Making Work Pay' (MWP) policies which attempt to create financial incentives for the inactive to take up work. Examples are the Earned Income Tax Credit (EITC) program in the United States and the Working Family Tax Credit (WFTC) in the UK. Both programs provide a tax credit when entering the labour market, which induces the inactives to participate in the labour market. In 2007, the Flemish government implemented such a MWP-policy, the *Jobkorting*. As will be explained in detail below, the *Jobkorting* gives a tax credit to those people who earn more than 5500 euro/year. This means that this instrument is similar to the EITC and the WFTC as it tries to stimulate inactive people to enter the labour market in order to be eligible for the tax credit. However, this instrument is not targeted to individuals who earn little and might create negative labour supply effects at the intensive margin of the labour market, as will be discussed below.

This section starts by explaining how the *Jobkorting* is assigned in the years it has been implemented and discusses the main differences between them. The second part investigates the influence of this credit on the budgetconstraint of households and discusses the potentially induced labour supply effects of implementing the *Jobkorting*.

2.1 The *Jobkorting*

Table (1) gives an overview of the *Jobkorting* from 2007 until 2010. In income year 2007 (for tax year 2008) every worker who lives in the Flemish region and earns less than 5.500 euro/year is not entitled to the tax deduction.[3] Every worker who earns between 5.500 and 21.000 euro/year receives a yearly tax credit of 125 euro. After reaching a yearly income of 21.000 euro, the credit begins to phase out and each additional euro earned reduces the credit by 10 cents. This formula implies that the credit completely disappears once the worker earns 22.250 euro/year. The formula that specifies the amount of *Jobkorting* in 2008 is similar to that of 2007. For 2009, the credit did not phase out after reaching a certain yearly income. Every worker who lives in the Flemish region and earns between 5.500-22.000 euro/year receives a yearly credit of 300 euro and this reduces to 250 euro if the yearly earned income is higher than 22.000 euro. There is a second difference between the *Jobkorting* of 2007/2008 and 2009. In 2007 and 2008, every month the worker received a share

[2] The tax wedge measures which percentage of gross earnings (when moving from a period of unemployment to a new job), is "absorbed" as a result of the combined effect of increased tax and social contribution rates and benefits withdrawal. For example, the taxwedge in Belgium in 2005 is estimated around 85% (Eurostat).

[3] Income year refers to the calendar year in which the income is earned. Tax year refers to the year in which the individuals report and pay their taxes. In Belgium, these two years differ by 1 year.

of the total yearly amount of the tax deduction. For example, if one is entitled to receive a yearly tax credit of 200 euro, the worker gets a monthly tax deduction of 16,6 euro. In 2009 the payment was not monthly but the yearly amount was given entirely in the second month of the year.[4]

The main goal of the introduction of the *Jobkorting* by the Flemish government is twofold. First, the tax credit will lead to a reduction of the tax burden for all Flemish workers. Secondly, it aims at an increase of the employment rate in Flanders because only workers who earn at least 5.500 euro/year are entitled to the *Jobkorting*. In other words, the tax credit is launched to induce labour supply effects at the extensive margin of the labour market as inactive people start to work in order to receive the *Jobkorting*. However, as can be seen in Table (1), the amount of tax credit is rather small compared to, for example, the WFTC where the yearly tax credit is equal to 4934 £/year (Strickland, 1998). Consequently, one can already expect in advance that the labour supply effects are minor in the case for Belgium.

[4] Note, however, that the effect of this difference will not be analyzed in this paper. The focus lies entirely on the effects of the financial incentives on the labour supply of households.

Table 1: Jobkorting

Tax credit Income year 2007- Tax year 2008	
Income:	Tax credit:
Less than €5500	€0
€5500 - €21000	€125
€21000 - €22250	€125 -((income - €21000) * 0.10)
€22250 or more	€0
Payment	Monthly (Total yearly tax credit/12)
Tax credit Income year 2008- Tax year 2009	
Income:	Tax credit:
Less than €5500	€0
€5500 - €21000	€200
€21000 - €23000	€200 -((income - €21000) * 0.10)
€23000 or more	€0
Payment	Monthly (Total yearly tax credit/12)
Tax credit Income year 2009- Tax year 2010	
Income:	Tax credit:
Less than €5500	€0
€5500 - €22000	€300
€22000 or more	€250
Payment	Once in February the total amount of yearly tax credit
Tax credit Income year 2010- Tax year 2011	
Income:	Tax credit:
Less than €5500	€0
€5500 - €17250	€125
€17250- €18500	€125 -((income - €17250) * 0.10)
€18500 or more	€0
Payment	Monthly (Total yearly tax credit/12)

Source: Belastingportaal Vlaanderen

2.2 Effect on the budgetconstraint and labour supply

Tax credits lead to a change in total disposable income of households, as discussed in the previous section. This part illustrates empirically, by using the microsimulation model MEFISTO, how the budgetconstraint of households alter when the government implements a policy with tax credits.[5] A budgetconstraint is the locus of all combinations of net income at the different hours points available for a specific household. Obviously, this income is household dependent as disposable income is determined by the presence of children, being married or earning a high wage, etc. Therefore, this section discusses the budgetconstraints of a single female

[5] Modelling and Evaluating Flanders FIscal and Social TOmorrow. This microsimulation model is constructed for the FLEMOSI-project. For more information, see *http://www.flemosi.be*.

without children who works full time and has an hourly wage of 20,2 euro.[6]

Four different budgetconstraints are shown in figure (1) where three different examples of tax credits are implemented. The first tax credit is the one that was actually implemented in 2009 and is called *Jobkorting* 2009. However, because this tax credit is rather small and labour supply effects are expected to be limited, we also choose to simulate a more generous tax credit that is equal to 1747 euro/year, which represents 10% of the average yearly income of the working people in the sample.[7] The third type of tax credit is the same as the second, i.e. 1747 euro/year, but is more selective as only people with a yearly income below 22.000 euro are eligible for this credit. For the remaining part of the paper, this former credit is called High *Jobkorting* and the latter Selective High *Jobkorting*.

Looking at the budgetconstraint in the scenario where no tax credit is implemented, net disposable income does not increase linearly with working hours but has several kinks, especially when working few hours a week. The horizontal part of the budgetconstraint points at a marginal tax rate of 100%, which means that disposable income does not increase when working more hours a week.[8] This is due to the fact that social assistance decreases when one earns more income from working.

Implementing the *Jobkorting* 2009 hardly affects the budgetcontraint of this household as its size is negligible. The two alternative tax credits, High *Jobkorting* and Selective High *Jobkorting*, have a much larger effect on the budgetcontraint of this single female and one can already expect in advance that they will alter labour supply in a more considerable way.

Looking at this figure, several potential labour supply effects can arise after the implementation of some sort of tax credit. First, when working only a few hours a week (8-13 hours interval), one sees that the slope of all the budgetconstraints increase compared to the situation in which there is no tax credit. This higher wage results in a substitution effect where leisure is more expensive and more labour is supplied. However, next to this effect, a negative income effect might arise which leads to a decrease in labour supply. Combining both effects leads to an ambigious effect on total labour supply. Second, when working more than 15 hours a week, one sees that all the budgetconstraints are shifted outwards in a parallel way which induces only a negative income effect which reduces labour supply. Third, the budgetconstraint of the Selective High *Jobkorting* returns to the original budgetconstraint when working more than 25 hours a week. She actually receives less income when working 30 hours than when she works 25 hours a week. So, including this selective tax credit might result in negative labour supply effects when working a lot of hours a week. Combining all these potential effects lead to an ambigious result on total labour supply for each type of tax credit. It is expected that some individuals reduce and others increase their labour supply after the introduction of such

[6] Mefisto is able to derive the budgetconstraints of all types of households, but only this type is shown for informational purposes.

[7] As discussed in the next section, the Belgian EU-SILC dataset is used.

[8] Note that this cannot be seen as an unemployment trap, as this term mainly points at a situation where income of working (for example, part-time or full-time) is not significantly higher, or even lower, than the income of inactivity. In figure (1), this is not the case.

tax credits. Therefore, this paper analyses, using a specific structural labour supply model, the potential labour supply effects of these three different tax credits.

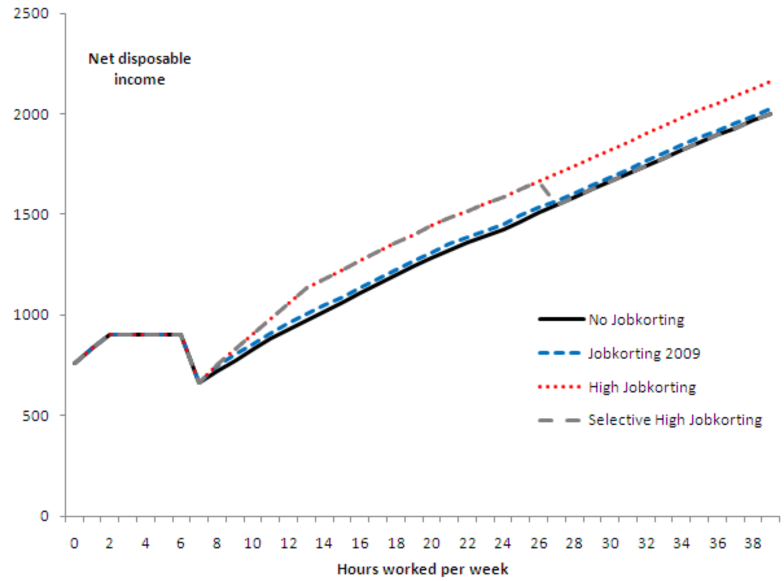

Figure 1: Budgetconstraint for 3 different types of tax credit.

3 Modelling labour supply

In order to analyse how the implemetation of different types of *Jobkorting* affect the Belgian labour supply, a proper model needs to be developed. This section first discusses which data are used and secondly derives in detail the discrete labour supply model.

3.1 Data

This paper uses the Belgian database of the European Union Statistics on Income and Living Conditions (EU-SILC), which is constructed in a two step sampling procedure and is representative for the Belgian population in private households. The data was collected in the second half of 2006 and contain information on income received in 2005. The sample consists of 5860 households or 14329 individuals. Only private households are included, so all persons living in collective households and institutions are excluded from the target population. The survey provides detailed information on earnings as well as on sociodemographic characteristics of each household.

The labour supply model presented in this paper is estimated on two different sub-samples of couples and single females.[9] Being available for the labour market is the basic condition to belong to one of these specific subgroups. This means that the individual is aged between 16 and 65 years and is not sick, in education, disabled or (pre)retired. Analogous with the bulk of the literature, the self-employed are not modelled due to the lack of reliable information of hours worked and because their labour supply decisions are probably very different than those of salary workers. Households whose children are already available for the labour market but are still living with their parents are also excluded from the sample. It is reasonable to assume that their labour supply decisions are different than the ones of a normal household without working-children because it is not clear whether these households see their labour supply decision as a collective or as an individual process.[10] The 'mixed' households where only one of the partners is available for the labour market are also excluded. Examples are households where the female is self-employed and the male is an employee or households where the male is already retired and the female still works as an employee.

Figure (2), (3) and (4) display the actual distribution of hours worked for single women and men and women in a couple from the selected subsamples. A clear pattern of concentration of hours can be observed around inactivity, marginal part-time, part-time, full time and overtime. Therefore, the discrete structural labour supply model, which is discussed in the next section, assumes that each household chooses among

[9] Labour supply of single men is not modelled in this paper. In line with many studies in literature, no convergence could be found in the estimation of male labour supply. This can be explained by the fact that almost all single men work full time and consequently little variation is observed.

[10] The labour supply model assumes that the labour supply decision is collective, as discussed in the next section. Note that this is not the only reason for the exclusion of these households. Including a household with 3 working members would lead to a computationally cumbersome exercise when the researcher assumes that there are 5 different discrete labour supply points. This would mean that there are 125 different possible labour supply combinations for each household.

5 different discrete hours points; i.e. non-participation, marginal part-time, part-time work, full-time and over-time.[11]

The microsimulation model MEFISTO is applied to obtain the budgetconstraint of each household.[12] It models the tax benefit system of Flanders and is able to generate net disposable income from gross income by applying the appropriate tax benefit rules.

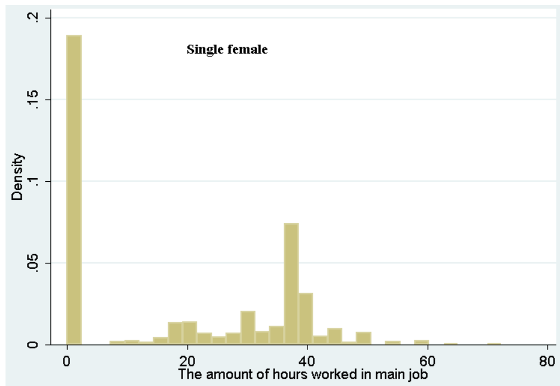

Figure 2: Observerd labour supply: single female

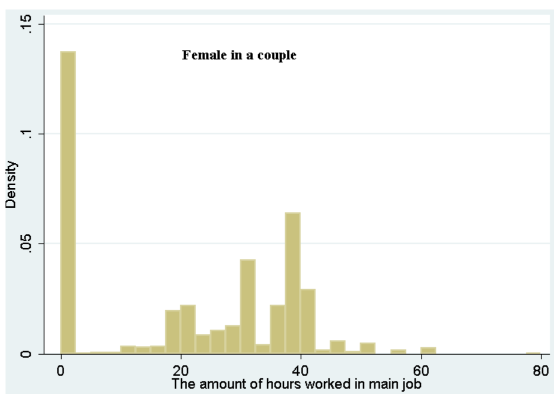

Figure 3: Observed labour supply: female in a couple

[11]Inactivity is equal to 0 hours, marginal part-time to 15 hours, part-time to 25 hours, full-time to 40 hours and over-time to 50 hours.

[12]Modelling and Evaluating Flanders FIscal and Social TOmorrow.

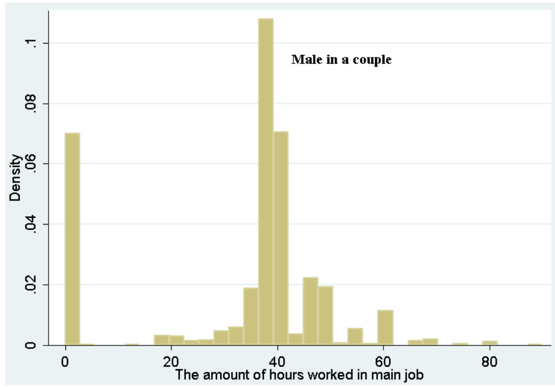

Figure 4: Observed labour supply: male in a couple

3.2 The structural model of labour supply

3.2.1 Specification of the model

The labour supply of each household is modelled as a Random Utility Model (RUM), as in Van Soest (1995). The amount of hours worked by the male and female of household i is, respectively, equal to h_{imj} and h_{ifk}. where the male works j hours and the female k. In such models, the utility V_{ijk} faced by household i, when working (h_{imj},h_{ifk}) hours, contains a structural and a random component. This structural component of utility can be measured or approximated by the researcher, whereas the random component of utility is unknown, at least for the researcher. This utility can be written as follows:

$$V_{ijk}=\underbrace{U(h_{imj}, h_{ifk}, C_{ijk} \mid X_i)}_{\text{Structural part}}+\underbrace{\epsilon_{ijk}}_{\text{Random part}} \tag{1}$$

The first element reflects the structural or deterministic component of utility from household i and is a function of hours worked (h_{imj},h_{ifk}) or amount of leisure, consumption (C_{ijk}) when working (h_{imj},h_{ifk}) hours and household characteristics X_i. As discussed before, it is assumed that each household is restricted to choose between a limited discrete set of hours. Total consumption C is equal to total disposable income because the model is static and does not allow for savings in the future. The actual utility level V_{ijk} differs from the measured utility $U(h_{imj}, h_{ifk}, C_{ijk} \mid X_i)$ with a random term ϵ_{ijk}, which depends on the number of hours worked (h_{imj},h_{ifk}) by both male and female in household i. It arises from factors such as measurement errors concerning the variables in X_i, unobserved preference characteristics or optimization errors of the household. Without this random component, the model would be deterministic. This means that once the functional form of utility and the household's characteristics are known, one would be able to determine the exact utility-maximizing choice of hours level. Taking this random component into account leads to a probability distribution over the available hours levels.

Assuming that this random term is identically and independently distributed according to an extreme value distribution, McFadden (1974) proves that the probability that household i chooses a combination of hours (h_{imj},h_{ifk}) out of the discrete set (h_{imz},h_{ify}) with $z = 0, ..., Z$ and $y = 0, ..., Y$ is given by:[13]

$$\begin{aligned} P_{ijk} &= \Pr\left(U_{ijk} \geq U_{izy}, \forall z = 0, ..., Z \ , \forall y = 0, ..., Y\right) = \\ & \frac{\exp U(h_{imj}, h_{ifk}, C_{ijk} \mid X_i)}{\sum_{z=0}^{Z} \sum_{y=0}^{Y} \exp U(h_{imz}, h_{ify}, C_{izy} \mid X_i)}. \end{aligned} \tag{2}$$

In line with the work of Keane and Moffit (1998) and Blundell et al. (1999), a quadratic functional form with interaction between both spouses is assumed:[14]

$$\begin{aligned} U(h_{imj}, h_{ifk}, C_i|X_i) &= \beta_c(X_i).\left[C_{ijk} - F(X_i)\right] + \alpha_c.\left[C_{ijk} - F(X_i)\right]^2 + \\ & \beta_f(X_i).\left[80 - h_{ifk}\right] + \alpha_f.\left[80 - h_{ifk}\right]^2 + \beta_m(X_i).(80 - h_{imj}) + \alpha_m.\left[80 - h_{imj}\right]^2 + \\ & \alpha_{fc}\left[80 - h_{ifk}\right].\left[C_{ijk} - F(X_i)\right] + \alpha_{mc}.\left[80 - h_{imj}\right].\left[C_{ijk} - F(X_i)\right] + \alpha_{fm}\left[80 - h_{ifk}\right]. \end{aligned} \tag{3}$$

The preference parameters depend on personal and household characteristics. Factors such as education, number and age of children, the individual's own age and the region of residence will affect the preference for work. This observed heterogeneity will be introduced linearly in the model:[15]

$$\begin{aligned} \beta_c(X) &= \beta_{c0} + \beta_c' X_i^c \\ \beta_f(X) &= \beta_{f0} + \beta_f' X_i^f \\ \beta_m(X) &= \beta_{m0} + \beta_m' X_i^m \end{aligned} \tag{4}$$

The model also accounts for possible fixed costs of work, $F(X_i)$, which are subtracted from total disposable household income C_i. These costs can be both psychological and physical and are expressed in both cases in

[13] This notation allows to differentiate the discrete choice points between male and female. This paper, however, assumes the same discrete labour supply points for both genders.

[14] It is assumed that the total amount of available hours a day is equal to 16 hours. Therefore, total leisure time a week equals (80-hour worked).

[15] More advanced models also control for unobserved heterogeneity in the preference structure by adding a random term in each preference parameter which is typically normally distributed, see Van Soest (1995).

monetary values. Similar to the preference parameters, these costs vary linearly with the amount of young children and educational dummies of the mother and try to capture possible fixed costs of working, such as child care related expenses. These costs can be written as follows:[16]

$$
\begin{aligned}
F(X_i) &= f_0 + f_1(X_i) \text{ if } h_{ifk} > 0 \mid h_{imj} > 0 \\
F(X_i) &= 2[f_0 + f_1(X_i)] \text{ if } h_{ifk} > 0 \;\&\; h_{imj} > 0 \\
F(X_i) &= 0 \text{ if } h_{ifk} = 0 \;\&\; h_{imj} = 0
\end{aligned}
\tag{5}
$$

As can be seen in (2) and (3), total net disposable income C_{ijk} of each household at each discrete hours point is needed in order to derive the probabilities. The survey, however, does not contain the net income at each discrete hours point; it only observes total gross income at the actual observed level of labour supply. It is frequently assumed in literature that the hourly wage rate is independent of the amount of hours worked, which implies that gross earnings increase linearly with working time. Consequently, the gross income at each discrete hours point can be calculated by multiplying every hours point with the hourly wage of each individual. In most datasets, the hourly wage is not given and has to be derived in order to calculate the gross income for each discrete hours point. Due to the assumption of constant hourly wages, one obtains the hourly wage of each individual by dividing the observed gross current income by the actual observed number of hours worked. Once this hourly wage is calculated, one can derive the gross earnings at each discrete hours point and the budget constraints for the households are calculated in MEFISTO.

However, there are also households where the gross earnings are not observed but are included in the subsample, for example unemployed or inactive households. Their hourly wage is imputed with an estimated wage equation, corrected for possible selection bias using a Heckman correction model. Table (2) and table (3) present the estimated coefficients for the hourly wage for respectively male and female in a couple. Most coefficients have the expected sign. Looking at the wage equation for men, one sees that the relation between experience and hourly wage is concave and between age and hourly wage convex. This means that higher experience leads to a higher hourly wage but the increase in wages declines the higher the level of experience. The relation between age and wage is convex for men and concave for women. From the age of 5 onwards, the higher the age of men, the higher the hourly wage and this increase grows with the age of the men. Note that these coefficients are not significant for the female. Higher education leads to a higher hourly wage for both men and women. Table (4) and table (5) give the results for the selection equation which controls for possible selection bias. The estimated coefficients have the expected sign but some differences can be seen when comparing men and women. Having young children has a significant negative effect on the probability of being observed in the labour market for women but not for men.

The imputed wages are only assigned to these individuals for which there is no hourly wage observed, the other individuals receive their observed hourly wage. In 14% of all cases, imputed wages are used.

[16] The next section also briefly discusses a model in which no fixed costs are included.

Table 2: Hourly wages male

Variables	Coef.	St. Error	P-value
Hourly wage:			
Experience	.425	.090	0.000
Experience squared	-.0120	.001	0.000
Age	-.573	.191	0.000
Age squared	.011	.002	0.000
Schooling : no degree	-2.160	1.060	0.040
Schooling :high school	1.300	.440	0.000
Schooling: higher education	6.290	.487	0.000
Flanders	-1.220	.490	0.010
Wallonia	-1.390	.510	0.000
Constant	15.801	3.400	0.000

Table 3: Hourly wages female

Variables	Coef.	St. Error	P-value
Hourly wage:			
Experience	.2460	.100	0.015
Experience squared	-.0030	.002	0.075
Age	.079	.140	0.572
Age squared	.-.001	.002	0.897
Schooling: no degree	-.951	1.020	0.353
Schooling: high school	1.172	.402	0.004
Schooling: higher education	5.940	.538	0.000
Flanders	-1.646	.372	0.000
Wallonia	–1.468	.395	0.000
Constant	6.871	2.522	0.006

Table 4: Selection equation male

Variables	Coef.	St. Error	P-value
Select:			
Experience	0.099	0.015	0.000
Experience squared	0.000	0.000	0.810
Age	0.148	0.034	0.000
Age squared	-0.003	0.000	0.000
Schooling: no degree	-0.429	0.170	0.010
Schooling: high school	0.456	0.098	0.000
Schooling: higher education	1.030	0.106	0.000
Flanders	0.300	0.110	0.000
Wallonia	-0.086	0.113	0.430
Number of children between 0-3 year	-0.071	0.113	0.520
Number of children between 3-6 year	-0.022	0.132	0.860
Number of children between 6-9 year	0.110	0.148	0.456
Number of children between 9-12 year	0.082	0.139	0.550
Number of children between 12-16 year	0.022	0.122	0.850
Constant	-1.753	0.643	0.000
rho	-.048	.067	
sigma	6.950	.103	
lambda	-.333	.471	
LR test (rho = 0) :	chi2(1)=0.400	Prob > chi2 :0.527	

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Table 5: Selection equation female

Variables	Coef.	St. Error	P-value
Select:			
Experience	.159	.011	0.000
Experience squared	-.001	.001	0.000
Age	.0743	.026	0.005
Age squared	-.002	.001	0.000
Schooling: no degree	-.0776	.166	0.640
Schooling: high school	.246	.079	0.002
Schooling: higher education	.931	.084	0.000
Flanders	.148	.089	0.096
Wallonia	.130	.093	0.162
Number of children between 0- 3 year	-.315	.086	0.000
Number of children between 3-6year	-.198	.091	0.030
Number of children between 6-9 year	-.345	.094	0.000
Number of children between 9-12 year	-.112	.094	0.235
Number of children between 12-15 year	-.151	.087	0.082
Constant	-.813	.484	0.093
rho	-.007	.233	
sigma	5.255	..081	
lambda	-.035	1.222	
LR test (rho = 0) :	chi2(1)=0.000	Prob > chi2 : 0.980	

3.2.2 Estimation of the model

The structural model of labour supply is estimated using the method of maximum likelihood. The basic idea of maximum likelihood is that it estimates the parameters of the labour supply model in such a way that the joint probability of observing the actual hours points for the selected sample is maximized. Equation (2) gives the probability associated with the chosen hours level of household i. The joint probability, or the likelihood, of all households, say H households, is given by the product of these individual probabilities:

$$L = \prod_{i=1}^{H} \frac{\exp U(h_{imj}, h_{ifk}, C_{ijk} | X_i)}{\sum_{z=0}^{Z} \sum_{y=0}^{Y} \exp U(h_{imz}, h_{ify}, C_{izy} | X_i)} \tag{6}$$

Equation (6) is a function of the unknown parameter values, given the available data and reflects the likelihood function. Taking logarithms gives the log-likelihood function of the structural labour supply model:

$$\log L = \sum_{i=1}^{H} \left[U(h_{imj}, h_{ifk}, C_{ijk} | X_i) - \log \left(\sum_{z=0}^{Z} \sum_{y=0}^{Y} \exp U(h_{imz}, h_{ify}, C_{izy} | X_i) \right) \right] \tag{7}$$

The method of maximum likelihood maximizes equation (7), given the available data. This means that the parameter values are estimated in such a way that it produces the highest probability of observing the actual hours values.

Once model (2) is estimated, one can calculate the expected labour supply of each household, respectively for male and female:

$$E(h_{im}) = \sum_{z=0}^{Z} \sum_{y=0}^{Y} p_{izy}.h_{imz} \tag{8}$$

$$E(h_{if}) = \sum_{y=0}^{Y} \sum_{z=0}^{Z} p_{izy}.h_{ify} \tag{9}$$

3.2.3 Results of estimation

Table (6) gives the parameter estimates of the structural labour supply model for couples and single females and reveals some intuitive results from which only the most important ones are discussed. Looking at the coefficients that determine the heterogeneity for total disposable income in a couple, a significant negative effect is found for the linear term of the age of the women. Apparently, the older the female in a couple, the less additional household utility is obtained from extra income. On the other hand, however, the quadratic term for female age is significantly positive which implies that the age effect in income decreases up to the point where the female reaches the age of 52 after which the effect of income once again increases. This age effect is not significantly observed for men and for the subsample of single females.

Looking at the estimates for the amount of leisure, a significant negative effect and a significant positive effect is found for respectively the linear and the quadric term of the age of a single female. This results in the familiar convex function which means that the preference for leisure decreases up to the age of 36, after which the preference for leisure increases again. Thus, young single female and older ones have a lower preference for labour supply. This parabolic effect is not observed for women in a couple and only the significant negative linear age effect for leisure is observed for men in a couple. Having young children also has a positive significant effect on the estimated coefficient for leisure for single female and female in a couple. This means that the preference for work is lower for these households or that they prefer more leisure time than a similar female without young children.

Fixed costs of work also seem to be significantly important in the estimation of the structural labour supply model. Remember that the fixed costs parameters are not estimates of the actual fixed costs of work because they can also include non-pecuniary costs of work, such as search costs and commuting costs. They can also pick up other institutional factors that influence the amount of labour supply, without actually representing preferences of the worker. Therefore, it is always important to keep these considerations into mind when looking at these coefficient estimates.[17] The higher the eduction level of a single female, the lower the fixed costs of work. The constant term is, for both couples and single female, significantly positive.

[17] This remark holds for all the estimated coefficients. In line with literature, this model does not incorperate the demand side of the model so one must be cautious when interpreting the results as purely preferences of the worker.

Table 6: Estimation results

Variables	Couples Coef.	Couples St. Error	Single female Coef	Single female St. Error
Consumption:				
Age female	-0.026238***	0.007638	0.0153008	0.0188429
Age female squared	0.000253***	0.0000875	-0.0002321	0.0002305
Age male	-1.46E-03	0.0064309	-	-
Age male squared	0.0000817	0.0000781	-	
Children 0-3	0.0130222	.0.0177991	0.2338055	0.1947892
Children 3-6	-4.38E-02***	0.0218395	0.1196096	0.1525883
Children 6-9	0.0186443	0.0197161	-0.1295517	0.0842049
Large city	0.0266864	0.046281	-0.0909822	0.1394683
Median city	0.0066937	0.0460028	-0.0796307	0.1427769
Wallonia	-0.026338	0.0203695	0.0025297	0.0561413
Brussels	0.0679079***	0.0339876	0.1801158***	0.089167
Constant	1.947265***	0.3231685	0.9679574**	0.5140718
Fixed costs of work:				
Children 0-3	4.43E-01	3.69E-01	-1.309066	0.9211357
Children3-6	0.8556197	0.5038872	0.5779535	1.019603
Middle education	-	-	-1.424723***	0.7284128
High education	-	-	-2.812376***	1.097881
Constant	11.40454***	2.002373	8.003098***	2.255549
Consumption squared:	0.0151876***	0.0047029	0.0769407***	0.0297078
Leisure male:				
Age male	.-0.0054151***	0.0024713	-	-
Age male squared	0.000078	0.0000291	-	-
Children 0-3	-0.0008024	0.0059051	-	
Children 3-6	0.0034109	0.0070707	-	
Children 6-9	-0.00503	0.0075245	-	-
Large city	0.0320153	0.0175567	-	-
Median city	0.0306621	0.017403	-	-
Wallonia	0.0264304***	0.0068835	-	-
Brussels	0.0061452	0.0100042	-	-
Constant	0.9639143	0.0702209	-	-
Leisure male squared:	-0.0095821***	0.0002867	-	-
Leisure female:				
Age female	-0.0013478	0.0022246	-0.0120318***	0.003076
Age female squared	0.0000472	0.000028	0.0001653***	0.0000376
Children 0-3	-0.0009471	0.0072153	0.0130952	0.0178473
Children 3-6	0.0137752	0.0091711	-0.0065991	0.0233065
Children 6-9	0.0134794***	0.0054935	0.0333296***	0.0150268
Large city	0.0009503	0.0138907	0.0227169	0.0219967
Median city	0.0047423	0.0135497	0.0174243	0.0224721
Wallonia	0.017518***	0.0060005	0.0108828	0.0090068
Brussels	0.0062204	.0.0103911	-0.0277914***	0.0114312
Constant	0.4879718***	0.0743171	0.7390682	0.0868975
Leisure female squared:	-0.0067805***	0.0003452	-0.0058076***	0.0005688
Cross term consumption and leisure male:	0.0044629**	0.0019576	-	-
Cross term consumption and leisure female:	-0.0075193***	0.0014996	0.0032088***	0.004365

* p<0.10, ** p<0.05, *** p<0.01

The income is equal to income/1000

Given these parameter estimates, one is able to calculate the expected labour supply of each household (see equation (8) and (9)) and compare them to the actual observed labour supply. Table (7) presents the observed labour supply of single females and both male and female in a couple, combined with the aggregate probabilities for each category, once with and without fixed costs of work. As discussed in Dickens and Lundberg (1993), Tummers and Woittiez (1991) and Van Soest (1995), a structural labour supply model without fixed costs does not capture the data very well. They argue that the model overpredicts the amount of part-time jobs and underpredicts unemployment as such models do not incorporate possible costs of working. Including fixed costs lead to a major improvement of the fit for the inactive people, as can be seen in table (7). Notwithstanding the inclusion of these fixed costs, the model does not predict the observed labour supply completely correct. A possible explanation is that this model assumes that each discrete hours level is equally available in the labour market for each individual. This is not observed in reality, thus neglecting these opportunities might lead to results which are not completely in line with the observed situation. These hours restrictions can be included in a more extended labour supply model (see Dagsvik et al (1989) and Aaberge et al (1999)) but is not included in this paper.[18]

Instead of looking at the fit with the observed labour supply, one can calculate the wage elasticities in order to make a judgement of the performance of the model. The structural basis of this discrete labour supply model implies that there is no explicit labour supply function where one can derive the wage elasticity from. Therefore, numerical methods are used to analyse the sensitivity of labour supply with respect to wage changes. The individual's gross wage is increased by 10%, keeping all the other characteristics constant. MEFISTO simulates the new budgetconstraint of each household and the new expected labour supply can be calculated, given the estimated coefficients. Dividing the percentage change in expected labour supply by the percentage change in wage leads to the wage elasticity. Table (8) presents the wage elasticities for both male and female in a couple and for single female. The hours elasticity reflects by how much total labour supply changes after a certain change in the wage rate. For example, total labour supply for women in a couple is expected to increase by 2.2% if hourly wages increase by 10%. The labour supply elasticities are in line with the expectations and the literature, see for example Blundell and MaCurdy (1999). Female elasticities are, on average, higher than the elasticity of men and are bigger for female in a couple than for single female. The same quantitative conclusion was found for Belgium in Orsini and Decoster (2007), where hours elasticity for females and males in a couple is, respectively, equal to 0,30 and 0,08, which only slightly differs from the results estimated in table (8).[19] The participation elasticity is defined as the expected percentage change in labour market participation due to a 10% increase in gross wages. It measures the responsiveness of non-participants to an increase in their (potential) gross wage. The same conclusion can also be made here; married women are the most sensitive compared to single female and married men.

[18] Alternatively, as pointed out in Van Soest (1995), including alternative specific constants leads to a perfect fit with the observed data. The method of calibration, as suggested in Creedy and Kalb (2005), also leads to a complete fit, which is discussed and applied in the next section.

[19] They estimated it on the household budget survey of 2001.

Table 7: Observed and predicted weekly hours distribution

Observed:	Male in couple	Female in couple	Single Female
Inactivity(0-5)	9,56	27,92	34,08
mar part-time (5-20)	1,86	13,07	10,57
part-time (20-30)	2,68	14,99	10,29
full-time (30-45)	71,87	41,13	41,03
overtime (>45)	14,03	2,89	4,03
Predicted without fixed costs:	Male in couple	Female in couple	Single Female
Inactivity (0-5)	1,6	18,4	27
mar part-time (5-20)	8,2	21,2	19,7
part-time (20-30)	18,2	22,1	18,3
full-time (30-45)	34,6	20,5	17,5
overtime (>45)	37,4	17,8	17,5
Predicted with fixed costs:	Male in couple	Female in couple	Single Female
Inactivity (0-5)	8,39	27,56	34,2
mar part-time (5-20)	0,31	5,52	4,99
part-time (20-30)	10,51	28,13	22,54
full-time (30-45)	61,91	31,36	29,18
overtime (>45)	18,87	7,41	9,04

Table 8: Estimated labour supply elasticities

	Hours elast.	Participation elast.
Female in couple	0,2213	0,1286
Males in couple	0,0629	0,0481
Single female	0,1606	0,1091

4 Implementing the *Jobkorting*

This section evaluates the potential labour supply effects of the *Jobkorting* by using the structural labour supply model which is described above. Instead of presenting the probabilities of each hours category, such as in table (7), this section follows the method of calibration and presents the effects of the reforms by using transition matrices, as recommeded by Creedy and Kalb (2005). The method of calibration draws error terms from the extreme value type 1 distribution and adds them to the structural part of utitity (see equation (1)). If this results in the observed labour supply being the optimal choice for the individual, the draw is accepted; otherwise, another set of error terms is drawn and checked. This is repeated until 100 sets of error terms which lead to the observed labour supply are drawn. This produces a baseline which corresponds perfectly to observed labour supply behaviour.These error terms are used to compute a distribution of labour supply after the implementation of the tax credits. The credits lead to a change in disposable household income and consequently in the structural part of utitily, $U(h_{imj}, h_{ifk}, C_{ijk} \mid X_i)$. Combining the new structural utility with the error terms from calibration, makes it possible to calculate probabilities of being in each of the discrete hours points after the reform, conditional on the pre-reform labour supply. Consequently, one is able to generate transition matrices.

The last subsection discusses whether these tax credits are actually self financing, as many policymakers claim them to be. They argue that these credits lead to a decrease in unemployment and to an increase in the number of hours worked by the currently active population. This results in a positive effect on government revenue through higher personal income taxation, higher social security contributions and lower unemployment benefits and hence partly cover the original cost of the implementation of the tax credits.

4.1 Labour supply effects

The labour supply responses of the implementation of the *Jobkorting* of 2009 are presented in table (9) and (10). The former displays all the transitions between the different discrete hours points (for example, the percentage of people going from inactivity to part-time work) and the latter calculates the change in labour supply in Full time Equivalents.

The first impression confirms the prediction made earlier that labour supply responses are very small. Looking more into detail, one sees that the tax credit generates effects at both intensive and extensive level of the labour market. Around 0.61% of all inactive single women and 0.79% of all inactive women in a couple start to work after the implementation of the *Jobkorting*.[20] Expressing these changes in Full Time Equivalents, 1495 FTE are generated from the inactive population who are potentially available for the labour market. As can be seen in table (9) and (10), the majority of the inactives change to full time work. There are also positive labour supply effects of people who are already participating in the labour market,

[20] This is respectively the sum of 0.03, 0.24, 0.31, 0.03 in the table for single female and 0.23, 0.41 and 0.15 in the table for female in a couple.

i.e. at the intensive margin. For example, 0.29% of all women in a couple who work marginal part-time before the tax reform change their labour supply status to full-time work. Summing over all categories and for the three subsamples, total labour supply increases by 1970 FTE. Note that it is not surprising that labour supply of women who live in a couple change the most compared to single women and men. This was already seen in the estimated elasticities, where both total labour supply elasticity and participation elasticity is the largest for women who live in a couple. However, the introduction of this tax credit also produces some negative labour supply effects at the intensive margin of the market. The model predicts, for example, that 0.02% of all single women who work part-time before the implementation of the tax credit reduce their labour supply to marginal part-time. For men in a couple, 0.32% of all men who work overtime reduce their labour supply to full-time work. Combining all these negative effects over the three subsamples and the categories results in a decrease of 297 FTE. Eventually, the introduction of the *Jobkorting*, like it was actually implemented in 2009, leads to a very small net increase in labour supply of 1673 FTE.[21]

This limited effect on total labour supply is not surprising as the amount of tax credit is very low and hardly influences the incentives of households, as was discussed when presenting the budgetconstraints (see section 2.2). Therefore, this paper analyses the labour supply effects of a fictitious tax credit which is substantially higher than that of 2009. Table (11) and (12) present the labour supply effects when the tax credit is increased up to 1747 euro/year, which is approximately 10% of the average yearly disposable income. Compared to the *Jobkorting* of 2009, a larger increase from inactivity into the labour market is observerd for the three subsamples. For example, 3.03% of all women who live in a couple change their labour supply status from inactivity to full-time work, compared to only 0.41% when the *Jobkorting* of 2009 is implemented. The same effect is also observed for single female and men who live in a couple. Next to these larger positive extensive effects, higher positive intensive labour supply effects are also observed. For example, 3.30% of all women who live in a couple increase their labour supply from marginal part-time to full-time, compared to 0.29% in the case of the lower tax credit. This type of tax credit also produces negative intensive labour supply effects, which are in line with the ones observed in the case of the tax credit of 2009. Eventually, this higher tax credit induces 14315 more Full Time Equivalents, which is almost ten times as large as the net effect of the *Jobkorting* of 2009.[22]

The third simulation is the implementation of the same higher tax credit, but instead of making every worker eligible, it is now limited to all workers who earn a yearly income between 5500 and 22000 euro. Table (13) and (14) present the labour supply effects of this selective tax credit. As expected, the negative intensive effects are substantially higher as more people lower their labour supply in order to be eligible for the tax credit. For example, 1.84% of all men who live in a couple and are working overtime before the implementation of the credit reduce their labour supply to full-time. The total net effect is lower than the

[21] One must be cautious with these results. Including standard errors is beneficial here to derive more robust confidence intervals.

[22] Note, however, that the budgetary cost is substantially higher in this case. These costs, and the amount compensatory effects are discussed in the next subsection.

non-selective version of the tax credit and is equal to 5094 FTE, which is still higher than the labour supply effects of the *Jobkorting* of 2009.

4.2 Compensatory costs effects

It is frequently assumed by policymakers that in-work tax credits create large compensatory cost effects due to the increase in labour supply and decrease in unemployment. Therefore, they defend these costly policies by asserting that these types of credits are, to a great extent, self-financing. This section derives this amount of self-financing and discusses which type of the three presented in-work tax credits is the most beneficial for the government.

Let X be the gross income of the individuals in the selected sample, Y the net income, R the total amount of revenues for the government, S_g and S_n respectively the social contributions of the employer and the employee, T the total amount of taxes paid to the government. The total amount of revenues for the government R can be written as follows:

$$R = T + S_g + S_n. \tag{10}$$

The net income of an individual can be written in terms of gross income, taxes and benefits:

$$Y = X - T - S_n \tag{11}$$

Rewriting equation (10) and (11) in terms of changes due to the inclusion of a specific policy reform, for example an in-work tax credit:

$$\Delta R = \Delta T + \Delta S_g + \Delta S_n \tag{12}$$

$$\Delta Y = \Delta X - \Delta T - \Delta S_n \tag{13}$$

Combining (12) and (13) eventually leads to an expression for the change in government revenue due to the inclusion of the policy reform:

$$\Delta R = \Delta X - \Delta Y + \Delta S_g \tag{14}$$

This paper defines the total amount of compensatory costs of the tax credits as the difference between the change in revenue for the government in the situation in which labour supply does not change and in the case in which labour supply changes. This difference can be seen as the total amount of recovery of budgetary costs due to behavioural labour supply responses induced by the in-work tax credit. Therefore, if labour supply does not change, this means that only net income of individuals change due to the tax credit.

Gross income and the amount of social security contributions of the employer remain unchanged. The total change in revenue without behavioural responses can be written as follows:

$$\Delta R = -\Delta Y \tag{15}$$

In the other scenario in which behavioural responses arise, both gross income and social security contributions of the employer change, which leads to the following change in government revenue:

$$\Delta R = \Delta X - \Delta Y + \Delta S_g \tag{16}$$

The difference between (15) and (16) can be seen as the total amount of recovery of budgetary costs for the government and can be expressed in terms of newly created FTE.Table (15) presents both the budgetary cost without and with behavioural responses of the three different types of tax credits and their decomposition. As expected from the small positive labour supply effect of the *Jobkorting* 2009, the compensatory effect represents only 2.81% of the budgetary cost without behavioural responses. This means that the government pays 204561 euro per additional created Full Time Equivalent. This unitcost is substantially reduced to 136911 euro/FTE when the higher tax credit is implemented, due to the larger increase in labour supply. However, in order to arrive at this increase, total budgetary cost is almost six times as large as the orginal tax credit. The total budgetary cost of the higher selective tax credit without behavioural responses is even higher than the one with labour supply responses. This is mainly due to the fact that labour supply decreases when working a lot of hours in order to be eligible for the tax credit.

Table 9: Transition matrix Jobkorting 2009†

Pre-reform:	Post-reform					
Single female:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity(0-5)	99.40	0.03	0.24	0.31	0.03	100
Marginal part-time (5-20)	0	99.87	0.07	0.06	0	100
Part-time (20-30)	0	0.02	99.98	0	0	100
Full-time (30-45)	0	0.01	0.01	99.98	0	100
Overtime (>45)	0	0	0.27	0	99.73	100
Female in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity(0-5)	99.21	0.00	0.23	0.41	0.15	100
Marginal part-time (5-20)	0.05	99.42	0.19	0.29	0.05	100
Part-time (20-30)	0.00	0.00	99.74	0.20	0.06	100
Full-time (30-45)	0.00	0.00	0.00	99.97	0.03	100
Overtime (>45)	0.00	0.00	0.00	0.00	100.00	100
Male in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity(0-5)	100.00	0.00	0.00	0.00	0.00	100
Marginal part-time (5-20)	0.22	99.19	0.00	0.25	0.34	100
Part-time (20-30)	0.00	0.00	100.00	0.00	0.00	100
Full-time (30-45)	0.00	0.00	0.06	99.87	0.06	100
Overtime (>45)	0.00	0.00	0.04	0.32	99.64	100

† Percentages are computed as the proportion of each specific hours group.

Table 10: Changes in FTE by category Jobkorting 2009†

Pre-reform:	Post-reform					
Single female:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity	0	9	123	253	31	417
Marginal part-time	0	0	4	9	0	13
Part-time	0	2	0	0	0	2
Full-time	0	4	2	0	1	7
Overtime	0	0	15	0	0	15
Total	0	15	144	262	33	453
Female in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity	0	0	211	601	266	1078
Marginal part-time	13	0	33	129	32	206
Part-time	3	0	0	82	42	128
Full-time	0	0	0	0	23	23
Overtime	0	0	0	0	0	0
Total	16	0	244	812	362	1434
Male in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity	0	0	0	0	0	0
Marginal part-time	8	0	0	15	29	53
Part-time	0	0	0	0	0	0
Full-time	23	0	116	0	76	215
Overtime	0	0	26	84	0	110
Total	31	0	142	99	105	378

† The FTE is derived by dividing total yearly hours worked by 2000.

Table 11: Transition matrix Jobkorting High †

Pre-reform:	Post-reform					
Single female:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity(0-5)	96.14	0.21	1.22	1.93	0.51	100
Marginal part-time (5-20)	0.00	97.52	0.85	1.12	0.52	100
Part-time (20-30)	0.00	0.00	99.66	0.26	0.08	100
Full-time (30-45)	0.00	0.00	0.00	99.98	0.02	100
Overtime (>45)	0.00	0.00	0.00	0.00	100.00	100
Female in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity(0-5)	94.81	0.05	1.28	3.03	0.83	100
Marginal part-time (5-20)	0.26	94.33	1.49	3.30	0.62	100
Part-time (20-30)	0.02	0.00	98.03	1.42	0.53	100
Full-time (30-45)	0.00	0.00	0.00	99.81	0.19	100
Overtime (>45)	0.00	0.00	0.00	0.00	100.00	100
Male in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity(0-5)	95.92	0.03	0.76	2.80	0.48	100
Marginal part-time (5-20)	0.15	96.62	0.54	1.74	0.96	100
Part-time (20-30)	0.00	0.00	99.07	0.70	0.23	100
Full-time (30-45)	0.04	0.01	0.26	99.27	0.42	100
Overtime (>45)	0.06	0.00	0.13	1.64	98.17	100

† Percentages are computed as the proportion of each specific hours group.

Table 12: Changes in FTE by category Jobkorting High†

Pre-reform:	Post-reform					
Single female:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity	0	64	629	1596	525	2814
Marginal part-time	0	0	46	153	100	299
Part-time	0	0	0	27	14	41
Full-time	0	0	0	0	5	5
Overtime	0	0	0	0	0	0
Total	0	64	676	1776	644	3159
Female in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity	0	27	1168	4434	1522	7152
Marginal part-time	69	0	264	1462	387	2182
Part-time	14	0	0	595	374	982
Full-time	0	0	0	0	132	132
Overtime	0	0	0	0	0	0
Total	83	27	1432	6491	2415	10449
Male in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity	0	4	173	1018	218	1414
Marginal part-time	5	0	13	106	82	207
Part-time	0	0	0	26	14	40
Full-time	200	18	475	0	505	1197
Overtime	77	0	87	425	0	589
Total	282	22	748	1576	819	3447

† The FTE is derived by dividing total yearly hours worked by 2000.

Table 13: Transition matrix selective Jobkorting High†

Pre-reform:	Post-reform					
Single female:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity(0-5)	97.51	0.21	1.23	0.94	0.11	100
Marginal part-time (5-20)	0.00	98.09	0.81	0.85	0.25	100
Part-time (20-30)	0.00	0.05	99.74	0.18	0.03	100
Full-time (30-45)	0.00	0.12	1.26	98.61	0.00	100
Overtime (>45)	0.00	0.09	2.39	0.09	97.44	100
Female in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity(0-5)	95.75	0.08	1.57	2.19	0.41	100
Marginal part-time (5-20)	0.21	96.62	1.35	1.63	0.19	100
Part-time (20-30)	0.07	0.03	98.94	0.84	0.12	100
Full-time (30-45)	0.07	0.13	1.04	98.66	0.10	100
Overtime (>45)	0.15	0.12	1.10	0.74	97.88	100
Male in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity(0-5)	97.63	0.00	0.63	1.38	0.35	100
Marginal part-time (5-20)	0.67	98.42	0.07	0.77	0.08	100
Part-time (20-30)	0.00	0.00	99.51	0.30	0.19	100
Full-time (30-45)	0.05	0.01	0.64	98.96	0.34	100
Overtime (>45)	0.04	0.01	0.57	1.84	97.54	100

† Percentages are computed as the proportion of each specific hours group.

Table 14: Changes in FTE by category selective Jobkorting High[†]

Pre-reform:	Post-reform					
Single female:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity	0	64	637	780	116	1596
Marginal part-time	0	0	45	116	47	208
Part-time	0	3	0	18	6	27
Full-time	0	80	495	0	0	575
Overtime	0	7	131	2	0	139
Total	0	153	1307	916	169	2546
Female in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity	0	44	1435	3206	753	5438
Marginal part-time	57	0	240	722	116	1134
Part-time	46	7	0	354	87	493
Full-time	208	225	1121	0	68	1622
Overtime	52	28	186	50	0	316
Total	363	304	2982	4331	1024	9004
Male in a couple:	Inactivity	Marginal part-time	Part-time	Full-time	Overtime	Total
Inactivity	0	0	144	502	159	805
Marginal part-time	25	0	2	47	7	80
Part-time	0	0	0	11	12	23
Full-time	238	27	1156	0	409	1831
Overtime	57	5	369	478	0	909
Total	319	32	1670	1038	587	3648

[†] The FTE is derived by dividing total yearly hours worked by 2000.

Table 15: Compensatory effects of different types of tax credit

	Jobkorting 2009	Jobkorting High	Selective Jobkorting High
Cost no behaviour (billion euro):	*352.32*	*2194.70*	*1061.60*
Change in net income (Y) (billion euro)	352.32	2194.70	1061.60
Change in gross income (X) (billion euro)	0	0	0
Change in SSC employee (Sg) (billion euro)	0	0	0
Cost with behaviour (billion euro):	*342.42*	*1959.92*	*1073.57*
Change in net income (Y) (billion euro)	350.26	2382.20	1123.40
Change in gross income (X) (billion euro)	13.32	336.95	40.39
Change in SSC employee (Sg) (billion euro)	4.52	85.33	9.44
Compensatory effect (pct) :	2.81	10.70	-1.13
Cost per new FTE (euro):	204561	136911	210769

5 Conclusion

In line with the Earned Income Tax Credit in the United States and the Working Family Tax Credit in the United Kingdom, the Flemish government implemented in 2007 a similar in-work tax credit in order to increase the employment rate and to make working financially more attractive. This paper investigates how total labour supply changes and checks if the compensatory costs are large enough to defend such expensive policies.

In line with more recent literature about labour supply, this paper assumes that households choose among a discrete set of hours instead of a continuous one. Based on the observed labour supply in the Belgian EU-SILC data, 5 discrete hours points are chosen; inactivity, marginal part-time, part-time, full-time and over-time work. To account for possible costs of working, the model accounts for fixed costs of work, such as search costs, child care related expenditures or commuting costs.

It appears that the tax credit that was actually implemented in 2009, the *Jobkorting*, leads to only minor changes in labour supply. In line with the estimated wage elasticities, married women alter their labour supply the most. This small result is not surprising as the amount of in-work tax credit is negligible compared to, for example, the EITC. Therefore, this paper also investigates how two other tax credits, which are considerably larger in size, affect the labour supply decision. If the tax credit is increased to 1747 euro/year instead of 250 euro, total change in labour supply equals 14315 Full Time Equivalents (FTE), instead of 1673 FTE. Consequently, the compensatory effect is much larger and equals 10.7% instead of 2.8% but the budgetary cost is huge.

Bibliography

Aaberge, R., U. Colombino, and S. Ström (1999). Labour supply in italy: An empirical analysis of joint household decisions, with taxes and quantity constraints. *Journal of Applied Econometrics 14*(4), 403–422.

Arrufat, J. L. and A. Zabalza (1986). Female labor supply with taxation, random preferences, and optimization errors. *Econometrica 54*, 47–63.

Bargain, O. and K. Orsini (2006). In-work policies in europe: Killing two birds with one stone? *Labour Economics 13*, 667–697.

Blundell, R. and T. Macurdy (1999). Labor supply: A review of alternative approaches. *3*, 1559–1695.

Card, D. and P. K. Robins (1996). Do financial incentives encourage welfare recipients to work? evidence from a randomized evaluation of the self-sufficiency project. *Princeton University Working paper No. 738*.

Creedy, J. and G. Kalb (2005). Discrete hours labour supply modelling: Specification, estimation and simulation. *Department of Economics - Working Papers Series 928* (928).

Dagsvik, J. and S. Strom (1989). A labour supply model for married couples with nonconvex budget sets and latent rationing. *Central bureau of statistics, Discussion paper*.

Decoster, A., K. De Swerdt, and G. Van Camp (2010). Modelling labour supply and policy reform in the belgian tax benefit model mimosis. *Report for FPS Social Security, Part 2.*

Dickens, W. T. and S. J. Lundberg (1993). Hours restrictions and labor supply. *International Economic Review 34*(1), 169–192.

Hausman, J. A. and P. Ruud (1986). Family labor supply with taxes. *American Economic Review 74*, 242–248.

Keane, M. and R. Moffitt (1998). A structural model of multiple welfare program participation and labour supply. *International Economic Review*.

Killingsworth, C. C. (1976). Must a negative income tax reduce labor supply? : a study of the family's allocation of time. *Journal of Economic Literature 14*(3), 946–948.

MCFadden, D. (1974). Conditional logit analysis of qualitative choice behavior. *Frontiers in Econometrics Chapter 4*.

Soest, A. v. (1995). Structural models of family labor supply: A discrete choice approach. *The Journal of Human Resources 30*(1), 63–88.

Strickland, P. (1998). Working family tax credit and family credit. *House of Commons 46/april*.

Tummers, M. P. and I. Woittiez (1991). A simultaneous wage and labor supply model with hours restrictions. *The Journal of Human Resources 26*(3), 393–423.

List of Tables

List of Figures