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Participation Tax Rates in Finland, Earned-income Tax Credit Investigated

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ABSTRACT

Previous estimates on participation tax rates (PTRs) are reviewed and new, updated PTR estimates of the Finnish case are provided with 2013 data. The results indicate that there has been an increase in the average PTR in Finland after 2011. The sensitivity of PTR calculations is tested in order to understand the dynamics behind the results. This is something that is lacking in the earlier literature. The contribution of different parts of the social security system to the level of PTR is calculated. Furthermore, a recent reform, the increase of Earned-income Tax Credit (EITC), is evaluated in an *ex-ante* manner. It could be possible to utilize the underlined methodology when evaluating and designing policy reforms. First, the reform's effect on average participation tax rate is calculated. Second, the obtained result with respect to average PTR is plugged into a search theoretic general equilibrium model, and an employment effect is estimated. Also a more traditional "partial equilibrium" effect is calculated. The EITC reform, that costs (in static terms) €450 million, lowers the average PTR by 1 pp., which is calculated to induce a 0.6-0.8 % increase in the number of employed using 0.25 elasticity of labor supply.

JEL Classification: J20, J22, H20

Keywords: Participation tax rates; Earned-income Tax Credit; social security; general equilibrium modeling

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Contents

1 INTRODUCTION

During the recent period of low or even negative GDP growth and rising unemployment rate in Finland, there has been a lot of discussion about improving the financial incentives to work. The Finnish government, for instance, has stated as one of its main projects, that "incentive traps preventing acceptance of work will be removed and structural unemployment reduced" (Prime Minister's Office (2016)). Before the incentives can be improved, however, it's important to know the current situation, that is, what is the size of the problem and what types of individuals face the biggest challenges. This paper concentrates on the Finnish case, but the phenomenon is more or less universal.

One of the main concerns has been the low-income earners' (low) incentives to work as, by and large, individuals with relatively low productivity, measured by the *participation wage rate (PWR)*[1], face the lowest incentives to actively search for work. This paper reviews the previous estimates on incentives to work and unemployment traps in Finland, presents an analysis of where we are at the moment, and, finally, discusses the employment effects of a recent reform aiming to increase incentives to work – an increase in the Earned-income Tax Credit (EITC).

Incentives to work are often measured by *the participation tax rate* (PTR), which describes how the tax and benefit system affects the financial gains to work on the extensive margin.[2] If the participation tax rate was, say, 50 %, then half of the participation wage would be lost due to increased taxation and decreased social security benefits upon accepting a job offer. The reduction of average participation tax rate is often seen as a central policy objective when discussing incentives to work on the extensive margin. This incentive problem, however, is not easily solved.

In a static world, there are basically only three means of tackling the problem of too low incentives to work. First, the level of social security transfers, unemployment benefit, for example, could be lowered. This channel is cost-efficient, but politically difficult, and furthermore, can lead to other undesired outcomes such as increased income inequality.

Second, it is possible to increase the incentives to work part-time, by, for example, protecting part of the social security benefits from decreasing when the labor income increases. In 2013 in the Structural Policy Programme, the Finnish government decided

[1] Participation wage rate is defined to be the (hypothetical) wage that an unemployed person receives when he or she becomes employed.

[2] *The extensive margin* refers to the decision of whether to work or not. *The Intensive margin*, on the other hand, refers to the decision whether to work more or less.

that, *"to remove incentive traps, a protected portion of work income will be introduced in unemployment security*."[3] This type of measure doesn't, however, remove incentive traps, but instead, relocates the problem. In the case of the aforementioned measure, the incentive to work part-time did *increase*, but the incentive to move from part-time work to full-time, on the contrary, *decreased* (Kotamäki and Kärkkäinen (2014)). In theory, it is then possible, that the aggregate hours worked in an economy decrease, even though the employment rate increases. The question is about the relative sizes of the labor supply elasticities on the intensive and the extensive margin, which is outside the scope of this paper.

Third and finally, (effective marginal) tax rates, or, the social security benefit adjustment rates, can be diluted in order to increase the disposable income when employed. The central idea is to make employment *relatively* more attractive than unemployment. The most common example of this type of measure is the Earned-income Tax Credit (EITC) in the US, although, a variation of EITC is in place in many developed countries; the Finnish EITC is presented and analyzed in more detal later in this paper. The problem with these measures is the price – an increase in the EITC, for instance, affects a large group of people and, in order to achieve significant changes in the incentives, the tax relief should be sufficiently big, and, consequently, expensive.

A good social security system puts efficiency and equity into a "correct" balance. This paper focuses on the efficiency part of the Finnish social security by discussing the financial incentives to work and reviewing some recent relevant research evidence. The equity part is not in the scope of this paper, and, consequently, income distribution will not be discussed here.

The organization of this paper is as follows. The second section reviews the earlier literature. The focus is on the Finnish research literature, but also selected papers of international flavor are considered. The third and fourth section present, respectively, the data and research methods. The fifth section discusses the calculated participation tax rates, and the sixth ponders the labor market effects of Earned-income Tax Credit. The seventh section concludes.

2 THEORETICAL AND EMPIRICAL BACKGROUND

This section concentrates first and foremost on the empirical evidence on participation tax rates in Finland, although, a number of selected articles of international flavor are also presented. The focus is on the economic incentives to become employed. The subject is, however, first approached with the help of a theoretical model.

[3] http://valtioneuvosto.fi/documents/10184/1043920/Structural+policy+programme-29082013.pdf/411abbb0-966d-4aae-b2a8-eeafcd70675c

2.1 Theoretical Background on Incentives to Work

This subsection presents a highly stylized theoretical framework, which models individual agent's incentive to transition from unemployment to work. The model is based on the work by Hopenhayn and Nicollini (1997). The purpose of the model is to formally show the most basic mechanisms that are in the background when interpreting the participation tax rate. The model is, thus, one that attemps to describe primarily the individual incentives to search for work and, therefore, the demand side of the economy is not explicitly modeled. The model does produce qualitatively similar results as the current labor market workhorse model of Pissarides (2000).

An unemployed individual makes a decision on how much to invest in the higher probability of becoming employed. In practice this would mean, for example, time invested in training and in labor market search in general. Assume a value function of the following form:

$$V_t^U = u(c_t^U) - v(e_t) + \beta(p(e_t)V_{t+1}^E + (1 - p(e_t))V_{t+1}^U) \quad \textbf{(1)}$$

$$V_t^E = u(c_t^E) + \beta V_{t+1}^E \quad \textbf{(2)}$$

where V_t^U and V_t^E denote, respectively, value function of the unemployed and of the employed. For simplicity, once an individual becomes employed, he or she will remain employed. The model is, thus, intended to capture first and foremost the incentives that an unemployed individual faces. The disposable income of the unemployed and employed are denoted by c_t^U and c_t^E, $p(e_t)$ denotes the probability of becoming employed, e_t is the time invested in activities that increase one's chance of becoming employed, and β is the utility discount factor. The budget constraints in the individual problem are

$$c_t^U = c(0) \quad \textbf{(3)}$$

$$c_t^E = c(w_t) = w_t - T(w_t) \quad \textbf{(4)}$$

where $c(0)$ denotes the disposable income when unemployed and w_t is the gross wage rate.

The model can be solved for an optimal search effort, e, which enables one to make inferences relevant to this paper. In order to obtain an analytical solution, following Hopenhayn and Nicolini (1997), assume a linear utility function, $v(x) = x$, logarithmic utility function $u(x) = \log(x)$, and a hazard function $p(x) = 1 - \exp(-r\,x)$, where $r > 0$. The optimal search effort can then be solved

$$e_t = \frac{\log(\beta r(V_{t+1}^E - V_{t+1}^U))}{r} \quad \textbf{(5)}$$

The future value of employment must be greater than the future value of unemployment in order for e_t to be well-defined ($V_{t+1}^E > V_{t+1}^U$). Equation (5) will not be developed further here, but, instead two stylized facts are presented. These effets are the most basic and obvious effects, but also quantitatively most important. More subtle effects, that do exist, are outside the scope of this paper.

First, assuming a marginal tax rate below 100 %, an increase in the next period (participation) wage rate will induce an individual to invest more effort into labor market search.

$$\frac{\partial e_t}{\partial w_{t+1}} = \frac{\partial u(c_{t+1}^E)/\partial w_{t+1}}{r(V_{t+1}^E - V_{t+1}^U)} = \frac{1 - T'(w_{t+1})}{r(V_{t+1}^E - V_{t+1}^U)(w_{t+1} - T(w_{t+1}))} > 0 \quad \textbf{(6)}$$

The strength of the effect depends on taxation and wage rate. If the response in utility, that is, in consumption, was very high, then the increase in search efforts in response to wage change would also be high. If the marginal tax rate, $T'(w_{t+1})$, is very high, the incentive to search for work is low. As a matter of fact, if the marginal tax rate is higher than 100 %, an increase in wage rate will *lower* the search efforts. Furthermore, $(V_{t+1}^E - V_{t+1}^U)$ in the denominator implies that the higher the difference in utility between working and being unemployed, the lower the change in search effort in response to wage rate. If the difference between working and being unemployed was very high in the first place, a small change in the wage rate wouldn't induce a big behavioral response, because the relative change would be low.

Second, an increase in the unemployment benefit level will lead to lower search efforts.

$$\frac{\partial e_t}{\partial c(0)} = -\frac{\partial u(c_{t+1}^U)/\partial c(0)}{r(V_{t+1}^E - V_{t+1}^U)} = -\frac{1}{r(V_{t+1}^E - V_{t+1}^U)c(0)} < 0 \quad \textbf{(7)}$$

This is also something that is reflected in the participation tax rate; the higher the unemployment benefit (relative to net wage), the lower the probability of employment and the higher the PTR. Furthermore, this theoretical result is backed up by a mountain of empirical evidence (see Tatsiramos and van Ours (2014) for an extensive review on the subject).

2.2 Earlier PTR Estimates in Finland

There are two approaches to the calculation of PTRs. The legislation can be described and inspected with the help of example households. Good citations from Finland are Viitamäki (2015) and Laitila and Viitamäki (2009) in this research branch. With this method, problems of the legal system can be identified, although, in a non-representative manner. Viitamäki (2015), among other things, shows that for an average

one child single-parent who receives Earnings-related Unemployment Allowance, the effective marginal tax rate is around 100 % up to gross income of €2,500. The financial incentives to work for this household type are, thus, non-existent.

In this paper, a more data oriented method is used, where the average PTRs are calculated using data, thus, trying to create a representative description of the current situation and locate the groups that are observed to be in the most dismal position in terms of financial incentives to work. There are a number of earlier papers of this research branch in Finland.

Parpo (2004) examined the 2003 Finnish social transfer scheme and incentives to work using microsimulation methods. The results show that, in most cases, employment is economically worthwhile. There are, however, a number of exceptions. In households that received unemployment benefits, approximately 3.4 percent had an effective marginal tax rate over 100 percent and 13 percent of unemployed households had PTR over 80 percent.[4] Furthermore, unemployment traps existed mostly in the two lowest income deciles. Of different household types, single parents stood out in having the highest risk of being trapped in unemployment; every other single parent was in a situation, in which transition from unemployment to full-time work was not financially reasonable.

Legislation Year	**2003**
Data Year	**2001**
I Single	7.8
II Childless couple	5.3
III Single parent	51.3
IV Two parents	5.3
V Others	5.2
	12.8

Table 1 Individuals in unemployment trap (%) according to Parpo (2004)

According to Honkanen et al (2007a), PTRs fell significantly as a result of policy changes between 1995 and 2004; the average PTR fell by 13 percent during this period. Running (micro)simulations with 1995 legislation, 68 percent of single parent households were found to be in unemployment trap, while in 2004, the corresponding figure was 43 percent. Both Hakola-Uusitalo et al (2007) and Honkanen et al (2007b) further discover, that the incentives to work have continued to improve since 2004, mainly due to the easing of income taxation. PTRs have further fallen by almost two percentage points between 2004 and 2007.

[4] An individual is defined to be in unemployment trap when the PTR is higher than 80 %

Legislation Year	**1995[a1]**	1995[a2]	**2000[a1]**	2000[a2]	**2004[a1]**	2004[a2]	**2004[b]**	**2007[b]**
Data Year	**2004**	2004	**2004**	2004	**2004**	2004	**2004**	**2004**
I Single	77.1	66.5	71.5	61.5	68.5	58.1	-	67.6
II Childless couple	67.2	60.1	62.6	55.7	60.3	52.7	-	59.0
III Single parent	85.1	80.8	79.6	74.9	77.3	71.8	-	73.4
IV Two parents	77.5	69.8	71.0	61.7	68.6	58.6	-	64.9
V Others	62.1	56.1	57.4	51.6	54.5	48.2	-	53.5
	77.2	58.8	66.8	58.8	64.2	55.7	64.2	62.4

Table 2 Participation tax rates by Honkanen et al (2007a,b) and by Hakola-Uusitalo et al (2007)
a[1] Honkanen et al (2007a) with the within-year unemployment duration in the wage equation
a[2] Honkanen et al (2007a) without the within-year unemployment duration in the wage equation
b Hakola-Uusitalo et al (2007) and Honkanen et al (2007b)

Honkanen (2008) examines a register based data from November 2006. According to the author, November is a reasonable proxy for the yearly average. All households in the data had received housing allowance during the study period, thus, there is a risk of selection bias, and the results may not be externally valid. The author finds that the average PTRs for a single unemployed person is 57.4 % when he or she becomes employed with the average wage rate as participation wage rate, and 71.6 % when the participation wage rate is half of the average wage rate. Single parents, on the other hand, have PTR of 63 % with average wage rate, and, 75 % with half of the average wage rate, thus, single parents face clearly higher PTRs than their counterparts without children. On the other hand, single parents are less dependent on social income support, whereupon the marginal effective tax rate (METR) is slightly lower for single parents than for singles.[5] The inference is that acquisition of *some* work income is slightly more profitable for an unemployed single parent than for a single unemployed individual.

Kärkkäinen (2011) estimates the Finnish PTRs with 2006 data and 2010 legislation. He finds that the average PTR with 2010 legislation was 62.1 %, which again indicates a moderate decrease in the average PTR since 2007 (see table 2 and 3). Kärkkäinen (2011) also calculates the PTRs for part-time work, using participation wage rate of 50 % of full time workers' estimated full participation wage rate. He finds that singles and single parents have the highest PTRs to part-time work - a little over 70 % with adjusted unemployment benefits.[6] If the adjusted unemployment benefit is assumed to be completely lost when becoming employed, the average PTR will go as high as 100 % for single parents.

[5] The METR is the percentage of an extra income that a person loses due to income taxes, payroll taxes, and any decline in tax credits and welfare entitlements.

[6] Adjusted unemployment benefit means that an unemployed can continue to receive a part of the old unemployment benefit when working. The adjustment rate at the moment in Finland is 50 % ie. an additional euro decreases the unemployment benefit by 50 cents.

Legislation Year	2010[c1]	2010[c2]	2010[c3]
Data Year	**2006**	**2006**	**2006**
I Single	67.2	73.8	90.9
II Childless couple	61.1	64.0	94.8
III Single parent	74.5	72.8	102.3
IV Two parents	63.1	66.4	93.3
V Others	51.8	56.8	79.1
	62.1	66.1	91.3

Table 3 Participation tax rates according to Kärkkäinen (2011)

c[1] Employment to full-time job

c[2] Employment to part-time job with adjusted UB

c[3] Employment to part-time job without adjusted UB

VATT (2013) considered the employment effects of social policy and tax reforms that entered into force in the beginning of 2012 in Finland. The data used was the 2010 Income Distribution Statistics. Individuals that had over 10 months of employment or unemployment history in 2010 were divided into 20 groups by age, household type and education. As can be seen from table 4, the estimated PTRs are considerably lower than in earlier studies. This can be explained, at least partly, by the different estimation of the participation wage rate; group averages of selected groups are used instead of regression model analysis. Nevertheless, once again single parents are found to have the highest average PTR.

Legislation Year	2012[c1]	2012 [c2]	2012 [c3]	2012 [c4]
Data Year	**2010**	**2010**	**2010**	**2010**
I Single	55.6	53.6	53.7	50.9
II Childless couple	45.7	44.8	51.9	51.3
III Single parent	59.5	55.8	62.0	58.4
IV Two parents	55.5	52.9	56.3	53.4
V Others	58.9	49.2	54.1	52.2

Table 4 Participation tax rates accordingo VATT (2013)

c[1] Below 40 year-olds, at most secondary degree education

c[2] Below 40 year-olds, higher than secondary degree education

c[3] At least 40 year-olds, at most secondary degree education

c4 At least 40 year-olds, higher than secondary degree education

Finally, Kotamäki and Kärkkäinen (2014) find that average PTRs have increased since 2011 by, on average, 3.5 percentage points. The change has been rather uniform across all household types. The authors also calculate the PTR to part-time work (U-> ½ E in Table 5), ie. PTR with 50 % lower wage rate compared to full-time work. The results show that the change in PTRs of part-time workers is clearly negative, whereas the incentive to move from part-time to full-time job has significantly decreased (1/2 E -> E in Table 5). These effects are mostly due to the reform where a €300 protected portion

on monthly work income was added to unemployment benefits and to the general housing allowance.

Legislation	2011	2015	change
Data Year	2012	2012	
U -> E	59.4	62.9	+3.5
U -> ½ E	64.2	59.7	-4.5
½ E -> E	54.6	66.2	+11.6

Table 5 Average PTRs in 2011 and 2015 according to Kotamäki and Kärkkäinen (2014)

The studies reviewed in this section are not fully comparable for at least three reasons: (i) the used data year in the microsimulation varies, (ii) the microsimulation model evolves potentially affecting the results and (iii) the estimation method and specification of PWRs varies across studies. Still, the general trend with respect to work incentives was clear; the incentives to work have improved from the 1990s until approximately 2010.

2.3 Finland in the International Context

Each country has its own unique tax and social security scheme, and therefore a data-based comparison of countries is difficult. There are some papers that use the EUROMOD microsimulation model to compare European countries' social security and tax systems. Immervoll et al (2007), for example, calculate that the participation tax rates are the highest in the Nordic countries (Denmark, Finland, Sweden), relatively high in the continental Europe (Austria, Belgium, France, Germany, Luxembourg, and the Netherlands), and the lowest in the Anglo-Saxon and Southern European countries (Greece, Ireland, Italy, Portugal, Spain, and the UK).

Countries can also be compared using example households. OECD provides calculations on participation tax rates given certain assumptions on participation wage rate and family structure. Figure 1 show PTRs for a single person receiving unemployment benefit in a number of OECD countries. The OECD calculations discussed briefly here are reported in Appendix A.

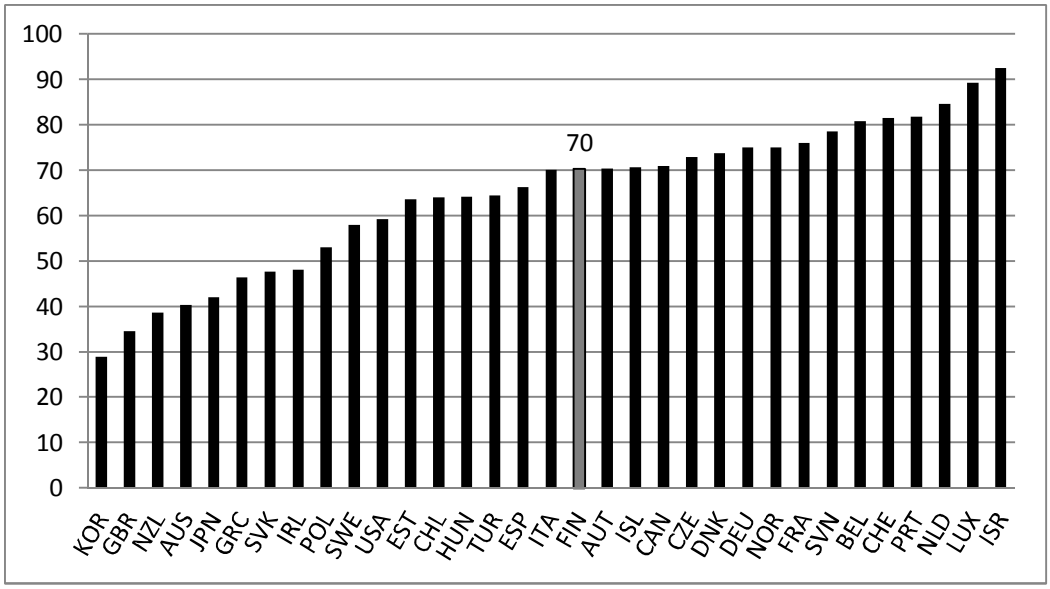

Figure 1 Participation Tax Rates for a transition into full-time work (with average wage) for a single person receiving unemployment benefits at the initial level (OECD)

Finland is rather close to the OECD average in terms of participation tax rate when comparing single individuals with average wage (AW) as the participation wage rate. The picture changes slightly if we change the assumptions on family composition or average wage. Two observations arise. First, the lower the PWR, the better Finland seems to fare in the country comparison in terms of work incentives. For instance, if a single person with no children became employed with 33 % of the AW, the PTR would be 72 %, which is still high, but 5 pp. *lower* than the EU average. On the other hand, if a person became employed with 150 % of the AW, the PTR would be 67 %, which is 5 pp. *higher* than the EU average.

Second, family structure, in particular, children, turn this picture around. Especially lone parents in Finland, according to the OECD calculations, have low work incentives compared to other EU or OECD countries. A lone parent with two children, receiving 33 % of AW when becoming employed, is calculated to have 79 % PTR, which is 6 pp. *higher* than the EU average. The situation doesn't markedly improve if the PWR increases; the lone parent with two children receiving 150 % of AW is calculated to have 69 % PTR, which is still 5 pp. *above* the EU average.

3 DATA AND THE LEGAL FRAMEWORK

The data used in this paper is a registry based micro data from 2013. The same data is utilized in the background of the Finnish microsimulation model (SISU), which is used

when calculating the PTRs. The data is a random sample, combined from various registries covering approximately 15 percent of all Finnish households, that is, approximately 800 000 individuals. In this section, essential statistics of variables and parameters related to the PTR calculations are presented ie. the legislative framework of the unemployment benefit scheme is described. Also the Finnish income tax code is briefly described.

There are three types of unemployment benefits in Finland: *Earnings-related Unemployment Allowance*, *Basic Unemployment Allowance* and *Labor Market Subsidy*.

An unemployed individual will receive Labor Market Subsidy if she is not eligible to any other unemployment benefit. The Labour Market Subsidy is a means-tested benefit, that is, any other income that the unemployed person receives (or his or her parents in the same household) may decrease the amount of the subsidy. The Labour Market Subsidy can be paid for an indefinite period. According to the data, approximately 251,500 individuals in 2013 received labor market subsidy, which amounts to 41 % of all individuals that received unemployment benefits for at least a day. The average (gross) subsidy per weekday was €36.8 or €9,298 per year.

The Basic UA and Earnings-related UA are paid to persons who meet the eligibility condition regarding previous employment (6 months), and they are paid for a maximum of 500 days.[7] If an individual is dismissed for business or production related reasons, and he or she is eligible for either Earnings-related UA or Basic UA, he or she will be paid the allowance at a higher rate. Also participation in active labor market measures will entitle a person to the increased allowance rate. If the allowance runs out, the unemployed person is eligible for the Labor Market Subsidy.

The Basic Unemployment Allowance is a flat-rate benefit of the same base amount as the Labor Market Subsidy. In 2013, there were 62,400 individuals, or, 10 % of all unemployed, that received the Basic UA, with the average allowance being €32.8 per day, or €8,267 per year.

Finally, the Earnings-related Unemployment Allowance is claimed from an unemployment fund, and it is available only to the members of the unemployment fund who fulfill the eligibility criteria. Membership is voluntary. The level of Earnings-related UA is a function of pre-unemployment earnings, with the average allowance being approximately €64.8 per day, and the average increased allowance being €74.4 per day. There were 300,300 individuals receiving Earnings-related UA in 2013, which sums up to 49 % of all the unemployed.

[7] Individuals with less than 3 years of work experience are entitled to 400 days. The current government has decided to cut the maximum duration of unemployment benefits by 100 days as of 2017. Over 58 year-olds can still in the future receive 500 days of benefits, or even more if they are entitled to the so called “unemployment tunnel”.

It should be noted that the number of unemployed used above and in Table 6, is the number of unemployed over the whole year. According to the KELA statistics, the relevant numbers *at the end of the year 2013* for Labor Market Subsidy, Basic UA and Earnings-related UA are, respectively, 173,284, 39,761 and 181,405; in total, approximately 400,000 unemployed.

The Labor Market Subsidy and the Basic Unemployment Allowance are both funded by the state[8], whereas the Earnings-related UA is funded primarily by the state and partly with compulsory insurance payments from the wage. Only approximately 5.5 % of the funding is taken directly from the pocket of the insured themselves. The financing of unemployment protection is described in more detail in Kela (2015). Key statistics of the unemployment benefits are presented in Table 6.

	N	**€/day**	**Expenditure (millions)**	**Share of total**
Labor Market Subsidy	251,496	36.0	€1,344	41 %
Basic UA	62,354	32.8	€246	10 %
Earnings-related UA	300,251	65.8	€2,322	49 %
	614,100	50.3	€3,912	100 %

Table 6 Unemployment benefits in the Finnish system in 2013

There are also additional benefits that the unemployed typically receive (Table 7). Approximately one third of the unemployed receive General Housing Allowance, which is originally intended for low-income households, and it is available for both rental and owner-occupied homes. Additionally, roughly one fifth of the unemployed receive social income support according to the SISU data. Unlike the unemployment benefits, which are individual level benefits, the General Housing Allowance and Social Income Support are household level benefits.

	Labor market subsidy		**Basic unemployment allowance**		**Earnings-related benefit**			
	%	N	%	N	%	N	%	N
Housing Allowance	53,5	16 812	57,0	3 584	12,0	4 333	33,7	25 950
Income Support	38,5	11 822	35,6	2 556	4,3	1 537	22,1	17 064

Table 7 Link between unemployment benefits and other social security in 2013

Another important factor related to work incentives is taxation. The Finnish labor income tax code is depicted in figure 2. It is clearly progressive; the average tax rate

[8] Also municipalities take part in the funding of Labor Market Subsidy for the long-term unemployed.

increases with income. The average tax rate is approximately 8 % up to the earned gross income of 10,000 after which the average tax rate starts to steadily increase. An individual earning €100,000 p.a. has an average tax rate of 44.4 %.

The vertical lines and numbers mark the biggest "jumps" in the marginal tax rates. The first big jump, at about €14,000 income p.a., is due to the fact that the Earned-income Allowance reaches its maximum level, thus, paid municipal income tax, church income tax and insurance payments start to increase.

The second steep increase, at about €19,000 of earned gross income, is due to the first bracket of the income tax scale in central government taxation. The third change, a drop in marginal tax rate of approximately 4 pp., exists because the Basic Allowance fades out at an income level of approximately €26,000. The fourth, fifth, sixth and seventh vertical lines in figure 1 denote the tightening of progressivity in central government income taxation. Finally, the eighth vertical line denotes a slight drop in the marginal tax rate because the Earned-income Allowance fades to zero.

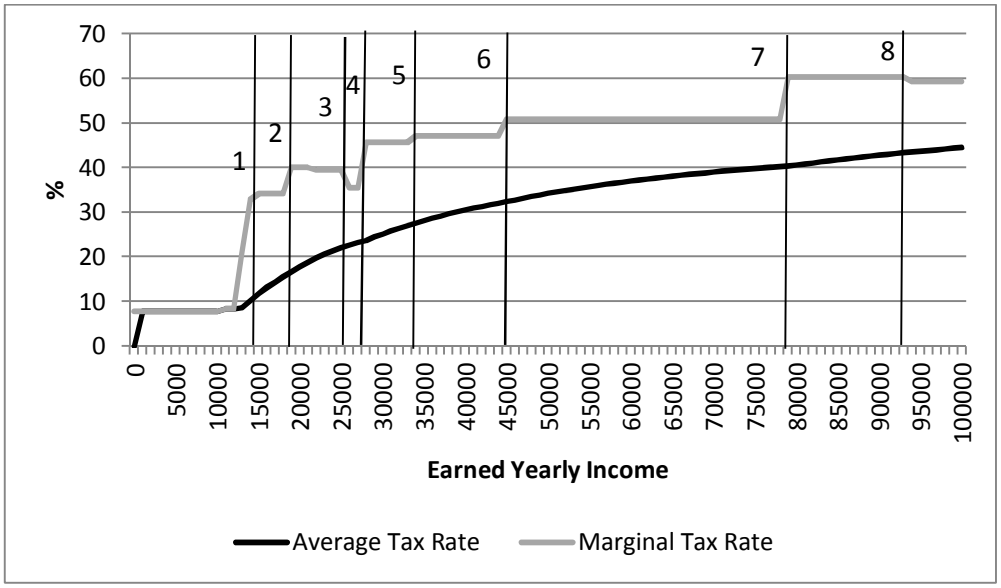

Figure 2 The Finnish Tax Scheme in 2016

4 METHODS

4.1 Participation Wage Regression

Honkanen et al (2007a) discuss the importance of participation wage rate (PWR) estimation in the context of PTR calculations. The authors conduct the wage estimation in two ways. The first model is a standard OLS, where the monthly wage rate is

explained with a number of variables such as age, sex, family status, level of education, field of education and region. The second model is as the first one, but augmented with the within-year duration of unemployment. The two regression models produce somewhat different results in that, when the duration of unemployment is an explanatory variable, the out-of-sample predicted average wage rate is clearly lower, and consequently the PTRs are higher. The estimation of PWRs has a significant effect on the level of PTRs, but the effect should be smaller when examining yearly changes. Honkanen et al (2007a, Table B.1) wage regression's predicted values are documented in table 8.

	Predicted Values	
	Model 1[1]	Model 2[2]
Minimum	1,200	1,200
1. quartile	1,200	1,463
Median	1,411	2,197
Mean	1,569	2,341
3. quartile	1,770	2,850
Maximum	4,695	8,340

Table 8 Predicted monthly wage rate according to Honkanen et al (2007a)
[1]Duration of unemployment is an explanatory variable
[2] Duration of unemployment is *not* an explanatory variable

The first wage regression, Model 1 in Table 8, attemps to factor in the duration of within-year unemployment as a proxy for the fact that the objective group is the unemployed. Nevertheless, the specification might still suffer from selection bias. Those individuals that have been unemployed for the whole year have no observation of any wage income at all, thus, it is hard to say if the predicted wage rate is really representative for those individuals. Consequently, it is difficult to say how severe the selection bias truly is. It can be argued, though, that the inclusion of within-year unemployment into the regression mitigates the selection bias to a certain extend.

In the earlier literature, there is practically only one method used in order to account for selection bias – the Heckman selection model (cf. Heckman (1976, 1979)) or a related selection model. In the Heckman model, two equations are estimated. First, a selection equation is formalized, where each individual's probability to participate in the labor market is estimated. Second, the wage regression itself is estimated using the Mills ratio from the first equation as an explanatory variable that attemps to control for the potential selection bias.

To sum up, there are three methods used in predicting the wage rate to the unemployed: 1) to use simple group means as in VATT (2013), 2) to use OLS as in Honkanen et al (2007a), Hakola-Uusitalo et al (2007), Kärkkäinen (2011) or Kotamäki and Kärkkäinen (2014) or 3) to use a selection model as in Kalb et al (2003a), Kalb and Scutella (2003b), Mercante and Mok (2014), Creedy and Mok (2015) or Siebertova et al (2015).

Although the determination of the wage equation is very important, it is not in the heart of this paper, thus, the further comparison of different models is left for future research.

This paper uses the method applied by Honkanen et al (2007a, 2007b); the forecasting model is estimated with standard OLS using the data presented in the previous section. The estimated model is documented in detail in Appendix A. Also, a number of sensitivity checks are conducted in order to analyze the goodness of the estimated model in this context. Sensitivity checks are returned to at the end of next section.

The wage regression is conducted for all full-time workers. Groups that are left out include individuals that are retired, on parental leave, in the military service and students. Furthermore, also entrepreneurs and individuals receiving adjusted unemployment benefit are excluded from the estimation sample. The explained variable is the logarithm of monthly wage rate and explanatory variables include gender, region, level and field of education, marital status, number of small children, age, age squared, amount of capital income and, finally, the duration of within-year unemployment. The relevant *predicted* monthly wage rates *for unemployed individuals* are reported in table 9.

	Predicted Values
	Model 1[1]
Minimum	1,200
1. quartile	1,628
Median	1,952
Mean	2,134
3. quartile	2,435
Maximum	17,607

Table 9 Predicted monthly wage rate used in PTR calculations
[1]Duration of unemployment is an explanatory variable

The predicted wages from Model 1 in Table 10 are further categorized according to household types in the following way; (I) singles, (II) childless couples, (III) single parents, (IV) couples with children and (V) others.

	Average monthly wage, €		**N**	
	Male	**Female**	**Male**	**Female**
I Single	2,068	1,977	15,942	7,959
II Childless couple	2,377	2,022	11,884	9,027
III Single parent	2,172	1,872	585	3,093
IV Two parents	2,542	1,994	7,892	7,959
V Others	2,076	1,848	2,760	2,445
	2,260	1,972	39,063	30,483

Table 10 Predicted participation wage rates for the unemployed by household

Two adult households, either childless couples or two parents, have the highest monthly PWR of approximately €2,200 and €2,300, respectively. On the other end, one-adult households have the lowest PWRs. The predicted participation wage differences are more pronounced when inspecting the PWRs by gender. Unsurprisingly, males have higher PWRs, but also, it is possible that the unemployment risk is higher for a male than for a female. The only exception is the category of single parents where there are considerably more females than males.

Already from the estimation results of table 9 and 10, it can be inferred that, *ceteris paribus*, the participation tax rate will be higher for one adult households compared to two adult households.

Table 11 reports the average predicted participation wage rates for the unemployed by benefit type. A lower unemployment benefit predicts a lower PWR[9] – the level of unemployment benefit is, thus, positively correlated with the level of PWR. This is partly due to the fact that individuals receiving Labor Market Subsidy are, on average, younger than those receiving some other type of benefit. On the other hand, this observation reflects selection. Measured by observable characteristics, those that insure themselves against unemployment seem to also earn higher wages in the labor market.

	PWR	**N**
Labor Market Subsidy	1,905	32,466
Basic Allowance	2,062	6,022
Earnings-related UI	2,388	31,058
	2,134	69,546

Table 11 Predicted monthly participation wage rate for the unemployed by benefit type

The distribution of the predicted PWR is of the expected shape (figure 2). The distribution is positively skewed, that is, the right tail is longer and the mass of the distribution is concentrated on the left of the distribution.

[9] This is not a causal statement, but merely a result of the OLS regression.

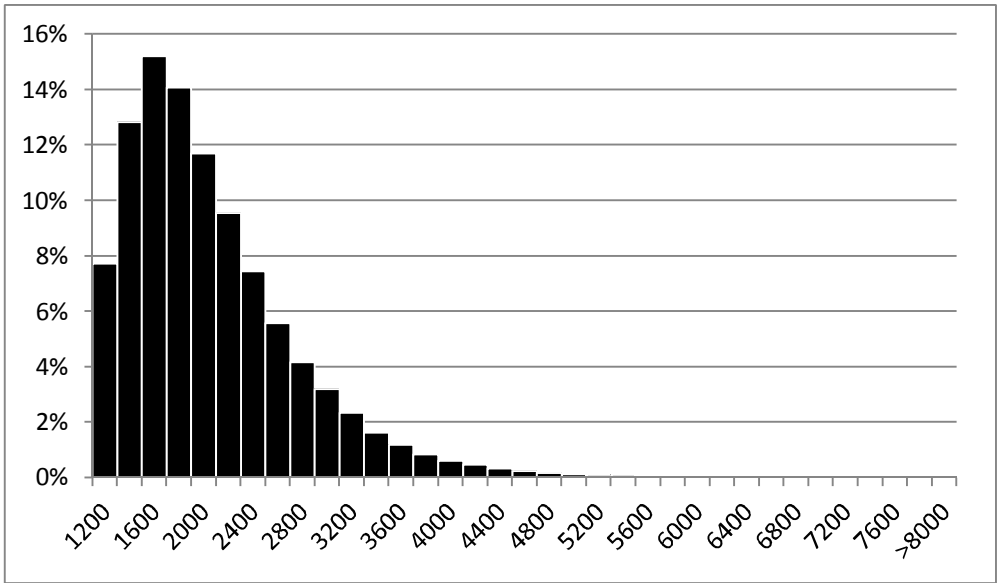

Figure 3 Distribution of the Participation Wage Rate

A number of sensitivity checks are conducted. The results of sensitivity checks are reported in Appendix B. First, the wage equation is estimated without the duration of unemployment as an explanatory variable. The mean PWR is clearly higher when the within-year duration of unemployment is not an explanatory variable. The difference in the average monthly wage rate between these two models is nearly €500. Second and third, a constant average monthly wage of, respectively, €2,134 and €2,598 are used for all individuals in order to estimate the significance of PWR variation between different groups. Fourth and finally, an observed wage that determines the level of Earnings-related Unemployment Allowance is used. It is observed to approximately 50 % of the sample. All these sensitivity scenarios are documented in Appendix B and discussed in more detail in the next subsection.

4.2 Calculation of PTRs

The participation tax rate (PTR) measures how much taxes increase and transfers decrease, when one becomes employed from full unemployment. PTR is a good indicator for gains to work; the lower the PTR, the stronger are an unemployed person's financial incentives to work.

The calculation of the PTR is no different from the calculation of effective marginal tax rates, other than that the focus is on the extensive margin, that is, in the transition from unemployment to full-time work. PTR, τ, can thus be defined as the change in the net tax rate when a person becomes employed:

$$\tau = \frac{T(w) - T(0)}{w} = \frac{\big(w - c(w)\big) - (0 - c(0))}{w} = 1 - \frac{c(w) - c(0)}{w} \qquad \textbf{(8)}$$

where w, *T(w)* and *c(w)* denote, respectively, participation wage rate, transfers net of taxes and disposable income, which, again, equals participation wage minus net taxes: *c(w)=w-T(w)*.

PTR is low, when the difference between disposable income when working and when unemployed (*c(w)-c(0)*) is high, and in general, this is where to an efficient tax/social security system aims at. As discussed earlier, there are only so many direct ways of lowering the PTR; by decreasing the level of unemployment benefit (*c(0)*), or, by lowering wage taxes (*T(w)*). Also the gross wage, *w*, could be influenced with, for example, wage subsidies or the minimum wage. This mechanism is outside the scope of this paper.

In theory, the participation tax rate can exceed 100 %, but only if disposable income is greater when unemployed than when employed (*c(0)>c(w)*). This can be the result of either the participation wage (*w*) being very low, labor income taxation being very high and/or the unemployment benefit being very high. Usually the PTR is below 100 %, but as earlier research has shown, there are exceptions. In this paper, following the usual practice, an individual is regarded to be in an unemployment trap when the PTR is above the 80 % threshold.

The method for calculating PTRs is roughly the same as in Honkanen et al (2007a, b) and in other related papers. The method is described in detail in the following steps.

1. All **unemployed** individuals, that is, all individuals between 18 and 63 years of age, that have received some sort of unemployment benefit during the data year 2013, are collected from the data to the sample. These benefits include Earnings-related UA, Basic UA and Labor Market Subsidy. Individuals receiving adjusted UBs are excluded from the sample. In the microsimulation (step 4 below), individuals NOT receiving UB are NOT dropped out as, for example, family composition determines the level of certain benefits such as housing allowance and social income support. These individuals' sample attributes are not, however, modified in any way.

2. Many of the sample individuals have been unemployed only part of the year. In the "*first stage*", these individuals are converted into full-year unemployed. Similarly, some individuals have reveiced several types of unemployment benefits during the year. In this case, the primary benefit is assumed to be the Labor Market Subsidy, the secondary is the Basic Unemployment Allowance and the third benefit is the Earnings-related Unemployment Allowance. Finally, the sample is modified so that all

labor income, pension income, parental subsidies, sickness allowances and student aid are set to zero.

3. In the "*second stage*", the sample individuals (see item 1) are converted into workers using the predicted participation wage rate. Again, unemployment benefits, pension income, parental subsidies, sickness allowances and student aid are set to zero. Workers are assumed to bring their 1-6 year-old children to the public day care for 11 months.

4. In both stages ("full-year unemployed" and "working full-year"), the full SISU microsimulation model is excecuted - separately for each member of the sample household. This is how the estimate for disposable income for each individual in the sample is obtained. Household level benefits, such as General Housing Allowance, Social Income Support and daycare fees are distributed evenly among the household adults.

5. Finally, the PTRs are calculated according to equation (8), where *c(w)* is taken from the "*first stage*", *c(0)* is taken from the "*second stage*" and *w* is determined according to a wage regression described in subsection 4.1.

5 FINDINGS

5.1 Participation Tax Rates

In this section, PTRs with 2013 data and with 2011-2016 legislation are reported. Calculations are conducted with the SISU microsimulation model. The model calculates disposable incomes for all individuals, taking into account the details of tax and benefit systems and the composition of households. The results stem from changes in the tax and benefit systems only, and not from the changes in the data, because the data is held constant in all the simulations. The results reflect, thus, changes in only those factors that the government has fairly direct control of - the business cycle or demographic changes play no role in the analysis, except indirectly in the selection of the base year, which is taken to be 2013 (the newest data year). All the monetary parameters are inflated or deflated with consumer price accordingly.[10]

The average PTR has increased approximately 2.6 pp. between 2011 and 2016. The

[10] The selection of the index variable is non-trivial as Honkanen and Tervola (2014) show. Using index of wage and salary earnings, for example, can lead to slightly different results. This paper is primarily interested in changes in purchasing power, instead of income distribution, thus, the use of consumer price inflation as the index variable is justifiable.

year 2012 was an important year, because the basic amount in all unemployment benefit types was increased by roughly 20 %, which had a significant effect on the average PTR. Furthermore, the introduction of a new General Housing Allowance scheme in 2015 simplified the system considerably, but, at the same time, changed the incentives to work. Also several smaller adjustments have been made to the parameters of the system, such as a small cut in the higher Earnings-related UBs, an increase for single parents in the Social Income Support, and a large number of changes in the tax scheme. The most recent major change, the €450 million increase of the Earned-income Tax Credit, contributed to a significant decrease in the average PTR in 2016.

Table 12 reports the average PTRs by unemployment benefit (UB) type. Individuals receiving Earnings-related Unemployment Allowance have clearly higher PTRs than individuals receiving Labor Market Subsidy or Basic Unemployment Allowance. In 2016, an individual receiving Earnings-related Allowance loses around 76 percentage of increased income when he or she becomes employed, whereas an individual receiving Labor Market Subsidy or Basic Unemployment Allowance loses "only" about 60 percent. Financial incentives to seek for a job are, thus, much lower with Earnings-related Unemployment Allowance than with other benefit types ie. for approximately half of the unemployed. The benefit level of Earnings-related UB is, in gross terms, approximately double compared to the benefit level of other benefit types, which naturally leads to higher PTRs. It's important to keep in mind that the *level* of the PTRs is sensitive to the specification of PWR, which is why a comprehensive sensitivity analysis is conducted at the end of this section.

	2011	**2016**	**Change**
I Labor Market Subsidy	56.0	59.4	3.4
II Basic Unemployment Allowance	56.5	59.7	3.1
III Earnings-related UB	74.5	76.3	1.7
	64.3	**67.0**	**2.6**

Table 12 Average PTRs by benefit type

Table 13 reports the average PTRs, categorized by household type. The average PTR of a single parent is higher than others', primary due to three distinct factors. First, the estimated PWR of a single parent is, on average, lower than PWRs of other groups. A single parent is predicted to earn, on average, a monthly wage of €1,920, which is about 10 % lower than the average PWR, and 20 % lower than the average PWR predicted for the two-parent household. Moreover, the average female PWR for a single parent is only €1,872. Second, the (income contingent) daycare fee increases the PTR of households with small children. Remember that in the simulation, it is assumed that children below the age of seven are in public daycare for 11 months per year. The Finnish day-care system actually affects the two-parent households the most, because their wage rate is higher. Nonetheless, also single-parents are affected to a certain extent. Third and finally, in the Finnish unemployment benefit scheme, there is a top-up

for families with children. Also General Housing Allowance and Social Income Support are relatively speaking more beneficial for families with children. These factors increase the level of the unemployment benefit for families with children and, consequently, the PTRs increase as well.

	2011	2016	Change
I Single	66.8	68.1	1.3
II Childless couple	59.9	63.6	3.7
III Single parent	74.6	73.8	-0.8
IV Two parents	65.7	69.4	3.7
V Others	59.2	62.9	3.8
	64.3	**67.0**	**2.6**

Table 13 Average PTRs by household type with 2013 data and 2016 legislation

Figure 4 plots the distribution of PTR in the aggregate (upper-left corner) and categorized by unemployment benefit type with 2013 data and 2016 legislation. The distributions are rather concentrated around the mean value. Median value is close to the mean value. Standard deviation is around, or, a little above 10 %. The aggregate histogram is actually two-peaked; there is a lot of mass around 60 % where the mean of Labor Market Subsidy and the Basic Unemployment Allowance are located, and then there is another mass-concentration around 75 % where the mean of the Earnings-related Unemployment Allowance is.

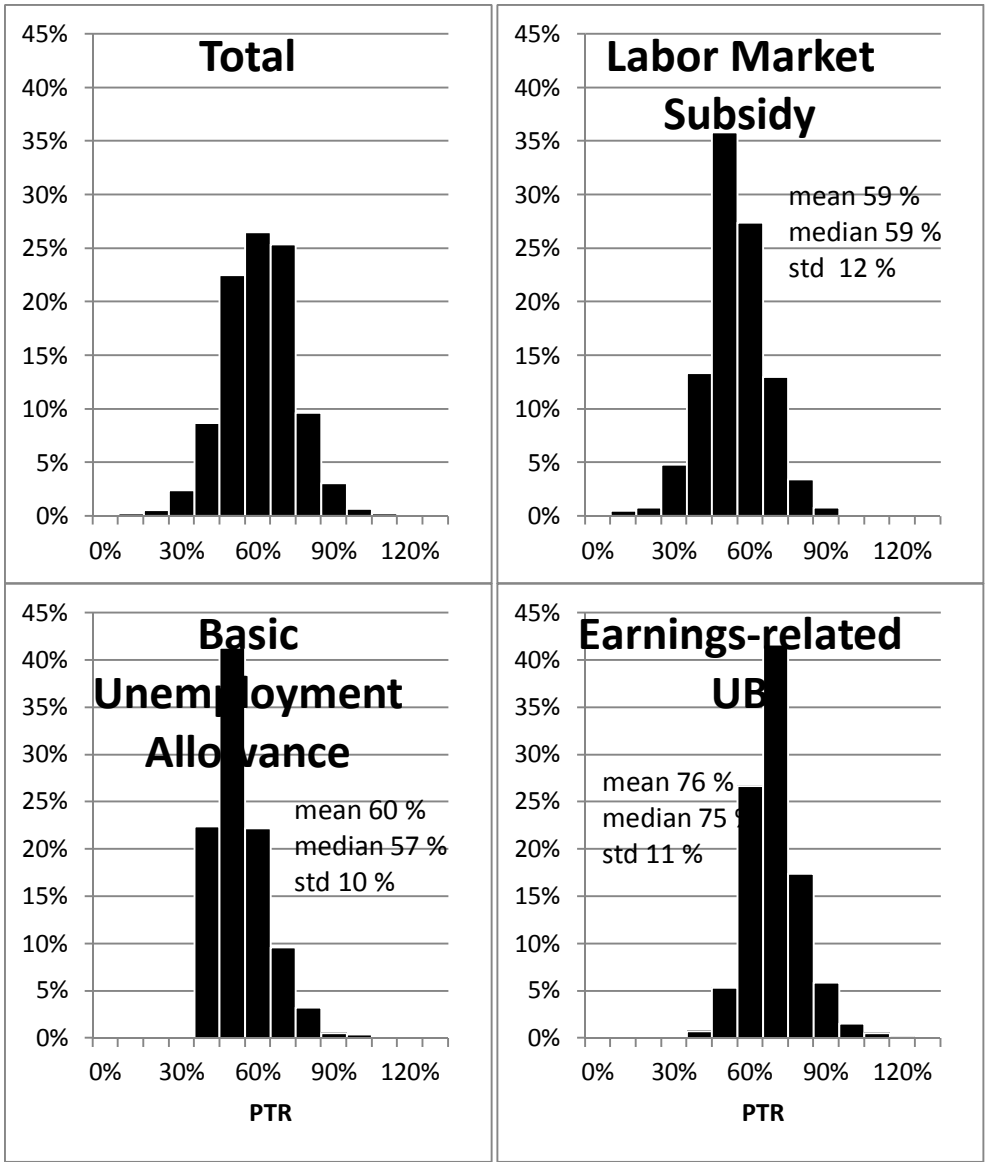

Figure 4 Distribution of participation tax rates in 2016, total and by benefit type

Table 14 reports the frequency of unemployment traps by household type. An individual is in an unemployment trap when the disposable income doesn't significantly increase once the person becomes employed. Quantitatively, an individual is assumed to be in unemployment trap when his or her PTR is higher than 80 %. Single parents have the highest risk of being in unemployment trap – with 2016 legislation, approximately 30 percent of single parent households are trapped in unemployment, whereas the frequency for other households is between 12 and 21 percent. These relatively high numbers are partly the result of the PWR specification. The numbers are clearly lower and yearly changes different with different PWR specification. As noted before, PWR

estimation is very relevant in terms of the PTR levels. These sensitivity of the results are addressed next.

	2011	2016	Change
I Single	17.4	14.4	-3.0
II Childless couple	10.4	12.3	1.9
III Single parent	37.7	30.6	-7.1
IV Two parents	17.8	21.0	3.2
V Others	10.2	12.0	1.8
	15.9	15.9	0.0

Table 14 Individuals in unemployment trap

5.2 Decomposition of Results

A number of additional decompositions or, sensitivity simulations, are conducted. This is one of the contributions of this paper – a sufficient sensitivity testing is missing in most of the studies in the field. All the numerical results are reported in Appendix C. These calculations are meant to be interpreted as no more than sensitivity checks and. not as policy advices. One of the main objectives of this paper is to locate, and show the existence of major problems in the Finnish social security scheme, and with sufficient sensitivity testing the pictures starts to clear with respect to various assumptions.

First sensitivity check (Table C.12) is such that the top-ups related to children in the unemployment benefit scheme and Social Income Support scheme are removed. These benefits are tied to unemployment and, thus, actually financially encourage unemployment. These features of the system are, thus, problematic from the point of view of incentives to work. Work-related benefits are also discussed in depth in Immervoll et al (2007), who find that a "working poor" policy is more desirable than a demogrant policy on efficiency grounds. The removal of top-ups generates an average PTR decrease of 1.3 percentage points, and, furthermore, the average PTR of single parents and two-parent households would decrease 3-4 percentage points each with the removal of these benefits. It is then clear, that the top-ups are not the only problem of the system, but still a significant one in terms of participation tax rates.

Second (Table C.9), the assumption of 11 months of day-care is tested. Day-care system is heavily subsidized in Finland, which is argued to be one of the important features of the Nordic system in the sense that it is a feature that allows the co-existence of high employment rate and high taxation (see Kleven (2014)). A decrease in the day-care fee would lower PTRs. Accordingly, if the day-care fee was completely free of charge, the average PTR would be approximately 0.6 pp. lower. Single parent households would have 0.7 pp. lower PTR and two-parent households 2.5 pp. lower PTR. This difference between single parents and two-parent households comes from their different levels of income, as the day-care fee is income contingent in Finland.

Third (Table C.10), both day-care fee and General Housing Allowance are removed from the simulation. The sensitivity check is, of course, radical, but at the same time, some major changes are starting to be seen. Without these two features of the system, the average PTR in 2016 decreases by 3.4 pp. The yearly *change* in PTR between 2011 and 2016 is rather uniform between different household types except for one-adult households. Also, both, single-person households and single-parent households observe a significant decrease in their PTR level. It can then be inferred, that the General Housing Allowance scheme is definitely one that has a very big decreasing effect on PTRs: on average 3.4 pp. and around 6 pp. for one-adult households.

Fourth (Table C.11), all the household level benefits, General Housing Allowance, Social Income Support and day-care fees, are completely removed in order to evaluate their total contribution on PTRs. The results from this sensitivity check are significant. The average PTR decreases by 5 pp. and by almost 12 pp. for single parent households. Also one-adult households observe a 9 pp. drop in their PTR compared to the baseline. In this sensitivity scenario, households with one adult actually face better incentives to work than two-adult households. The change in PTR between 2011 and 2016 is now uniform, around 4 pp., across all household types.

From this fourth sensitivity check, it can be inferred that both the General Housing Allowance and Social Income Support are potentially very problematic in terms of financial incentives to work. On the other hand, lowering it might lead to undesired outcomes in terms of income distribution. Moreover, cuts in the Social Income Support may even be against the Finnish constitution. The core problem is that clearly the Social Income Support is not functioning as it should, but at the same time, reforming its structure is very challenging. One critical bug in Social Income is that it should be, according to the law, temporary, but, for many, it has turned into a permanent support, which totally devastates the incentives to acquire low-paid work.

The fifth, sixth, seventh and *eighth* sensivity checks are tests on the wage regression. *Fifth* (Table C.5*)*, the wage regression is estimated so that the within-year unemployment duration is removed from the wage regression (Model 2). The differences in the PTR levels are significant. While the average PTR with 2016 legislation is 62 % *without* unemployment duration in the wage regression, it is approximately 5 pp. higher *with* it. This sensitivity check underlines the crucial significance of the PWR estimation and the uncertainty that surrounds it. The year to year PTR changes are rather uniform across household types except one-adult household. The one-adult households are most subject to Social Income Support and General Housing Allowance (as seen above), which has a negative effect on PTRs when the PWR is low.

Sixth (Table C.6), the observed previous wage rate is used as the PWR estimate. This observation is only for those that have received Earnings-related Unemployment

Allowance, because the benefit is related to previous earnings and it is therefore saved to the official registries, whereas there is no direct information on the previous wage rate for those that have received either the Labor Market Subsidy or the Basic Unemployment Allowance. This sensitivity check is, thus, conducted only on 47 % of the selevant sample. It is possible, that this scenario, if something, overestimates the participation wage rate, because typically wages decrease after a period of unemployment.

The participation tax rates are quite high when using only the observed wage rate as the PWR. Mostly the high PTR is explained by the fact that almost all the individuals in this sample receive Earnings-related Unemployment Allowance. This case underlines the observation that PTRs are quite high for individuals with unemployment insurance in Finland. The total average PTR in this case is 72.3 % in 2016 and 78.7 % for single parents. The average PTR is, however, slightly lower in this case than in the benchmark case where the average PTR for individuals receiving Earnings-related UA is 76.3 % (see Table 12).

Seventh and *eighth* sensitivity test is the use of constant PWR (Tables C.7 and C.8). At first, a constant monthly wage of €2,134 is used. Thereafter, a constant PWR of €2,600 is used. All the differences between households in these cases are due to the variation in the social security system and family structure, and not at all due to the differences in PWRs. These cases produce, respectively, average PTRs rather close to the ones produced by the Model 1 (Table C.4) and Model 2 (Table C.5). This is no surprise as the average PWRs are the same. In both cases, singles and single parents observe a decrease in PTR because their average wage rate increases. The opposite is observed for two-adult and two-parent households.

In general, the variation between household types stays rather constant despite the differences in PWR estimation. Even if there is considerable uncertainty in the true level of PTRs, the inferences drawn previously hold – single parent houlsehold and inviduals entitled to Earnings-related Unemployment Allowance still have clearly the highest PTRs. On the other hand, their PTR has increased the least from 2011 to 2016. It can be concluded, that at least the qualitative inferences drawn in this section are rather robust to the estimation of PWR. The average PTRs (in 2016) that are discussed in this subsection are reported also in Table 16.

	Average PTR	Description
1	67.0 %	Baseline
2	66.4 %	No day-care fee
3	63.6 %	No day-care fee or General Housing Allowance
4	61.9 %	No day-care-fee, General Housing Allowance or Social Income Support
5	63.3 %	Duration of unemployment is not an explanatory variable in PWR estimation
6	72.3 %	Observed wage as PWR for those that receive Earnings-related UA
7	66.8 %	Constant monthly PWR of €2,134
8	62.8 %	Constant monthly PWR of €2,600

Table 15 Decomposing the results with 2016 legislation

6 APPLICATION: EARNED-INCOME TAX CREDIT, PTRS AND LABOR SUPPLY RESPONSE

6.1 Description of the Reform

In the summer 2015, the Finnish government decided, in its strategic program, of a number of reforms.[11] One of the tax reforms was to increase the EITC. The bottom line was to increase incentives to work, focusing on low and medium incomes. The total size of the measure was estimated by the MoF to be €450 million and it was implemented in the beginning of 2016.[12]

Earned-income Tax Credit (EITC) is a tax relief that is directly deducted from the state income tax. All earned income is included in the total: pension income, unemployment benefits and sickness allowance are also included. If an individual has too little state income taxes to deduct from, the credit is applied to municipal income tax, to Church tax, and to the health insurance contribution. The calculation of the credit is as follows (2016 parameters without the reform in parenthesis). In 2016, the EITC equals 11.8 % (8.6 %) of base income that exceeds €2,500. The maximum total credit is, however, €1,260 (€1,045). If the net taxable earned income exceeds €33,000, the credit is reduced by 1.46 % (1.2 %) of the excess that goes over €33,000. The maximal amount of credit is €1,260 between approximately €11,000 and €33,000 of earned income. The credit

[11] See Prime Minister's Office (2015)

[12] http://vm.fi/artikkeli/-/asset_publisher/tyotulovahennyksen-kasvattaminen-keventaa-verotusta

seizes to exist after approximately €120,000 of relevant yearly income. The EITC scheme and the reform are depicted in figure 5.

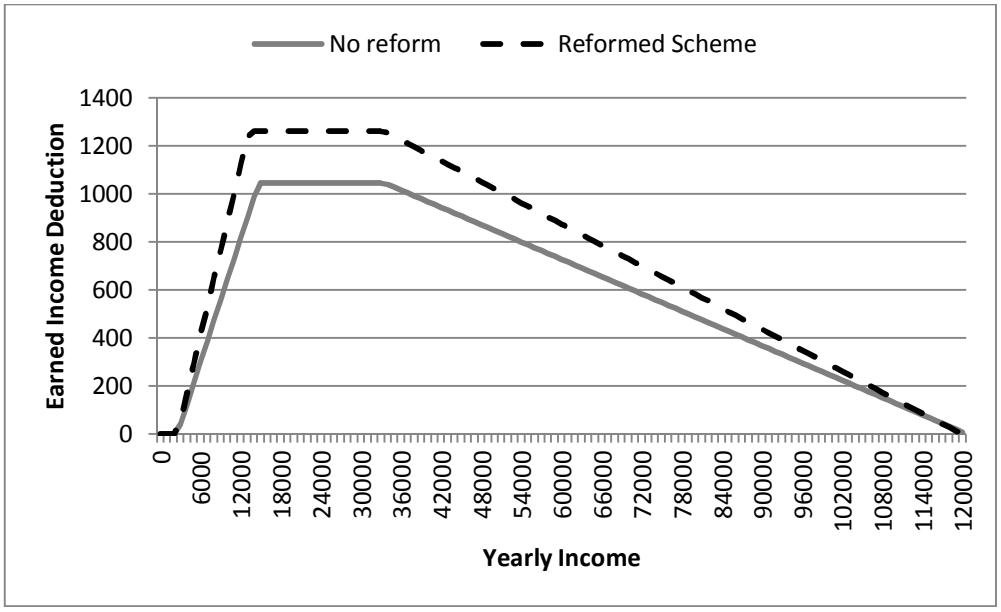

Figure 5 Earned-income Tax Credit before and after the reform

The reform is analyzed with the aid of SISU microsimulation model. Increase in the EITC clearly lowers PTRs because it is a cut in the overall tax rate. The effect of the reform in terms of PTRs for different household types is reported in table 16 below. The reform scenario is identical to that of previous section's values for 2016.

	Baseline	Reform	Change
I Single	69.1	68.1	-1.0
II Childless couple	64.7	63.6	-1.0
III Single parent	74.7	73.8	-1.0
IV Two parents	70.5	69.4	-1.1
V Others	63.9	62.9	-1.0
	68.0	**67.0**	**-1.0**

Table 16 Changes in participation tax rates due to EITC reform in 2016, percentage points

The gain from the reform is rather uniform across household types that have received some unemployment benefit in 2013; the change in the average PTR is around 1 pp. and all household types clearly benefit from the reform. Unemployment traps decrease by, on average, 1.9 pp. and the biggest impact is once again directed to the single-parent households; one-adult single household risk of being trapped in unemployment decreases by 1.7 pp., two-adult household risk by 1.4 pp, single-parent risk by 3.5 pp. and the two-parent household risk by 2.9 pp.

There is vast literature on the effects of tax breaks such as the EITC. The most researched single subject is probably the Earned-income Tax Credit in the US. Eissa and Hoynes (2005) provide a nice review where they conclude that there are clear labor supply responses to EITC, and that the mechanism seems to point towards the extensive margin. These matters are turned to next.

6.2 Dynamic Response in General Equilibrium

As there is a clear change in PTRs, there can also be a behavioral response. It is not possible to calculate behavioral responses with the static SISU microsimulation model, thus, an alternative method is used in order to estimate the long-run change in employment; the extensive margin labor supply response is calculated using a simple search theoretic macroeconomic model. In practice, two separate steady state equilibria are compared. A similar model is used in a different context in Zanetti (2012). The model is presented briefly in the following.

A representative household has a utility function of the form:

$$\sum_{t=0}^{\infty} \beta^t \left(\log(c_t) - \mu \frac{{n_t}^{1+\varphi}}{1+\varphi} \right) \quad \textbf{(9)}$$

Utility is thus drawn from consumption and disutility from working. A common simplifying assumption is made; individuals are fully insured against variations in labor income due to labor market status of household members (Merz (1995)). The representative households makes decisions in the extensive margin ie. the household chooses employment instead of working hours. The household budget constraint reads:

$$(1+\tau^c)c_t + k_{t+1} + b_{t+1} = (1-\tau^n)w_t n_t + (1-n_t)ben_t + s_t$$
$$+ (1 + (1-\tau^k)r_t)k_t + \left(1 + r_t^b\right)b_t + \pi_t \quad \textbf{(10)}$$

$$0 \leq n_t \leq 1 \quad \textbf{(11)}$$

where c_t, n_t, k_t, w_t, r_t and ben_t denote consumption, labor supply (employment), wage rate, real interest rate and unemployment (net) benefit, respectively. Utility discount factor, disutility of labor and inverse of extensive margin labor supply elasticity are denoted respectively by β, μ and φ. Furthermore, τ^c, τ^k and τ^n denote consumption, capital and labor tax rate, respectively. Every period, an exogenous amount of jobs are destroyed. Total employment evolves according to:

$$n_t = (1-\delta^n)n_{t-1} + h_t, \quad \textbf{(12)}$$

where δ^n is an exogenous job separation rate and h_t denotes the periodic number of new

hires. The evolution of unemployment is a mirror image of equation (13):

$$u_t = 1 - (1 - \delta^n) n_t \tag{13}$$

Job creation rate, f_t, is defined to be the ratio of new hires to the number of unemployed workers:

$$f_t = \frac{h_t}{u_t} \tag{14}$$

The marginal value of accepting a work relationship, W_t^N, is the net wage less the marginal disutility from working, and the expected discounted gain from taking part in the labor market:

$$W_t^N = (1 - \tau^n) w_t - \mu \frac{n_t^{\varphi}}{\lambda_t} + \beta E_t \frac{\lambda_{t+1}}{\lambda_t} \{ \left(1 - \delta^n (1 - f_{t+1})\right) W_{t+1}^N + \delta^n (1 - f_{t+1}) W_{t+1}^U \} \tag{15}$$

where λ_t is the marginal utility of consumption: $\lambda_t = \frac{1}{(1+\tau^c) c_t}$. The marginal value of unemployment is given by the following:

$$W_t^U = ben_t + \beta E_t \frac{\lambda_{t+1}}{\lambda_t} \{ f_{t+1} W_{t+1}^N + (1 - f_{t+1}) W_{t+1}^U \} \tag{16}$$

The equilibrium wage is a solution of Nash bargaining, where the surplus of a job is divided among workers and employees according to their bargaining power, η. Firm surplus, J_t , is given by the cost of hire, ν. The bargaining rule for a match is of the standard form:

$$\eta J_t = (1 - \eta)(W_t^N - W_t^U) \tag{17}$$

Substituting equations (16), (17) and $J_t = \nu$ into (18), the following wage setting equation is obtained:

$$(1 - \tau^n) w_t = \mu \frac{n_t^{\varphi}}{\lambda_t} + ben_t + \frac{\eta}{1 - \eta} \nu \left(1 - \beta \frac{\lambda_{t+1}}{\lambda_t} (1 - \delta^n)(1 - f_{t+1})\right) \tag{18}$$

A representative firm maximizes its profits, π_t, with respect to production technology (20) and evolution of employment (12), by choosing n_t and k_t. Profits are given by:

$$\pi_t = y_t - w_t n_t - (r_t + \delta) k_t - \nu h_t \tag{19}$$

where ν denotes the cost of posting a vacancy.

Output of the firm is y_t and physical capital depreciation rate is denoted by δ. The production function of a firm is given be the usual Cobb-Douglas specification:

$$y_t = Ak_t^{\alpha} n_t^{1-\alpha} \quad \textbf{(20)}$$

Output elasticity of capital is denoted by α and $A_t = (1+ \gamma^A)^t A_{t-1}$, where γ^A denotes an exogenous growth rate of the economy. The public sector budget constraint is given by:

$$\begin{aligned} & b_{t+1} + \tau^n w_t n_t + \tau^c c_t + \tau^k r_t k_t \\ & = g_t + (1 - n_t) ben_t + s_t + (1 + r_t^b) b_t \end{aligned} \quad \textbf{(21)}$$

where b_t, g_t, and s_t denote respectively public debt, government consumption and government transfers. The government transfers is allowed to vary (it is the endogeneous variable in the government budget constraint) in order to make sure that the public sector budget constraint holds at all times. Finally, the economy wide resource constraint must hold at all times:

$$y_t = c_t + i_t + g_t + v\, h_t \quad \textbf{(22)}$$

where i_t denotes investments and is given by:

$$i_t = k_{t+1} - (1 - \delta) k_t \quad \textbf{(23)}$$

As many parameters as possible are calibrated using existing research knowledge. The rest are set to match certain average key ratios in the data between 2009 and 2014. The relevant exogenous variables and parameters are presented in table 17.

The output elasticity of labor, *1-α*, is calibrated to match the wage sum share of national income, which is 0.649 which implies the value of α=0.351. The TFP growth rate, γ^A, is assumed to be 0.9 % following European Commission (2015). Physical capital depreciation rate, δ, and public consumption expenditures, *g*, are calibrated match the National Accounts data. The exogeneous job destruction rate is set to 0.6 following Obstbaum (2011a, 2011b).

Utility discount factor, β, is calibrated so that the capital to output ratio matches the data. The parameter for bargaining power, η, is set to 0.5 following most of the earlier literature. This implies that the employer and employee have equal power in the wage bargaining process. The parameter denoting the disutility of labor, μ, is calibrated so that the share of employed in labor force matches the data value of 91.8 %.

The labor supply elasticity parameter, φ, is an important parameter in terms of results. There is, however, some controversy upon the reasonable value of this parameter (see, for instance, Keane (2011) or Keane and Rogerson (2012)). In a recent survey, Chetty (2012) concluded that the preferred estimate of structural Hicksian elasticitiy on the extensive margin is 0.25. The Frisch elasticity of labor supply is the upper bound of Hicksian elasticity, thus, the elasticity proposed by Chetty (2012) is a conservative value for the Frisch elasticity. The value of φ=*0.25* is used in this paper.

The hiring cost parameter, v, is calibrated, in accordance with the earlier literature, so that hiring costs equal 1 % of total output. The unemployment benefit level is difficult parameter to calibrate in a representative agent model. As discussed in section 3, there are three different unemployment benefit types which are hard to summarize in one variable. A simplifying assumption is then made; the exogenous unemployment benefit level is calibrated so that the aggregate unemployment benefit expenditure to gdp ratio matches the data.

Finally, the effective consumption, capital income and labor income tax rates are are calculated using the Mendoza et al (1994) methodology.

Parameter	Value	Description
α	0.351	Output elasticity of capital
γ^A	0.009	TFP growth rate
δ	0.06	Capital depreciation rate
δ_n	0.06	Separation rate
μ	0.139	Utility function parameter for disutility of labor
β	0.960	Utility discount factor
$1/\varphi$	0.25	Firsch elasticity of labor supply
η	0.5	Parameter for bargaining power
τ^c	0.239	Consumption tax rate
τ^k	0.315	Capital income tax rate
τ^n	0.448	Labor income tax rate
vh/y	0.01	Hiring costs to gdp ratio
ben/y	0.019	Unemployment benefits to gdp ratio
b/y	0.493	Debt to gdp ratio
g/y	0.243	Government consumption to gdp ratio

Table 17 Calibration of the model

The participation tax rate can be defined, according to equation (1), as follows:

$$\tau^{PTR} = 1 - \frac{(1-\tau^n)w_t - ben_t}{w_t} = \tau^n + \frac{ben_t}{w_t} \quad \textbf{(24)}$$

Consequently, the change in the participation tax rate equals the change in the average effective tax rate, $\frac{\partial \tau^{PTR}}{\partial \tau^n} = 1$. Hence, we can compare the values of two separate steady states, one with τ^n=0.448 and another with τ^n=0.438, in other words, the PTR change of 1.0 pp. is plugged into the general equilibrium model. The results and relevant mechanisms in the long run are described in the following.

A level decrease in labor taxation impacts first and foremost the labor market. Lower labor income tax rate increases the disposable wage income, inducing higher willingness to search for a job – the number of new hires will increase, thus,

employment will increase with consumption and output. It can be shown, that in the model framework, the long-run change in employment will be exactly as high as the change in output due to the Cobb-Douglas specification of the production function. The results implied by the model are reported in Table 18.

Variable	**Deviation from the original steady state (%)**	
y	0.64	Output
c	0.64	Consumption
n	0.64	Employment
k	0.64	Capital
π	0.64	Profits
s	-2.53	Government transfers
f	4.83	Job creation rate
h	0.64	New hires

Table 18 The results due to 1.0 pp. decrease in average PTR

The model implies, that the number of employed will increase in the long run by approximately 0.6 %. According to the Labor Force Survey, there were, on average, 2.46 million employed yearly between 2009 and 2014, thus, the reform would increase the average number of employed by 16,000. If the Ministry of Finance static public sector cost estimate of €450 million was taken as such, the cost of one employee due to the reform would be around €29,000.

The estimated labor supply response is sensitive to the calibrated parameter values. Some sensitivity analysis is then in order. Table 19 shows the sensitivity of the model to certain key parameters. **The sensitivity check is conducted so that first the model is calibrated with the new parameter value, after which impact of the reform is recalculated.**

Parameter	**Change in value**	**Labor supply response to the reform (%)**	**Description**
-	**-**	**0.64**	**Baseline**
τ^c	+ 10 pp	0.57	Consumption tax rate
τ^n	+ 10 pp	0.93	Labor income tax rate
τ^k	+ 10 pp	0.63	Capital income tax rate
ben	+ 10 %	0.69	Unemployment benefit
1/φ	+ 0.2	0.72	Elasticity of labor supply
v	+ 1.5 pp	0.69	Cost of hiring
η	+0.1	0.61	Employer bargaining power

Table 19 Sensitivity analysis: labor supply response with changed parameter value

A ten percentage point increase in consumption tax rate in baseline calibration induces a 0.57 pp. increase in employment as a result of the reform; the higher the consumption tax rate, the lower the effect of the reform. A ten percentage point increase in labor income tax rate has a significant effect on labor supply response. The impact of the reform is now approximately 0.3 pp. higher. The capital income tax rate doesn't have a big impact on the results. The capital income tax rate is not explicitly part of the wage determing equation (19) and as a result, the effect is small. A 10 percent increase in the recalibration of unemployment benefit expenditures has a clear effect on the results. The labor supply response to the reform is now stronger. If the cost of a hire is calibrated to be, in total, 1.5 percent of GDP (instead of 1 percentage as in the baseline scenario), the labor supply response of the reform would increase to 0.69 %. Finally, an increase in the employer bargaining power (η) allows employers to get higher share of the "good" that comes from the reform, thus, reducing the labor supply response.

In basically all cases, in the recalibration, the parameter measuring disutility of labor, μ, is changed, which implies a different labor supply response in the model. Additionally, of course, the altered paramer values also contribute to the changed response.

Furthermore, another interesting sensitivity check is to make government transfers, s_t, an exogenous variable and government debt, b_t, or government consumption, g_t, an endogenous variable. It turns out that government debt has no effect on the labor supply response of the reform, that is, labor supply response is 0.64 also when the government debt is an endogenous variable. The debt to gdp ratio does decrease in order balance the government budget constraint. Endogenizing government consumption, on the other hand, reduces the impact of the reform. As a result of a tax cut, the level of government consumption decreases directly reducing the aggregate demand. Private consumption does increase, but all in all, aggregate demand increases less than in the baseline scenario.

6.3 Behavioral Response in Partial Equilibrium

The previous subsection's general equilibrium model is in many ways subject to criticism. The model calibration can be, for instance, imprecise, or in general the specification of the model can be questioned. Does it take all the relevant factors into account? Are the interconnections between variables simplified in a correct manner? As an illustration, also a more traditional partial equilibrium employment response is calculated, which is not directly linked to an economic model.

The formula for the calculation of employment response is straightforward:

$$\frac{dn_t}{n_t} = \varphi \frac{du_t^n}{u_t^n} \tag{25}$$

where the notation is as before and $u^n{}_t$ denotes the relative gains from work $u_t^n = \frac{(1-\tau^n)w_t - ben_t}{w_t}$. Using this expression, equation (26) can now be written in terms of the participation tax rate:

$$\frac{dn_t}{n_t} = \varphi \frac{d\tau^{PTR}}{1-\tau^{PTR}} \quad \textbf{(26)}$$

As before, using an extensive margin elasticity of 0.25, the equation (27) yields a relative employment effect of approximately 0.8 %[13]. Given the same level employment as in the previous section, the increase in employment is approximately 19,000.

Interestingly, the "partial equilibrium" approach here produces higher employment effect than the general equilibrium model. *Ex-ante*, one might think that the general equilibrium models labor supply effect would be stronger, because there is a feedback loop in the model that reinforces the positive effect of a tax cut. However, when comparing these two methods of calculation, this turns out not to be the case.

There are also uncertainties in the partial equilibrium calculation. One central source of uncertainty is the estimation of participation wage rate. If, for example, the regression model without the within year duration of unemployment was used, the average (before reform) participation tax rate would be 64.3 % instead of 68 %. In this case, the relative change in employment would be 0.7 %[14] and, consequently, the increase in employment roughly 17,000.

Partial equilibrium estimates are criticized for not taking general equilibrium effects into account, thus, undermining the aggregate effect. General equilibrium models, on the other hand, are often based on rather strong assumptions, which create uncertainty upon the results. In this paper, depending on assumptions used, the long-run employment effect of the reform in employment is estimated to be something between 16,000 and 19,000.

7 CONCLUSIONS

This paper has sought to increase understanding of the functioning of the labor market in two different ways. First of all, in this study, participation tax rates have been calculated using 2013 data and 2011-2016 legislation. Second, this paper has attempted to estimate the (ex-ante) economic effects of newly legislated reform, where the Earned-income Tax Credit was increased significantly. First, the effect of the reform on participation tax rates were calculated, after which the impact of the reform was estimated using a simple general equilibrium model. Also a more traditional partial

[13] =0.25*1.0 %/(1-68.0 %) ≈ 0.8%
[14] =0.25*1.0 %/(1-64.3 %) ≈ 0.7%

equilibrium employment effect is calculated.

According to the earlier literature, the average participation tax rate has decreased in the first decade of the 21st century. The trend seems to have turned, however, as the participation tax rate has increased from 64.3 in 2011 to 67.0 in 2016. A 2.6 percentage point increase only due to legislation in half a decade is not trivial. Depending on the details of the PWR estimation, the timely increase can go as high as 3.6 pp. if we assume a constant PWR of €2,100.

The claim is confirmed that the *single parents* and individuals receiving *Earnings-related Unemployment Allowance* still have the highest PTRs. The observation in itself is not surprising, but what is surprising is that so little legislative changes have been made to remedy the situation. Future research should hope to dwell deep into the situation of these individuals and suggest concretic, corrective improvements. Some selected propositions from the earlier literature include, for example, i) making Earnings-related Unemployment Benefit profile declining in time, ii) making further, targeted reductions on the daycare fees[15], iii) making Earned-income Tax Credit dependent on the number of children, iv) introducing the idea of basic income or negative income tax into the system and so on. Restructuring the system should be made patiently, analytically and comprehensively.

In addition and for the first time in the literature, also the effect of the Finnish day-care fees, General Housing Allowance and Social Income Support schemes on PTRs are quantitatively calculated. Not taking the aforementioned features of the Finnish social security system into account when calculating PTRs, the between group differences even out almost completely and the average PTR decreases by approximately 5 pp. and 10 pp. for the single-household category. These components of the system are an important part of the solution of making work more attractive in Finland.

Furthermore, this paper discusses the effects of one very recent reform – a significant increase in the Earned-income Tax Credit, in other words, a decrease in taxation. The reform is estimated to lower the participation tax rate by 1.0 percentage points, which, in monetary terms, translates to an increase of, at most, €215 p.a. in disposable income. The reform impacts almost all wage earners in the economy, thus, in this sense it is not a well targeted measure.

The Finnish microsimulation model SISU is not dynamic in nature, that is, it is not possible to simulate behavioral responses with the model. In order to make a prediction on the potential employment effects, a different model must be used. A standard search theoretic general equilibrium model is calibrated and solved in order to estimate the long-run employment effect of the reform. According to calculations made in this

[15] There is a government proposal that aims to increase daycare fees, but at the same time, the fees for certain low-income households are decreased.

paper, the long-run employment effect of the reform could be approximately 0.6 % increase in the number of employed or, approximately 16,000 workers. Using a more straightforward partial equilibrium method would give an approximate employment effect of 19,000. Consequently, given the uncertainty around the matter, it might be reasonable to conclude that the estimated increase in number of employed is around 15-20,000.

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APPENDIX A: PARTICIPATION TAX RATES (OECD)

PWR (% of average wage)	No children			2 children		
	Single person	One-earner married couple	Two-earner married couple	Lone parent	One-earner married couple	Two-earner married couple
33	72	72	72	79	79	79
50	69	69	69	76	76	76
67	69	69	69	74	74	74
100	70	70	70	74	74	74
150	67	67	67	69	69	69

Table A.1 Participation Tax Rates in Finland with certain household types and Participation Wage Rates. Source: OECD, Tax-Benefit Models.

PWR (% of average wage)	No children			2 children		
	Single person	One-earner married couple	Two-earner married couple	Lone parent	One-earner married couple	Two-earner married couple
33	77	79	76	73	76	80
50	73	74	73	70	72	75
67	71	72	71	71	71	72
100	67	66	67	70	67	68
150	62	62	62	65	62	63

Table A.2 Participation Tax Rates, EU average with certain household types and Participation Wage Rates. Source: OECD, Tax-Benefit Models.

APPENDIX B: ESTIMATION OF PARTICIPATION WAGE RATE

Explanatory variable: log of monthly wage rate			
Variable	**Estimate**	**Standard Error**	**T**
Constant	7.369	0.03	237.63
Gender 1 (=male)	0.088	0.04	2.19

Gender 2 (=female)	0.000		
Education level and field			
Male: Pre-primary education	-0.466	0.02	-23.56
Male: Upper secondary level education	-0.550	0.01	-73.72
Male: Lowest level tertiary education	-0.398	0.01	-51.07
Male: Lower-degree level tertiary education	-0.315	0.01	-41.29
Male: Higher-degree level tertiary education	-0.084	0.01	-11.11
Male: Doctorate or equivalent level tertiary	0.000		
Female: Pre-primary education	-0.556	0.03	-21.24
Female: Upper secondary level education	-0.628	0.01	-76.44
Female: Lowest level tertiary education	-0.499	0.01	-60.09
Female: Lower-degree level tertiary education	-0.433	0.01	-52.08
Female: Higher-degree level tertiary education	-0.143	0.01	-17.39
Female: Doctorate or equivalent level tertiary	0.000		
Male: General Education	0.185	0.02	9.85
Male: Teacher Education and Educational Science	-0.081	0.02	-4.05
Male: Humanities and Arts	-0.092	0.02	-4.77
Male: Social Sciences and Business	0.135	0.02	7.26
Male: Natural Sciences	0.052	0.02	2.73
Male: Technology	0.157	0.02	8.53
Male: Agriculture and Forestry	0.040	0.02	2.09
Male: Health and Welfare	0.159	0.02	8.37
Male: Services	0.129	0.02	6.90
Male: Other or Unknown Field	0.000		
Female: General Education	0.183	0.03	7.28
Female: Teacher Education and Educational Science	0.044	0.03	1.73
Female: Humanities and Arts	0.015	0.03	0.58
Female: Social Sciences and Business	0.153	0.02	6.14
Female: Natural Sciences	0.119	0.03	4.66
Female: Technology	0.165	0.03	6.60
Female: Agriculture and Forestry	0.084	0.03	3.27
Female: Health and Welfare	0.175	0.02	7.03
Female: Services	0.075	0.02	3.01
Female: Other or Unknown Field	0.000		
Region			

Male: Uusimaa	0.082	0.01	14.88
Male: Varsinais-Suomi	-0.038	0.01	-6.22
Male: Satakunta	-0.015	0.01	-2.13
Male: Kanta-Häme	-0.012	0.01	-1.74
Male: Pirkanmaa	-0.008	0.01	-1.37
Male: Päijät-Häme	-0.017	0.01	-2.42
Male: Kymenlaakso	0.007	0.01	1.03
Male: Etelä-Karjala	-0.002	0.01	-0.28
Male: Etelä-Savo	-0.085	0.01	-10.79
Male: Pohjois-Savo	-0.040	0.01	-5.98
Male: Pohjois-Karjala	-0.101	0.01	-13.33
Male: Keski-Suomi	-0.047	0.01	-7.14
Male: Etelä-Pohjanmaa	-0.087	0.01	-12.12
Male: Pohjanmaa	-0.047	0.01	-6.72
Male: Keski-Pohjanmaa	-0.036	0.01	-3.86
Male: Pohjois-Pohjanmaa	-0.025	0.01	-4.12
Male: Kainuu	-0.093	0.01	-9.94
Male: Lappi	0.082	0.01	14.88
Male: Ahvenanmaa			
Female: Uusimaa	0.086	0.01	15.28
Female: Varsinais-Suomi	-0.010	0.01	-1.69
Female: Satakunta	-0.022	0.01	-3.15
Female: Kanta-Häme	0.008	0.01	1.05
Female: Pirkanmaa	-0.002	0.01	-0.40
Female: Päijät-Häme	-0.012	0.01	-1.65
Female: Kymenlaakso	-0.017	0.01	-2.37
Female: Etelä-Karjala	-0.024	0.01	-2.94
Female: Etelä-Savo	-0.030	0.01	-3.85
Female: Pohjois-Savo	-0.003	0.01	-0.37
Female: Pohjois-Karjala	-0.044	0.01	-5.74
Female: Keski-Suomi	-0.033	0.01	-4.87
Female: Etelä-Pohjanmaa	-0.039	0.01	-5.36
Female: Pohjanmaa	-0.049	0.01	-6.71
Female: Keski-Pohjanmaa	-0.034	0.01	-3.46
Female: Pohjois-Pohjanmaa	-0.013	0.01	-2.11
Female: Kainuu	-0.051	0.01	-5.28
Female: Lappi	0.086	0.01	15.28
Female: Ahvenanmaa			
Other variables			
Male: Not married	-0.056	0.00	-24.00
Male: Married	0.000		

Female: Not married	-0.002	0.00	-0.96
Female: Married	0.000		
Male: Single	0.031	0.00	6.91
Male: Childless couple	0.044	0.00	9.94
Male: Single parent	0.066	0.01	7.03
Male: Two-parent household	0.083	0.00	18.32
Male: Senior household	0.000	0.03	0.00
Male: Others	0.000		
Female: Single	0.044	0.01	8.81
Female: Childless couple	0.023	0.00	4.75
Female: Single parent	0.022	0.01	3.74
Female: Two-parent household	-0.004	0.00	-0.84
Female: Senior household	-0.072	0.01	-6.04
Female: Others	0.000		
Male: Age	0.034	0.00	51.91
Female: Age	0.025	0.00	35.20
Male: Age^2	0.000	0.00	-41.36
Female: Age^2	0.000	0.00	-26.53
Male: Children below the age of 3 in the same household	0.044	0.00	14.19
Male: No children below the age of 3 in the same household	0.000		
Female: Children below the age of 3 in the same household	0.189	0.00	46.80
Female: No children below the age of 3 in the same household	0.000		
Male: Capital income	0.080	0.00	47.70
Female: Capital income	0.047	0.00	24.81
Male: Unemployment months during the year	-0.045	0.00	-53.64
Female: Unemployment months during the year	-0.038	0.00	-30.35
n	254 893		
R^2	0.42		

Table B.1 Regression for Participation Wage Rate (PWR)

APPENDIX C: PWRS AND PTRS 2011-2016

C.1 Sensitivity of the Participation Wage Rate

	Predicted Values				
	Model 1[a]	Model 2[b]	Model 3[c]	Model 4	Model 5
Minimum	1,200	1,200	1,200	2,134	2,598
1. quartile	1,628	2,075	1,874	2,134	2,598
Median	1,952	2,459	2,346	2,134	2,598
Mean	2,134	2,598	2,572	2,134	2,598
3. quartile	2,435	2,964	2,984	2,134	2,598
Maximum	17,607	17,607	97,970	2,134	2,598

Table C.1 Predicted monthly wage rate used in PTR calculations

[a] Duration of unemployment is an explanatory variable

[b] Duration of unemployment is *not* an explanatory variable

[c] Observed previous wage; only individuals receiving Earnings-related UA

	Average Participation Wage Rate		
	Model 1	**Model 2**	**Model 3**
I Single	2,035	2,565	2,519
II Childless couple	2,217	2,706	2,644
III Single parent	1,927	2,292	2,213
IV Two parents	2,273	2,634	2,621
V Others	1,977	2,427	2,401
	2,133	**2,598**	**2,572**

Table C.2 Participation wage rate 2011–2016 with 2013 data

	Average Participation Wage Rate	
	Model 1	**Model 2**
Labor Market Subsidy	1,908	2,420
Basic Allowance	2,057	2,436
Earnings-related UI	2,384	2,816
	2,133	**2,598**

Table C.3 Participation wage rate by unemployment benefit type

C.2 Sensitivity of the Participation Tax Rate

	Average Participation Tax Rate, Model 1						Change 2011-2016
	2011	2012	2013	2014	2015	2016	
I Single	66.8	68.8	69.8	70.3	69.5	68.1	1.3
II Childless couple	59.9	62.6	64.1	64.8	64.3	63.6	3.7
III Single parent	74.6	77.2	78.3	78.6	76.2	73.8	-0.8
IV Two parents	65.7	68.1	70.2	70.9	70.3	69.4	3.7
V Others	59.2	62.2	63.6	64.0	63.8	62.9	3.8
	64.3	**66.7**	**68.2**	**68.8**	**68.1**	**67.0**	**2.6**

Table C.4 Participation tax rate 2011–2016 with 2013 data using PWRs according to model 1

	Average Participation Tax Rate, Model 2						Change 2011-2016
	2011	2012	2013	2014	2015	2016	
I Single	61.1	62.9	63.9	64.5	64.4	63.8	2.7
II Childless couple	56.4	58.7	60.0	60.8	60.4	59.9	3.5
III Single parent	71.6	74.4	75.5	75.9	74.2	72.4	0.8
IV Two parents	62.7	64.9	66.8	67.5	67.0	66.4	3.7
V Others	55.1	57.8	59.0	59.5	59.4	58.8	3.7
	60.2	**62.3**	**63.6**	**64.3**	**64.0**	**63.3**	**3.1**

Table C.5 Participation tax rate 2011–2016 with 2013 data using PWRs according to model 2

	Average Participation Tax Rate, Model 3						Change 2011-2016
	2011	2012	2013	2014	2015	2016	
I Single	69.8	71.7	72.3	73.2	72.7	71.7	1.9
II Childless couple	67.6	69.7	70.1	71.2	70.3	69.7	2.1
III Single parent	78.5	80.4	81.2	82.0	80.7	78.7	0.2
IV Two parents	74.3	76.2	76.7	77.8	76.8	76.1	1.8
V Others	68.3	70.4	70.9	71.7	71.1	70.4	2.1
	70.4	**72.4**	**72.9**	**73.9**	**73.1**	**72.3**	**1.9**

Table C.6 Participation tax rate 2011–2016 with 2013 data using PWRs according to model 3

	Average Participation Tax Rate, Model 4						Change 2011-2016
	2011	2012	2013	2014	2015	2016	
I Single	63.6	65.8	66.8	67.4	67.5	66.9	3.3
II Childless couple	60.0	62.8	64.2	65.1	64.6	64.0	4.0
III Single parent	72.8	75.9	77.1	77.5	75.7	73.8	1.1
IV Two parents	66.3	68.9	70.9	71.8	71.1	70.4	4.0
V Others	56.3	59.3	60.5	61.1	61.0	60.4	4.1
	63.1	**65.6**	**67.0**	**67.8**	**67.4**	**66.7**	**3.6**

Table C.7 Participation tax rate 2011–2016 with 2013 data using constant PWR of €2,134

	Average Participation Tax Rate, Model 5						Change 2011-2016
	2011	2012	2013	2014	2015	2016	
I Single	59.9	61.6	62.5	63.2	63.2	62.6	2.8
II Childless couple	56.8	59.1	60.3	61.2	60.7	60.2	3.4
III Single parent	69.1	72.0	73.2	73.7	73.1	72.1	3.0
IV Two parents	62.3	64.4	66.2	67.0	66.5	65.9	3.6
V Others	53.9	56.3	57.4	58.0	57.8	57.4	3.5
	59.5	**61.7**	**62.9**	**63.6**	**63.3**	**62.7**	**3.2**

Table C.8 Participation tax rate 2011–2016 with 2013 data using constant PWR of €2,600

	Average Participation Tax Rate, Model 1						Change 2011-2016
	2011	2012	2013	2014	2015	2016	
I Single	66.8	68.8	69.8	70.3	69.5	68.1	1.3
II Childless couple	59.9	62.6	64.1	64.8	64.3	63.6	3.7
III Single parent	73.5	76.2	77.4	77.7	75.5	73.1	-0.4
IV Two parents	63.2	65.6	67.7	68.5	67.8	67.4	3.8
V Others	58.8	61.9	63.2	63.7	63.4	62.5	3.8
	63.7	**66.1**	**67.5**	**68.1**	**67.4**	**66.3**	**2.7**

Table C.9 Participation tax rate 2011–2016 without day-care fees

	Average Participation Tax Rate, Model 1						Change 2011-2016
	2011	2012	2013	2014	2015	2016	
I Single	60.7	62.6	63.6	63.9	63.0	62.4	1.7
II Childless couple	59.3	62.0	63.5	64.2	63.6	62.9	3.6
III Single parent	63.9	67.4	68.7	68.9	68.2	67.7	3.8
IV Two parents	62.1	64.6	66.7	67.4	66.7	66.0	3.9
V Others	57.8	60.9	62.2	62.7	62.3	61.6	3.8
	60.5	**63.0**	**64.4**	**65.0**	**64.2**	**63.6**	**3.0**

Table C.10 Participation tax rate 2011–2016 without day-care fees or General Housing Allowance

	Average Participation Tax Rate, Model 1						Change 2011-2016
	2011	2012	2013	2014	2015	2016	
I Single	55.5	59.0	59.8	60.3	60.1	59.3	3.8
II Childless couple	58.7	61.5	63.0	63.7	63.2	62.5	3.9
III Single parent	58.4	62.0	62.9	63.3	63.2	62.3	3.9
IV Two parents	61.0	63.7	65.7	66.4	65.9	65.1	4.1
V Others	56.6	60.0	61.2	61.7	61.5	60.7	4.1
	57.9	**61.1**	**62.4**	**63.0**	**62.6**	**61.9**	**3.9**

Table C.11 Participation tax rate 2011–2016 without day-care fees, Social Income Support or General Housing Allowance

	Average Participation Tax Rate, Model 1						Change 2011-2016
	2011	2012	2013	2014	2015	2016	
I Single	66.6	68.5	69.5	70.0	69.2	67.8	1.2
II Childless couple	59.8	62.4	63.9	64.7	64.1	63.4	3.7
III Single parent	72.8	74.4	75.6	75.8	73.1	70.7	-2.1
IV Two parents	61.8	64.3	66.3	67.1	66.4	65.6	3.8
V Others	58.2	61.3	62.6	63.1	62.8	62.0	3.8
	63.1	**65.5**	**66.9**	**67.5**	**66.8**	**65.7**	**2.6**

Table C.12 Participation tax rate 2011–2016 without top-ups related to children in unemployment benefits

	Model 1		Model 2		Model 3		Model 4		Model 5	
	2011	2016	2011	2016	2011	2016	2011	2016	2011	2016
I Single	17.4	14.4	5.2	5.9	6.7	5.7	12.1	14.5	4.7	6.6
II Childless couple	10.4	12.3	3.0	4.0	0.3	0.4	16.5	18.9	6.5	9.1
III Single parent	37.7	30.6	26.2	24.0	43.5	41.3	30.0	29.5	16.0	22.3
IV Two parents	17.8	21.0	10.8	13.7	17.5	24.6	26.0	28.4	14.4	16.9
V Others	10.2	12.0	2.3	4.0	1.6	3.3	9.3	10.6	3.7	5.1
	15.9	**15.9**	**6.8**	**8.0**	**8.3**	**10.0**	**17.3**	**19.5**	**7.9**	**10.4**

Table C.13 Individuals in unemployment trap, %

The **Aboa Centre for Economics (ACE)** is a joint initiative of the economics departments of the Turku School of Economics at the University of Turku and the School of Business and Economics at Åbo Akademi University. ACE was founded in 1998. The aim of the Centre is to coordinate research and education related to economics.

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