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The impact of in-work benefits on employment and poverty

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Abstract

This article studies the impact of design characteristics of in-work benefits on employment and poverty in an international comparative setting, taking account of both first and second order labour supply effects. We use the micro-simulation model EUROMOD, which has been enriched with a discrete labour supply model. The analysis is performed for four EU-member states: Belgium, Italy, Poland and Sweden. The results show that design characteristics matter substantially, though the specific effects differ in magnitude across countries, indicating there is no one-size-fits-all solution. Throughout the analysis, numerous trade-offs are uncovered: not only between employment and poverty goals, but also within employment incentives itself (extensive vs. intensive margin). Taking account of behavioural reactions attenuates the impact on poverty outcomes, signalling the importance of bringing these effects into the empirical analysis.

JEL: D13, D31, J22

Keywords: in-work benefits, design characteristics, labour supply, at risk of poverty

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1 Introduction

Poverty reduction and employment growth are major challenges in today's Europe. The lack of substantial progress in the fight against poverty stands in stark contrast to the ambitious policy goals formulated by the European Union (EU). Despite years of growing employment in the decade before the Great Recession, Europe failed to make substantial progress in combating relative income poverty, particularly among the working-age population (Cantillon and Vandenbroucke, 2014). An increasing inadequacy of minimum incomes contributed at least partially to these disappointing poverty trends (Nelson, 2013 and Cantillon et al., 2015), but also in-work poverty has become more prevalent (increase from 8.3% in 2010 to 9.5% in 2014 in the EU28 (Eurostat, 2016). Individuals with a low earnings potential or belonging to disadvantaged groups increasingly encounter difficulties in finding a job. They often face low work incentives and have a higher risk of being poor (Immervoll and Pearson, 2009; Marchal and Marx, 2015).

Making-work-pay policies have been put forward as a way to both combat in-work poverty and improve work incentives, as they increase disposables incomes without raising the cost of work for the employer. In-work benefits are at the core of these policies and have received considerable attention from both policy makers and scholars. They can be defined as *"permanent work-contingent tax credits, tax allowances or equivalent work-contingent benefit schemes, designed with the dual purpose of alleviating in-work poverty and increasing work incentives for low-income workers"* (OECD, 2011). Its main objectives can be described as, on the one hand, increase employment by creating financial rewards for remaining in-work or for taking up a low-paid job, and on the other hand, increase incomes of disadvantaged groups of workers and their families (Immervoll and Pearson, 2009). With the United Kingdom and the United States as the first two countries to implement these policies, various (European) countries followed their example (for an overview, see Kenworthy, 2015).

Looking at employment effects, most studies on in-work benefits point towards positive effects at the extensive margin (i.e. the choice between working and not working), meaning that employment rates among the target group are raised due to the in-work benefit. Most researched in-work benefits are the Earned Income Tax Credit (EITC) in the USA and the Working Family Tax Credit (WFTC) in the UK. For both the EITC (e.g. Blank et al., 2000; Chetty et al., 2013) and the WFTC (e.g. Blundell and Sheppard, 2011; Brewer et al., 2006), positive employment effects at the extensive margin were found. Mead (2014) indicates however that the EITC mainly encourages individuals to remain in employment, rather than to increase the likelihood to enter employment. The evidence about the intensive margin (i.e. the choice of how many hours you work) is more mixed and the effects found are often smaller. Depending on the design of the benefit, it is possible that individuals reduce their number of hours worked, as one might decide to work fewer hours to qualify for the benefit (Saez, 2002; OECD, 2011). Overall, the impact of financial incentives on labour supply decisions depends on the balance between income and substitution effects (Blundell and Macurdy, 1999). According to the income effect individuals may reduce their working hours as in-work benefits increase disposable incomes and hence the same income level can be attained with less effort. However, one can gain more per hour worked and thus incentivize individuals to work more, which is the substitution effect. Research indicates that, on average, low-income workers are more responsive to financial incentives (hence, the substitution effect dominates) than middle or high income earners (the income effect dominates) (Blundell et al., 2000 and Chetty et al., 2013). Thus, in-work benefits targeted at low-income workers tend to result in

substantial positive employment effects at the extensive margin and small negative effects at the intensive margin.

In-work benefits are not only implemented to improve work incentives, but also to reduce in-work poverty. By considering both aspects in the evaluation, in-work benefits may be a welfare maximizing policy, as they contribute to achieving the right balance between poverty alleviation and work incentives (OECD, 2011). It is however difficult to assess the poverty reducing effect of in-work benefits in general. Studies provide mixed evidence, with results mainly driven by the design of the benefit, as well as its interaction with other policies and the form of the income distribution. There are also indications that the poverty impact is largest in countries with a dispersed income distribution, as is the case in the USA and the UK.

Any increase in labour supply needs to be matched by sufficient demand to accommodate additional jobseekers. Even though in-work benefits are unlikely to create additional employment in weak labour markets, they can still be effective as a redistribution measure by cushioning income losses associated with deteriorating earnings prospects. Another element that drives the success of in-work benefits is its interaction with other redistributive and labour market measures. In-work benefits increase the gap between incomes in and out of work. Any policy aspect that affects this gap has therefore implications for the functioning of the in-work benefit itself. This includes levels and eligibility conditions of out-of-work benefits, tax burden on low-wage workers, and policies affecting wage levels and distributions (such as statutory minimum wages) (Immervoll and Pearson, 2009). Moreover, it is interesting to note that in-work benefits are considered to be relatively cost effective. Immervoll et al. (2007) show that the taxpayers' cost of redistributing one euro in the form of an in-work benefit can be around one euro, implying an efficiency cost close to zero. This is a remarkable outcome compared to the sometimes large efficiency costs of other redistribution measures.

Few studies have considered the impact of the design characteristics of in-work benefits in detail (see e.g. Liebman, 2001, who uses a microsimulation model to determine the optimal design of the EITC). Examples of design characteristics include the unit of assessment and the way income information is used in eligibility conditions. This article is the first, to our knowledge, to study the impact on both employment and poverty outcomes of various designs of in-work benefits in an international comparative perspective. In addition, we provide information on the budgetary impact of taking labour supply effects into account. The analysis is performed for four EU member states: Belgium, Italy, Poland and Sweden. We make use of the EU tax-benefit microsimulation model, EUROMOD, to control for both the size of the in-work benefit and the wider context, enabling us to focus on the impact of the design characteristics. In the next section, we present the data and methodology used, as well as the different simulation scenarios. We then show the empirical outcomes. The final section concludes.

2 Data and methodology

2.1. Data and EUROMOD

In empirical analyses[1] of in-work benefits, different tracks have been followed. OECD studies typically use the OECD tax-benefit model with hypothetical families (see e.g. Immervoll and Pearson, 2009), while other studies have worked with representative samples of the population, often in combination with a tax-benefit microsimulation model (e.g. Bargain and

Orsini, 2006). Most studies are focusing on in-work benefits in one country only (mainly in the Anglo-Saxon world). The few studies that take an international comparative perspective apply the so-called "policy swaps", namely introducing in-work benefits existent in one country into the tax-benefit system of another country; examples of such studies are Bargain and Orsini (2006) and Marx et al. (2012). We take a different track by introducing a stylized in-work benefit, step by step, in four EU countries, with each step corresponding to a different design characteristic. We simulate counterfactual scenarios by using a fiscal microsimulation approach. This approach allows us to estimate household incomes under different tax options, holding everything else constant and, therefore, avoiding endogeneity problems (Bourguignon and Spadaro, 2006).

The policy reform simulations are performed using EUROMOD, the multi-country European-wide tax-benefit microsimulation model. We use the policies as simulated in EUROMOD on June 30, 2015. The underlying data are those from EU-SILC 2012. EUROMOD simulates tax liabilities (direct taxes and social insurance contributions) and cash benefit entitlements on the basis of the tax-benefit rules in place and information available in the underlying dataset. The components of the tax-benefit system which are not simulated (e.g. contributory benefits) due to lack of information in the cross-sectional survey data (e.g. on previous employment), as well as market incomes, are taken directly from the data. These income components are uprated to 2015-level, using the standard EUROMOD uprating factors. EUROMOD is a static model: the arithmetic simulation of taxes and benefits takes no account of potential behavioural reactions of individuals. As such, EUROMOD is of value in terms of assessing the first order effects of tax-benefit policies and in understanding how tax-benefit policy reforms may affect income distributions, work incentives and government budgets in a partial equilibrium (see Sutherland and Figari (2013); Figari and Narazani (2015) for further information). In order to measure employment effects, we have enriched EUROMOD with labour supply reactions.

2.2. Measuring labour supply effects

Labour supply effects are calculated for four different household types, of which one or two partners are available for the labour market[2]: couples with one partner available for work, couples with two partners available, single men and single women. Self-employed individuals are excluded from the sample for two reasons: for them no reliable information about monthly hours worked is available in the survey and labour supply decisions of self-employed people are possibly very different from those of salaried workers. Any household with more than two persons available for the labour market are excluded from the sample, as it is not clear how these households pool their incomes. For each country, four different labour supply models are provided, one for each group. Basic descriptive statistics of these different subgroups in each country can be found in Table A1 in the supplementary data section.

A discrete labour supply model, type Van Soest (1995) is used to evaluate the impact of the design of in-work benefits on labour supply. The parameters of the utility function, which are estimated by using maximum likelihood, can be found in Table A2 in the supplementary data section. Looking at the specification of the model, we assume, in line with Blundell et al. (1999), a quadratic specification of the deterministic part of the utility function, in which we allow for interaction effects between non-working time and income and we also included dummy variables for working part-time. We also allowed for heterogeneity in the estimated coefficients of consumption and non-working time. In our analysis, we only take labour supply effects into account. We assume that each person can work the amount of hours per

week desired, thus without taking labour demand constraints into account. Also other possible general equilibrium effects are neglected.

The EU-SILC 2012 contains information on the weekly amount of hours usually worked in the main job, as well as in the second and subsequent jobs. We assume that each individual available for the labour market faces a choice set of five discrete points: not working, working part-time (either 'minimum' or 'maximum'), working full-time or over-time. Singles and households where one person is available for the labour market can thus choose between 5 discrete working points. When both partners are available, 25 different discrete points can be chosen: 5 possible options of one partner combined with 5 possible options of the other partner. We use the current pattern in hours of work in each country to choose the exact amount of hours linked to each discrete point. In Belgium, individuals can choose to work either 0, 19, 30, 38 or 50 hours per week; in Italy and Poland 0, 20, 30, 40 or 50 hours per week and in Sweden 0, 16, 26, 36 or 50 hours per week.

Total disposable household income is calculated in each discrete hours point, using EUROMOD. Gross earnings from employment are calculated by multiplying gross hourly wages by the respective working hours in each category. Hourly wages are obtained by dividing observed monthly gross incomes by the actual observed number of hours worked. For individuals for whom no gross earnings are observed and who are available for the labour market, gross hourly wages are calculated on the basis of a Heckman selection model, with separate estimations for men and women in each country (results are available from authors upon request).

Gross household income is equal to the sum of both labour and non-labour incomes of all household members. Social security contributions and personal income taxes are deducted from gross income, while social transfers are added to obtain total disposable household income. Social transfers include child, education and housing benefits. If a person is not working, entitlement to social assistance benefits is checked. No unemployment benefits are simulated[3]. We assume full take-up of benefits.

2.3. Measuring poverty impact

Poverty is measured using the standard EU poverty line, i.e. 60% of median equivalent disposable income of the total population in each country. Poverty rates are calculated both on the basis of a fixed poverty line (as defined in the baseline simulation, see next section) as well as one that is recalculated on the basis of changed incomes (a so-called 'floating' poverty line). We consider both first and second order poverty effects, i.e. without and with taking labour supply effects into account. We show headcount poverty rates of individuals between 18-64 years old; poverty gap outcomes and results for those in in-work poverty are available from the authors upon request. The statistical significance of the results is tested, based on a method proposed by Goedemé et al. (2013).

2.4. Scenarios for simulations

Table 1 summarizes the different scenarios we simulate, focussing on three different categories of design characteristics: a. Unit of assessment; b. Income related characteristics; c. Employment related characteristics[4]. The first category looks at the distinction between individual and household based systems. As this distinction is crucial, it is taken up in all the simulations of alternatives. For the income related characteristics, we look at the impact of

introducing a threshold (either based on gross income or on hourly wage), a tapering-out and a tapering-in phase. For the employment related characteristics, we look at the impact of introducing an in-work benefit based on hours worked.

Table 1: Overview of the different in-work benefit (IWB) simulations

Name	Individual (ind) (a)	Household (hh) (a)	Compare to
Baseline	Current system, 2015 policies, IWB simulated if existing		/
Scenario 1	Abolish currently existing IWB		Baseline
Scenario 2: lump sum (b)	**2A**: lump sum if working at least 1 hour per week	**2B**: lump sum if min. 1 person in household is working at least 1hour per week. Amount IWB multiplied with modified OECD equivalence scale	Scenario 1
Scenario 3: threshold based on gross income (b)	**3A**: eligible if individual gross income is below threshold	**3B**: eligible if household gross income is below threshold. Amount IWB multiplied with modified OECD equivalence scale	Scenario 2A (ind) or 2B (hh)
Scenario 3: threshold based on hourly wage (b)	**3C**: eligible if individual hourly wage is below threshold	/	Scenario 2A
Scenario 4: tapering-out (b)	**4A**: threshold and tapering-out based on individual gross income	**4B**: threshold and tapering-out based on household gross income. Amount IWB multiplied with modified OECD equivalence scale	Scenario 3A (ind) or 3B (hh)
Scenario 5: tapering-in based on gross income (b)	/	**5B**: threshold, tapering-out and tapering-in based on household gross income. Amount IWB multiplied with modified OECD equivalence scale	Scenario 4B
Scenario 5: tapering-in based on hours worked (c)	**5A**: threshold and tapering-out based on individual gross income. Tapering-in based on hours worked	/	Scenario 4A

Note: 1. (a): Unit of assessment; (b): Income related characteristics; (c): Employment related characteristics.

2. In order to correct for the household size, we have decided to multiply the amount of the IWB received by its household with the modified OECD equivalence scale of that household. We performed some sensitivity checks using either no equivalence scale or using an extreme equivalence scale counting each household member as one. Differences found when using either one of these methods are very limited (results are available from authors upon request).

The simulations are performed step-by-step. We first look at the impact of the existing in-work benefit (Baseline), by comparing it with a counterfactual simulation without the benefit (Scenario 1). This is done for all countries except Poland, where there is no in-work benefit in place in 2015. We then introduce a lump sum for all at work, either on an individual or a household basis (Scenario 2). Next we make the in-work benefit more complex by introducing, respectively, an income threshold (Scenario 3), a tapering-out (Scenario 4) and a tapering-in phase (Scenario 5). In order to make our results as 'clean' as possible, we introduce the stylized in-work benefit as a benefit that has no interactions with other elements

of the tax-benefit system, with the exception of social assistance (i.e. the newly calculated in-work benefit is considered as part of household income for the means-test).

The threshold based on gross income (Scenario 3) is set equal to the 30th percentile of gross individual wages in each country. For a household in-work benefit, the same threshold is used, corrected for the household size by multiplying it with the OECD equivalence scale of each household. The threshold based on hourly wages is set equal to the threshold based on gross monthly wage divided by 4.33 (going from monthly to weekly) and by the amount of hours worked in a full-time job in each country. Both tapering-out and tapering-in rates are set equal to 30%. For the former, this means that the in-work benefit diminishes with €0.3 per euro that is earned above the threshold, until the in-work benefit equals zero. For the latter, this means that per euro one starts earning, one receives €0.3 of the in-work benefit, until the maximum amount of the in-work benefit is reached.

When introducing a lump sum in-work benefit for all at work, we do this using a budget equal to 1% of the specific countries' GDP, which should be sizeable enough to generate significant effects. Introducing an income threshold is then done in two steps: first, we use the benefit amount as set in the lump sum simulation, and we only change the design of the in-work benefit. This allows us to investigate the impact of the 'pure' design characteristics (which therefore by definition cannot be budgetary neutral). Second, we change the height of the in-work benefit, until the budget used for the new in-work benefit equals 1% of GDP in the first order (i.e. without taking possible budgetary effects due to employment changes into account). The same pattern of analysis is followed in the subsequent steps.

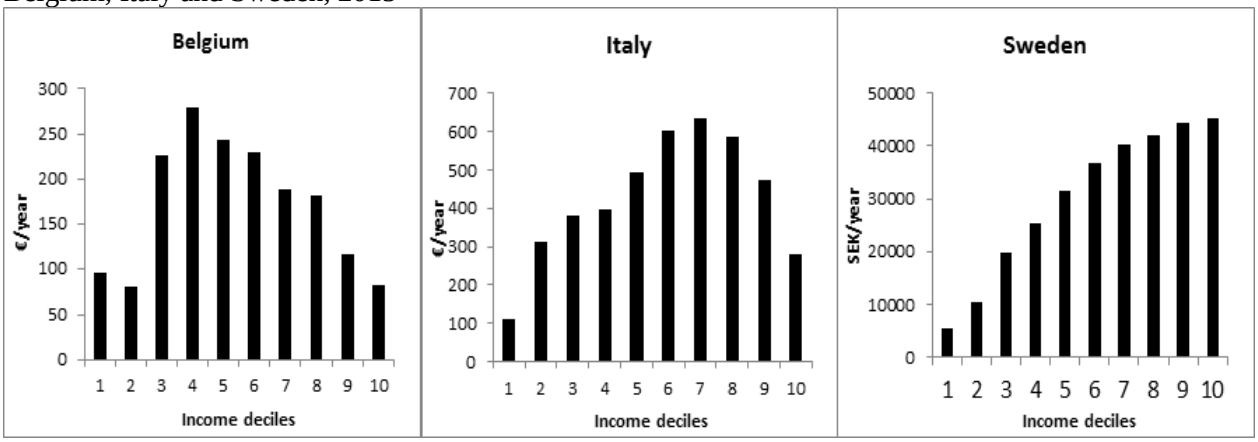
3 Results

3.1. Current in work-benefits

Belgium, Italy and Sweden currently have an in-work benefit in place. In Belgium, this comes in the form of a reduction of the monthly paid social security contributions for individuals with a low hourly wage, equal to a maximum monthly reduction of €184 in 2015, for an individual working full-time and earning the minimum wage. There is a tapering-out rate of 19%, until the benefit equals zero. A fraction (14.4%) of the benefit is tax deductible. The eligibility of the in-work benefit is not based on total income, which might give an incentive to diminish the hours worked in order to become eligible, but on hourly wage, hereby targeting at individuals with a low earnings potential. Moreover, the benefit gives an incentive to work more hours, as the total amount of the benefit linearly increases with the hours worked by the individual. The budget for the Belgian in work-benefit is limited, around 600 million euro or 0.16% of GDP in 2015. The Italian work tax credit is also individual-based and equals a maximum tax reduction of €80 per month in 2015, for persons with a taxable income lower than €24,000 per year. There is a tapering-out zone of 48%. The budget of the Italian working tax credit equals €8.4 billion per year or 0.5% of Italians' GDP. The Swedish Earned Income Tax Credit takes the form of a reduction of personal income taxes paid, both by employees and self-employed individuals. It is individual-based and focusses only on employment incentives, not on poverty. The Swedish EITC has no tapering-out phase, meaning that every employee or self-employed person in Sweden receives the benefit, regardless their income. The main reason for not installing a tapering-out phase is to avoid negative work incentives at the intensive margin. The downside of this strategy is a large budgetary cost, around 100 billion Swedish Krona (SEK) per year or 2.4% of Swedish' GDP.

Recipients of the Belgian in-work benefit are mainly found in the middle of the income distribution (Figure 1), while the Italian in-work benefit mainly goes toward the higher income deciles and the Swedish EITC is more given to individuals in the top.

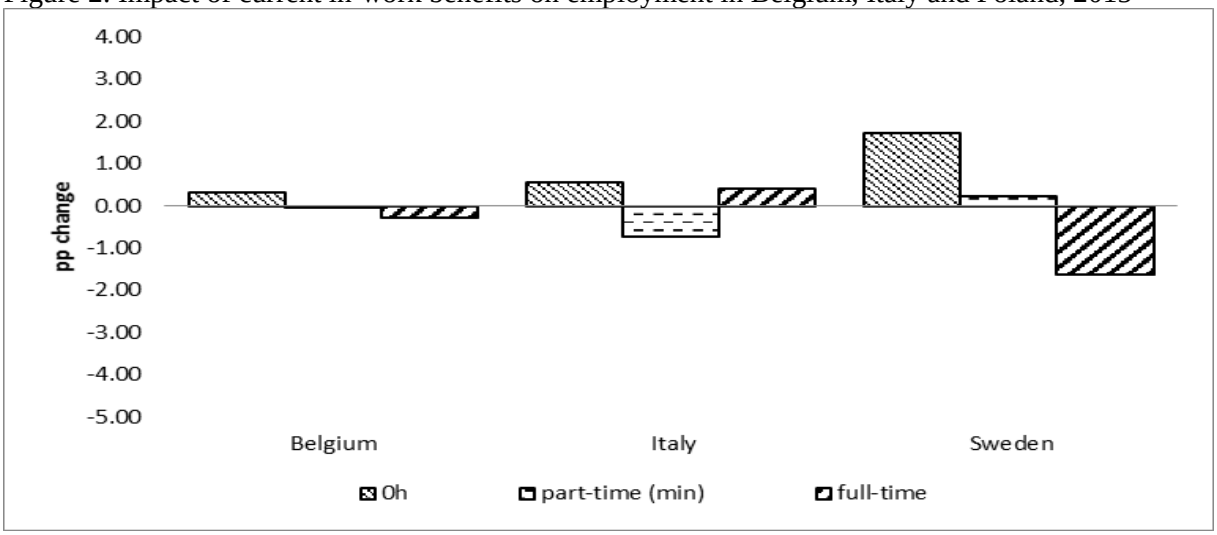
Figure 1: Average gain per recipient over the income distribution of the existing in-work benefits in Belgium, Italy and Sweden, 2015



Note: Income deciles based on disposable equivalent household income
Source: Own calculations based on EUROMOD (underlying data EU-SILC 2012)

The existing in-work benefits create positive employment effects. Abolishing them would result in a significant increase of individuals who choose not to work in all three countries (see Figure 2). In Belgium, we notice a significant decrease of individuals working full-time, although the effect is small due to the limited budget. In Italy, we notice a decrease in individuals working part-time, partly compensated by an increase of individuals working full-time. The biggest employment effects are found in Sweden, where the abolishing of the existing in-work benefit would result in a decrease of full-time working individuals.

Figure 2: Impact of current in-work benefits on employment in Belgium, Italy and Poland, 2015



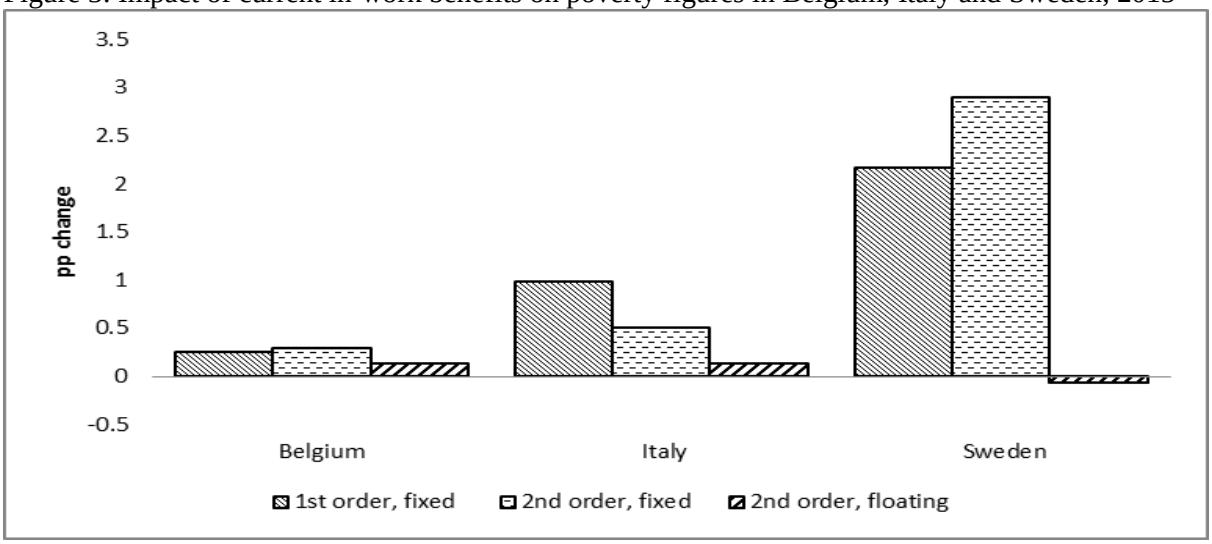
Source: Own calculations based on EUROMOD (underlying data EU-SILC 2012)

The first order budgetary cost of the current in-work benefits in Belgium, Italy and Sweden equals respectively 621 million euro; 8,369 million euro and 99,611 million SEK per year. When taking labour supply effects into account, the net governmental cost diminishes to

respectively 423 million euro (68%); 6,904 million euro (82%) and 80,436 million SEK per year (81%)[5].

Abolishing the existing in-work benefits increases first order poverty in all three countries when using a fixed poverty line (see Figure 3). In Belgium, the effect on the poverty headcount is rather small, while the poverty increasing effects in Italy and especially Sweden are larger. With a floating poverty line this negative effect disappears in all three countries. This is due to the fact that the current in-work benefit mainly gives extra income to household in the middle, but also higher in the income distribution. Taking labour supply effects into account, first and second order effects in Belgium are comparable. In Italy, the negative poverty effect of abolishing the existing in-work benefit is higher in first order, while the opposite is true in Sweden. This is due to the fact that the Italian in-work benefit is targeted to individuals in the middle of the income distribution (giving them work incentives both at the extensive and intensive margin), while the Swedish working tax credit is mainly aimed at individuals higher in the income distribution (giving them incentives mainly to work more hours). When using a floating poverty line, the poverty impact of abolishing the existing in-work benefits disappears and becomes insignificant.

Figure 3: Impact of current in-work benefits on poverty figures in Belgium, Italy and Sweden, 2015



Source: Own calculations based on EUROMOD (underlying data EU-SILC 2012)

3.2. Alternative scenarios of in-work benefits

We now discuss the impact of the stepwise introduction of an alternative in-work benefit (IWB) in the four countries. We show the impact on work incentives, the government budget and poverty.

3.2.1 Employment effects

The impact on work incentives is expressed as a percentage point change in the number of emloyed in each working hours category relative to the previous scenario (see Table 1). Compared with having no IWB at all, introducing a lump sum IWB generates positive employment effects in all countries (see Figure 4). An individual based system generates stronger employment incentives than a household based, due to the fact that the latter does not give incentives to the second partner in the household to start working. In Belgium and

Poland, the difference in employment effects between an individual and household lump sum is limited, while in Italy and Sweden the disincentive for the second partner is quite important, resulting in the individual based system outperforming the household based one.

Introducing a threshold based on either gross income or hourly wages while keeping the lump sum at the same level as in Scenario 2 (and hence decreasing the budget) results in negative employment effects, as the difference in income between not-working and working for individuals above the threshold is diminished. We notice an increase in individuals not working or working a limited amount of hours and a decrease in individuals working (almost) full-time. When simulations are done in a budget neutral way, the amount of the IWB can be increased, resulting in mixed effects on work incentives when using a threshold based on gross income: at the extensive margin, it becomes financially more attractive for individuals to start working, as the amount of the IWB increases, resulting in a bigger income difference between not working and working. At the intensive margin, people decide to work fewer hours, in order to remain under the eligibility threshold; this results in a decrease in the probability of working full-time in all countries. Moreover, a household based system does not give an employment incentive to the second partner in the household to start working, as total gross household income may surpass the income threshold, resulting in the loss of the IWB. We find a significant increase in the probability of working zero hours in all household based systems (except for Poland).

One way to avoid these negative effects at the intensive margin is to use a threshold based on hourly wages. Eligibility is then no longer dependent on total household income, and thus gives in principle no incentives for individuals to diminish their working hours in order to become eligible. This results, however, in a negative employment effect at the extensive margin in all countries, in comparison with Scenario 2.

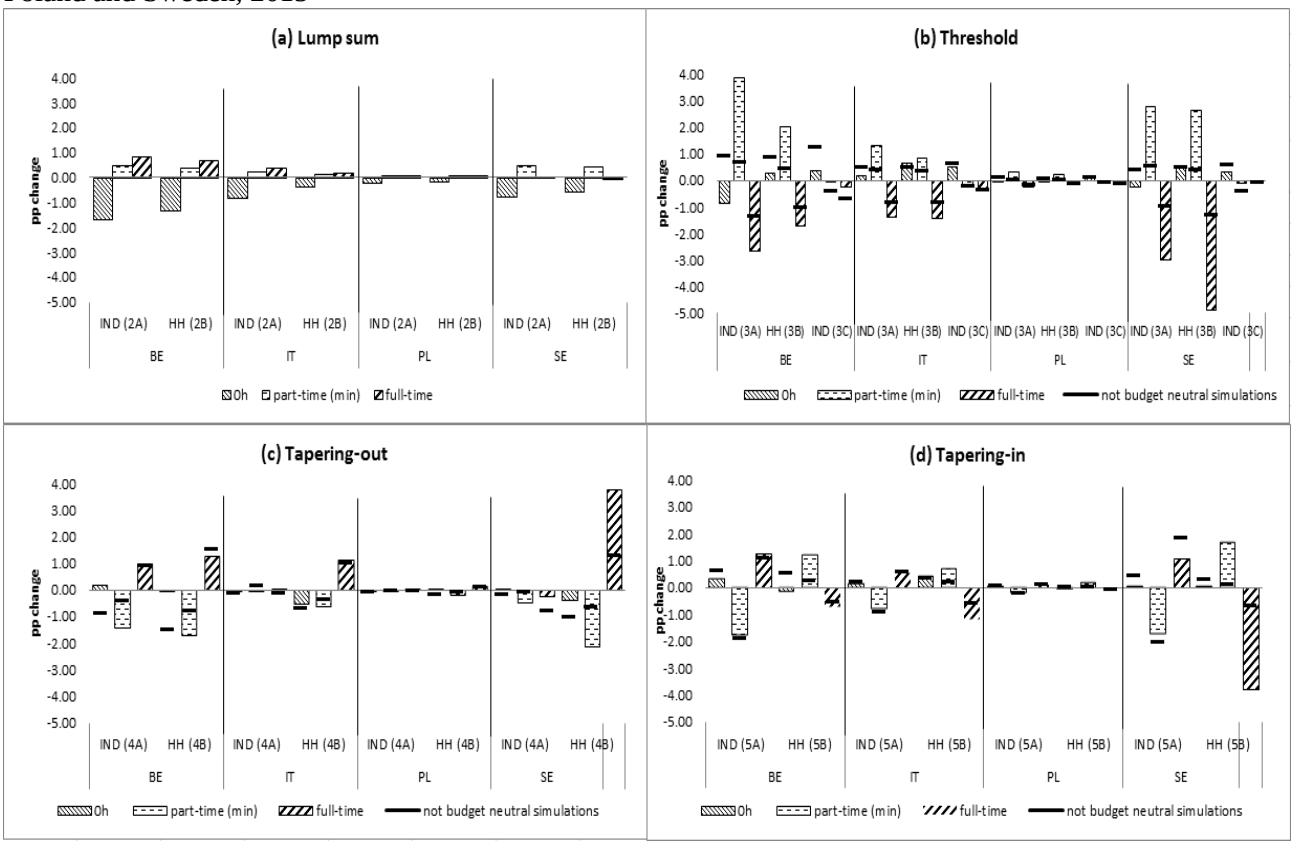
Introducing a tapering-out phase aims to give incentives to individuals to increase their hours worked in comparison with a single cut-off threshold. This is indeed the case, especially in a household based system. We notice a decrease of individuals who are not working and an increase of individuals working (almost) full-time. But, this type of IWB comes at a budgetary cost (see next section, Figure 5), and, in order to work in a budget-neutral way, the basic amount of the IWB needs to be lowered, resulting in mixed employment effects. In an individual based system, it gives a negative incentive to start working (mainly in Belgium and Sweden): the slower the tapering-out, the lower the basic amount of the IWB and the lower the incentive to start working. In a household based system, introducing a tapering-out can give an incentive to the second partner in the household to start working (mainly in Italy and Sweden): even if the total household income exceeds the income threshold, the family can still receive a part of the IWB in the tapering-out phase.

Introducing a tapering-in phase based on gross household income in a non-budget neutral way results in negative employment effects in all countries at the extensive level, with an increase of individuals not working due to the lower amount of the in-work benefit in the phase-in region. When working in a budget neutral way, the maximum amount of the IWB is increased, which results in mixed outcomes. It becomes desirable to lower the amount of hours worked in order to become eligible for the IWB, while the effect at the extensive margin is more mixed. The tapering-in can give an incentive to increase the hours worked if a person only works a few hours and is in the tapering-in phase of the IWB (working more hours not only generates a higher income from work but also a higher IWB). But, as the amount of the basic IWB increases, it can give an incentive to the second partner in the

household to diminish the hours worked in order to become or remain eligible for the IWB. In Belgium, we see a small decrease in individuals working zero hours, while we see the opposite in Italy. In Poland and Sweden, the differences at the extensive margin are not significant.

Introducing a tapering-in phase based on hours worked in a non-budget neutral way increases the probability of either not working or working full-time, and decreases that of working part-time. Also in the budget neutral simulations, we notice a negative incentive to start working part-time in Belgium and Italy, while the results in Poland and Sweden are not significant. It also gives an incentive to individuals to work more hours. In all countries, we see a significant increase in the probability of working full-time.

Figure 4: Impact of alternative scenarios of in-work benefits on employment effects in Belgium, Italy, Poland and Sweden, 2015



Source: Own calculations based on EUROMOD (underlying data EU-SILC 2012)

3.2.2. Budgetary Impact

We now discuss the budgetary impact of, on the one hand, changing the design in a non-budget-neutral way and, on the other hand, of incorporating labour supply effects, which we call the return effects. We express the government budget in the different scenarios as a percentage of the 1% of GDP budget. In all four countries, the return effects of the lump-sum in work benefit are larger for the individually based benefit than for the household one. The size of the effect differs however: it is the largest in Belgium, the country with the largest work incentive impact, and smaller in the other three countries (see Figure 5).

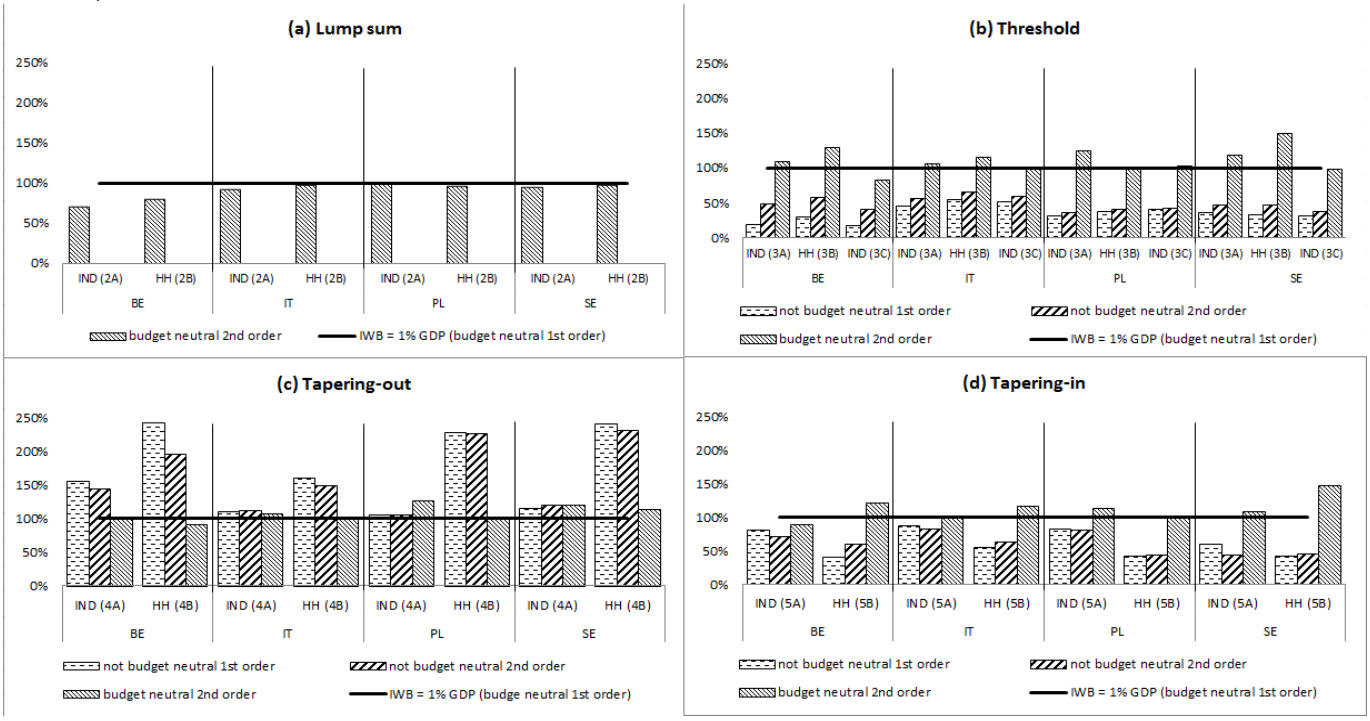
Introducing a threshold based on either income or hourly wage while keeping the basic amount at the level as in Scenario 2 diminishes the first order governmental cost substantially.

When labour supply effects are accounted for, the governmental cost increases back (due to the negative work incentives), resulting in a net cost ranging between 36% in Poland for an individual based system and 67% in Italy for a household based system (when using a threshold based on income). In all simulations except for Sweden, the governmental cost of an individual based system is lower than for a household one. When using the height of the in-work benefit as determined in the budget neutral scenarios and when incorporating labour supply effects, the cost for the government budget can be high, both in an individual and household based system. In an individual system, the budgetary loss of individuals diminishing their hours worked is more important than the budgetary gain of individuals starting to work, resulting in a second order budgetary loss for the government. In a household based system, this loss is even higher, due to the extra disincentive for the second partner. When hourly wages are used for the threshold (3C), the budgetary cost is comparable with using a lump-sum IWB.

Introducing a tapering-out phase while keeping the policy parameters fixed as in Scenario 3 comes at a relatively large first order budgetary cost, especially for the household based systems. Due to positive work incentives the total budgetary cost diminishes, but remains substantial, ranging between 112% in Italy for an individual based system to 232% in Sweden for a household based system. Introducing a tapering-out phase when policy parameters are set in a budget neutral way, the governmental cost is lower in all countries as the extra budgetary gain of individuals deciding to work more hours is larger than the budgetary loss of individuals not working. In an individual based system, the budgetary cost remains above 1% of GDP in all countries, while in a household based system it is below 1% in Belgium and Poland.

When adding a tapering-in phase, we find opposite outcomes for the income and hours worked simulations. Keeping the other policy parameters fixed as in Scenario 4 yields a first order budgetary gain for the government in all simulations. Taking also labour supply effects into account reduces the budgetary cost of an individual based system, as the extra budgetary gain of individuals working full-time is higher than the loss of individuals who do not work. In a household based system the budgetary cost increases when taking labour supply effects into account, due to more individuals deciding not to work and less individuals working full-time. When policy parameters are set as in budget neutral first order scenario, the budget decreases in an individual based system and increases in a household based system (when compared to respectively Scenario 4A and 4B), as one would expect following the directions of the work incentives (see supra).

Figure 5: Budgetary impact of alternative scenarios of in-work benefits in Belgium, Italy, Poland and Sweden, 2015



Source: Own calculations based on EUROMOD (underlying data EU-SILC 2012)

3.2.3. Poverty effects

We finally look to the impact of the different design scenarios on poverty by showing the percentage point changes of each scenario as compared to the previous one (see Table 1). We show first and second order effects on poverty rates using a fixed poverty line, in order to isolate the static effect of design changes from the effect of changes in labour supply. We also include the second order impact using a floating poverty line, in order to incorporate the effect of changes in the overall income distribution. Whether changes are statistically significant is indicated in Tables A4 and A5 in the supplementary data section. In comparison to a system without an IWB, the introduction of a lump-sum IWB reduces first order poverty rates when using a fixed poverty line in all countries (see Figure 6). The effect is stronger when using a household based system in comparison to an individual one. The latter is more beneficial for one person households and couples where both partners are at work, while the former is better for larger families and couples with only one working partner, which are more often found in the bottom of the income distribution. Taking account of labour supply effects reduces the poverty impact in all countries except Belgium, when using a fixed poverty line. Using a floating poverty line, the poverty reducing effect of the IWB strongly diminishes in all countries. As median income rises (due to the introduction of the IWB), also the poverty line increases, causing some families to fall below the poverty line (which were before found just above the fixed poverty line).

Introducing an income threshold based on gross income, in addition to the basic amount of Scenario 2, in an individual based system increases first order poverty rates. Individuals above the threshold stop receiving the IWB, causing some household to fall below the existing poverty line. Looking at a household based system, first order poverty effects are zero or very small in all countries. This can be expected, as families with low incomes keep receiving the

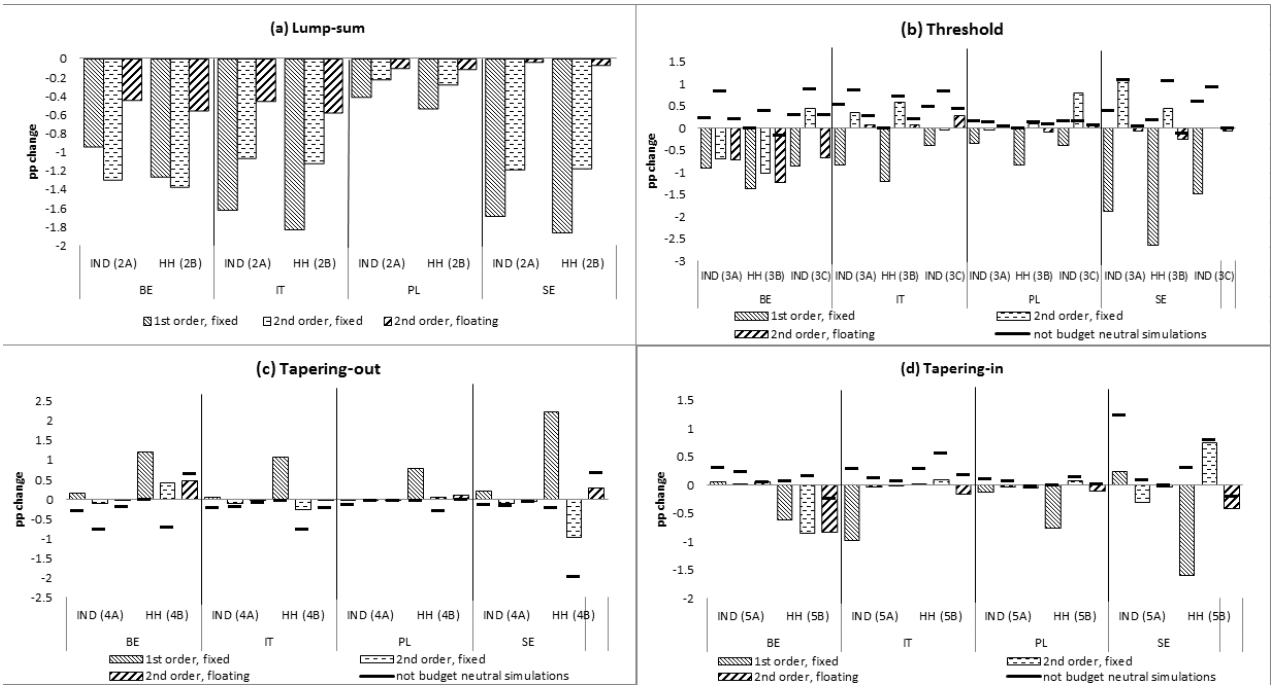
IWB. Introducing an income threshold in a budget neutral way gives the opportunity to increase the monthly amount of the IWB. Targeting the available resources to individuals/households with low gross incomes has a significant positive impact on first order poverty figures, with the household based system outperforming the individual one. Taking labour supply effects into account, the poverty reducing impact of the IWB strongly diminishes. Moreover, in Italy and Sweden, using an income threshold generates negative second order poverty effects in comparison with a lump-sum in work benefit, when using a fixed poverty line. This can be explained by the fact that, at the intensive margin, negative work incentives, in comparison with a lump-sum in work benefit, are given to individuals in order to become eligible for the IWB. In a household based system, extra negative work incentives at the extensive margin are generated for the second partner in the household, causing certain households to fall below the poverty line. When using a floating poverty line, this negative effect disappears. When hourly wages are used for the threshold (3C), results are roughly similar to those of the income threshold scenario (3A). Small differences may arise because individuals with a low hourly wage are not necessarily concentrated in the lowest income deciles. The stricter the hourly wage threshold, the higher the probability to target the poor.

Introducing a tapering-out phase when keeping the other policy parameters as in Scenario 3 results in very limited (Italy and Sweden) or insignificant (Belgium and Poland) first order effects on poverty figures. Setting the policy parameters in line with budget neutrality (i.e. lowering the basic amount of the IWB) has a negative impact on individuals lower in the income distribution, and thus on poverty figures, mainly in a household based system. Taking labour supply effects into account, the introduction of a tapering-out phase makes the negative first order poverty effect to disappear, resulting in an either insignificant or small positive effect on poverty figures. This might be explained by the fact that a tapering-out phase gives incentives to individuals to work more hours, both in an individual and a household based system, allowing some families to move over the poverty line.

Introducing a tapering-in phase based on gross household incomes (5B) when keeping the other policy parameters as in Scenario 4 increases first-order poverty in Italy and Sweden, while results are not significant in Belgium and Poland. Setting the policy parameters in line with budget neutrality (i.e. increasing the basic amount of the IWB), results in some households to jump over the poverty line, and thus positive first order poverty results. Taking labour supply effects into account yields mixed results: in Belgium, we notice a positive effect on second order poverty figures, comparable to the first order results. In Sweden, however, we notice a negative effect when using a fixed poverty line, but a positive one when using a floating poverty line. In Italy and Poland, the impact of introducing a tapering-in phase has an insignificant impact on poverty figures. The differences in results in Belgium and Sweden are due to a different interplay of work incentives at both the intensive and extensive margin (see supra).

Tapering-in can also be based on hours worked (5A). When keeping the other policy parameters as in Scenario 4, first order poverty increases in all four countries. Setting the policy parameters in line with budget neutrality (i.e. increasing the basic amount of the IWB) results in a small positive effect on first order poverty results in Italy and Poland, while the opposite effect is found for Sweden. In Belgium, the effects on poverty are not significant. Taking labour supply effects into account results in very small poverty effects, which are not significant in most countries. In Sweden we notice a small poverty reducing effect when using a fixed poverty line, which becomes insignificant when the poverty line is recalculated.

Figure 6: Impact of alternative in-work benefits on poverty figures in Belgium, Italy, Poland and Sweden, 2015



Source: Own calculations based on EUROMOD (underlying data EU-SILC 2012)

4 Conclusion

In this article, we have studied the impact of various designs of in-work benefits on both poverty and work incentives in Belgium, Italy, Poland and Sweden in an international comparative setting. Both the existing and alternative in-work benefits provide in general an incentive for people to take up a job. This incentive is stronger for an individual based in-work benefit in comparison with a household based one, a result often found in the literature (see e.g. OECD, 2005). In-work benefits have a poverty reducing effect, though this effect differs in magnitude according to the design. Especially an income threshold in a household system appeared to be a successful part of anti-poverty design. An important differentiating design characteristic is the unit of eligibility, with a household-based system generating a bigger effect on poverty reduction than an individual based one. But, when labour supply affects are taken into account, this effect is strongly attenuated (and sometimes becomes even negative), showing the importance of taking account of these second order effect in policy evaluation. Our results indicate that in-work benefits can indeed help to combat working-age poverty in Europe, but that is important to carefully pay attention to the design and the specific context. The difference in outcomes across countries indicates there is no one-size-fits-all solution.

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Supplementary material

Table A1: Basic descriptive statistics of the four subsamples

A. Belgium

	Couples, both available		Couples, one available	Single male	Single female
	Male	**Female**			
Average working time/week (hours)	36.8	26.9	23.5	31	25.8
Average hourly gross wage (€)	20.5	17.2	17.7	18.7	17
Participation rate (%)	91.2	80.8	64.1	77.9	76.6
Average age (years)	41.5	39	48.8	42.8	43.6
Higher education degree (%)	43.4	50.8	36.8	39.1	39.8
Presence of child (0-18) (%)	65.1		36.1	7.5	38.4
Income quintile 1 (%)	11.7		21.5	25.2	35.2
Income quintile 2 (%)	12.5		24	16.8	22
Income quintile 3 (%)	18.8		21.4	17.4	20.8
Income quintile 4 (%)	25.2		16.2	18.8	12.5
Income quintile 5 (%)	31.8		16.9	21.9	9.5
Number of households	1,494		674	453	631

B. Italy

	Couples, both available		Couples, one available	Single male	Single female
	Male	**Female**			
Average working time/week (hours)	38.3	23	21.5	36.1	30.3
Average hourly gross wage (€)	15.8	15.4	19.7	15.5	15.7
Participation rate (%)	95.5	68	60.4	91.2	83.5
Average age (years)	44.1	41.2	47.7	42.2	44.8
Higher education degree (%)	14.4	18.3	17.6	19.1	24.2
Presence of child (0-18) (%)	68.7		46.8	4.8	28.8
Income quintile 1 (%)	13.3		18.7	16.1	27.5
Income quintile 2 (%)	17		17.7	8.6	17.5
Income quintile 3 (%)	18.6		16.5	13.3	18
Income quintile 4 (%)	25.2		19.2	26.1	19.5
Income quintile 5 (%)	25.9		26.9	36	17.6
Number of households	3,693		2,394	1,112	1,519

C. Poland

	Couples, both available		Couples, one available	Single male	Single female
	Male	**Female**			
Average working time/week (hours)	40.7	29.9	32	33.8	29.8
Average hourly gross wage (€)	19.7	15.7	17.4	19	16.4
Participation rate (%)	96	78.3	79.7	83.4	78
Average age (years)	40.9	38.7	46.2	43.9	44.7
Higher education degree (%)	24.5	35.8	25.5	26.3	30.7
Presence of child (0-18) (%)	68.8		46.8	8.2	39.6
Income quintile 1 (%)	16.4		21.8	29.9	22.8
Income quintile 2 (%)	16.7		16.4	15.1	23.8
Income quintile 3 (%)	17.8		17.1	16.3	19
Income quintile 4 (%)	21.2		19	16	16.2
Income quintile 5 (%)	27.9		25.8	22.7	18.2
Number of households	2,556		1,498	331	667

D. Sweden

	Couples, both available		Couples, one available	Single male	Single female
	Male	**Female**			
Average working time/week (hours)	32.1	30	31.3	32	28.9
Average hourly gross wage (€)	28	24.2	37.3	24	26.2
Participation rate (%)	98.4	95.6	95.1	95.3	94.2
Average age (years)	43.9	41.6	48	41.3	43.8
Higher education degree (%)	35.7	48.5	36.9	23	41.9
Presence of child (0-18) (%)	62.8		39.2	13.5	32.3
Income quintile 1 (%)	7.2		14.2	22.3	32
Income quintile 2 (%)	13.4		13.5	19.8	23.2
Income quintile 3 (%)	20.1		20.1	23.8	21.3
Income quintile 4 (%)	26		22.9	21.8	12.7
Income quintile 5 (%)	33.4		29.3	12.5	108
Number of households	2,109		843	400	465

Source: own calculations based on EUROMOD (using EU-SILC 2012 for BE, IT, PL and SE)

Table A2: Estimated parameters of the quadratic utility function for single females

A. Belgium

	Coefficient		Standard error
Disposable household income			
Work experience female	0.0145	***	0.003
Work experience female squared	-0.000	***	0.000
Constant	1.4644	*	0.758
Disposable household income squared	-0.178	***	0.046
Non-working time			
Presence of child 0-3y[1]	0.0278	***	0.010
Presence of child 4-6y[1]	0.010		0.010
Presence of child 7-12y[1]	0.003		0.006
Age	-0.001		0.002
Age squared	0.000		0.000
Constant	0.490	***	0.069
Non-working time squared	-0.004	***	0.000
Non-working time * Consumption	-0.002		0.007
Dummy for working part-time	1.584	***	0.138

Note: *: p<0.1; **:p<0.05; ***:p<0.01. Excluded categories are [1]: Presence of child 13-18y. Estimations for the other subgroups are available from the authors upon request.

B. Italy

	Coefficient		Standard error
Disposable household income			
Work experience female	0.031	***	0.002
Work experience female squared	-0.000	***	0.000
Constant	4.085	***	0.413
Disposable household income squared	-0.217	***	0.038
Non-working time			
Number of children in household	0.022	***	0.004
Age	-0.019	***	0.003
Age squared	0.000	***	0.000
Middle education[1]	-0.004		0.013
Higher education[1]	-0.018	**	0.008
EU-migrant[2]	-0.1	***	0.014
Non EU-migrant[2]	-0.114	***	0.012
Regio2[3]	-0.009		0.009
Regio3[3]	-0.039	***	0.009
Regio4[3]	-0.013		0.009
Regio5[3]	0.004		0.013
Constant	1.206	***	0.069
Non-working time squared	-0.006	***	0.000
Non-working time * Consumption	-0.015	***	0.003
Dummy for working part-time	2.888	***	0.108

Note: *: p<0.1; **:p<0.05; ***:p<0.01. Excluded categories are [1]: Lower education; [2]: Non-migrant; [3]: Regio1. Estimations for the other subgroups are available from the authors upon request.

C. Poland

	Coefficient		Standard error
Disposable household income			
Work experience female	0.001		0.003
Work experience female squared	0.000		0.000
Constant	0.082		0.550
Disposable household income squared	-0.021		0.036
Non-working time			
Number of children in household	-0.018	***	0.004
Age	-0.013	***	0.003
Age squared	0.000	***	0.000
Middle education[1]	-0.031	**	0.014
Higher education[1]	0.008		0.010
Migrant[2]	-0.202		0.136
Regio2[3]	0.023	**	0.010
Regio3[3]	0.019		0.011
Regio4[3]	0.020		0.010
Regio5[3]	0.008		0.011
Regio6[3]	0.012		0.010
Constant	0.472	***	0.074
Non-working time squared	-0.002	***	0.000
Non-working time * Consumption	0.057	***	0.008
Dummy for working part-time	2.329	***	0.154

Note: *: p<0.1; **:p<0.05; ***:p<0.01. Excluded categories are [1]: Lower education; [2]: Non-migrant; [3]: Regio1. Estimations for the other subgroups are available from the authors upon request.

D. Sweden

	Coefficient		Standard error
Disposable household income			
Work experience female	0.002	***	0.000
Work experience female squared	-0.000	***	0.000
Constant	0.639	***	0.201
Disposable household income squared	-0.004	**	0.002
Non-working time			
Number of children in household	-0.004		0.010
Age	0.011	**	0.005
Age squared	-0.000	***	0.000
Middle education[1]	-0.051		0.031
Higher education[1]	-0.109	***	0.018
EU-Migrant[2]	0.014		0.031
Non EU-Migrant[2]	0.053	**	0.021
Regio2[3]	0.009		0.017
Regio3[3]	0.006		0.022
Constant	1.069	***	0.181
Non-working time squared	-0.008	***	0.001
Non-working time * Consumption	0.002		0.002
Dummy for working part-time	1.790	***	0.208

Note: *: p<0.1; **:p<0.05; ***:p<0.01. Excluded categories are [1]: Lower education; [2]: Non-migrant; [3]: Regio1. Estimations for the other subgroups are available from the authors upon request.

Source: own calculations based on EUROMOD (using EU-SILC 2012 for BE, IT, PL and SE)

Table A3: Impact on work incentives of different stylised in-work benefits, 2015

A. Belgium

Simulation	Compared to	Number of hours work				
		0	19	30	38	50
Policies 2015		21.82	11.06	10.56	45.26	12.30
No in-work benefit	Policies 2015	0.31*	-0.01	-0.08	-0.28*	0.06
Individual IWB						
Lump-sum	No in-work benefit	-1.68*	0.48*	0.34*	0.86*	0.00
Threshold	Lump-sum					
Income (not bn)		0.94*	0.69*	-0.09	-1.32*	-0.22*
Income (bn)		-0.87*	3.86*	0.44*	-2.67*	-0.77*
Hourly wage (not bn)		1.29*	-0.38*	-0.25*	-0.67*	0.01
Hourly wage (bn)		0.36*	-0.06	-0.05	-0.25*	0.00
Tapering-out income	Threshold income					
not budget neutral		-0.83*	-0.38*	0.66*	0.93*	-0.38*
Budget neutral		0.21*	-1.44*	0.22*	1.00*	0.01
Tapering-in hours worked	Tapering-out					
Not budget neutral		0.63*	-1.87*	-0.11*	1.12*	0.22*
Budget neutral		0.32*	-1.76*	0.04	1.27*	0.12*
Household IWB						
Lump-sum	No in-work benefit	-1.32*	0.39*	0.28*	0.69*	-0.04
Threshold income	Lump-sum					
Not budget neutral		0.89*	0.46*	-0.01	-0.99*	-0.35*
Budget neutral		0.27*	2.02*	0.38*	-1.70*	-0.98*
Tapering-out income	Threshold					
Not budget neutral		-1.45*	-0.74*	0.15*	1.57*	0.48*
Budget neutral		-0.07	-1.70*	-0.31*	1.29*	0.79*
Tapering-in income	Tapering-out					
Not budget neutral		0.52*	0.27*	0.01	-0.54*	-0.26*
Budget neutral		-0.13*	1.20*	0.39*	-0.71*	-0.75*

B. Italy

Simulation	Compared to	Number of hours work				
		0	19	30	38	50
Policies 2015		21.59	10.28	8.20	49.88	10.02
No in-work benefit	Policies 2015	0.56*	-0.74*	-0.47*	0.40*	0.28*
Individual IWB						
Lump-sum	No in-work benefit	-0.82*	0.26*	0.13*	0.41*	0.02
Threshold						
Income (not bn)		0.54*	0.42*	-0.05	-0.83*	-0.08
Income (bn)	Lump-sum	0.20*	1.32*	0.04	-1.40*	-0.15*
Hourly wage (not bn)		0.65*	-0.19*	-0.10*	-0.34*	-0.02
Hourly wage (bn)		0.50*	-0.13*	-0.07	-0.28*	-0.01
Tapering-out income	Threshold income					
Not budget neutral		-0.11*	0.18*	0.10*	-0.10*	-0.05
Budget neutral		-0.03	-0.01	0.06	0.02	-0.03
Tapering-in hours worked	Tapering-out					
Not budget neutral		0.21*	-0.89*	0.02	0.61*	0.06
Budget neutral		0.14*	-0.80*	0.06	0.56*	0.04
Household IWB						
Lump-sum	No in-work benefit	-0.39*	0.15*	0.06	0.17*	0.01
Threshold income	Lump-sum					
Not budget neutral		0.53*	0.38*	0.05	-0.82*	-0.14*
Budget neutral		0.65*	0.86*	0.16*	-1.42*	-0.26*
Tapering-out income	Threshold					
Not budget neutral		-0.68*	-0.35*	-0.04	1.02*	0.05
Budget neutral		-0.52*	-0.61*	-0.11*	1.12*	0.12*
Tapering-in income	Tapering-out					
Not budget neutral		0.36*	0.22*	0.05	-0.59*	-0.04
Budget neutral		0.42*	0.73*	0.21*	-1.17*	-0.19*

C. Poland

Simulation	Compared to	Number of hours work				
		0	19	30	38	50
Policies 2015		16.99	7.52	7.86	50.98	17.66
No in-work benefit	Policies 2015	0	0	0	0	0
Individual IWB						
Lump-sum	No in-work benefit	-0.20*	0.08	0.05	0.11*	-0.03
Threshold	Lump-sum					
Income (not bn)		0.12*	0.05	-0.02	-0.16*	0.00
Income (bn)		-0.06	0.33*	0.05	-0.26*	-0.06
Hourly wage (not bn)		0.16*	-0.06	-0.04	-0.09	0.03
Hourly wage (bn)		0.11*	-0.05	-0.03	-0.06	0.02
Tapering-out income	Threshold income					
Not budget neutral		-0.03	0.00	0.03	0.00	-0.01
Budget neutral		-0.01	-0.02	0.02	0.01	-0.01
Tapering-in hours worked	Tapering-out					
Not budget neutral		0.08	-0.20*	-0.02	0.11*	0.03
Budget neutral		0.04	-0.17*	0.01	0.11*	0.02
Household IWB						
Lump-sum	No in-work benefit	-0.17*	0.08	0.05	0.07	-0.04
Threshold income	Lump-sum					
Not budget neutral		0.10*	0.03	0.00	-0.11*	-0.02
Budget neutral		-0.01	0.21*	0.07	-0.16*	-0.12*
Tapering-out income	Threshold					
Not budget neutral		-0.13*	-0.04	0.01	0.16*	0.01
Budget neutral		0.04	-0.19*	-0.06	0.12*	0.09
Tapering-in income	Tapering-out					
Not budget neutral		0.05	0.01	0.00	-0.06	0.00
Budget neutral		-0.05	0.18*	0.07	-0.10*	-0.09

D. Sweden

Simulation	Compared to	Number of hours work				
		0	19	30	38	50
Policies 2015		7.73	9.17	14.49	66.08	3.53
No in-work benefit	Policies 2015	1.72*	0.23*	-0.61*	-1.63*	0.30*
Individual IWB						
Lump-sum	No in-work benefit	-0.75*	0.47*	0.39*	0.06	-0.15*
Threshold	Lump-sum					
Income (not bn)		0.41*	0.56*	-0.11	-0.96*	0.09
Income (bn)		-0.25*	2.79*	0.50*	-3.01*	-0.04
Hourly wage (not bn)		0.63*	-0.36*	-0.33*	-0.07	0.13*
Hourly wage (bn)		0.34*	-0.10*	-0.22*	-0.10*	0.07
Tapering-out income	Threshold income					
Not budget neutral		-0.14*	-0.05	1.04*	-0.78*	-0.06
Budget neutral		0.01	-0.47*	0.72*	-0.24*	-0.02
Tapering-in hours worked	Tapering-out					
Not budget neutral		0.44*	-2.04*	-0.36*	1.86*	0.10
Budget neutral		0.06	-1.74*	0.57*	1.11*	0.00
Household IWB						
Lump-sum	No in-work benefit	-0.55*	0.42*	0.37*	-0.07	-0.16*
Threshold income	Lump-sum					
Not budget neutral		0.50*	0.43*	0.31*	-1.27*	0.03
Budget neutral		0.49*	2.65*	1.93*	-4.89*	-0.19*
Tapering-out income	Threshold					
Not budget neutral		-0.98*	-0.63*	0.54*	1.33*	-0.27*
Budget neutral		-0.39*	-2.12*	-1.37*	3.79*	0.09
Tapering-in income	Tapering-out					
Not budget neutral		0.30*	0.12	0.15*	-0.65*	0.09
Budget neutral		0.03	1.70*	2.21*	-3.76*	-0.17*

* = statistical significant at confidence interval level of 0.05, calculations based on method developed by Goedemé et al. (2013)

Note: not bn = not budget neutral simulations. bn = budget neutral simulations

Source: own calculations based on EUROMOD (underlying data EU-SILC 2012)

Table A4: Individual (IND) / Household (HH) based in-work benefit: impact on poverty headcount, working age adults (18-64y old) and in-work poverty, first order, fixed and floating poverty line, 2015

A. Belgium

Simulation	Compared to	Poverty headcount (% point Δ) 18-64y old				Poverty headcount (% point Δ) – in work poverty			
		Fixed		Floating		Fixed		Floating	
		IND	HH	IND	HH	IND	HH	IND	HH
Policies 2015		10.05%				3.80%			
No in-work benefit	Policies 2015	0.26*		-0.02		0.27*		0.07	
Lump-sum	No in-work benefit								
Individual		-0.94*		0.14		-0.88*		-0.25*	
HH equiv. scale			-1.26*		-0.13		-1.11*		-0.47*
Threshold	Lump-sum (equivalence scale for HH)								
Income (not bn)		0.23*	0.00	-0.41*	-0.71*	0.14	0.00	-0.17*	-0.33*
Income (bn)		-0.9*	-1.36*	-0.8*	-1.36*	-1.07*	-1.31*	-1.05*	-1.19*
Hourly wage (not bn)		0.29*		-0.38*		0.25*		-0.09	
Hourly wage (bn)		-0.86*		-0.81*		-1.01*		-1*	
Tapering-out	Threshold income								
Not budget neutral		-0.29*	0.00	0.33*	1.36*	-0.18	0.00	-0.02	0.59*
Budget neutral		0.14	1.19*	0.27*	1.21*	0.16	1.18*	0.31*	1.08*
Tapering-in	Tapering-out								
Income (not bn)			0.07		-0.50*		0.05		-0.25*
Income (bn)			-0.62*		-0.06		-0.56*		-0.26*
Hours worked (not bn)		0.31*		-0.09		0.34*		0.09	
Hours worked (bn)		0.05		-0.09		0.13		-0.04	

B. Italy

Simulation	Compared to	Poverty headcount (% point Δ) 18-64y old				Poverty headcount (% point Δ) – in work poverty			
		Fixed		Floating		Fixed		Floating	
		IND	HH	IND	HH	IND	HH	IND	HH
Policies 2015		17.53%				11.50%			
No in-work benefit	Policies 2015	0.99*		0.14		0.82*		0.21	
Lump-sum	No in-work benefit								
Individual		-1.61*		-0.5*		-1.48*		-0.68*	
HH equiv. scale			-1.82*		-0.73*		-1.55*		-0.76*
Threshold	Lump-sum (equivalence scale for HH)								
Income (not bn)		0.53*	0.00	-0.07	-0.31*	0.35*	0.00	-0.09	-0.23*
Income (bn)		-0.84*	-1.21*	-0.87*	-1.14*	-1.11*	-1.02*	-1.13*	-0.97*
Hourly wage (not bn)		0.49*		0.02		0.34*		-0.01	
Hourly wage (bn)		-0.39*		-0.38*		-0.6*		-0.54*	
Tapering-out	Threshold income								
Not budget neutral		-0.20*	-0.01	0.09	0.58*	-0.15	-0.01	0.09	0.46*
Budget neutral		0.04	1.08*	0.21*	1.05*	0.1	0.91*	0.28*	0.89*
Tapering-in	Tapering-out								
Income (not bn)			0.30*		-0.05		0.28*		0.03
Income (bn)			0.01		-0.06		-0.76*		-0.46*
Hours worked (not bn)		0.30*		0.22*		0.33*		0.24*	
Hours worked (bn)		-0.97*		-0.61*		0.02		-0.07	

C. Poland

Simulation	Compared to	Poverty headcount (% point Δ) 18-64y old				Poverty headcount (% point Δ) – in work poverty			
		Fixed		Floating		Fixed		Floating	
		IND	HH	IND	HH	IND	HH	IND	HH
Policies 2015		16.92%				13.31%			
No in-work benefit	Policies 2015	/		/		/		/	
Lump-sum	No in-work benefit								
Individual		-0.41*		-0.15		-0.38*		-0.19*	
HH equiv. scale			-0.53*		-0.24*		-0.48*		-0.24*
Threshold	Lump-sum (equiv. scale for HH)								
Income (not bn)		0.15	0.00	-0.01	-0.16	0.14	0.00	0.02	-0.14
Income (bn)		-0.34*	-0.83*	-0.28*	-0.88*	-0.43*	-0.76*	-0.38*	-0.83*
Hourly wage (not bn)		0.15		-0.03		0.13		0.00	
Hourly wage (bn)		-0.39*		-0.15		-0.47*		-0.25*	
Tapering-out	Threshold income								
Not budget neutral		-0.12	-0.01	-0.11	0.49*	-0.13	-0.01	-0.09	0.42*
Budget neutral		-0.03	0.78*	-0.06	0.87*	-0.02	0.71*	-0.04	0.81*
Tapering-in	Tapering-out								
Income (not bn)			0.01		-0.16*		0.02		-0.13
Income (bn)			-0.75*		-0.78*		-0.68*		-0.71*
Hours worked (not bn)		0.11		0.02		0.13		0.05	
Hours worked (bn)		-0.13		-0.03		-0.13		-0.02	

D. Sweden

Simulation	Compared to	Poverty headcount (% point Δ) 18-64y old				Poverty headcount (% point Δ) – in work poverty			
		Fixed		Floating		Fixed		Floating	
		IND	HH	IND	HH	IND	HH	IND	HH
Policies 2015		13.7%				9.95%			
No in-work benefit	Policies 2015	2.17*		-1.04*		2.01*		-0.51*	
Lump-sum	No in-work benefit								
Individual		-1.68*		-0.49*		-1.79*		-0.74*	
HH equiv. scale			-1.86*		-0.51*		-1.89*		-0.72*
Threshold	Lump-sum (equiv. scale for HH)								
Income (not bn)		0.39*	0.17	-0.69*	-0.98*	0.34*	0.16	-0.55*	-0.83*
Income (bn)		-1.88*	-2.65*	-1.55*	-2.79*	-2.1*	-2.66*	-1.69*	-2.59*
Hourly wage (not bn)		0.59*		-0.26*		0.54*		-0.15	
Hourly wage (bn)		-1.48*		-1.21*		-1.67*		-1.37*	
Tapering-out	Threshold income								
Not budget neutral		-0.11	-0.21*	-0.05	1.87*	-0.10	-0.20*	-0.05	1.14*
Budget neutral		0.19*	2.23*	0.23*	2.52*	0.26*	2.26*	0.25*	2.32*
Tapering-in	Tapering-out								
Income (not bn)			0.31*		-0.86*		0.40*		-0.62*
Income (bn)			-1.59*		-1.55*		-1.39*		-1.35*
Hours worked (not bn)		1.23*		0.53*		1.40*		0.79*	
Hours worked (bn)		0.24*		0.24*		0.38*		0.39*	

* = statistical significant at confidence interval level of 0.05, calculations based on method developed by Goedemé et al. (2013)

Note: Not bn = not budget neutral simulations. bn = budget neutral simulations

Source: own calculations based on EUROMOD (underlying data EU-SILC 2012)

Table A5: Individual (IND) / Household (HH) based in-work benefit: impact on poverty headcount, working age adults (18-64y old) and in-work poverty, second order, fixed and floating poverty line, 2015

A. Belgium

Simulation	Compared to	Poverty headcount (% point Δ) 18-64y old				Poverty headcount (% point Δ) – in work poverty			
		Fixed		Floating		Fixed		Floating	
		IND	HH	IND	HH	IND	HH	IND	HH
Policies 2015		10.05%				3.80%			
No in-work benefit	Policies 2015	0.3*		0.13		0.24*		0.1	
Lump-sum	No in-work benefit								
Individual		-1.3*		-0.45*		-0.71*		-0.26*	
HH equiv. scale			-1.37*		-0.56*		-0.71*		-0.3*
Threshold	Lump-sum (equiv. scale for HH)								
Income (not bn)		0.82*	0.40*	0.21*	-0.17	0.34*	0.14	0.08	-0.07
Income (bn)		-0.7*	-1.03*	-0.73*	-1.24*	-0.51*	-0.39*	-0.54*	-0.51*
Hourly wage (not bn)		0.87*		0.29*		0.37*		0.15	
Hourly wage (bn)		-0.32*		-0.68*		-0.35*		-0.42*	
Tapering-out	Threshold income								
Not budget neutral		-0.75*	-0.69*	-0.17	0.67*	-0.30*	-0.33*	-0.07	0.18
Budget neutral		-0.12	0.42*	-0.01	0.45*	-0.1	0.40*	0.05*	0.34*
Tapering-in	Tapering-out								
Income (not bn)			0.16		-0.24*		0.09		-0.1
Income (bn)			-0.85*		-0.83*		-0.23*		-0.35*
Hours worked (not bn)		0.24*		0.05		0.11		0.03	
Hours worked (bn)		0.01		0.05		-0.04		-0.01	

B. Italy

Simulation	Compared to	Poverty headcount (% point Δ) 18-64y old				Poverty headcount (% point Δ) – in work poverty			
		Fixed		Floating		Fixed		Floating	
		IND	HH	IND	HH	IND	HH	IND	HH
Policies 2015		17.53%				11.5%			
No in-work benefit	Policies 2015	0.51*		0.14		0.49*		0.21	
Lump-sum									
Individual	No in-work benefit	-1.06*		-0.46*		-0.89*		-0.43*	
HH equiv. scale			-1.12*		-0.58*		-0.89*		-0.5*
Threshold									
Income (not bn)	Lump-sum (equiv. scale for HH)	0.85*	0.71*	0.28*	0.20	0.66*	0.58*	0.21	0.2
Income (bn)		0.44*	0.35*	0.07	0.06	0.3*	0.3*	0.01	0.08
Hourly wage (not bn)		0.83*		0.43*		0.64*		0.32*	
Hourly wage (bn)		0.58*		0.27*		0.39*		0.15	
Tapering-out									
Not budget neutral	Threshold income	-0.17	-0.75*	-0.06	-0.19	-0.15	-0.58*	-0.07	-0.12
Budget neutral		-0.11	-0.27*	-0.04	-0.03	-0.11	-0.2	-0.03	-0.02
Tapering-in									
Income (not bn)	Tapering-out		0.56*		0.19		0.42*		0.14
Income (bn)			0.09		-0.16*		0.04		-0.12
Hours worked (not bn)		0.13		0.07		0.11		0.05	
Hours worked (bn)		-0.04		-0.02		-0.03		-0.04	

C. Poland

Simulation	Compared to	Poverty headcount (% point Δ) 18-64y old				Poverty headcount (% point Δ) – in work poverty			
		Fixed		Floating		Fixed		Floating	
		IND	HH	IND	HH	IND	HH	IND	HH
Policies 2015		16.92%				13.31%			
No in-work benefit	Policies 2015	/		/		/		/	
Lump-sum									
Individual	No in-work benefit	-0.23*		-0.1		-0.2		-0.08	
HH equiv. scale			-0.28*		-0.12*		-0.24*		-0.1
Threshold									
Income (not bn)	Lump-sum (equiv. scale for HH)	0.13*	0.14*	0.03	0.08	0.11*	0.12*	0.03	0.08
Income (bn)		-0.04	-0.05	0	-0.09	-0.07	-0.02	-0.02	-0.03
Hourly wage (not bn)		0.16*		0.07		0.13*		0.05	
Hourly wage (bn)		0.1		0.09		0.05		0.04	
Tapering-out									
Not budget neutral	Threshold income	-0.02	-0.29*	-0.02	0.00	-0.02	-0.27*	-0.02	-0.02
Budget neutral		-0.01	0.05	-0.01	0.09	-0.01	0.02	-0.01	0.03
Tapering-in									
Income (not bn)	Tapering-out		0.14*		0.02		0.12*		0.03
Income (bn)			-0.07		-0.11*		-0.03		-0.05
Hours worked (not bn)		0.07		-0.02		0.08		-0.02	
Hours worked (bn)		-0.03		-0.05		-0.02		-0.05	

D. Sweden

Simulation	Compared to	Poverty headcount (% point Δ) 18-64y old				Poverty headcount (% point Δ) – in work poverty			
		Fixed		Floating		Fixed		Floating	
		IND	HH	IND	HH	IND	HH	IND	HH
Policies 2015		13.7%				9.95%			
No in-work benefit	Policies 2015	2.9*		-0.07		2.62*		0.29*	
Lump-sum	No in-work benefit								
Individual		-1.18*		-0.04		-1.13*		-0.17*	
HH equiv. scale			-1.17*		-0.07		-1.1*		-0.19*
Threshold	Lump-sum (equiv. scale for HH)								
Income (not bn)		1.09*	1.06*	0.05	-0.13	0.99*	0.94*	0.15	-0.03
Income (bn)		0.79*	1.12*	-0.07	-0.25*	0.67*	0.96*	-0.03	-0.12
Hourly wage (not bn)		0.92*		0.00		0.81*		0.1	
Hourly wage (bn)		0.44*		-0.08		0.32*		-0.1	
Tapering-out	Threshold income								
Not budget neutral		-0.15	-1.95*	-0.05	0.69*	-0.15	-1.66*	-0.07	0.34*
Budget neutral		-0.11*	-0.98*	-0.05	0.29*	-0.1	-0.86*	-0.07	0.19*
Tapering-in	Tapering-out								
Income (not bn)			0.80*		-0.19*		0.72*		-0.1
Income (bn)			0.74*		-0.41*		0.62*		-0.33*
Hours worked (not bn)		0.10		0.00		0.13		0.06	
Hours worked (bn)		-0.3*		-0.03		-0.26*		-0.02	

* = statistical significant at confidence interval level of 0.05, calculations based on method developed by Goedemé et al., 2013

Note: not bn = not budget neutral simulations. bn = budget neutral simulations

Source: own calculations based on EUROMOD (underlying data EU-SILC 2012)

[1] Theoretical studies mainly draw on optimal tax literature, see for instance Saez (2002). He derived theoretically that when extensive labour supply reactions are incorporated in the optimal tax schedule, subsidizing low-income workers becomes welfare-improving.

[2] That is, aged between 18-64 years old, not in education, (pre)retired or receiving a sickness or disability benefit

[3] As our labour supply model is based on the free choice of people whether to work or not and how many hours to work, we assume they are not eligible to receive unemployment benefits.

[4] In-work benefits can also take non-employment related characteristics into account, *e.g*. the presence of children. As they are often on the border with other policy domains, they are not taken into account in our simulations.

[5] When individuals start working or decide to work more hours, the government has to pay less social benefits and receives more revenues from social security contributions and personal income taxes.