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The Impact of In-Work Benefits on Female Labor Supply and Income Distribution in Spain

Luis Ayala and Milagros Paniagua

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Luis Ayala[a,c]

Milagros Paniagua[b,c]

[a] *Universidad Rey Juan Carlos*

[b] *Instituto de Estudios Fiscales*

[c] *EQUALITAS*

Abstract

In-work benefits (IWBs) have become very common transfer programs that seek to meet both efficiency and equity targets. An expanding literature has assessed the effects of these policies on income distribution and labor supply showing important implications for female labor participation. In this paper, we estimate the distributional and behavioral impacts of a simulated IWB in Spain based on the replacement of the existing working mother tax credit (WMTC) using as a reference the US Earned Income Tax Credit (EITC). We simulate the effects of the proposed scheme using EUROMOD and a discrete choice model of labor supply. Our results show that the enhancement of the proposed IWB would have significant and positive effects both in terms of female labor participation and inequality and poverty reduction. The introduction of this IWB would generate a substantial increase in labor participation at the extensive margin and a non-negligible reduction at the intensive margin.

JEL: I38, H23, J22

Keywords: in-work benefits; female labor supply; microsimulation; EITC; EUROMOD.

Corresponding author:

Luis Ayala (ORCID: 0000-0002-3141-827X)

Email: luis.ayala@urjc.es

Phone: +34 914959248

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INTRODUCTION

Policymakers try to prevent unemployed individuals from falling into poverty by offering unemployment benefits and other out-of-work transfers, including insurance and means-tested social assistance. A usual criticism is that traditional cash benefits might reduce unemployed individuals' incentives to work. In different countries, new policies that focus on low-income families with children have been put into effect, combining social assistance reforms with earned income tax credits. Regarding the latter, in-work benefits (IWBs) have become increasingly popular. In some countries, these schemes yield positive effects in terms of higher labor participation and lower poverty rates, leading to both efficiency and equity gains (Hotz and Scholz 2003; Nichols and Rothstein 2015). In their most basic form, IWBs are income tax credits that are available to low-income families—usually with children—that increase with earned income up to a certain point.

Many governments use tax credits and work-conditioned transfers as a means of providing cash assistance to low-income families with children (Brewer et al. 2009; Immervoll and Pearson 2009). However, as stressed by Eissa and Liebman (1996) IWB usually create an ambiguous set of labor supply incentives. In the case of women with children, while standard theory predicts that these schemes encourage labor participation they may also reduce the number of hours worked by some women already in the labor force.

An expanding literature has assessed the effects of these policies on incomes and hours worked. One strand of this literature has focused on optimal design issues (Saez 2002; Creedy 2005; Blundell and Shephard 2012). Several studies have also evaluated the impact of IWBs on work incentives and employment, generally finding positive and significant effects (Eissa and Hoynes 2004; Eissa et al. 2008; Blundell et al. 2013; Nichols and Rothstein 2015). More recent research has broadened the debate about IWBs from work incentives to wider questions, such as fertility decisions or household composition effects (Francesconi and van der Klaauw 2007; Baughman and Dicker-Conlin 2009; Grogger and Karoly 2009; Chetty et al. 2013; Chetty and Saez 2013; Hoynes et al. 2015; Guyton et al. 2016; Fisher 2016; Hoynes and Rothstein 2017).

While IWBs have become a key component of the tax-benefit system in a number of countries—such as the UK and the US—the scope of these benefits is much more limited in other OECD countries. The focus on working mothers is a specificity of Anglo-Saxon countries, characterised by large low-wage sectors, relatively low taxes but high child-care costs. In continental Europe, childcare is typically more affordable, but high reliance on social security contributions, typically imply high effective marginal tax rates. The focus in continental Europe has therefore typically been more on individualised schemes targeting all low-paid workers irrespective of family situation (Bargain and Orsini, 2006).

Paradoxically, some of the countries with less tradition of wage subsidies for working mothers face similar challenges to those that inspired the implemented reforms mentioned above. Among OECD countries, this is especially the case for Southern European countries, where the levels of family protection are low, the incidence of low-wage jobs is high, and female activity rates are significantly lower than those of men. For instance, Spain stands out among industrialized countries because of its lower labor participation rates among women –13% lower than that of men in 2016–, the higher incidence of low-wage jobs -more than 13% of workers had incomes below the poverty line that same year, being among the highest in the EU-, strongly countercyclical earnings inequality (Bonhomme and Hospido, 2017), and very low family benefits as a proportion of GDP –they are just over half of the EU-28 average.

Could an IWB increase the labor participation of women? Which would be the effects on poverty and inequality? Could the results of a hypothetical new policy help to better understand female labor supply in other countries? Given the extent of low and unequal wages and the insufficient coverage provided by social benefits, it seems reasonable that such a policy could simultaneously encourage many women to join the labor market and reduce the incidence of monetary poverty. Low-income earners in Spain have little support, apart from the existing working mother tax credit (WMTC)—i.e., a refundable tax credit (100 euros per month[1]) for working mothers with children younger than 3 years of age. The introduction of an IWB could thus improve the labor participation of women with children and reduce income poverty in these households. To assess IWB effects, one

[1] If the monthly social contribution is lower than 100 euros per month, the benefit is bounded by the social contribution.

promising approach involves the microsimulation of the likely impact of an IWB on labor supply and income using structural models.

In this paper, we estimate the effects on female labor supply and the redistributive impact of a simulated IWB in Spain based on the replacement of the current WMTC with a new IWB with a very similar structure to that of the US Earned Income Tax Credit (EITC). For this purpose, we use data from the Spanish sample of the EU Statistics on Income and Living Conditions (EU-SILC) survey, which will be the input database for EUROMOD—the microsimulation tool for calculating disposable income before and after the reform. EUROMOD is the only tax-benefit microsimulation model covering all EU countries, enabling researchers and policy analysts to calculate, in a comparable manner, the effects of taxes and benefits on household incomes and work incentives of each country's population and for the EU as a whole. To evaluate labor responses, we use the discrete choice approach proposed by Aaberge et al. (1995) and Van Soest (1995). These models assume that individuals choose their working hours between a discrete set of possibilities. They simplify the representation of budgetary constraints, and the utility function must only be evaluated for a limited number of points. Our target group[2] is the set of working women (aged 18–60), neither receiving pensions nor self-employed- that is, all the women with real availability to work. We focus on female labor supply as the literature has found it much more elastic than that of males (Crossley and Jeon 2007; Lalumia 2008; Selin 2014; Blundel et al. 2016).

Using our behavioral microsimulation model, we find that the proposed reform might produce significant efficiency and equity gains. The introduction of this IWB would generate a substantial increase in labor participation at the extensive margin but with a non-negligible reduction at the intensive margin. Moreover, it would lead to a reduction in income poverty, with remarkable improvement in the poorest working households. These results may have important implications for female labor participation in other countries, especially those with similar levels of part-time jobs and a notable proportion of non-working mothers. However, as usual in this type of evaluations, this remarkable impact both on efficiency and equity is largely dependent on the demand side of the labor market.

[2] In terms of allowing them change their hours worked supply, although not all of them will be affected by the reform.

For the distributional impact to be effective, a sufficient increase in demand is essential to absorb the increase in labor force participation due to the new IWB.

The structure of the paper is as follows. The opening section summarizes the particular design features of both the current system and the new IWB based on the EITC scheme. The second section introduces the structural discrete choice model of labor supply, which is used to estimate potential changes in the number of hours worked. In the third section, the data are presented. The fourth section shows the main results of the microsimulation analysis. The paper ends with a brief list of conclusions.

1. THE PROPOSED IWB FOR SPAIN

Spain's experience in the field of IWBs is limited. As in most Mediterranean countries, active employment policies have not generally targeted individuals who are already in the labor market. They have largely aimed to improve the employability of young people and other groups affected by unemployment. On the other hand, the most common strategies to support families have been tax benefits, a very limited national child benefit, and some regional benefits for low-income families (Adiego et al. 2012). A birth allowance consisting of a refundable tax credit was introduced in 2007 and subsequently suppressed. Tax benefits are mainly embedded in the personal and family allowances that some years ago were converted into tax credits.

Currently, the closest policy to an IWB in Spain is the WMTC, a fiscal benefit for working mothers with children younger than three years of age that was first implemented in 2003. This credit can be received as an annual lump sum when filing a tax return or as a monthly tax-free subsidy. Because mothers must be employed to receive the benefit, its level depends on the social contributions that have been paid by both the employee and the employer. If the working mother's monthly social contributions are above 100 euros, this amount is the benefit that she will receive. If her social contributions are below that level, she will receive an amount equivalent to the amount paid.[3] If this monthly benefit is postponed until the following year's tax return, the woman will benefit from a refundable tax credit up to 1,200 euros per year, according to the same rules associated with the social

[3] Most women working full-time pay enough contributions to receive the benefit.

contributions paid. When the working mother has more than one child under the age of 3, proportional amounts are calculated to be added to her final disposable income.

< TABLE 1 around here >

The number of WMTC recipients—both the taxpayers who file a tax return at the end of the fiscal year and those who receive a tax-free subsidy of 100 euros per month—increased until 2008 and then decreased. The ability to manage payments through income tax returns by the National Tax Agency has helped this scheme attract more participants than other family policies managed by regional administrations. The most outstanding trend has been the shift towards a higher proportion of women opting for the tax-return option (Table 1).[4]

Few analyses examine the impact of the WMTC. In general, it has been interpreted as a policy with small distributional effects because all women who pay at least 100 monthly euros in social contributions are entitled to receive it regardless of their income level. In addition, this low-level benefit does not seem to encourage work. Fuenmayor et al. (2006) reviewed the fiscal impact of this policy using microsimulation and a theoretical cost-benefit model of the labor market participation of married women. They found that the deduction for maternity substantially softens the undesirable impact of the personal income tax structure in Spain, which provides favorable treatment to families with one non-working spouse through the joint tax declaration. Sánchez-Mangas and Sánchez-Marcos (2008) explored the effect of the WMTC policy on eligible women's labour market participation. They found a small but significant positive effect of the policy. Azmat and González (2010) found that WMTC significantly increased both fertility (by almost 5%) and the employment rate of mothers with children under three (by 2%).

Although not specifically focusing on this measure, other papers have analyzed the relationship between tax reforms and female labor supply. Examining taxable income elasticities, Badenes (2001), Díaz (2004), and Sanmartín (2007) analyzed the changes in the behavior of the second earners in households—mostly women—due to the removal of the obligation to file taxes jointly. In general terms, their results were inconclusive. Fuenmayor

[4] A similar result was found by Brewer (2001) for the US. The reason why this happens is because people might interpret this payment as an extra salary for holidays or special expenditures.

et al. (2017) also analyzed the reform that allowed spouses to choose between joint and separate taxation involving a reduction in tax rates for secondary earners. They found that married women in families more strongly affected by the fiscal reform increased their labor participation more than secondary earners from families less affected by the reform.

In our microsimulation model we propose the implementation of a new policy within the Spanish tax-benefit system replacing the current WMTC by an IWB with the same structure as the US Earned Income Tax Credit (EITC), following the optimal design proposed by Saez (2002).[5] Among the different IWBs enacted in OECD countries, the US EITC is one of the most popular schemes. It has become the largest benefit for low-income households in the US, and a rapidly expanding literature has focused on its impact on labor participation and redistribution. Because it seems to encourage work and promote redistribution, the EITC has become a very popular antipoverty program (Scholz 1996; Hoynes and Patel 2015; Nichols and Rothstein 2015), and it will be used as reference here.

However, it is not the only successful IWB. In the UK, IWBs have a long history, although they have undergone several reforms. Over the past three decades, the UK has offered three different IWBs. These family-based IWBs have turned into mechanisms that enhance efficiency and equity (Blundell 2006). Similar evidence has been found in other OECD countries. Bargain and Orsini (2005) found that wage subsidies in Finland, Germany and France encourage married women to take jobs and that family-based tax credits and individual wage subsidies yield significant poverty reductions. Figari (2010) confirmed the possibility of enhancing both the redistributive and incentive effects of the Italian tax-benefit system through the introduction of different IWBs. In addition, for Italy, De Luca et al. (2014) analyzed the labor supply and redistributive effects of introducing the EITC and the WTC as in US and UK, respectively, finding that they would have a significant positive effect on the labor supply of married women, weak negative effects on that of married men, and a strong and positive impact on equity. The EITC would be more effective than the WTC in promoting employment for women, while the WTC would be

[5] Saez (2002) suggests that, when behavioral responses are concentrated along the intensive margin, the best scheme is a traditional means-tested benefit with a substantial guaranteed income support and a large phase-out tax rate. By contrast, when behavioral responses are concentrated on the extensive margin, the optimal scheme is a transfer program with negative marginal tax rates at low income levels and a small guaranteed income.

more effective in reducing poverty. With a simulated IWB for Spain, Oliver and Spadaro (2012) show a potential increase in the percentage of the labor supply of working mothers and a small reduction in the number of hours worked by their partners. [6] The latter result is in line with the main findings for other countries, where higher disposable incomes that result from IWBs seem to discourage second earners' incentives to work.[7]

Being one of the main goals of this paper to analyze the effects of the proposed reform on female labor supply, taking the EITC as a reference may be a convenient option given the important effects found on women's labor participation. In the US, a large proportion of the dramatic increase in the labor force participation of single mothers with low educational levels in the 1990s could be attributed to the increased generosity of the EITC. Eissa and Liebman (1996) and Meyer and Rosenbaum (2001) showed that the EITC increased important incentives for entering the labor market, but the effects in the intensive margin were not as obvious. These results were in line with those anticipated by Pencavel (1987) and Blundell and MaCurdy (1999), who predicted low elasticities for individuals who were already working. These effects are different according to the type of household[8] since working families with children face higher costs and have higher labor supply elasticities than those without children.[9] The US EITC and the British Working Family Tax Credit (WFTC) seemingly act as labor disincentives for second earners, who are mostly women (Bargain and Orsini 2005). Nevertheless, empirical evidence suggests that the EITC promotes employment among eligible unmarried women with children, whereas it leads to disincentives for most eligible second earners (Eissa and Hoynes 2004).

[6] The difference of our simulation with respect to Oliver and Spadaro (2012) is that their proposed reform is to redesign the existing WMTC by enlarging the number of beneficiaries while we follow the optimal design proposed by Saez (2002).

[7] The impact of the WTC is affected by the Child Tax Credit (CTC), making the combination of the two a more complex proposal to be simulated as compared to the EITC.

[8] Family-based IWBs are more common in Anglo-Saxon countries, whereas Belgium –the so-called "Employment Bonus", a rebate on low skilled social security contributions– and France – "La Prime Pour l'Emploi", a tax credit for low-income households– have implemented individual IWBs. Family income-based eligibility rules and their interactions with other features of the tax-benefit system make the analysis of their impact on work incentives quite complex. In general terms, individual IWBs ultimately promote work incentives, whereas family-based IWBs tend to discourage the labor participation of second earners.

[9] Considering children's ages is important in the design of IWBs, as households with younger children usually show stronger behavioral responses. Blundell and Shepard (2012) studied the optimal design of these policies for low-income families and highlighted the importance of including age in the design of the incentives.

Following a scheme similar to the EITC, our proposal for Spain consists of three monthly thresholds: T1 (300 euros), T2 (680 euros), and T3 (1,000 euros). Working women with monthly earnings below T1 will receive a subsidy that phases in with income at a rate of 1.067. Those with earnings between T1 and T2 will receive a lump-sum benefit –the maximum amount (320 euros). For those with earnings between T2 and T3, the benefit will phase out according to the formula benefit=1000-earnings. Benefits will end when earnings are higher than 1,000 euros.

< FIGURE 1 around here >

In our simulated scenario, the new IWB replaces the existing WMTC so that a working mother who fulfills the requirements will receive the new IWB but not the WMTC. Figure 1 shows the design of the new policy, which differs in four fundamental aspects from the former credit. First, the IWB has a phase-out segment that does not exist in the current scheme. Second, the benefit level is much higher –320 euros instead of 100 euros per month. Third, in the new IWB, the income test considers earnings rather than contributions. Finally, only salaried women will have access to the IWB.[10]

Since no policy like the EITC has been designed in Spain, we decided to implement these parameters according to the following reasons. On the one hand, the reform is assumed to be revenue neutral (ex-ante) with respect to the current WMTC. On the other hand, because the general goal is to design a policy that mirrors the EITC, our IWB will have a similar relationship among its different parameters. Historically, the maximum amount to be paid by the EITC has been the same as the income level that determines the beginning of the plateau phase. Given that the EITC considers household income, some adjustments must be made using equivalence scales. We also assume that the amount defined as the maximum benefit and the initial income of the plateau phase will be very similar.

Additionally, in the EITC incomes at the end of the phase out represent an increase of over 200% –depending on the number of children– compared with the income level at the

[10] Given their different labor behaviors, only women aged 18–60 except self-employed and disability pensioners are included within the scheme. They are not included because their different labor behavior.

beginning of the plateau phase. In the Spanish case, the "mileuristas"[11] are a special concern, so we decided to set the income limit at 1,000 euros to qualify for the benefit. This amount represents a 233% increase from the starting income range of 300 euros, more or less in line with the relationship that exists in the EITC. The plateau phase has been defined broader than it is in the US scheme to ensure a relevant number of recipients in that segment. In other words, the goal is to have a greater number of people who receive benefits at the maximum amount, which is why we have set the beginning of the phase out at 680 euros –slightly above the minimum wage.[12] Finally, choosing 320 euros per month as the benefit limit not only is similar to the 300 euros at the beginning of the plateau phase – ensuring that the reform is revenue neutral– but also is closely linked to the levels set in other schemes in the Spanish tax-benefit system.

Therefore, the chosen levels can be justified both in terms of the existing design of similar policies in other countries and as comparable amounts to those set in other policies that have already been implemented in Spain.

2. A DISCRETE CHOICE MODEL OF LABOR SUPPLY

The EITC scheme proposed for Spain seeks to improve both labor participation and incomes among low-wage women. Given the likelihood of significant behavioral effects on both the intensive and extensive margins, possible changes in individual labor supply decisions must be analyzed. To estimate Spanish women's reactions to the IWB, we follow the literature of static structural discrete choice models of labor supply (Aaberge et al. 1995; Van Soest 1995; Creedy and Kalb 2005). These models are static because only current behaviors are considered—long-term reactions are not. An underlying economic model makes them structural, and they are discrete because only a few hourly levels are considered in the budgetary constraint. Which alternatives for the number of hours are included in the choice set is indeed relevant within the discrete choice setting. Some authors show that predicted errors are reduced when the alternatives are sampled from the original distribution rather than being imposed (Aaberge et al. 2009).

[11] In social policy debates in Spain, "mileurista" is a popular neologism that refers to a person who earns 1,000 euros a month.

[12] With the economic crisis, an important part of the lower wages fell to levels close to that minimum.

We focus on working women between the ages of 18 and 60 neither receiving pensions nor self-employed.[13] Figure 2 provides an indication of the weekly hours worked by the target group. As expected, Spain has a traditional Mediterranean distribution in the number of hours worked, with sizeable peaks corresponding to part- and full-time jobs. Primarily civil servants and bank employees constitute the peak corresponding to jobs with 35-hour work weeks.

< FIGURE 2 around here >

We convert weekly work hours into a set of three possible alternatives: 0, 20 and 40 hours, where 0 is assigned to women who work fewer than 10 hours, 20 to those who work more or equal 10 but fewer than 32, and 40 to the remaining women who are considered full-time workers. This discretization leads to 46.35% of targeted women out of the labor market and 14.21% and 39.44% working part-time and full-time respectively.

We seek to determine whether a new IWB can encourage Spanish women to work—either by joining the labor force or by increasing the number of hours worked. Notably, prior evidence has shown that most transitions take place on the intensive margin, with fewer changes in the number of hours worked by part-time employees. In a groundbreaking study, Scholz (1996) found that most workers who receive the EITC have incomes that position them in the flat or phase-out region, such that the unemployed are clearly incentivized to get a paying job when these schemes are implemented. Eissa and Hoynes (2004) found that labor supply responds to this transfer program but these responses are concentrated along the extensive margin rather than the intensive one.

A basic model of labor participation may clarify these relationships. In this model, individuals have a limited amount of time to allocate to work and leisure. The trade-off between leisure and income can be represented by the individual's utility function:

[13] Men's reactions have not been considered, as the proposed new policy does not apply to them. Regardless, we follow the conclusions of Bargain and Peichl (2013), who reviewed 282 estimated elasticities for OECD countries and found that elasticities are much higher for women than for men, which are positive but very small in most cases.

$$U=U(y,L) \quad [1]$$

where L is leisure and y is net income, including labor and non-labor income. If personal characteristics (X) are considered, a more generalized expression of the direct utility function is as follows:

$$U=U(y,h; X) \quad [2]$$

where h is the number of hours worked. A usual functional form for this utility function is as follows:

$$U_i = \alpha y_i + \beta y^2_i + \gamma h_i + \delta h^2_i + \lambda y_i h_i \quad [3]$$

where $\alpha = \alpha_0 + \alpha_1 A$ and $\gamma = \gamma_0 + \gamma_1 B$, where A is a vector containing the variables related to income: age and education and B is the vector with the related variables to hours: number of children and age.

Apart from the aforementioned variables, fixed costs—such as childcare—are considered. In our model, they depend on the woman's number of children under 3 years of age. They are subtracted from disposable income when individuals work part- or full-time. This issue is addressed in the maximization of the likelihood function by reducing income for women who work 20 or 40 hours. Fixed costs are usually related to expenses incurred through childcare services such as kindergartens.

The variables chosen for equation [3] are usually considered when assessing behavior in the standard theory of labor supply. The trade-off between income and work hours is affected by personal characteristics to such extent that they may determine the final number of hours offered.

The proposed simulation is essentially probabilistic because the determinants of an individual's behavior cannot be known with any certainty. From a discrete choice perspective, individuals maximize their utility by selecting the number of hours they wish to work (h) subject to the constraint that only certain numbers of hours, $h_i \quad i = 1,...,k$, are

available. The utility associated with each level (U_i^*) is a function of $U(h_i / X)$ and ν_i, where ν_i is the error term:

$$U_i^* = U(h_i / X) + \nu_i = U_i + \nu_i \qquad [4]$$

A probability distribution over the available hours is influenced by the properties of ν_i: $p_i = P(h = h_i)$ for i=1,…,*k*. Utility maximization implies that a level of hours i is chosen if $U_i^* \geq U_j^* \ \ \forall j$ iff $U_i + \nu_i \geq U_j + \nu_j \ \ \forall j$ iff $\nu_j \leq U_i - U_j + \nu_i \ \ \forall j$.

For any given value of ν_i, probabilities are calculated as follows:

$$P(U_i^* \geq U^*{}_j \ \ \forall j) = P(U_i + \nu_i \geq U_j + \nu_j \ \ \forall j) = P(U_i + \nu_i - U_j \geq \nu_j \ \ \forall j) =$$
$$P(\nu_i + U_i - U_1 \geq \nu_1, \nu_i + U_i - U_2 \geq \nu_2, ..., \nu_i + U_i - U_k \geq \nu_k)$$

that assuming independence leads to $\prod_{j \neq i} P(\nu_j \leq U_i - U_j + \nu_i)$.

The overall probability can be obtained by aggregating the terms above over possible values of ν_i. Let us assume that the distribution of the error term ν is specified by its density function $f(\nu)$—in the continuous case—and its distribution function $F(\nu)$. Then,

$$p_i = P(h = h_i) = \int_{-\infty}^{\infty} \left(\prod_{j \neq i} F(\nu_i + U_i - U_j) \right) f(\nu_i) d\nu_i \qquad [5]$$

where the distribution of ν in terms of its density function follows a specific case of extreme value distribution:

$$f(\nu) = \exp(-\nu - e^{-\nu}) \qquad [6]$$

The extreme value distribution—also known as a Gumbel, double exponential, or Fisher-Tippett Type I—has a more general expression:

$$f(y) = \frac{1}{\beta}\exp(-\frac{y-\mu}{\beta})\exp(-e^{-\frac{y-\mu}{\beta}}) \quad [7]$$

Equation [6] is obtained substituting $\mu = 0$ and $\beta = 1$ in [7]. Substituting [6] in [5] the probabilities turn into

$$p_i = P(h = h_i) = \frac{\exp(Ui)}{\sum_j \exp(Uj)} \quad \forall i \in J \quad [8]$$

which is a multinomial logit specification.

3. DATA

The dataset used to estimate the model and both income changes and labor supply responses is the 2014 Spanish sample of the EU-SILC, which is transformed into a EUROMOD format to follow the standard structure required to run the simulations. We take 2014 as a reference because it is the most recent year that can be analyzed with the last version of EUROMOD. In order to test the sensitivity of the results to the year of study, the same estimates were made with 2010 data, a year in which the recession of the Spanish economy had already begun but without a rise in unemployment as drastic as that of the first half of the next decade.[14]

EUROMOD is a tax-benefit microsimulation model for the EU, which calculates the effects of tax-benefit reforms on household income, well-being, inequality and poverty on national and supranational levels (Sutherland 2007, Sutherland and Figari 2013). Tax-benefit models are based on micro-data from statistical sources that cover national populations. EU-SILC is the input database for the majority of the countries included in EUROMOD. The Spanish version of EU-SILC (ECV, *Encuesta de Condiciones de Vida*) contains information on incomes from various sources, such as labor, pensions, social benefits, and property. EUROMOD calculates disposable income by applying tax-ben policy rules using household level information on population characteristics and market

[14] While in 2014 a 46.4% of the women in the sample did not work that percentage was 27.4% in 2010.

incomes as inputs. In general terms, disposable income is defined as market income plus social benefits minus income taxes and social security contributions.

EUROMOD does not include behavior in the simulation of changes in household or individual income. It is used for the econometric estimation of the utility function in order to calculate disposable income at the three scenarios of labor participation (non-working, working part-time and working full-time). Disposable income depends on labor and capital income and also on the tax-benefit system. It's trough the latter as EUROMOD generates disposable income of all the households in the survey.

Not all the sources of a tax-benefit model can be simulated because of missing information in the input dataset. For instance, the treatment of old-age pensions or unemployment benefits requires longitudinal data on individuals' working lives. In such cases, some imputations are performed so that the final disposable income can be known. The policy changes that EUROMOD simulates are national and regional income taxes; social insurance contributions paid by employers, employees and the self-employed; family benefits; housing benefits; social assistance benefits; and other income-related benefits. As mentioned above, certain taxes and benefits, such as real estate taxes, pensions and survivor benefits, contributory benefits and disability benefits, are not generally simulated but taken from the input dataset.

As in other microsimulation models, all the calculations are performed twice, first under the current system and then after policy change are introduced. Disposable incomes are compared to assess whether households are better off after the simulated reforms. Using a microsimulation model whose input database is a survey that contains information of household and individual incomes is advantageous because it captures distributive changes. As in many other countries, household income is underestimated in Spain because of the lack of information on certain sources of income and the need for imputations (Adiego et al. 2012).

Transformed into a EUROMOD format, the original sample from the EU-SILC 2014 includes 11,965 households and 31,622 individuals. For our study, we have selected 5,398 women (aged 18–60) who are not receiving old-age, survival or disability pension and are not self-employed. Some of these women work, and others do not. Complete information

on their gross wages is needed to assess their transitions into the labor market. In the case of working women, the standard practice is to assign them the data that are reported in the survey -the wage rate implied by reported earnings and hours. For non-working women, a reservation wage needs to be estimated, controlling for the likely selection bias associated with labor market decisions.

Among the different alternatives, we use Heckman's two-step sample selection correction. The two-step statistical approach starts by setting up a model for the probability of employment, usually following a probit regression framework. The variables that we include in *X* are educational attainment (two dummy variables), work experience, age, age squared, other household income, region of residence and two dummy variables that represent whether the woman has a partner and whether she has children between 3 and 6 years of age. Once the probit model has been estimated, the resulting estimators are used to predict the probabilities of employment for all the individuals—working and non-working. The predicted values were introduced in the second equation —the wage equation— as an additional explanatory variable.

< TABLE 2 around here >

Table 2 presents estimates of the probability of employment for the women in our sample, the wage equation and the self-selection bias. Regional dummies (NUTS1) have been included in both estimates to control for differences in demand across territories.[15] Most of the variables used in the selection equation have also been included in the wage equation -when it makes economic sense. In the case of the variable age in the wage equation, although it is not explicitly specified among the explanatory variables, it is indirectly included through experience and educational attainment.

Most of the coefficients from the two-step estimation have the expected signs. On the one hand, having children between 3 and 6 years of age and cohabitating with a partner seem to reduce the probability of employment although the coefficients are not significant, whereas

[15] The classification of the regions is as follows: Region 1=Galicia, Asturias, Cantabria; Region 2=Basque Country, Navarre, Rioja, Aragón; Region 3=Madrid; Region 4=Castille and León, Castille-La Mancha, Extremadura; Region 5=Catalonia, Valencia, Balearic Islands; Region 6=Andalusia, Murcia, Ceuta, Melilla; Region 7=Canary Islands.

higher educational attainment increases this probability. On the other hand, the wage equation shows that both work experience and educational attainment increase gross wages. Finally, the inverse Mills ratio is significant, indicating the need for selection bias correction.

4. RESULTS

4.1. Labor market participation

We apply the labor supply model described in section 2 to the selected sample of women. We replicate the dataset comprising 5,398 women three times (0, 20 and 40 hours) because the model must have three possible states that women can choose—no work, part-time work or full-time work. The variables that we allow to change are the hours worked by the targeted women—men in the survey are assumed to display inelastic behaviors—monthly gross wages and other labor variables, such as the number of months employed or unemployed.

This new dataset is used as the EUROMOD input to estimate behavior using equation [3]. For the initial estimates, no reform is considered, and the 2013 tax and benefit rules are applied to the new dataset. The output can be seen in Table 3. In general terms, the results of the utility function estimates are in line with standard economic theory. Most of the coefficients are significant. Moreover, positive coefficients for income, negative for income squared and positive for hours squared are as expected from the economic theory. The hours coefficient is not negative but a very small positive.

< TABLE 3 around here >

These parameters determine the labor supply structure of our data according to the chosen utility function.[16] However, as mentioned before, the simulation is not deterministic, and a stochastic component needs to be considered. We incorporate the random process using the so-called maximum probability rule (Bargain and Orsini 2006), which ensures that the

[16] According to our results, 66 per cent of the marginal utilities are positive. Some authors, like Liégeois and Islam (2010), incorporate ex-ante on the likelihood function the constraint that all individuals have positive marginal utilities. Imposing such a restriction would, however, modify the behavior of the data.

optimal choice for each individual, given the estimated labor supply function, corresponds to the choice actually made. For its implementation, the observed distribution of the number of hours worked is replicated by drawing conditionally from the stochastic error structure, such that the predicted choice probability is maximized in the observed state. We then keep a number of draws that lead to predictions, where the predicted choice probability is maximized in the observed state. Using 100 draws, we apply the maximum probability rule to derive the preferred choice after the introduction of the new IWB. To calculate transition probabilities between states (0–20–40 hours) for all the women with children, we use the mean of the predicted transitions over the 100 repetitions.[17]

< TABLE 4 around here >

Table 4 presents the estimates for the three possible transitions. The introduction of an IWB would reduce the proportion of non-working women from 46.4% to 34.4% and the proportion of women working full-time from 39.5% to 31.4%. Part-time jobs would increase more than double because of transitions on the extensive margin (from 0 to 20 hours) and transition at the intensive margin (from 40 to 20 hours). The results mainly show an increase in the number of mothers who decide to join the labor market.[18] This finding is in line with other studies for Italy (Figari, 2009) and Spain (Oliver and Spadaro 2012), where a somewhat similar IWB scheme increases the labor market participation of coupled women by 6.0% and 6.5%, respectively.[19]

Although a third of these women would not alter their labor market participation, the new policy would foster substantial results on the extensive margin. Almost thirty-one percent of women who were not working before the reform are predicted to enter the labor market. This remarkable impact on the extensive margin requires reasons that would make

[17] Since we define three possible states in terms of the number of hours worked (0, 20 and 40 hours), the estimates focus on the changes that the new IWB would produce in the probability of moving from one of those states to another.

[18] A similar result of increasing labor participation was found with 2010 data. The main difference in 2014 with respect to 2010 is that at the most recent date there would be a higher percentage of women who would not work despite the reform and a smaller proportion of those who would stop working full time to do part-time work (13.7% in 2014 and 24.1% in 2010).

[19] Different models were estimated for single women and women cohabiting with their spouses but the estimated model in the case of the former did not converge.

such transitions realistic, given that public spending on childcare would not change. We estimated the effect of a variable representing the fixed costs associated with working and paying for childcare-related services.[20] In addition to the higher participation of women in the labor market, movements on the intensive margin would also occur, leading some women to reduce the number of hours worked. They would do so by moving from full- to part-time jobs due to the phase-out effect.[21] This result is in line with the IWB experience in other countries. Table 5 shows the differences in educational attainment in the possible transitions. Women moving from full- to part-time jobs or not being working are the most educated.

< TABLE 5 around here >

Despite the very significant behavioral impact, the analysis of labor supply in our microsimulation approach does not consider restrictions on the demand side. Our assessment of the proposed scheme largely depends on a partial analysis of the labor market. The expected employment improvement would only be attainable in a framework in which an expansion of the labor demand could absorb the supply side growth.

4.2. Distributional effects

Apart from improving labor market participation, IWB schemes also aim to increase low-wage individuals' earnings, thereby producing changes in the income distribution. The goal of increasing incomes of women who could benefit from the new IWB —thereby increasing household incomes— introduces a wide range of possible distributional effects. To identify this impact, we analyze disposable household income in three different contexts: the baseline; Scenario 1, in which the possible changes in labor behaviors are not considered; and Scenario 2, in which these behavioral changes are considered. Household disposable income is calculated by adding the incomes of all individuals in the household and adjusting the resulting number with an equivalence scale —the so-called modified OECD equivalence scale. The baseline setting takes into account the tax-benefit system in

[20] Fixed costs were introduced as a disposable income reduction when women decided to work 20 or 40 hours.

[21] Most women reducing the number of hours worked are in the higher income deciles whereas the ones in the lower deciles are encouraged to entering into the labor market.

force in 2013. In Scenario 1, the WMTC is replaced by the new IWB, but behavioral changes are omitted. In Scenario 2, these changes are considered. In the latter scenario, given that what we know is the probability of moving between the three states —not working, working part-time, and working full-time—, once we consider changes in labor supply households' disposable incomes are defined as the average incomes in each state multiplied by the corresponding transition probability.[22]

To assess how the implementation of the new policy might affect the original distribution, we estimate a set of inequality measures. To identify the global effects of our IWB, we first present estimates that assume that no labor participation changes occur. Second, we allow individuals to change their behaviors according to the parameters of the estimated econometric model. We include confidence intervals in the estimates to assess whether changes in inequality caused by the reform will be significant.

< TABLE 6 around here >

Overall, the new IWB for Spain seems to reduce inequality only when behavioral effects are addressed (Table 6). There is no significant difference between the Gini index for the reform without reactions and the baseline scenario, whereas the reform incorporating labor supply responses leads to a 8.8% reduction.[23] This difference is statistically significant and supports the consideration of behavioral reactions to correctly interpret inequality changes that result from the reform. The Theil index ($c = 0$) will decrease by almost 20%, and the Atkinson index ($\varepsilon=1$) will decrease by 18%.

< FIGURE 3 around here >

Further insights into the nature of inequality changes can be gained by looking at the effects of the new IWB on the income distribution as a whole. As stated before, when the effects of the new scheme are estimated without considering labor reactions, the differences between the baseline distribution and the one corresponding to the reform are

[22] We calculate a weighted mean using the transition probabilities and the disposable income she could have in the three hypothetical states (working 0, 20 or 40 hours).

[23] That difference was 4.2% in the simulation for 2010.

very small (Figure 3). However, when labor responses are considered, the new distribution is characterized by a greater weight of middle incomes and the reduction of the lower and upper tails. This new shape of the simulated distribution shows therefore the strong effect on inequality reduction of the reform under study.

Similar effects are found when we look at the different impact of the reform in each income decile (Figure 4). When labor responses are considered, income increases for all the deciles, but with a much greater impact on low-income deciles than on the richest households. While in the first decile the average income gain is about 60%, in the richest decile that increase is just over 2%. As the figure also shows, the data on the winners of the reform show the progressiveness of the new scheme, with a number of winners in the first decile that is five times greater than that of the highest decile.

< FIGURE 4 around here >

One of the IWB's main goals is to increase low-wage individuals' incomes. As such, one of the most relevant results to test is how poverty would change with implementation of the new policy. We use the index proposed by Foster, Greer and Thorbecke (FTG) (1984) as our poverty measure:

$$FGT(\alpha) = \frac{1}{n}\sum_{i=1}^{q}\left(\frac{z - y_i}{z}\right)^{\alpha}, \text{ with } \alpha \geq 0 \qquad [9]$$

where z is the poverty threshold; q are households whose incomes are below that threshold; y_i denotes household income; and α measures inequality aversion. We use the most standard value of the index ($\alpha=0$) that makes the FGT equal to the headcount ratio. As Table 7 shows, the poverty rate would not change significantly with the new IWB assuming no behavioral reactions. However, when labor supply responses are considered, the effects of the new IWB on the incidence of poverty become remarkably stronger with a reduction of more than 17%. This decrease in the poverty rate is even greater with lower poverty lines, illustrating the potential of IWB schemes to reduce severe poverty.[24]

[24] We use fixed poverty lines.

< TABLE 7 around here >

An interesting question is how the IWB might affect the poverty structure by household type, especially when behavioral changes are included in the evaluation. Prior empirical findings show that family-based tax credits and individual wage subsidies both reduce poverty significantly and change the composition of poverty in some countries (Bargain and Orsini 2006). Our estimates show a greater reduction of poverty rates for couples with children after the introduction of the new IWB in the Spanish tax and benefit system.[25] This reduction is even larger when 30% of the median income is used to determine the poverty threshold. The FGT index can be used to break down the reform's potential effect on the contribution to total poverty of each category. Given a population divided into $k = 1, 2, ..., K$ mutually exclusive groups, the index can be additively decomposed as follows:

$$FGT(\alpha) = \sum_{k=1}^{K} n_k \, FGT\,(\alpha)_k \qquad [10]$$

where $n_k = N_k/N$ represents the relative population of subgroup k, and $FGT(\alpha)_k$ represents the poverty index that corresponds to that subgroup.

< TABLE 8 around here >

As Table 8 shows, our estimates of the respective contributions to poverty confirm that couples with dependent children would be the main beneficiaries of the reform, remarkably reducing their contribution to poverty rates. This type of household —whose contribution would decrease by 16%— would remain one of the household types that substantially contribute to total poverty, but the gap with other groups would be substantially reduced

In short, the enhancement of the proposed IWB would yield significant and positive effects in terms of inequality and poverty reductions and promote substantial labor incentives. These observed results are in line with previous findings for Spain associated with the

[25] The poverty rate of single-parent households would decrease from 41.5% to 24.1%, and that of couples with children would decrease from 24.0% to 17.5%.

impact of different tax reforms on the labor supply (Labeaga et al. 2008). Nevertheless, this remarkable twofold impact is largely dependent on the demand side of the labor market. For this distributional impact to be effective, a sufficient increase in demand is essential to absorb the increase in labor force participation due to the new policy.

5. CONCLUSION

IWBs have proven to be effective tools in reducing poverty and enhancing labor participation in many countries. Although the effects might not be optimal in some population groups, such as secondary earners, the overall assessment of their performance seems positive in terms of efficiency and equity gains in a number of countries. Furthermore, recent evidence also points to positive unintended effects in a variety of dimensions, including improvements in health status and social relationships.

In this paper, we offer evidence of the potential effects of the implementation of a specific IWB scheme in Spain. We define a standard IWB scheme that follows the optimal design proposed by Saez (2002), which includes three earnings thresholds, a subsidy that phases in with income, a lump-sum benefit for individuals with earnings between the two first thresholds and benefits that phase out from the second threshold up until a given level. We take the general characteristics of the EITC as a reference.

One of the contributions of this paper is its treatment of behavioral responses. To estimate Spanish women's reactions to the IWB, we have followed a specific approach within the framework of structural discrete choice models of labor supply. Compared with other behavioral microsimulation models that are non-structural, this approach has the advantage of resting on both an economic model and the current distribution of hours worked. The estimated parameters from the utility function are in line with the prototypical models of labor supply, with income positively affecting utility and working hours having the opposite effect.

One of the paper's main findings is the sizeable impact that the new scheme might have on women's labor market participation. Our estimates yield a substantial reduction of the proportion of non-working women. Nevertheless, this result is compatible with extensive

margin movements, with a segment of working mothers moving from full- to part-time work. These results are somewhat similar to those of previous studies for other countries.

Taking into account behavioral reactions, the simulated results of the proposed IWB show unequivocal gains in terms of reducing inequality and poverty. However, these results do not hold when the reform is evaluated precluding the foreseeable changes in labor participation. When labor transitions are addressed, all the estimated inequality measures are remarkably lower after the simulated reform. Given that poverty reduction is one of the key targets of these reforms, the drastic decrease of poverty rates stands out. Our results unequivocally point to an especially marked reduction in the incidence of severe poverty. Furthermore, the introduction of an IWB like the simulated one would not only change poverty levels but also the composition of poverty in Spain. Families with children would particularly benefit from the new scheme.

It must be noted that the remarkable impact on labor participation and poverty reduction is largely dependent both on the demand side of the labor market and the generosity of the amounts chosen for the simulation. For the distributional impact to be effective, a sufficient increase in demand is essential to absorb the increase in labor force participation due to the new IWB. Regarding the phase-in and out ratio and the amounts chosen, the proposed reform has been designed following the optimal taxation theory to show the large impact of these policies when these parameters are generous.

Although results could be less positive in contexts of demand constraint or with lower levels of benefit, the proposed IWB might produce very positive equity effects without creating substantial labor disincentives. While the expected results should be subjected to the natural caveats that are implicit in this type of microsimulation models and to the parameters chosen, the resulting efficiency and equity improvements would seemingly give rise to higher levels of social welfare. Using our behavioral microsimulation model, we find that the proposed reform might produce significant efficiency and equity gains. Results may have also important implications for female labor participation in other countries, especially those with similar levels of part-time jobs and a notable proportion of non-working mothers.

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Table 1. Cost and number of recipients of the WMTC

COST	(Thousand euros)			BENEFICIARIES	Beneficiaries by filling the tax return
	All WMTC	Monthly payment	Tax credit in the tax return		
2003	607,24	231,00	376,24	2003	424,63
2004	652,11	169,07	483,05	2004	533,444
2005	721,00	162,20	558,80	2005	611,342
2006	766,63	154,70	611,93	2006	679,096
2007	827,63	130,80	696,83	2007	764,678
2008	871,18	118,80	752,38	2008	826,515
2009	870,64	99,80	770,84	2009	843,851
2010	862,88	95,90	766,98	2010	834,905
2011	865,36	79,20	786,16	2011	857,323
2012	848,35	77,64	770,71	2012	770,707
2013	822,40	75,27	747,13	2013	805,842
2014	806,23	66,57	739,66	2014	803,736

Source: National Tax Agency.

Table 2. Wage equation

Hourly gross wage (ln)	
Level of education (secondary)	.3146***
Level of education (tertiary)	.9779***
Work experience	.0363***
Work experience squared	-.0004***
Region 2	.2103***
Region 3	.1413***
Region 4	.0162
Region 5	.1104***
Region 6	-.0462
Region 7	-.1581**
Constant	.9232***
Selection equation	
Level of education (secondary)	.4690***
Level of education (tertiary)	.1967***
Age	.1404***
Age squared	-.0016***
Couple	-.0311
Children (age below 3)	-.0378
Other household income	-.0002***
Region 2	.1995***
Region 3	.1549**
Region 4	-.2084***
Region 5	.1565**
Region 6	-.3982***
Region 7	-.3751***
Constant	-3.096***
Lambda	.0592*
N	5,398

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 3. Estimates of the labor supply model

Income	
Age	-.003
Level of education (secondary)	-1.117**
Level of education (tertiary)	-3.055***
Constant	2.362***
Income squared	
Constant	-.686*
Hours worked	
Number of children	-.071
Age	.207*
Constant	.866*
Hours worked squared	
Constant	3.530***
Income * Hours	
Constant	-1.136
Fixed costs	
Number of children younger than 3	-.017
Constant	.503***
N	5,398
Log likelihood	-4927

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4. Labor supply effects (transitions between states)

		After IWB			
	Number of hours	0	20	40	Total
Before IWB	0	15.7	15.7	15.1	46.4
	20	4.9	4.8	4.4	14.1
	40	13.9	13.7	11.9	39.5
	Total	34.4	34.2	31.4	100.0

Table 5. Average educational level by transitions[a]

Number of hours	0	20	40
0	2.7	2.7	2.9
20	3.5	3.4	2.9
40	4.0	3.8	3.2

[a] A value between 0 and 5 was assigned to each of the six educational levels – *deb* variable in EUROMOD, ordering the categories from lower to higher educational level

Table 6. Distributional effects

	Baseline	Scenario 1	Scenario 2
Gini	0.3467 (0.3430, 0.3505)	0.3483 (0.3446, 0.3521)	0.3163 (0.3127, 0.3200)
Theil (c=1)	0.1947 (0.1899, 0.1995)	0.1964 (0.1916, 0.2013)	0.1661 (0.1615, 0.1707)
Theil (c=0)	0.2226 (0.2167, 0.2285)	0.2253 (0.2194, 0.2312)	0.1783 (0.1735, 0.1832)
Atkinson (ε=0.5)	0.1004 (0.0981, 0.1027)	0.1014 (0.0991, 0.1037)	0.0831 (0.0810, 0.0851)
Atkinson (ε=1)	0.1996 (0.1949, 0.2043)	0.2017 (0.1970, 0.2064)	0.1633 (0.1593, 0.1674)
Atkinson (ε=2)	0.9272 (0.8568, 0.9977)	0.9273 (0.8571, 0.9976)	0.4001 (0.3621, 0.4380)
P90/P10	5.45 (5.30, 5.60)	5.52 (5.36, 5.67)	4.36 (4.27, 4.46)
P90/P50	2.09 (2.06, 2.12)	2.10 (2.07, 2.13)	1.97 (1.95, 2.00)
P50/P10	2.60 (2.53, 2.67)	2.63 (2.56, 2.69)	2.21 (2.17, 2.25)

[1] The numbers in parentheses represent the confidence interval at a 95% level.

Table 7. Changes in poverty rates after the reform
(threshold: 60 and 30% of median income)

	Baseline	Scenario 1	Scenario 2
$\tau = 0.6$	22.2	22.4	18.3
$\tau = 0.3$	6.8	7.0	4.1

Table 8. Relative contribution to poverty rates

z = 0.6	RELATIVE CONTRIBUTION		
Household type	Baseline	Scenario 1	Scenario 2
1 adult	0.091	0.090	0.110
2 adults with no dependent children	0.158	0.157	0.165
Other households with no dependent children	0.216	0.214	0.225
1 adult with 1 or more dependent children	0.040	0.041	0.040
2 adults with 1 or more dependent children	0.293	0.296	0.245
Other households with 1 or more dependent children	0.202	0.202	0.215
z = 0.3	RELATIVE CONTRIBUTION		
Household type	Baseline	Scenario 1	Scenario 2
1 adult	0.133	0.130	0.198
2 adults with no dependent children	0.147	0.144	0.117
Other households with no dependent children	0.170	0.166	0.205
1 adult with 1 or more dependent children	0.052	0.051	0.053
2 adults with 1 or more dependent children	0.269	0.282	0.200
Other households with 1 or more dependent children	0.229	0.226	0.225

Figure 1. IWB proposal

Figure 2. Number of hours worked per week, 2014

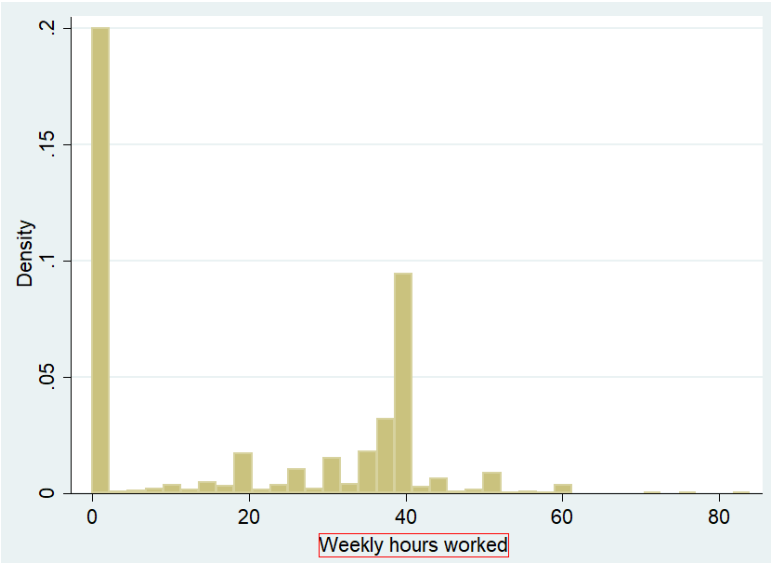

Figure 3. Income distribution in the different scenarios

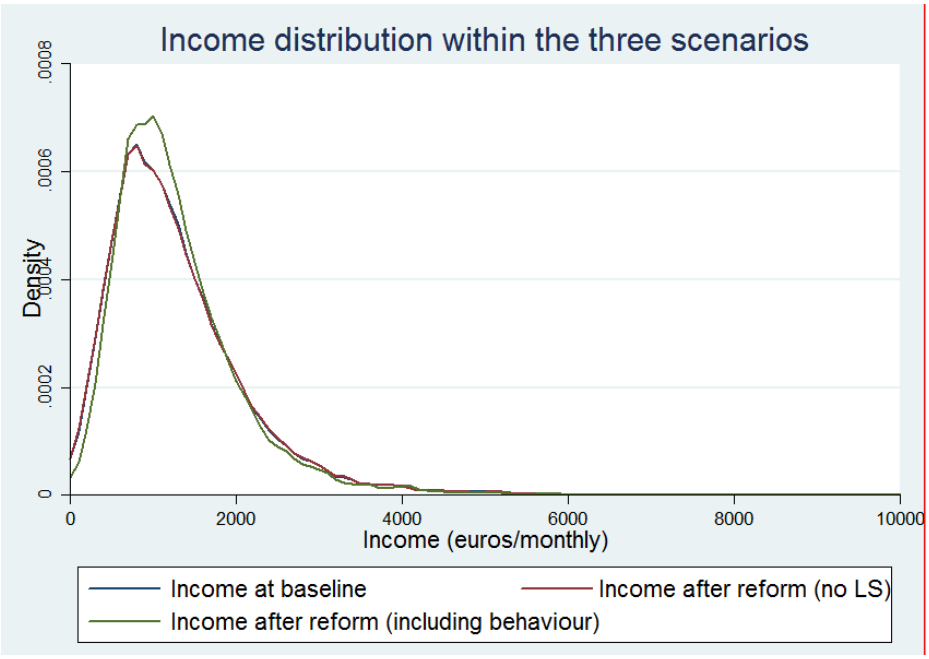

Figure 4. Average growth and winners by income decile