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Well-Being, Poverty and Labor Income Taxation:
Theory and Application to Europe and the U.S.*

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ADDITIONAL MATERIAL ONLY.

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Abstract

This document provides six appendices A-F related to Maniquet and Neumann (2016): A) the proof of proposition 1, B) the analysis of the optimal tax scheme according to the social preferences derived in section 3 in the paper, C) an extended description of the methodology used, the OECD Tax-Benefit Calculator, including all data, specific settings and assumptions, D) a comparison of budget curves across household types, exploring whether having children makes it easier to get out of poverty, E) extensions to check the robustness of the results in section 5 of the paper with respect to several assumptions made, and F) the full set of results of the application in section 5 of the paper, namely simulated budget curves for all countries and all household types and the values for the criterion developed in the paper to evaluate them.

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A Proof of proposition 1

Proof. We let the easy proof that R^{lex} satisfies *Poverty Reduction*, *Pareto* and *Independence* to the reader. We concentrate on the second statement. The proof is divided in three steps. In the first two steps, we prove that social preferences satisfying the three properties we have defined also satisfy other, stronger, properties. We begin by proving that if social preferences R satisfy *Poverty Reduction*, *Pareto* and *Independence*, then they satisfy the following strengthening of *Poverty Reduction*.

Property 1 For all economies (R_1, \dots, R_n) , for all pairs of allocations $z = (z_1, \dots, z_n)$ and $z' = (z'_1, \dots, z'_n)$, if, for two agents j and k

$$\begin{aligned} \ell_j &= \ell'_j = \ell'_k = \ell_k, \\ c_j &< c'_j < p < c'_k < c_k, \end{aligned}$$

whereas $z_i = z'_i$ for all other agents, then $z' P z$.

We prove this claim in two steps, corresponding to two cases for the value of $\ell_j = \ell'_j = \ell_k = \ell'_k$. Case 1: $\ell_j = \ell'_j = \ell_k = \ell'_k = 1$. Then there exist $z'' = (z''_1, \dots, z''_n)$ and $z''' = (z'''_1, \dots, z'''_n)$ such that $z''_j I_j z_j$, $z'''_j I_j z'_j$, $z''_k I_k z_k$ and $z'''_k I_k z'_k$,

$$\begin{aligned} \ell''_j &= \ell'''_j = \ell''_k = \ell'''_k < 1, \\ c''_j &< c'''_j < p < c'''_k < c''_k, \end{aligned}$$

and $z''_i = z'''_i = z_i = z'_i$ for all other agents. By *Pareto*, $z'' I z$ and $z''' I z'$. By transitivity, we now need to prove that $z''' P z''$, which corresponds to case 2.

Case 2: $\ell_j = \ell'_j = \ell_k = \ell'_k < 1$. Let us assume, contrary to the claim, that

$$z R(R_1, \dots, R_n) z' \tag{1}$$

where social preferences are written $R(R_1, \dots, R_n)$ to denote their dependence on the profile of individual preferences. Let bundles z_j^1, z_j^2 and z_j^3 be defined by

$$\begin{aligned} z'_j P_j z_j^3 I_j z_j^2 P_j z_j^1 I_j z_j, \\ \ell_j^1 &= \ell_j^2 = \ell'_j, \\ \ell_j^3 &= \ell_j. \end{aligned}$$

Now, we construct $z''_k, z^1_k, z^2_k, z^3_k$ and R''_k in such a way that

$$\begin{aligned} l''_k &= l^3_k = l_k, l^1_k = l^2_k = l'_k, \\ c''_k &> c_k, c^3_k - c'_k = c'_j - c^3_j, c^2_k - c^1_k = c^1_j - c^2_j, \\ z''_k &I''_k z^1_k P''_k z^2_k I''_k z^3_k P''_k z'_k, \text{ and} \\ I(z'_k, R''_k) &= I(z'_k, R_k). \end{aligned}$$

The construction of those bundles and preferences are illustrated in figure A.1.

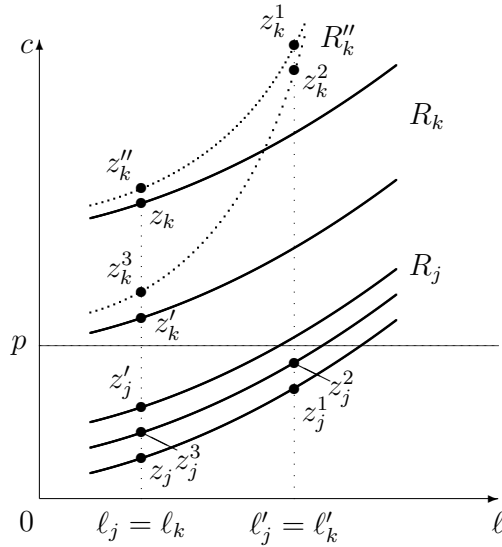


Figure A.1: Illustration of the proof of the first claim

Let preferences R'_k be such that

$$\begin{aligned} I(z_k, R'_k) &= I(z_k, R_k) \\ I(z'_k, R'_k) &= I(z'_k, R_k) \\ I(z''_k, R'_k) &= I(z''_k, R''_k). \end{aligned}$$

By *Independence*, eq. 1 implies that

$$z R(R_1, \dots, R'_k, \dots, R_n) z'. \quad (2)$$

Let us define $z'' = (z''_1, \dots, z''_n)$ by fixing $z''_i = z_i$ for all $i \neq k$ (z''_k is defined above). By *Pareto*,

$$z'' P(R_1, \dots, R'_k, \dots, R_n) z. \quad (3)$$

By transitivity, eq. 2 and 3 imply

$$z'' P(R_1, \dots, R'_k, \dots, R_n) z'. \quad (4)$$

By *Independence*,

$$z'' P(R_1, \dots, R''_k, \dots, R_n) z'. \quad (5)$$

We define z^1, z^2 and z^3 by: $z_i^1 = z_i^2 = z_i^3 = z_i$ for all $i \neq j, k$ and the corresponding bundles of j and k are defined above. By *Pareto*, we can deduce that

$$z^1 I(R_1, \dots, R''_k, \dots, R_n) z''. \quad (6)$$

By *Poverty Reduction*,

$$z^2 P(R_1, \dots, R''_k, \dots, R_n) z^1. \quad (7)$$

By *Pareto*,

$$z^3 I(R_1, \dots, R''_k, \dots, R_n) z^2. \quad (8)$$

By *Poverty Reduction*,

$$z' P(R_1, \dots, R''_k, \dots, R_n) z^3. \quad (9)$$

Gathering eq. 5, 6, 7, 8 and 10, we obtain

$$z' P(R_1, \dots, R''_k, \dots, R_n) z', \quad (10)$$

the desired contradiction.

We proceed by proving that social preferences satisfying *Poverty Reduction*, *Pareto* and *Independence*, and, therefore, property 4, also satisfy the following property.

Property 2 For all economies (R_1, \dots, R_n) , for all pairs of allocations $z = (z_1, \dots, z_n)$ and $z' = (z'_1, \dots, z'_n)$, if, for two agents j and k

$$\begin{aligned} \ell_j &> \ell'_j > \ell'_k > \ell_k, \\ c_j &= c'_j = c'_k = c_k = p, \end{aligned}$$

whereas $z_i = z'_i$ for all other agents, then $z' P z$.

Let us assume, contrary to the claim, that

$$z R z'. \quad (11)$$

The following construction is illustrated in figure A.2. Let $\delta_k^1 > 0$ be such that there exists $c_k^1 > p$ such that

$$(\ell_k + \delta_k^1, c_k^1) I_k z_k.$$

The idea is to choose δ_k^1 as close as possible to $\ell'_k - \ell_k$, but the shape of the indifference curve through z_k may be such that δ_k^1 is bounded above. Let c_j^1 be defined by

$$(\ell_k + \delta_k^1, c_j^1) I_j z_j.$$

Such a c_j^1 always exists, thanks to our assumption that consumption is necessary. This is the only role played by this assumption. By *Pareto*,

$$(z_1, \dots, (\ell_k + \delta_k^1, c_j^1), \dots, (\ell_k + \delta_k^1, c_k^1), \dots, z_n) I z. \quad (12)$$

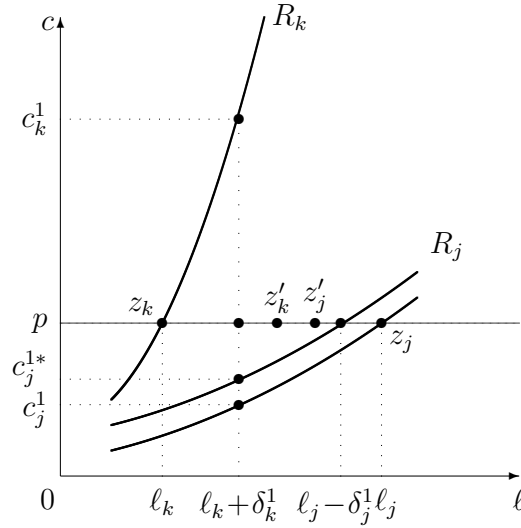


Figure A.2: Illustration of the proof of the second claim

Then, we can choose δ_j^1 such that

$$\frac{\delta_j^1}{\delta_k^1} < \frac{\ell_j - \ell'_j}{\ell'_k - \ell_k} \quad (13)$$

and define c_j^{1*} by

$$(\ell_k + \delta_k^1, c_j^{1*}) I_j (\ell_j - \delta_j^1, p).$$

By property 4,

$$(z_1, \dots, (\ell_k + \delta_k^1, c_j^{1*}), \dots, (\ell_k + \delta_k^1, p), \dots, z_n) \\ P(z_1, \dots, (\ell_k + \delta_k^1, c_j^1), \dots, (\ell_k + \delta_k^1, c_k^1), \dots, z_n). \quad (14)$$

By *Pareto*,

$$(z_1, \dots, (\ell_j - \delta_j^1, p), \dots, (\ell_k + \delta_k^1, p), \dots, z_n) \\ P(z_1, \dots, (\ell_k + \delta_k^1, c_j^{1*}), \dots, (\ell_k + \delta_k^1, p), \dots, z_n). \quad (15)$$

By transitivity, eq. 12 14 and 15 imply

$$(z_1, \dots, (\ell_j - \delta_j^1, p), \dots, (\ell_k + \delta_k^1, p), \dots, z_n) P z'. \quad (16)$$

Iterating this chain of social indifference and strict preference a finite number of times and constructing $\delta_k^2, \delta_j^2, \dots, \delta_k^M, \delta_j^M$ that satisfy eq. 13 at each iteration, we arrive at labor time

$$\ell_j'' = \ell_j - \sum_{m=1}^M \delta_j^m > \ell_j', \\ \ell_k'' = \ell_k + \sum_{m=1}^M \delta_k^m > \ell_k',$$

and allocation

$$z'' = (z_1, \dots, (\ell_j'', p), \dots, (\ell_k'', p), \dots, z_n)$$

such that, by iteration of the sequence leading to eq. 16,

$$z'' P z',$$

violating *Pareto*, because $\ell_i'' \geq \ell_i'$ for all i , $\ell_j'' > \ell_j'$ and $\ell_k'' > \ell_k'$.

We now complete the proof of the proposition. In this third step, all allocations will be composed of bundles containing a consumption level equal to p . Only labor times will vary, so that the objects we define are essentially unidimensional. The resulting proof boils down to the adaptation to this setting of Hammond (1982)'s characterization of the leximin in utility. Let economy (R_1, \dots, R_n) and allocations $z = (z_1, \dots, z_n)$ and $z' = (z'_1, \dots, z'_n)$ be such that

$$\min_i W^p(z_i) > \min_i W^p(z'_i).$$

We need to prove that $z P z'$. For all $i \in \{1, \dots, n\}$, let us define $z_i'' = (W^p(z_i, R - i), p)$ and $z_i''' = (W^p(z'_i, R - i), p)$. By *Pareto*, $z'' I z$ and $z''' I z'$, so that, by transitivity, $z''' R z''$. Without loss of generality, let us fix

$$z_1 = \min_i W^p(z_i, R_i) \\ z_2 = \min_i W^p(z'_i, R_i).$$

Let us choose ℓ_i^* for each $i \in \{1, \dots, n\}$ such that $\ell_i^* \geq \ell_1^*$ and $\ell_1 < \ell_1^* \leq \ell_i < \ell_2^*$. Let $z^* = ((\ell_i^*), \dots, (\ell_n^*))$. Using property 5 iteratively for each $i \in \{2, \dots, n\}$, we get the conclusion that $z^* P z''$. By transitivity, $z^* P z''$, violating *Pareto*. ■

B Optimal income taxation

In this appendix, we study the optimal tax scheme that can be derived from our criterion developed in the paper. Finding the formula of the optimal tax has been the main focus of optimal taxation theory (see the surveys in Boadway, 2012 or Kaplow, 2008). That will allow us to contrast the shape of our optimal tax scheme with the shape of two optimal tax schemes recently derived by Saez and Stantcheva (2016) from maximizing criteria embedding poverty alleviation also being compatible with Pareto efficiency.

It is well known that it is impossible to give the general formula of the tax scheme that maximizes social preferences without making strong assumptions on the distribution of types, especially when agents are heterogeneous in both wages and preferences. Let τ^* denote the tax scheme that maximizes our social preferences. If τ^* looks like τ^1 or τ^4 in figure 7 in the paper, that is, if either $-\tau^*(0) \geq p$, or $w_m - \tau^*(w_m) \leq p$, then we (unsurprisingly) do not have much to say about its shape. In the (more relevant) case in which $y^p - \tau^*(y^p) = p$ for some $y^p \leq w_m$, we are able to derive the following property of the optimal tax scheme. The income subsidy obtained by the agents earning exactly y^p is the largest subsidy: for all $y \geq 0 : \tau^*(y) \geq \tau^*(y^p)$. Let us prove this claim graphically in figure B.1.

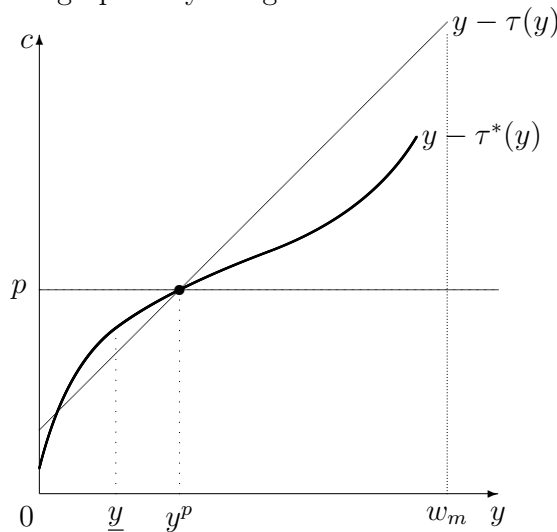


Figure B.1: Illustration of proposition B.1

Let us assume the claim is not true. Then, the optimal tax scheme τ^* is such that for some \underline{y} , $\tau^*(\underline{y}) < \tau^*(y^p)$. In the figure, $\underline{y} < y^p$ but the argument holds in the case $\underline{y} > y^p$ as well. The figure shows the curve $y - \tau^*(y)$ as

well as a 45°-line through $(y^p, y^p - \tau^*(y^p))$. This line represents the function $y - \tau(y)$ defined by: for all y , $\tau(y) = \tau^*(y^p)$. Note that τ amounts to transfer a strictly positive amount of money to all agents, which is obviously unfeasible.

Let us consider a new tax scheme, τ' , defined by

$$\tau'(y) = \max\{\tau(y), \tau^*(y)\}.$$

This is equivalent to stating that $y - \tau'(y) = \min\{y - \tau(y), y - \tau^*(y)\}$. At each earning level, the new tax amount is either unaffected or it is larger. Let us note that $\tau'(y^p) = \tau^*(y^p)$, so that the value of the social criterion is the same under τ' as under τ^* . This also means that all agents earning y^p under τ^* still choose to earn y^p under τ' . More generally, all agents choosing y under τ^* such that $\tau'(y) = \tau^*(y)$ still choose y under τ' . The other agents are likely to change their earning level, but, given the way τ' is defined, they will pay more tax under τ' than under τ^* . In summary, τ' leads to the same level of the social criterion but collects a budget surplus, which can be redistributed to agents earning around y^p , increasing the social criterion. That proves that τ^* is not optimal, a contradiction.

As a result, the graph of the optimal tax scheme τ^* needs to lie everywhere on or below the 45° line through (y^p, p) . We can summarize the above argument in the following proposition.¹

Proposition B.1 *Under assumption 1 in the paper, the optimal tax scheme τ^* satisfies the following property: either $-\tau^*(0) \geq p$, or $w_m - \tau^*(w_m) \leq p$, or for y^p such that $y^p - \tau^*(y^p) = p$,*

1. $\lim_{y \rightarrow y^p} \frac{d\tau^*(y)}{dy} \leq 0$ and marginal tax rates are on average non-positive below y^p , and
2. $\lim_{y^p \leftarrow y} \frac{d\tau^*(y)}{dy} \geq 0$ and marginal tax rates are on average positive above y^p .

¹It is possible to be more precise about the shape of the optimal tax under additional assumptions on the distribution of types. An immediate example can be derived from Brett and Weymark (2016). They study the shape of the tax scheme that any specified agent would find optimal for herself given her preferences over her own bundles, under the assumption that wage and preference heterogeneities can both be captured by a single parameter, and the assumption of a continuum of agents. Let us assume that the optimal tax scheme τ^* according to our criterion is also the preferred tax scheme of some of the agents choosing (y^p, p) . This is more likely the more convex preferences of that agents are around bundle (y^p, p) . Brett and Weymark (2016) prove that marginal tax rates are negative below y^p , except at the minimal earning level if it is positive, there is a kink at y^p , and marginal tax rates are positive above y^p , where they are designed in such a way as to maximize the collected tax.

This result should be contrasted with related results recently presented by Saez and Stantcheva (2016). They propose a generalized social weight approach to the optimal tax formula. There are two main features of their approach. First, they focus on local optimality rather than global optimality. A tax scheme is locally optimal if no budget-neutral perturbation of the tax scheme increases the value of the social criterion. Second, this focus on local perturbations allows them to express the effect on the value of the social criterion as a weighted sum of the marginal changes in incomes.

Their approach allows them to study criteria of poverty alleviation that are different from our criterion but that are also compatible with Pareto efficiency. Their first criterion is the minimization of the income poverty-gap ratio. That criterion minimizes the sum of income gaps, that is, the difference between actual incomes and the poverty line. In a sharp contrast to what we obtain, they prove that the optimal tax scheme involves positive marginal tax rates below the poverty line.

Their second criterion is the head count ratio (see Saez and Stantcheva, 2016, proposition B2, online appendix, p. 11). They find that the optimal tax scheme involves a negative marginal tax rate on the lowest incomes, but not on all incomes below y^p . The optimal tax scheme that minimizes the head count ratio would, therefore, be closer to our optimal tax scheme than the one that minimizes the poverty-gap ratio. This may come as a surprise. Indeed, remember that our criterion is derived from the normative property that a disposable income transfer from an agent above the poverty line to an agent below it should be a social improvement. We could have thought that this property would bring us close to the poverty-gap ratio, but it does not.

C Methodology: Constructing budget curves with the OECD Tax-Benefit Calculator

This appendix provides a detailed description of the methodology used in section 5 of the paper. In order to apply the criterion developed in the paper, we need to draw the actual budgets that agents face. Given that the tax function typically depends on the composition of the households, we partition the population into household types. Budgets are drawn using the OECD Tax-Benefit Calculator which takes account of all relevant regulatory aspects that transform pre-tax incomes into after-tax incomes in OECD countries.²

Selection of countries and systems. In our baseline application, we evaluate the ability of tax-transfer policies to alleviate poverty given official poverty lines, the official notion of disposable income and the legal minimum wage. As a result, we restrict our sample to the EU15 countries that have a legal minimum wage³ and the United States (US) and calculate budgets for tax-transfer rules of 2013.

Policies modeled. Some of the policies we are interested in are conditional. Our aim is to try to draw the budgets of the poorest people. As a result, when a benefit is means-tested, we assume that the conditions are satisfied. When the conditions do not bear on means, we assume they are not satisfied. Precisely, the tax-transfer policies that are taken into account are income support and social assistance (SA),⁴ family and child benefits (FB),⁵ housing benefits (HB), in-work benefits (IW), labor income taxes (IT) and social insurance contributions (SC).⁶ Unemployment *insurance* benefits are

²The calculator and the detailed policies modeled are documented on the website of the OECD Tax-Benefit Calculator as well as in the country chapters of the OECD series “Benefits and Wages”.

³Belgium (BE), France (FR), Germany (GE), Greece (GR), Ireland (IR), Luxemburg (LU), the Netherlands (NL), Portugal (PT), Spain (SP), the United Kingdom (UK).

⁴Eligibility to SA might be conditional on behavior, especially whether the individual is actively searching for work. It is assumed that all individuals fulfill all requirements for full social assistance benefits to be received. In some countries, additional benefits can be paid conditional on participation in active labor market programs. Such benefits are not taken into account.

⁵Childcare benefits for parents with children in externally provided childcare and the costs of that care can partly be modeled with the OECD Tax-Benefit Calculator. Though, this would involve further assumptions and complicate the analysis and comparability across countries. We thus do not implement childcare benefits here.

⁶Only personal income tax and employees’ social security contributions payable in respect of earnings and benefits are included. Central, state and local government income

not taken into account as they are typically conditional on past labor force participation and social contributions. As a result, young or long-term unemployed people typically do not benefit from it. Unemployment *assistance* benefits, which are not based on previous contributions, are considered to be part of SA. Finally, we assume that the policies implemented to fight against non take-up and fiscal evasion are distinct from the definition of the tax-transfer system itself and thus abstract from the latter phenomena here.

Regional heterogeneity. When taxes or benefits vary across region, the OECD calculator chooses a region that it considers typical. For instance, the whole tax-transfer system of Michigan, a typical manufacturing region, is used to represent the US.

Household types, wages, labor time. We consider six household types: singles and couples without children, with one child (aged 10), with two children (aged 10 and 12).⁷ All adults belong to the working-age population and we assume away any specific needs for adults or children due to, e.g., disability, sickness or invalidity. The wage earned is the legal monthly minimum wage in each country in 2013 (applying to the situation of January 1st), as reported by EUROSTAT. Germany introduced a legal minimum wage in 2015. The wage for Germany is this minimum wage deflated to 2013. In the OECD calculator, average wages (AW) are the key input data. Minimum wages therefore need to be defined as a percentage of AW and AWs will also be needed for the specification of various policies, e.g. to define certain thresholds. Table C.1 shows the minimum wages by country together with AWs calculated by the OECD. For single earners, disposable income is derived on the basis of the labor income that is earned when increasing hours worked from zero to full-time. Given that the OECD calculator can only assume a fixed number of hours worked for the second earner, we construct the budget curves for couples combining two different situations. First, we assume that the second earner does not work at all and the principal earner varies her hours from zero to full-time, such that the household earns once the minimum wage. Second, at this point the curve is continued under the assumption that the second earner works full-time and the principal earner again varies her hours from zero to full-time, such that at this latter point the household earns twice the minimum wage and works twice the full-time of a single earner.

taxes are included, but council tax in the United Kingdom is excluded. In general, only standard tax reliefs are included when calculating tax payments.

⁷Child and family benefits often vary with the age of children. We found their average levels across child ages to be mostly around the intermediate ages of 10 and 12. That is why we chose them.

	AW	w_m	$\frac{w_m}{AW}$
US	4,064.5	1,265.0	31.1
BE	3,849.8	1,994.6	39.0
FR	3,067.3	1,899.5	46.6
GE	3,725.0	1,938.8	39.2
GR	1,730.5	908.1	39.5
IR	2,762.8	1,941.5	52.9
LU	4,457.1	2,489.1	42.0
NL	4,035.1	1,951.5	36.4
PT	1,470.0	751.5	38.5
SP	2,168.9	999.9	34.7
UK	2,923.4	1,659.9	36.3

Note: AW is the average wage. w_m is the legal minimum wage. Germany introduced a legal minimum wage in 2015. w_m for Germany is this minimum wage deflated to 2013. AW and w_m in monthly USD. $\frac{w_m}{AW}$ in %. *Sources:* OECD and EUROSTAT.

Table C.1: Average wage and legal minimum wage by country

Further assumptions. Further assumptions are made within the OECD Tax-Benefit Calculator to implement the different policies. We report a few main assumptions in the following.

a) Time aspects. All tax-transfer amounts relate to the year of 2013 and are generally computed using the rules and regulations that were in force on July 1, 2013. All taxes, benefits and net incomes are thus determined for a particular month. Benefits and income taxes, which depend on annual incomes, are determined in relation to the annualized amounts (i.e. multiplied by 12). Any timing issues in the assessment of claimants' entitlement or the payment of benefits are disregarded.

b) Specific assumptions on in-work benefits. By construction of the policy, in-work benefits are paid only to those with earnings or those who have worked more than a certain number of hours per week. Thus, our assumptions made above about hours worked and wages earned determine the level of employment-conditional benefits. Delays in payment of benefits (which can be long for IW) are ignored.

c) Specific assumptions on housing benefits. From the countries under analysis, FR, GE, IR, LU, NL and the UK grant housing benefits (HB). Cash HB are particularly complex and might depend on various characteristics such as the rent, the size of dwelling and the region, amongst several others. Given this complexity, it is not possible to derive typical or

average HB for low-income households with the OECD calculator. Due to our income definition above, in our baseline scenario we nevertheless include HB and make three main simplifying assumptions: i) families live in privately rented accommodation; ii) where size is relevant and where housing benefits vary across region, we stick to the default choice of the OECD calculator; iii) for the level of rent, the OECD calculator's default assumption is 20% of AW for the housing cost (the OECD average), regardless of country, household type or income position. This is too coarse for our purpose. To arrive at rent levels that are somewhat more specific to our context, we use information from EUROSTAT on what share of their disposable income low-income households (below 60% of median equivalized disposable income) use to pay privately rented accommodation. We proxy household disposable income needed to implement this information with the household specific mean income (for minimum-wage households as defined above) that is derived with the OECD calculator when housing benefits are assumed away. The derived housing costs need to be implemented as percentage of AW in the OECD calculator. Tables C.2 and C.3 show the share of disposable income used for rents and the accordant share of AW. The former information is available for single and couple households with or without children. Therefore, the level of $\frac{rent}{net}$ is the same for singles with one child and two children (couples with one child and two children) in a given country. We show the information for all countries under analysis (and not only for those that grant housing benefits) because the level of rent sometimes determines other policies in some countries, e.g. the calculation of social assistance in the US. The EUROSTAT data only covers the European countries under analysis and we do not have similar information for the US. We use the household-type specific average $\frac{rent}{AW}$ over all other countries for the US (not shown in tables C.2 and C.3).

	$\frac{rent}{net}$	$\frac{rent}{AW}$
BE s0ch	46.90	15.21
BE s1ch	30.50	11.72
BE s2ch	30.50	13.81
BE c0ch	38.30	26.09
BE c1ch	32.35	23.67
BE c2ch	32.35	26.19
FR s0ch	47.80	18.20
FR s1ch	32.00	14.64
FR s2ch	32.00	16.16
FR c0ch	37.80	30.38
FR c1ch	31.05	26.17
FR c2ch	31.05	27.40
GE s0ch	40.30	11.59
GE s1ch	31.50	12.12
GE s2ch	31.50	15.99
GE c0ch	35.10	20.76
GE c1ch	28.50	19.55
GE c2ch	28.50	22.14
GR s0ch	71.50	23.58
GR s1ch	68.40	23.69
GR s2ch	68.40	24.82
GR c0ch	63.30	45.93
GR c1ch	52.30	39.67
GR c2ch	52.30	41.40
IR s0ch	30.80	15.59
IR s1ch	21.80	17.54
IR s2ch	21.80	20.91
IR c0ch	39.70	40.36
IR c1ch	28.00	33.37
IR c2ch	28.00	36.83

Note: $\frac{rent}{net}$ is the share of disposable household income paid for the rent in %. $\frac{rent}{AW}$ is the rent as share of the average wage in %. *s0ch* denotes a low-income single household without children, ..., *c2ch* a low-income couple household with two children. *Sources:* OECD and EUROSTAT.

Table C.2: Rents paid as percentage of disposable income and average wage, by country and household type - Part 1

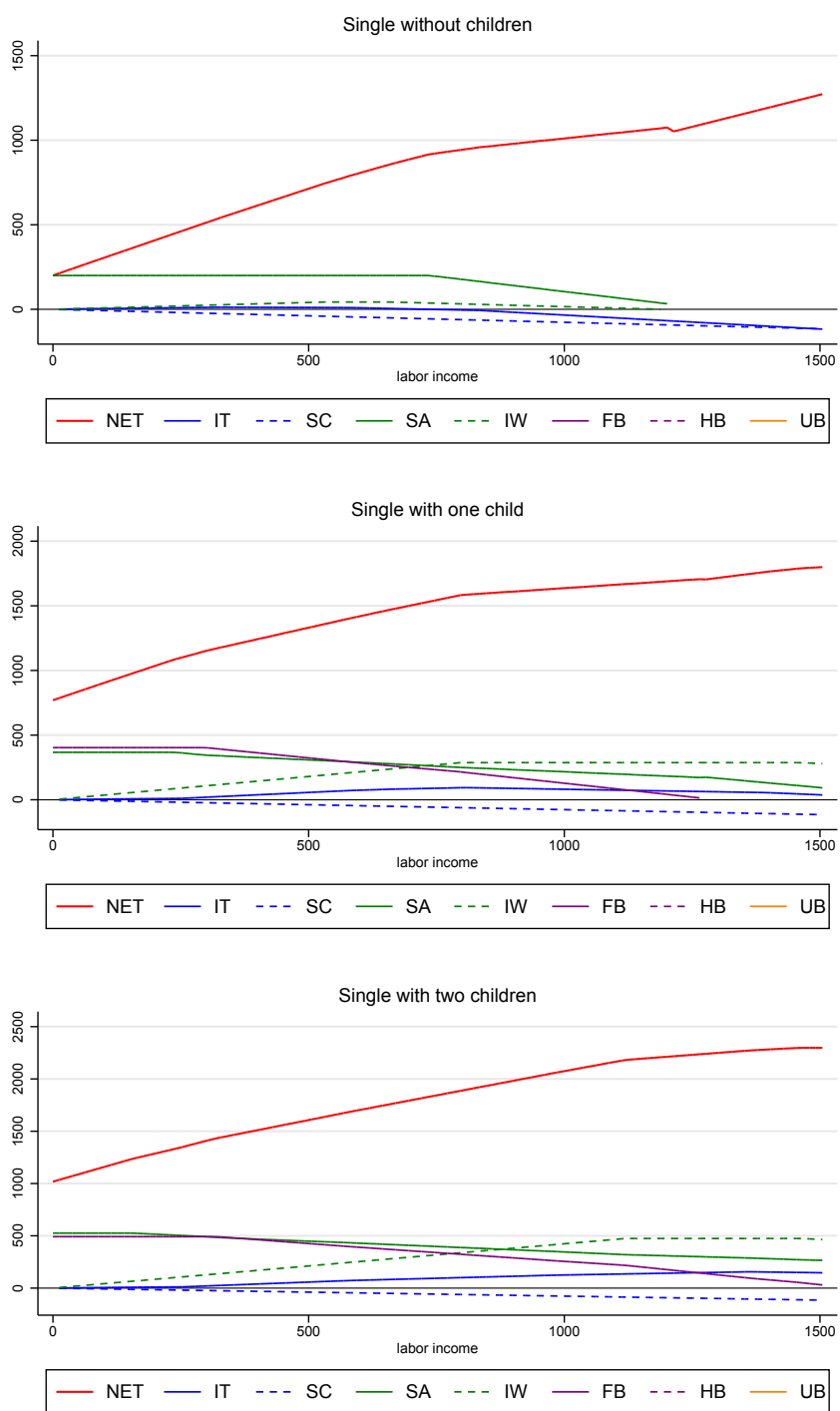
	$\frac{rent}{net}$	$\frac{rent}{AW}$
LU s0ch	43.60	16.47
LU s1ch	39.20	18.19
LU s2ch	39.20	22.67
LU c0ch	38.10	32.36
LU c1ch	29.25	28.06
LU c2ch	29.25	31.73
NL s0ch	49.70	14.80
NL s1ch	35.40	15.21
NL s2ch	35.40	16.17
NL c0ch	44.30	26.23
NL c1ch	30.50	20.70
NL c2ch	30.50	21.79
PT s0ch	31.30	10.72
PT s1ch	34.30	12.64
PT s2ch	34.30	13.81
PT c0ch	29.10	19.56
PT c1ch	48.75	34.49
PT c2ch	48.75	36.37
SP s0ch	53.10	17.26
SP s1ch	57.00	19.16
SP s2ch	57.00	19.80
SP c0ch	54.40	35.35
SP c1ch	50.55	33.23
SP c2ch	50.55	33.61
UK s0ch	58.10	19.21
UK s1ch	38.10	19.43
UK s2ch	38.10	23.14
UK c0ch	47.00	32.62
UK c1ch	44.95	35.91
UK c2ch	44.95	41.75

Note: $\frac{rent}{net}$ is the share of disposable household income paid for the rent in %. $\frac{rent}{AW}$ is the rent as share of the average wage in %. *s0ch* denotes a low-income single household without children, ..., *c2ch* a low-income couple household with two children. *Sources:* OECD and EUROSTAT.

Table C.3: Rents paid as percentage of disposable income and average wage, by country and household type - Part 2

Budget curve decomposition. Figures C.1 and C.2 show exemplarily for the US, how budget curves for the different household types evolve as the sum of the different tax-transfer components. SA mainly includes the Supplemental Nutrition Assistance Program (SNAP), which is designed to increase the food purchasing power of eligible low-income households (the former Food Stamps). It is dependent on household size and there is an income threshold for receiving SNAP. IW refers to the Earned Income Tax Credit (EITC) which is a refundable tax credit. Eligible for EITC are working families with children under 24 years of age and childless working persons aged between 25 and 65 that meet certain income thresholds. There are no cash HB. FB refer to the Temporary Assistance for Needy Families (TANF). Each state may establish its own benefit levels and determine its own benefit calculation. Michigan TANF are increasing in the number of family members and are somewhat above the average for all states. TANF is income dependent and Michigan applies certain income disregards in the calculation of the benefit. Concerning IT, there are several tax reliefs applicable, especially related to children. In 2013, the rate for employee SC was 7.65%.

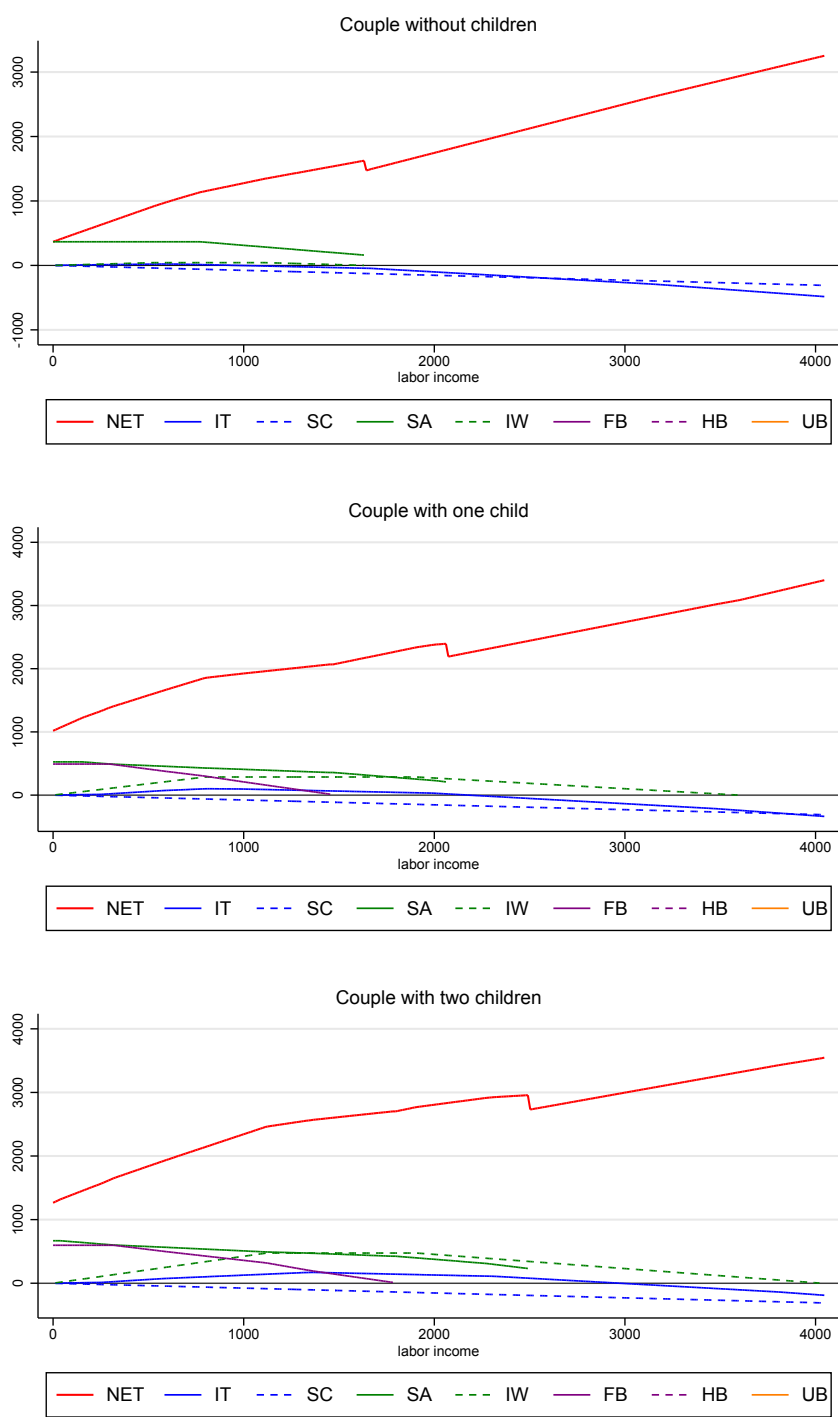
US (2013)



All values in USD per month.

Figure C.1: Budget curve decomposition for US single households

US (2013)



All values in USD per month.

Figure C.2: Budget curve decomposition for US couple households

Poverty lines and equivalence scales. Finally, in order to evaluate tax schemes with respect to poverty alleviation, we have to introduce poverty thresholds. In our baseline scenario, we stick to official poverty thresholds. In the Europe 2020 strategy, the European member states have agreed to use 60% of national median equivalized disposable income as the at-risk-of-poverty indicator. We thus use this poverty threshold for the European countries in our analysis, as reported by EUROSTAT. As the needs of a household increase with the number of its household members in a non-proportional way due to economies of scale in consumption, we also have to adjust poverty thresholds in an appropriate way to households of different size when comparing them in appendix D. The equivalence scale applied for the European countries is the modified OECD equivalence scale which assigns a value of 1 to the household head, of 0.5 to each additional adult member and of 0.3 to each child. Thus, the poverty threshold for a single-parent household with two children, for instance, will equal the poverty threshold of a pure single household multiplied by a factor of 1.6. For the US, we rely on the Supplemental Poverty Measure reported by the U.S. Census Bureau and an accordant specific and more complex three-parameter equivalence scale to account for family size.⁸ In appendix E.1, we compare our baseline results to the assumption of a poverty line that is 50% of the mean income in each country.

⁸Detailed information about this measure and its derivation for 2013 can be found in Short (2014). A historical comparison of official poverty measures used in the US up to the Supplemental Poverty Measure can be found in Meyer and Sullivan (2012).

D Does it help to have children?

In this appendix we compare whether it is easier for households with or without children to get out of poverty. We do that by rescaling budget curves so as to measure equivalized disposable income on the vertical axis as described in appendix C. We find that Germany, the UK and the US are the only countries in which social welfare is unambiguously higher among households with children.⁹

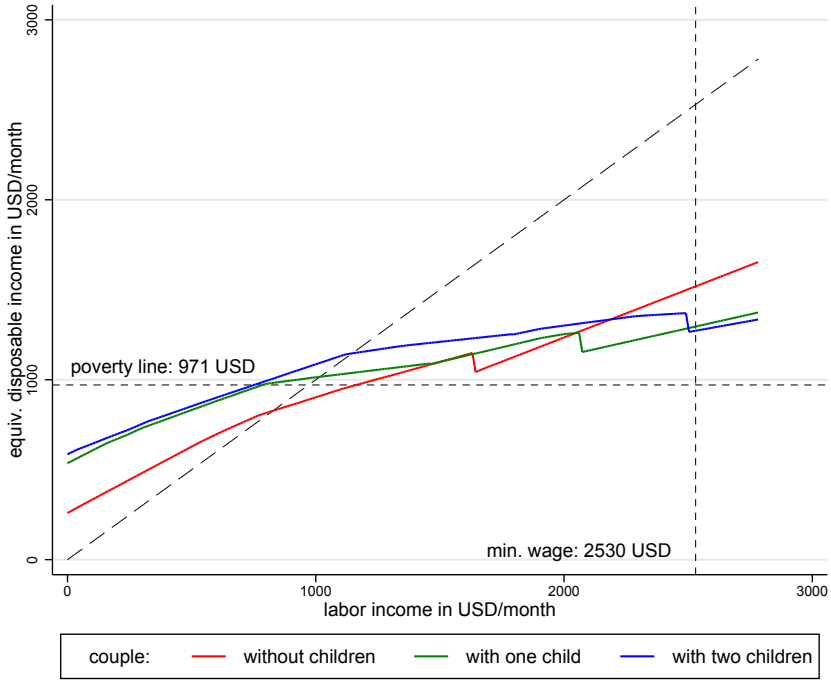
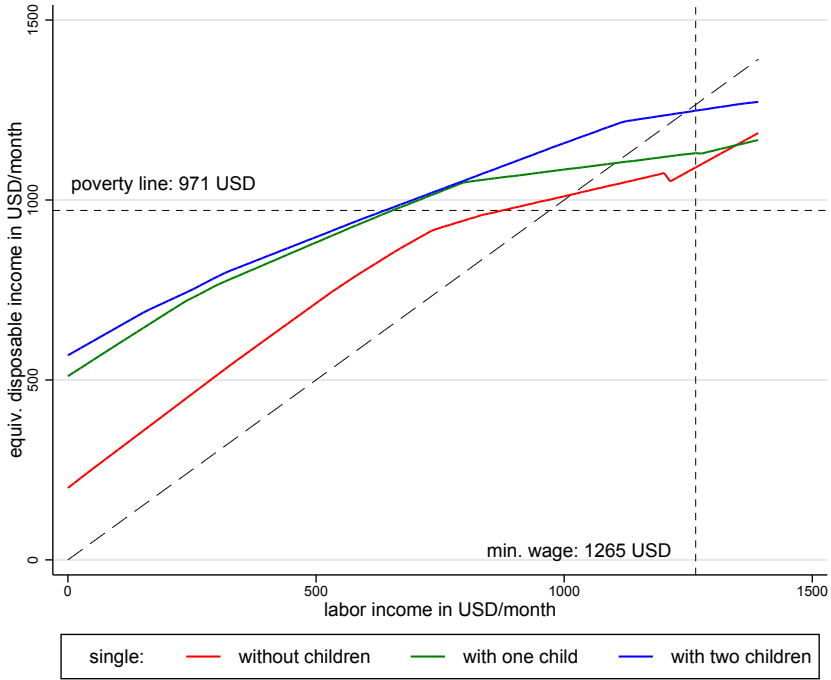
Figure D.1 compares budget curves of US singles on the left and couples on the right, with zero, one and two children. In both cases, the labor time that is required for those households to reach a disposable income equal to the poverty line is lower when there are children in the household. Maybe surprisingly, that does not come from differences in the shape of the budget curve, but from differences in the basic income. That is, the in-work benefits (the EITC) simply adjust the shape of the budget curves to the equivalence scale, so that they are almost parallel to each other. Maybe contrary to the received wisdom, the difference rather comes from the family benefits on the one hand and the social assistance that is more generous for households with children on the other hand (see decomposition above, figures C.1 and C.2).

Greece, Portugal and Spain are found to be the countries in our sample in which social welfare is unambiguously higher among households without children. In all cases, this is due to the simplicity and lack of generosity of the tax-transfer system. Figure D.2 shows the budget curves for all household types in Spain. The system is characterized by limited social assistance, which fades out at a tax rate of 100%, above which no benefit exists anymore. The difference in slopes that we can see in the graphs reflect the rescaling of disposable incomes according to the equivalence scale.

The other countries do not offer any clear pattern. In France, for instance, family benefits are more generous for the second child of a single-parent household than for the first child, but social assistance is lower for single parents with two children than with one. All in all, the budget curve of a single-parent with one child makes it easier for that household to get out of poverty than for singles without or with two children, as can be seen in figure D.3. For couples, on the contrary, the labor time it takes to get out of poverty increases with the number of children.

⁹Cp. appendix F.4.

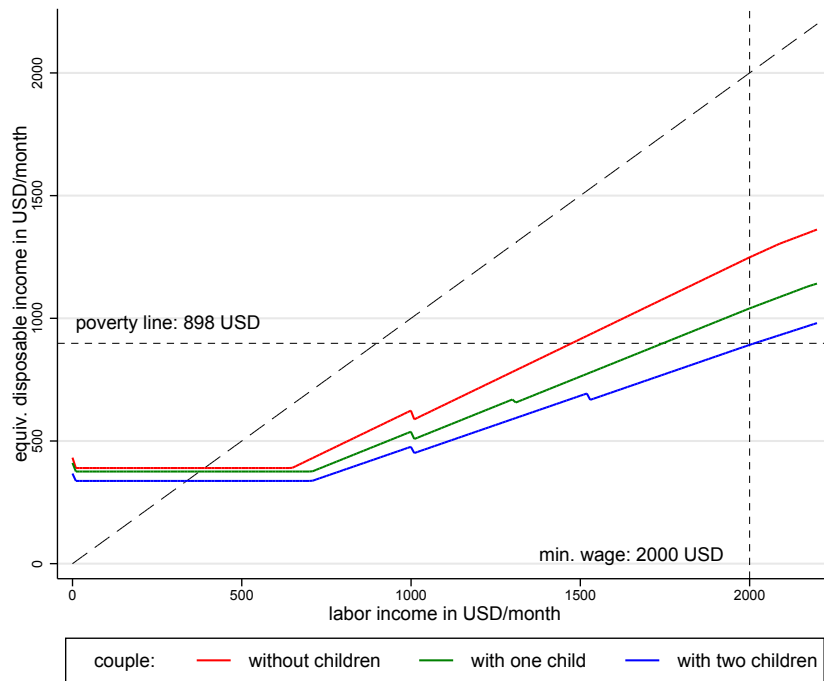
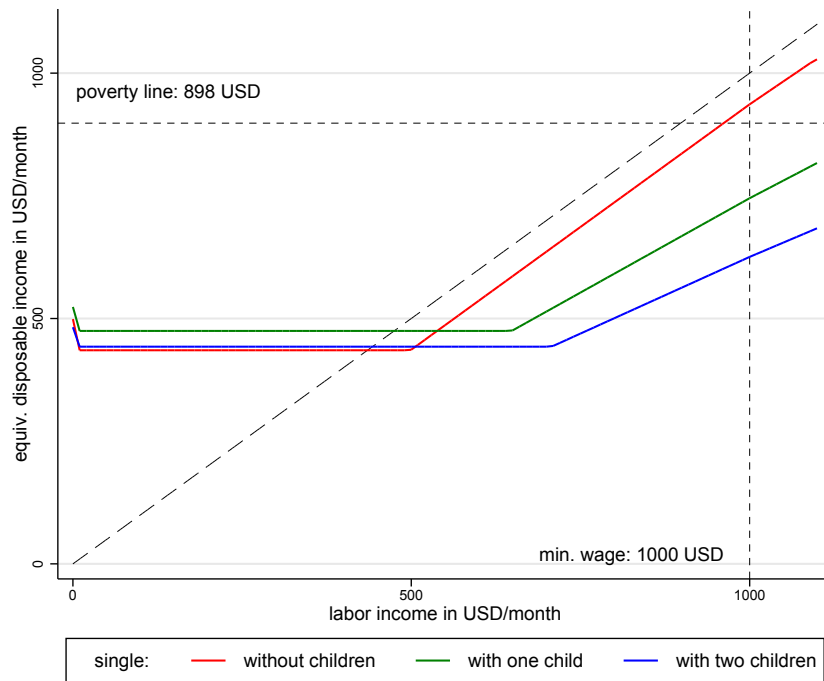
US (2013)



Wage = 31.1% of AW (= legal minimum wage).

Figure D.1: Budget curves for single and couple households with zero, one or two children: US

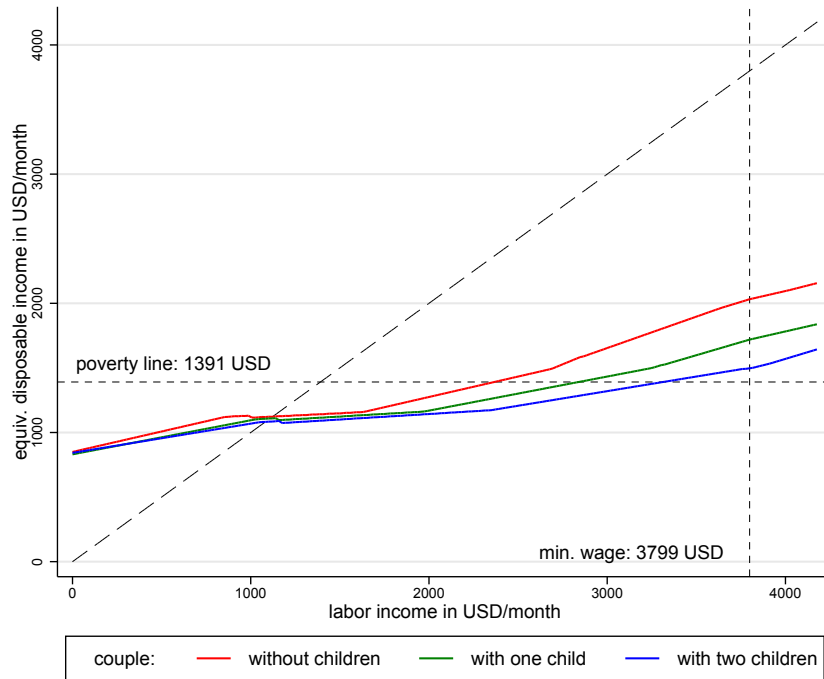
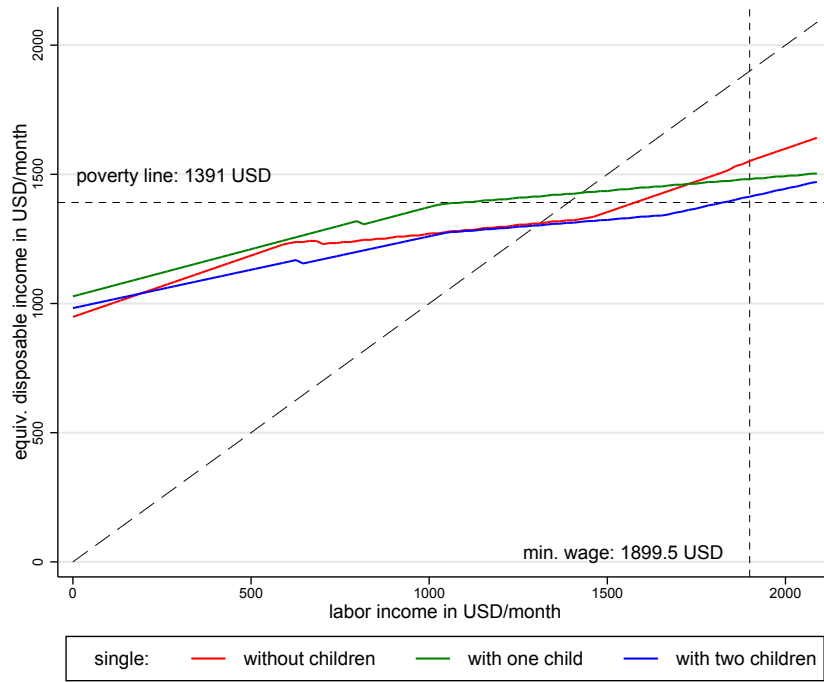
SP (2013)



Wage = 34.7% of AW (= legal minimum wage).

Figure D.2: Budget curves for single and couple households with zero, one or two children: SP

FR (2013)



Wage = 46.6% of AW (= legal minimum wage).

Figure D.3: Budget curves for single and couple households with zero, one or two children: FR

E Extensions

The application provided in the paper was developed under the assumptions that i) the relevant poverty line was the official one, ii) housing benefits are granted if existent in a country, iii) individual labor supplies were not rationed. We remove these three assumptions in this appendix.

E.1 Mean income poverty lines

All official poverty lines in the European countries under analysis are defined as 60% of the equivalized median income. Median income is determined both by the general living standards of a country and by the income inequality in that country. To remove the impact of income inequality onto the poverty line and make it depend only on the ability of the economy to produce income, we change the poverty line from the official ones to 50% of the mean income. As a consequence, countries with a larger income inequality are expected to do worse than previously according to our measure of social welfare.

Figure E.1 is the variant of figure 8 in the paper when the vertical axis is rescaled to take country mean income into account. Differences across countries become much larger compared to the baseline scenario. Most striking is the fact that the budget set of single parents with two children in the US is now the lowest one, dominated even by Greece (except in a small interval of incomes), Portugal and Spain. In those countries, welfare systems have suffered a lot from the sovereign debt crisis or are known for their quasi-absence of important benefits, e.g., the lack of a basic-income scheme in Greece. In the online appendix, we show that budget curves for other types of households display slightly different patterns, with the US always belonging to the set of the two or three worst performing countries.

E.2 Removing housing benefits

As outlined in appendix C, among the tax-transfer policies that we simulate, housing benefits (HB) require most assumptions (e.g. related to housing cost, housing size, reference region). It is also the policy with the most demanding eligibility conditions. In addition to that, it may induce a bias in our country comparisons, because countries that do not offer HB in cash may have a large and generously subsidized social housing (such as Belgium) directed towards the poorest. This subsidy is not added to the disposable income in those countries within our simulations. It may be interesting, therefore, to apply our criterion to a notion of disposable income that does not include HB.

Budget schemes - single with two children (2013)

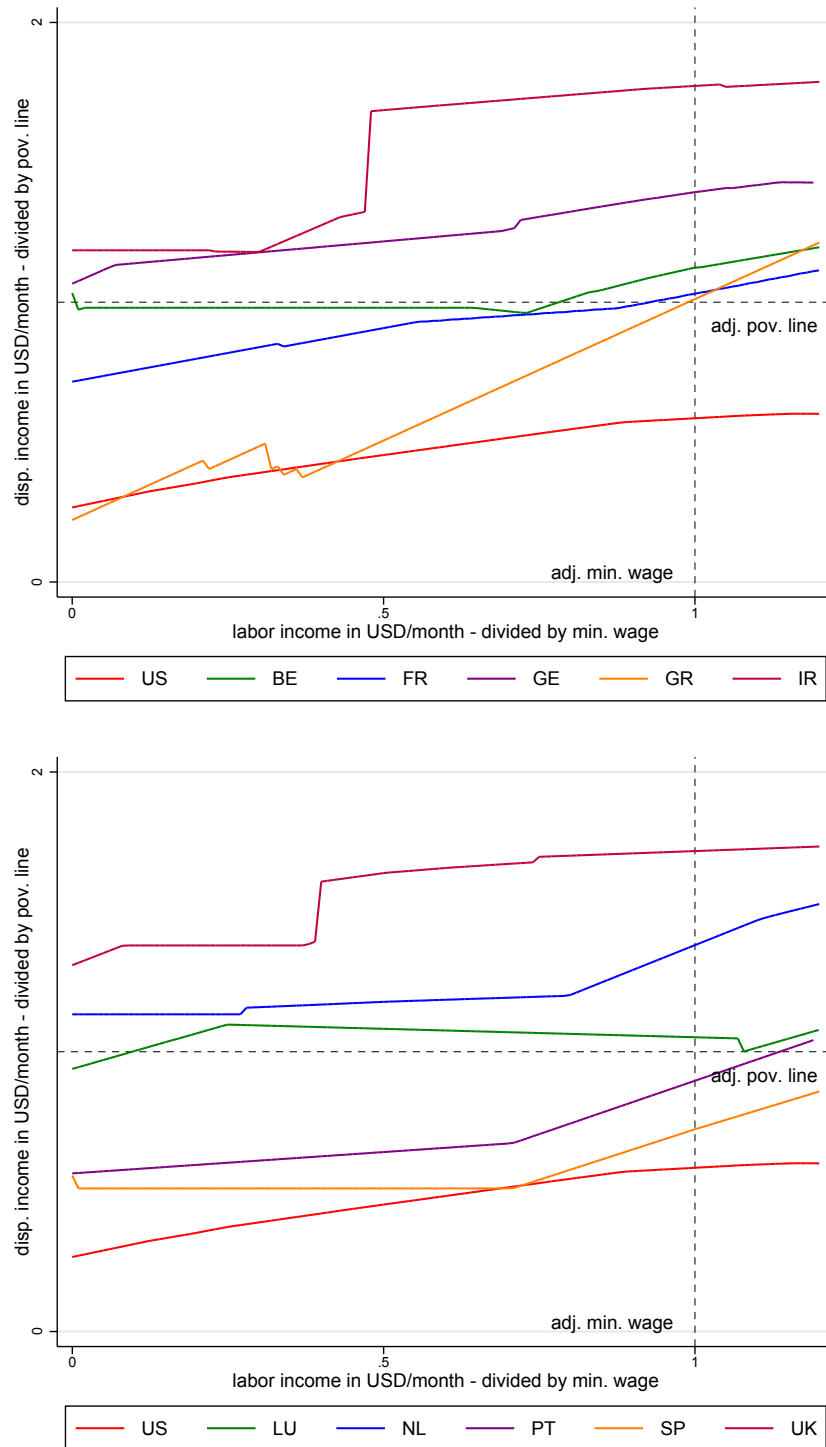


Figure E.1: Cross-country comparison of entire budget curves with 50% of mean income poverty line for single households with two children

Table E.1 reproduces table 1 in the paper for the six countries under analysis that provide HB, when the eligibility to HB is assumed away.¹⁰ Removing HB from the computation of disposable incomes has two effects. First, it decreases b , the disposable income of those who do not work. That effect varies between modest 157.69 USD in Luxemburg and the huge amount of 1016.49 USD in the UK, which equals the amount of HB granted at zero earnings for singles with two children.

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
FR	119.10	2,262.25	1,185.59	53.18	1,899.48	2,225.79	85.34
GE	67.09	1,300.80	1,337.20	45.10	1,938.84	2,076.62	93.37
IR	13.99	271.59	1,770.27	45.89	1,941.48	2,025.62	95.85
LU	24.05	598.57	3,038.07	84.76	2,489.11	3,538.16	70.35
NL	87.91	1,715.61	1,941.74	74.69	1,951.51	2,213.57	88.16
UK	39.94	663.06	1,494.22	58.52	1,659.93	1,986.20	83.57

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table E.1: Social welfare and its decomposition when eligibility for housing benefits is removed, for single households with two children

Second, it decreases τ , because HB typically fade out as income increases. This effect is the weakest (namely zero) in the Netherlands and Luxemburg, where HB do not depend on income as long as income is below a threshold much larger than the minimum wage. It is the largest in Ireland, where HB decrease with earned income at a one-to-one dollar rate, decreasing the effective tax rates on low incomes by 29.48 percentage points.

As a result, the effect on social welfare (first column) is the largest for the Netherlands. Because this country has a 100% marginal tax rate on low incomes, its performance on our measure of social welfare is extremely sensitive to whether or not the basic income is lower or larger than the poverty line. When we subtract HB from the definition of disposable income, it decreases below the poverty line, making it much harder for low-skill lone

¹⁰Note that this is different from just subtracting HB from the simulated disposable income in the former applications as there might be interactions of HB with other policies. We therefore have to re-simulate accordant budget curves. As a matter of fact, removing HB in the OECD calculator is done by setting housing costs (rents) to zero. Besides the possible interaction of removed HB with other policies, there might be a second implication of this approach, namely when the level of rents also has an influence on other policies independently of HB, as already mentioned in appendix C. Among the six countries of interest, this is the case for FR and GE. While the impact is limited, this is of course an unintended effect but we are not able to alter the OECD calculator in the preferred way at that time.

parents with two children to earn sufficient income to reach the poverty line.

At the other extreme, because HB fade out quickly even for low incomes in Ireland, the labor time it takes to reach the poverty line does not increase by much when HB are not taken into account. This illustrates that social welfare as we measure it is much more sensitive to changes in the definition of disposable income when tax and transfers are designed in such a way that τ is low. It also means that partial take-up or variations in eligibility conditions are more likely to have limited impact on social welfare when τ is low.

E.3 Taking unemployment rates into account

So far we have made the assumption that the earners in a household are free to choose their labor time. There are many reasons why this could not be the case, in particular in countries experiencing a high unemployment rate. The figures that we provided up to now should then be read as evaluating the ability of tax-transfer systems to help people get out of poverty *conditional on them having found a job*. This is consistent with the idea that tax-transfer systems should not depend on short-term fluctuations on the labor market. Consequently, as mentioned above, unemployment insurance benefits are not taken into account in the budget curves presented in this paper.

One may argue, though, that the possibility to find jobs should be part of the evaluations of the opportunities that are given to households to get out of poverty. We apply that idea in this appendix. The expected gross income of such an individual willing to work full-time at the minimum wage is simply the minimum wage weighted by the probability to find a job, approximated in our application by one minus the unemployment rate of low-skill individuals.

Unemployment rates of low-skill individuals vary between 9% in Luxembourg and the Netherlands and 33% in Spain in 2013.¹¹ Low skill means not having completed high school. Figure E.2 is the variant of figure 8 in the paper when the horizontal axis is rescaled to take country-specific unemployment rates of low-skill individuals into account. The main lesson is that the picture does not change much. On the one hand, the countries with the tax-transfer system offering the least opportunities to get out of poverty, Greece, Portugal and Spain, are also the countries experiencing the highest unemployment rates. On the other hand, the countries providing the highest social welfare are also those offering high basic incomes, and they are not affected when unemployment rates are taken into account. Countries with an intermediary level of social welfare do not differ much in their unemployment rate of low-skill individuals and its effect on social welfare.

¹¹See table F.13 for an entire list of the unemployment rates.

Budget schemes - single with two children (2013)

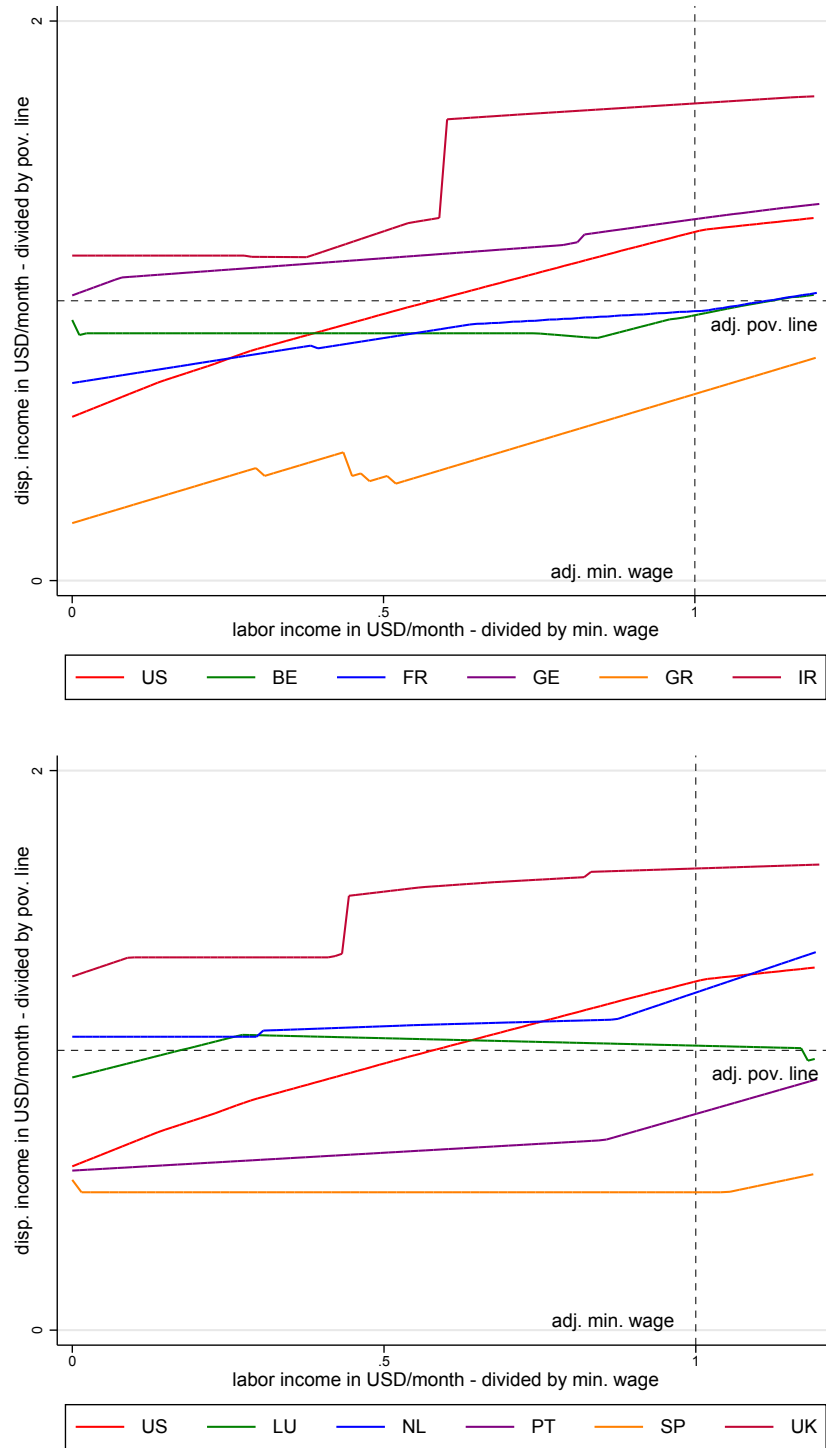


Figure E.2: Cross-country comparison of entire budget curves when minimum wages are adjusted for unemployment rates, for single households with two children

F Full set of results

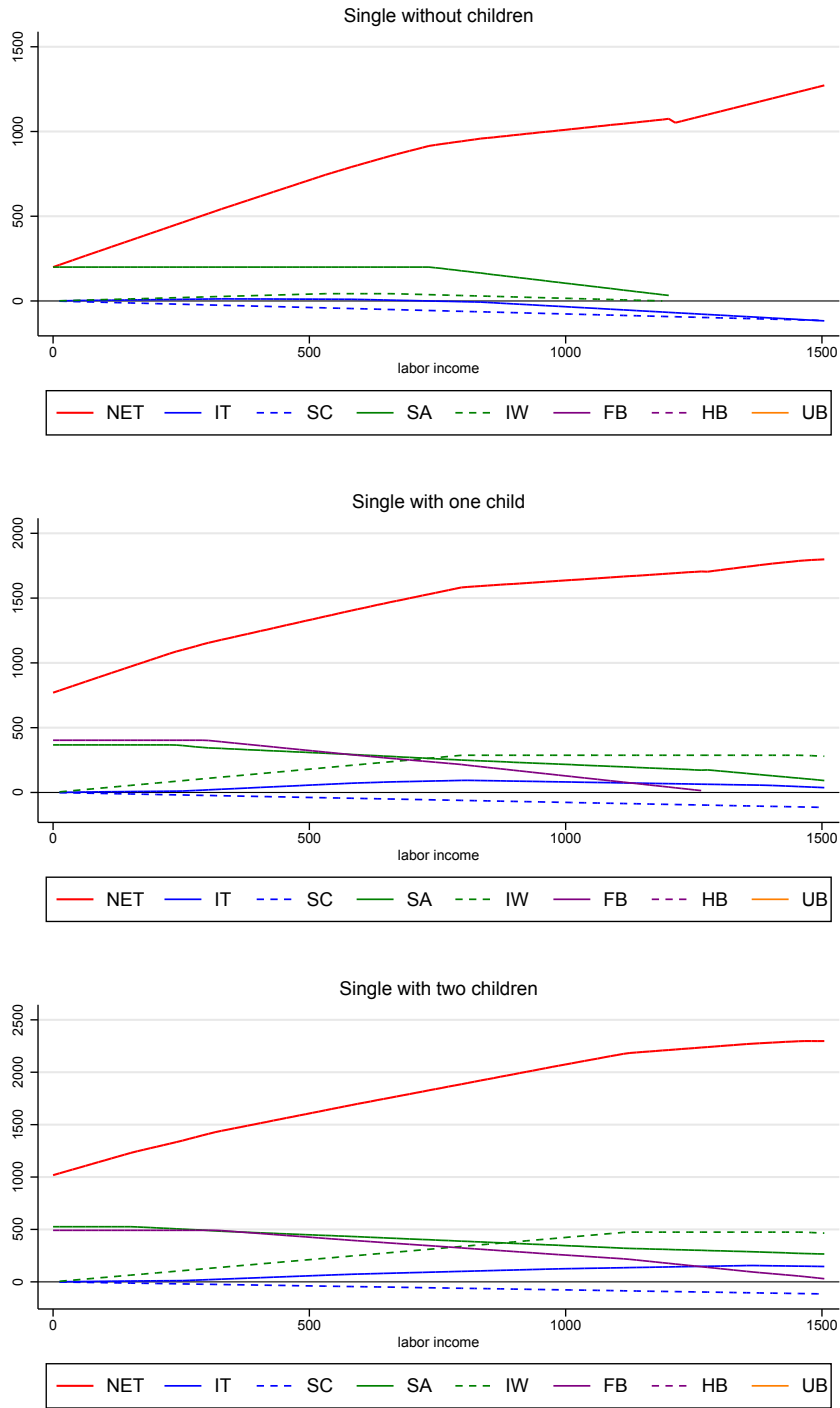
This appendix presents the full set of results of the applications presented in the paper and in appendices C to E above. Those applications focus on the analysis of tax schemes for single-parent households with two children and in appendices C and D on selected countries. This appendix presents results for all countries and all household types as specified in appendix C.

Precisely, appendix F.1 presents for all countries and household types simulated budget curves and their decomposition into the various tax-transfer components. Appendix F.2 presents household-type specific tables with the main statistic for all countries, i.e. the social welfare measure and its components. Appendix F.3 shows household-type specific figures that extend the cross-country comparison to entire budget curves. Appendix F.4 presents country-specific figures that show whether single households on the one hand and couple households on the other hand are treated differently depending on the number of children in the household. In appendix F.5 the extended cross-country comparison is done with the assumption of a poverty threshold that is 50% of mean income. Appendix F.6 shows the social welfare statistic when housing benefits are assumed away. Finally, appendix F.7 does the extended cross-country comparison when taking into account that household earners might need some time in order to find a job, before deciding about their hours of work.

F.1 Budget curve decomposition

Figures F.1 to F.22 show for all countries and household types how budget curves evolve as the sum of the different tax-transfer policies described above. They correspond to figures C.1 and C.2 in appendix C. As mentioned there, unemployment insurance benefits (UB) could be modeled with the OECD Tax-Benefit Calculator but are not taken into account here. That is why for all countries UB are still shown in the legend but no corresponding curve is drawn. The only exception, however, is the UK. There, the Jobseeker's Allowance has a part that is contribution-based (i.e. an insurance benefit) but also a part that is income-based (i.e. means-tested and thus an assistance benefit). Where lone parents are eligible to Income Support (SA), other family types claim this latter type of Jobseeker's Allowance. It is thus modeled but labeled under UB in the OECD calculator.

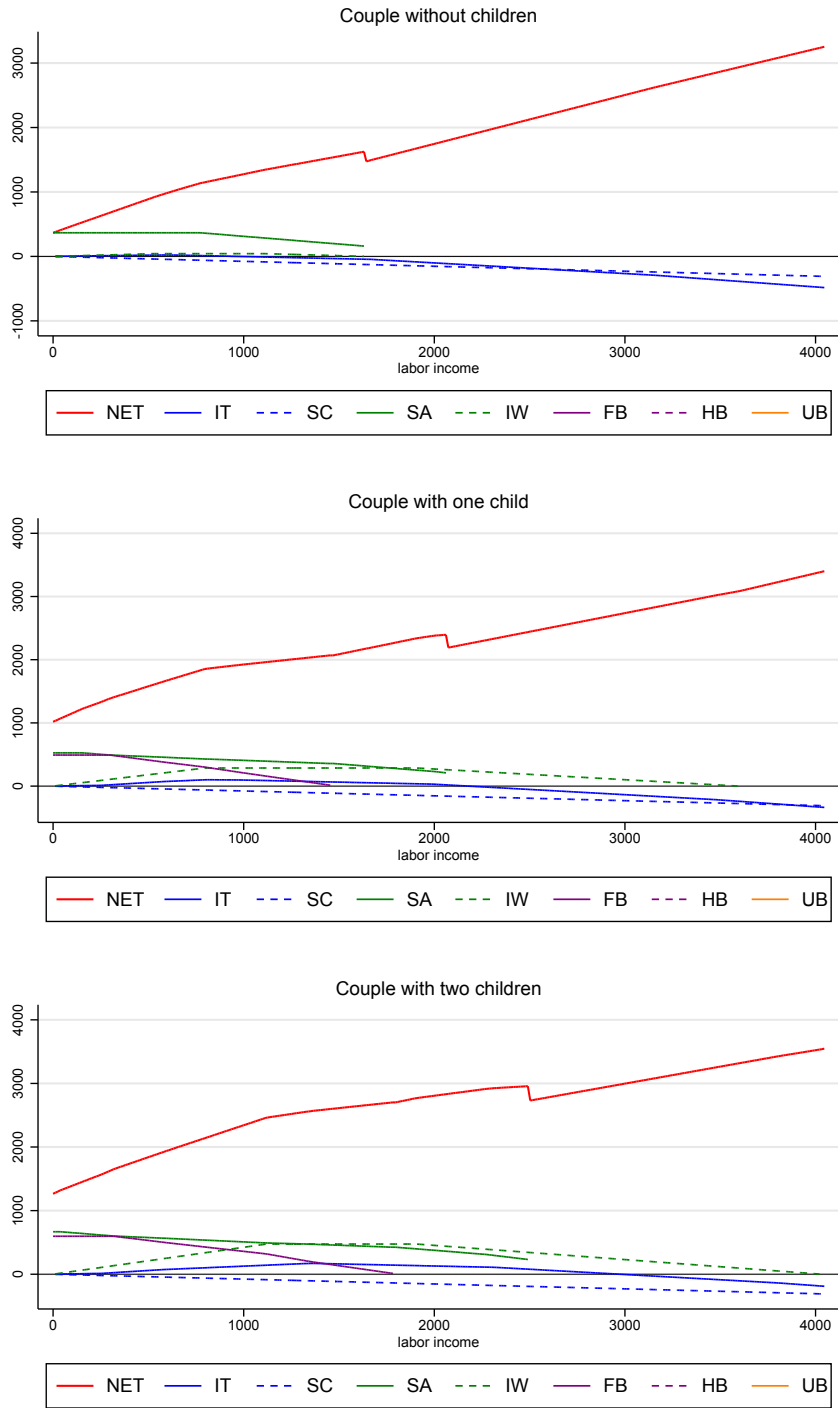
US (2013)



All values in USD per month.

Figure F.1: Budget curve decomposition for single households: US

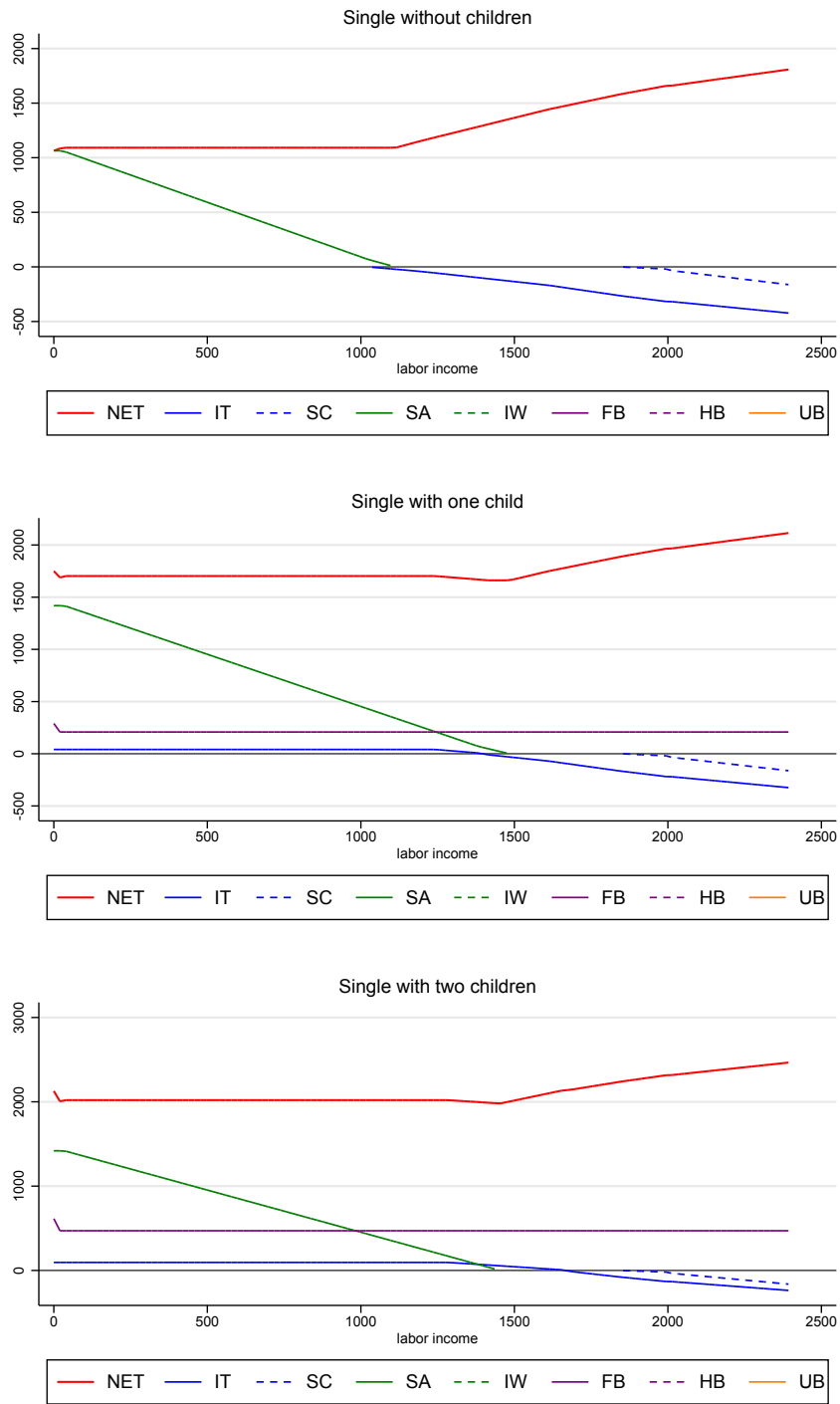
US (2013)



All values in USD per month.

Figure F.2: Budget curve decomposition for couple households: US

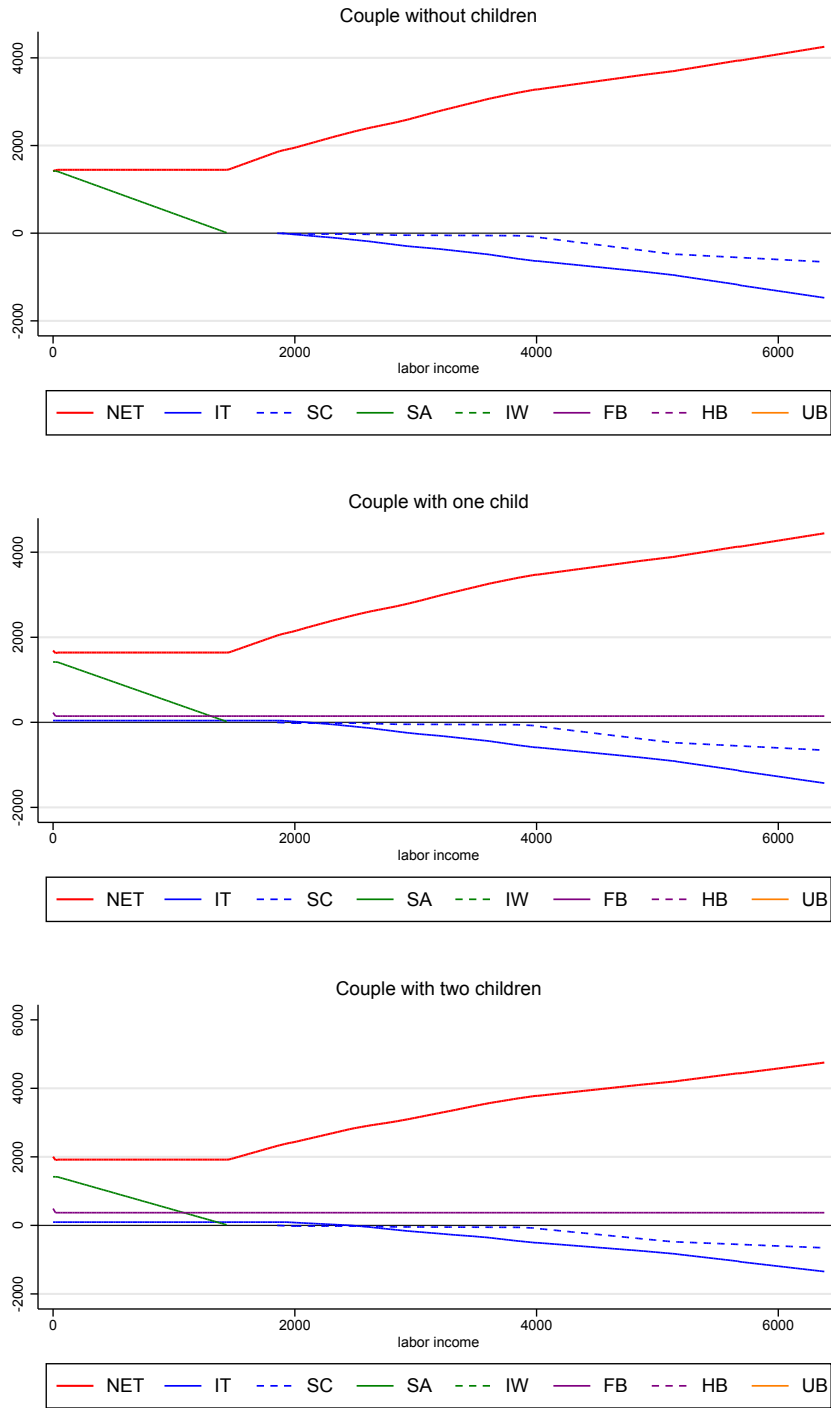
BE (2013)



All values in USD per month.

Figure F.3: Budget curve decomposition for single households: BE

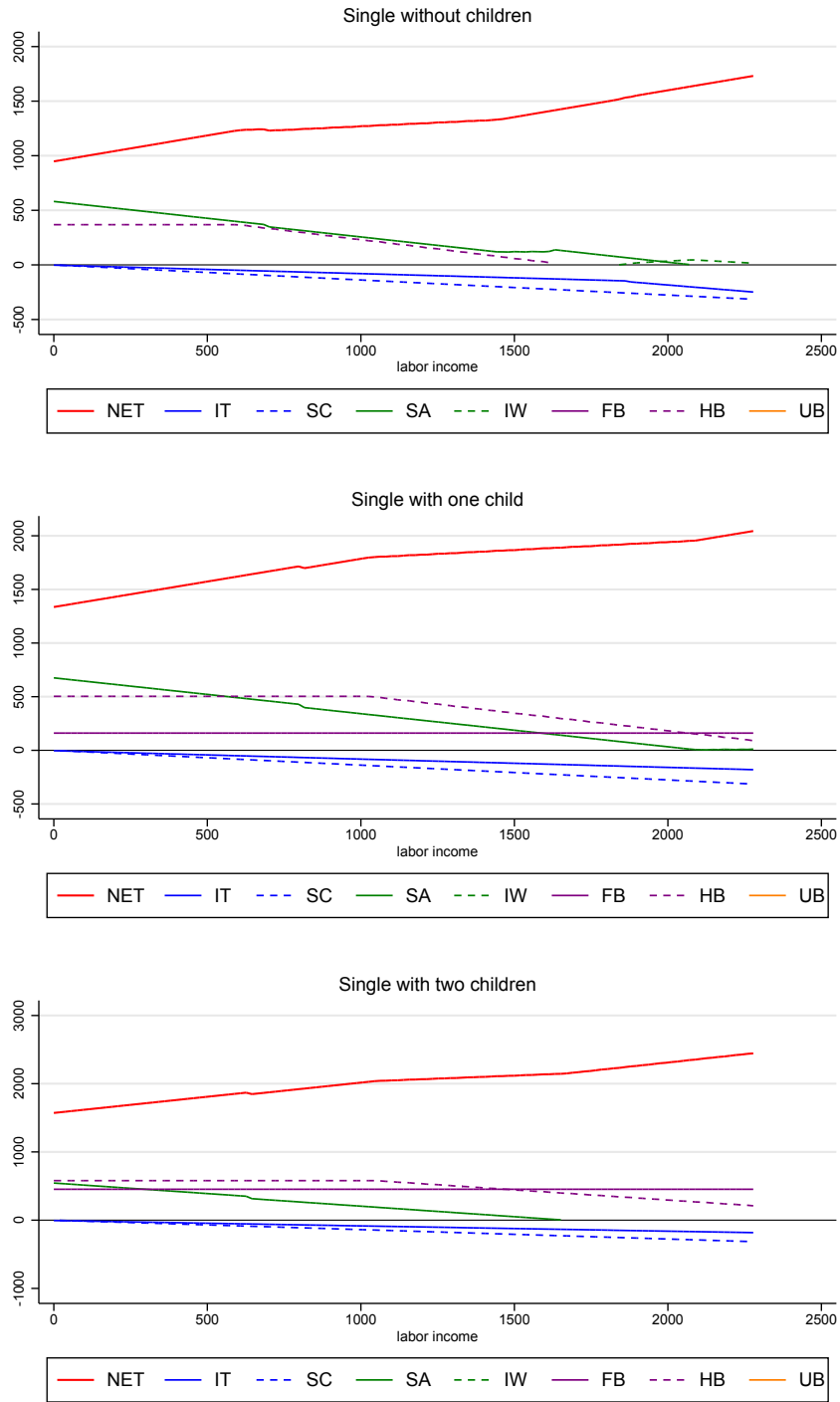
BE (2013)



All values in USD per month.

Figure F.4: Budget curve decomposition for couple households: BE

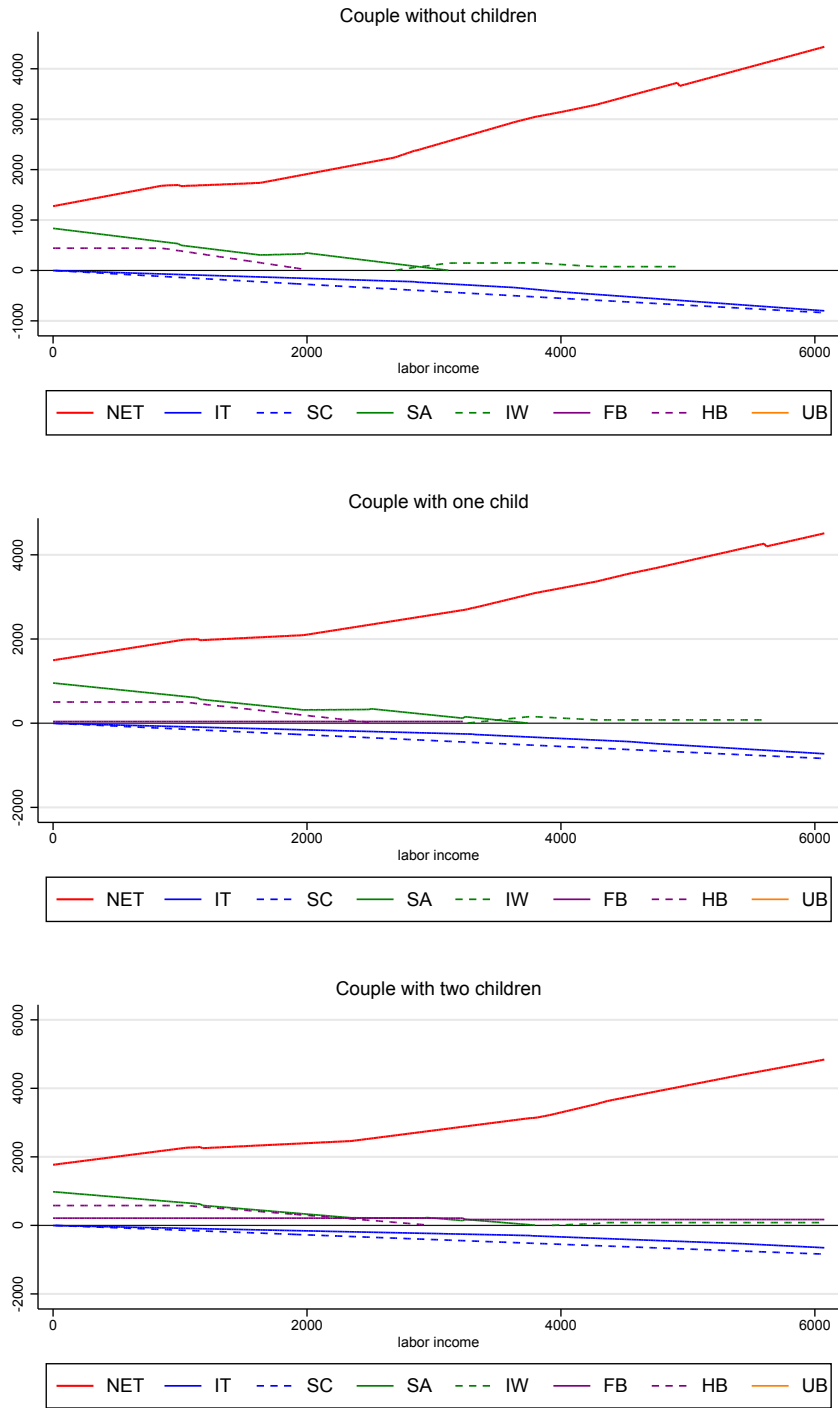
FR (2013)



All values in USD per month.

Figure F.5: Budget curve decomposition for single households: FR

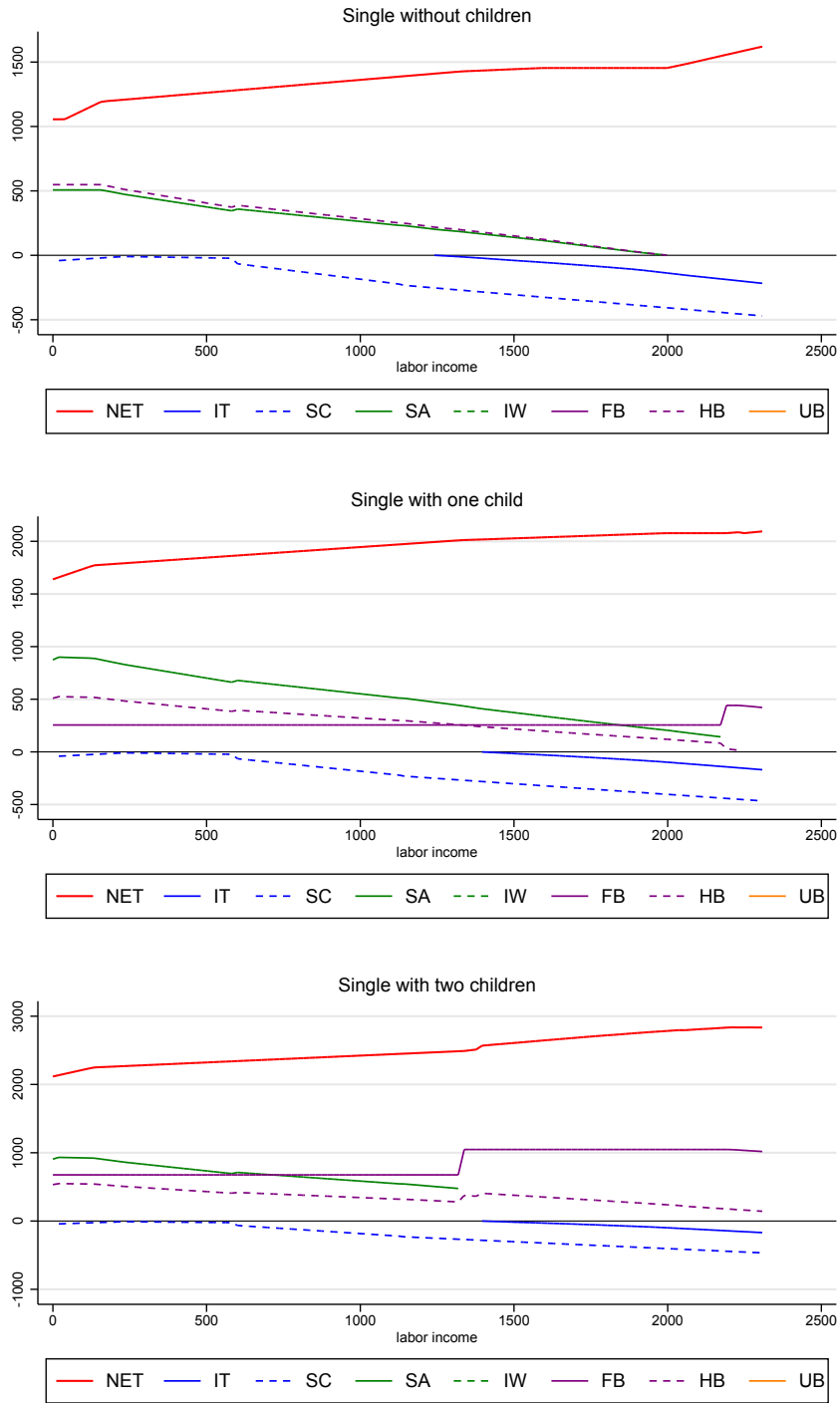
FR (2013)



All values in USD per month.

Figure F.6: Budget curve decomposition for couple households: FR

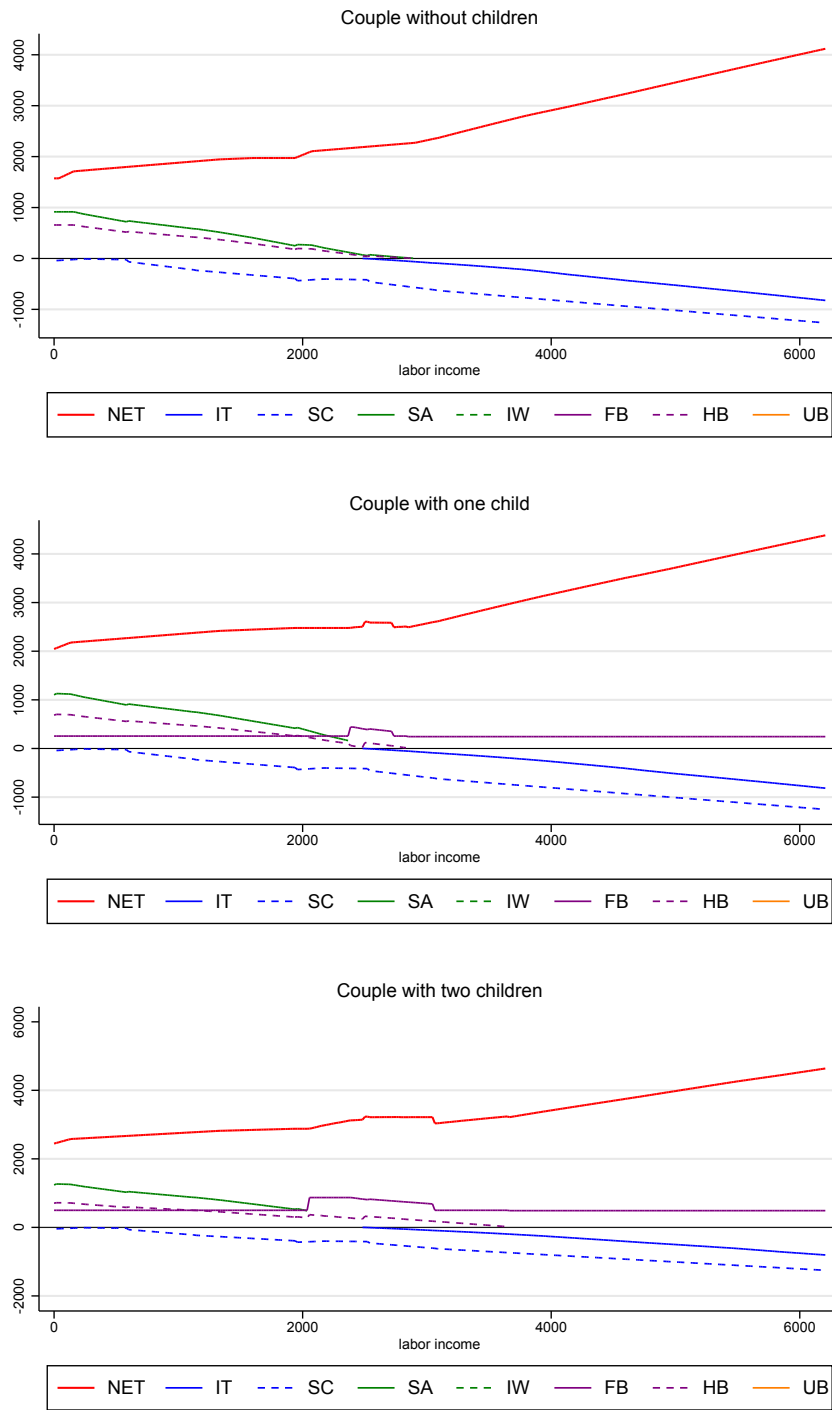
GE (2013)



All values in USD per month.

Figure F.7: Budget curve decomposition for single households: GE

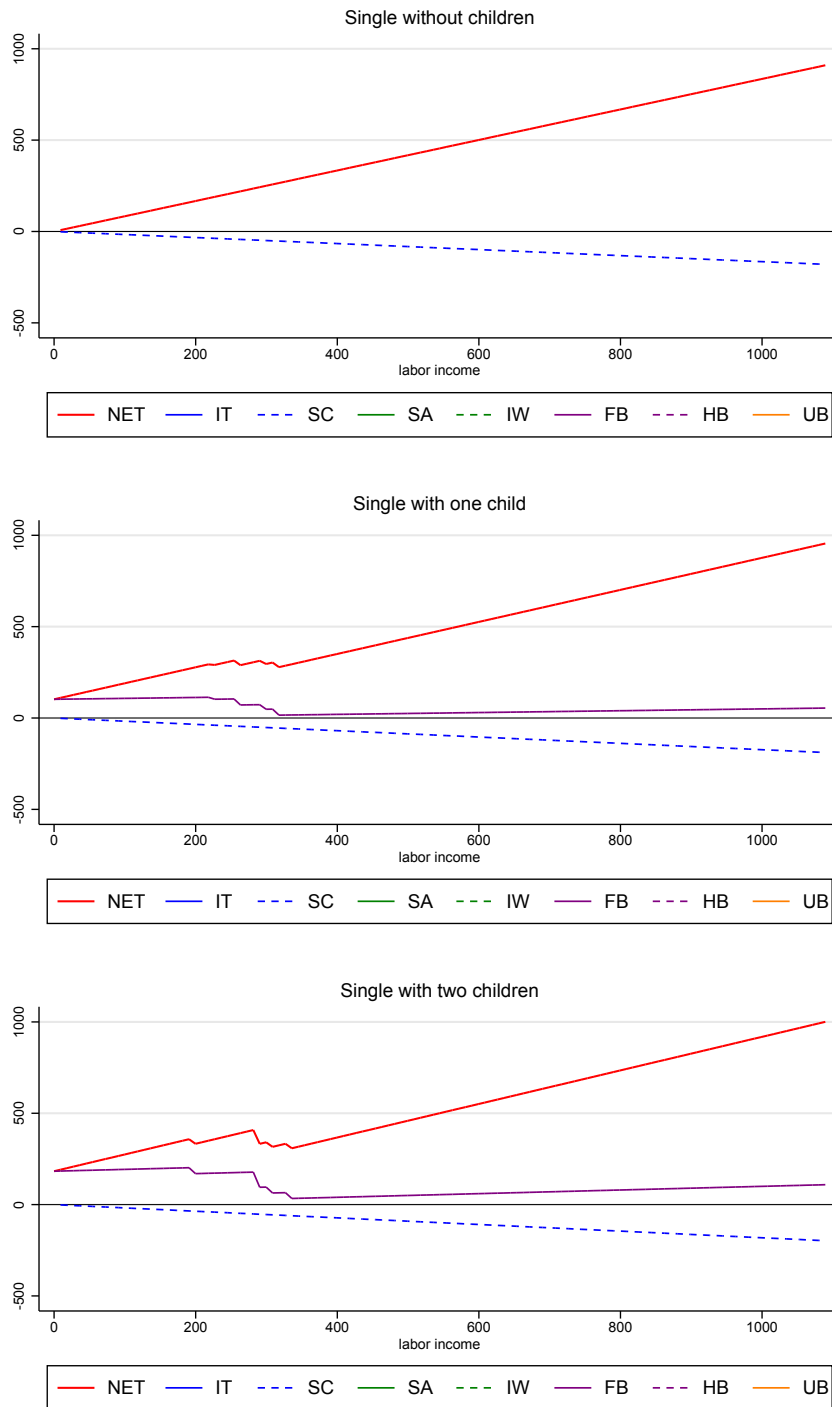
GE (2013)



All values in USD per month.

Figure F.8: Budget curve decomposition for couple households: GE

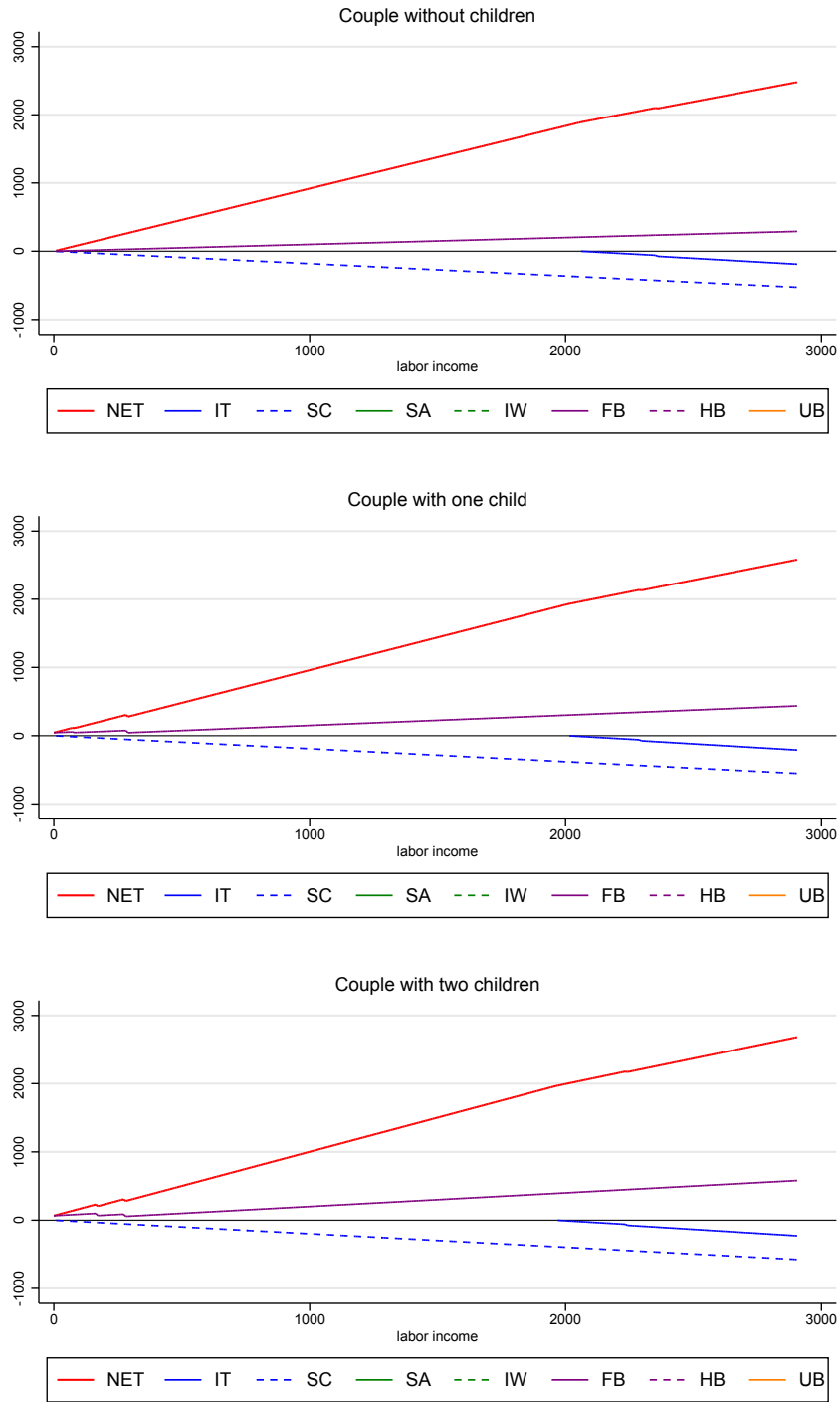
GR (2013)



All values in USD per month.

Figure F.9: Budget curve decomposition for single households: GR

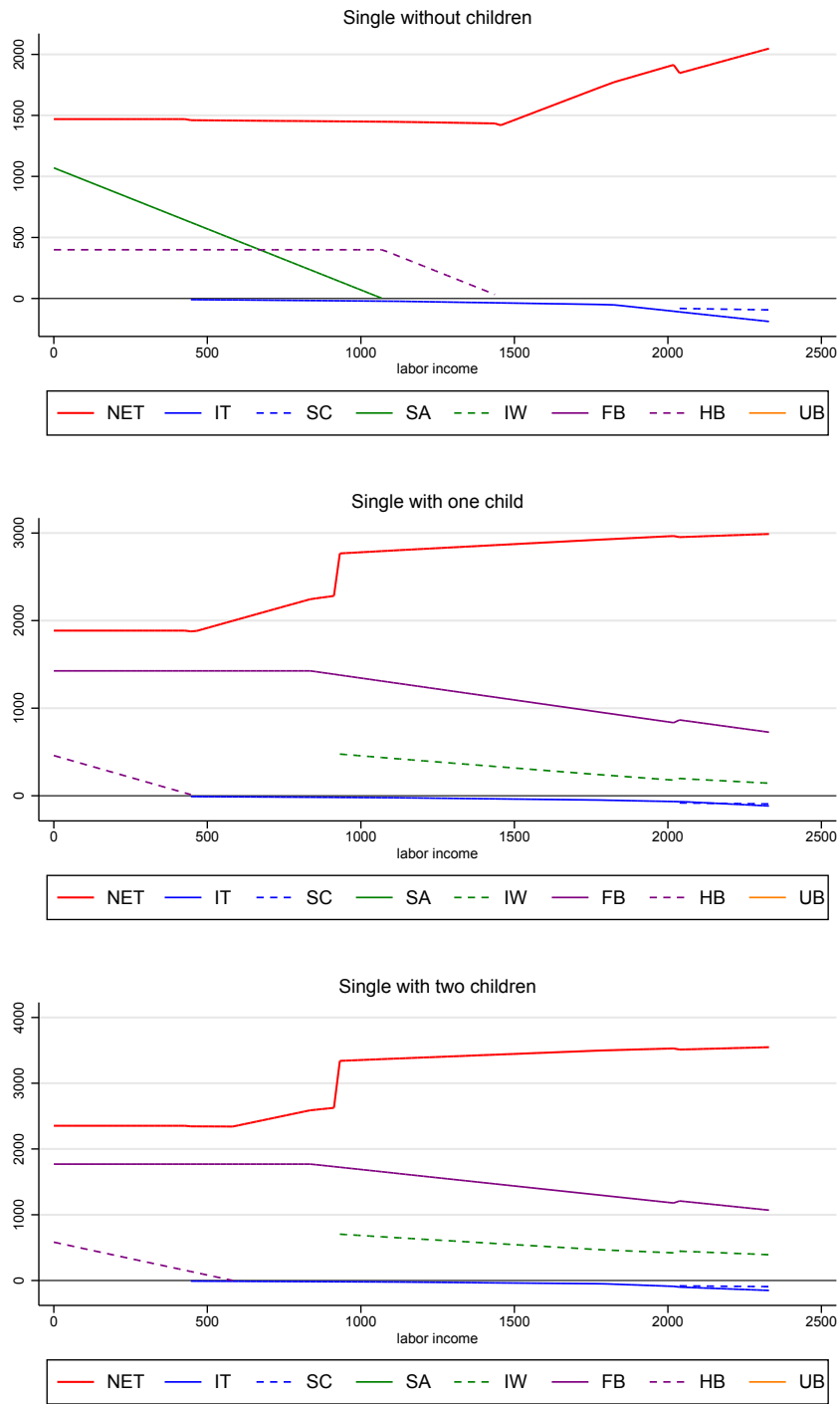
GR (2013)



All values in USD per month.

Figure F.10: Budget curve decomposition for couple households: GR

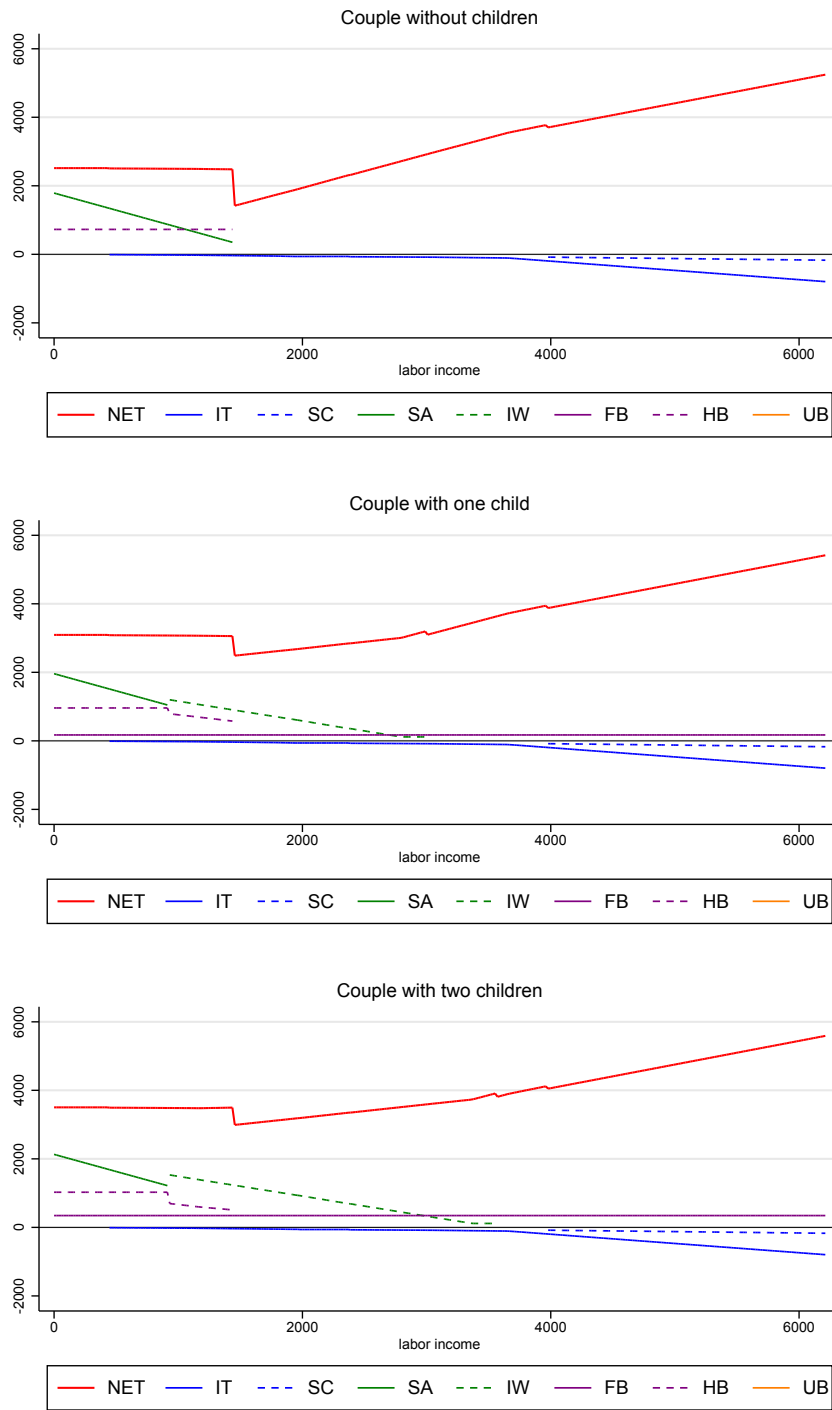
IR (2013)



All values in USD per month.

Figure F.11: Budget curve decomposition for single households: IR

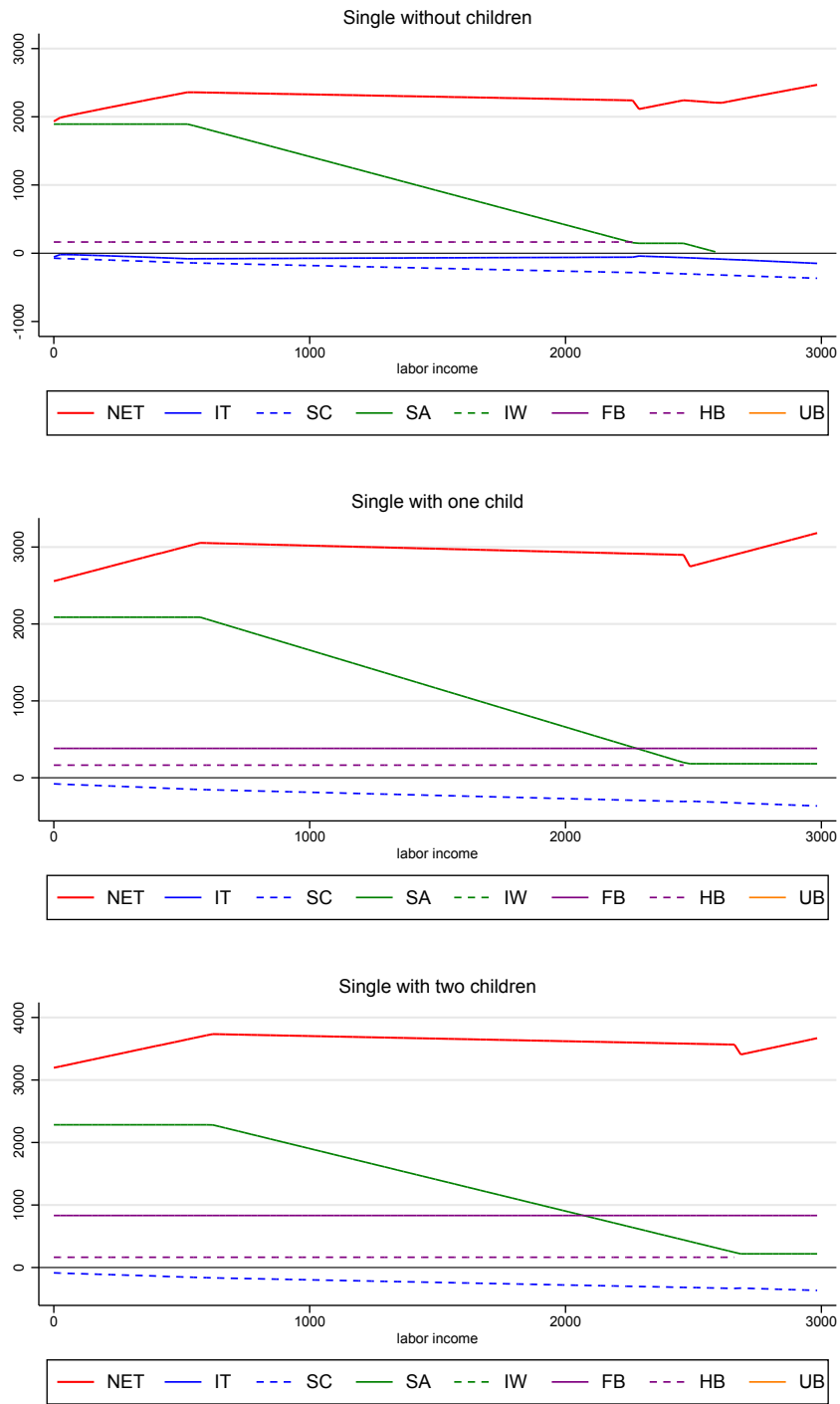
IR (2013)



All values in USD per month.

Figure F.12: Budget curve decomposition for couple households: IR

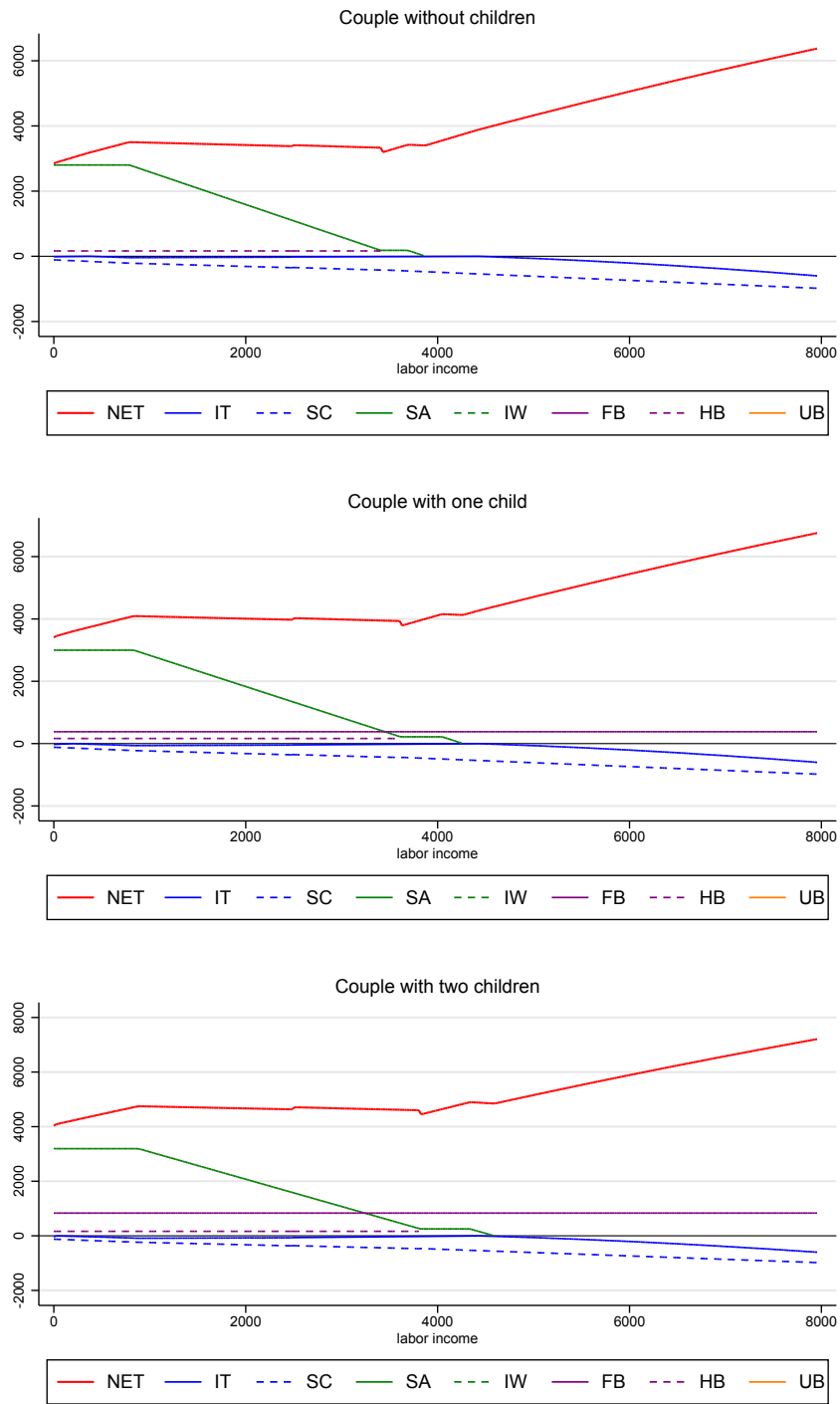
LU (2013)



All values in USD per month.

Figure F.13: Budget curve decomposition for single households: LU

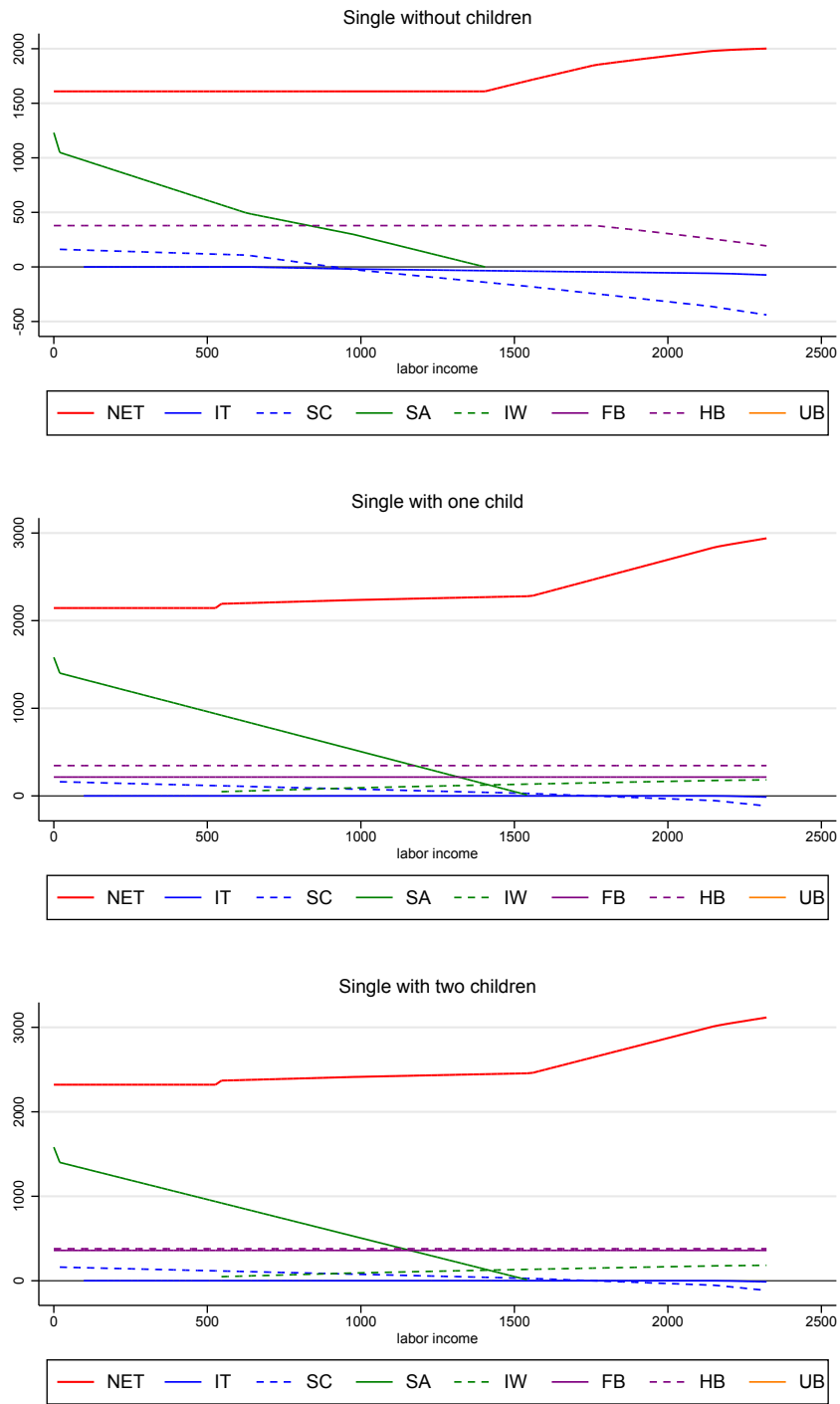
LU (2013)



All values in USD per month.

Figure F.14: Budget curve decomposition for couple households: LU

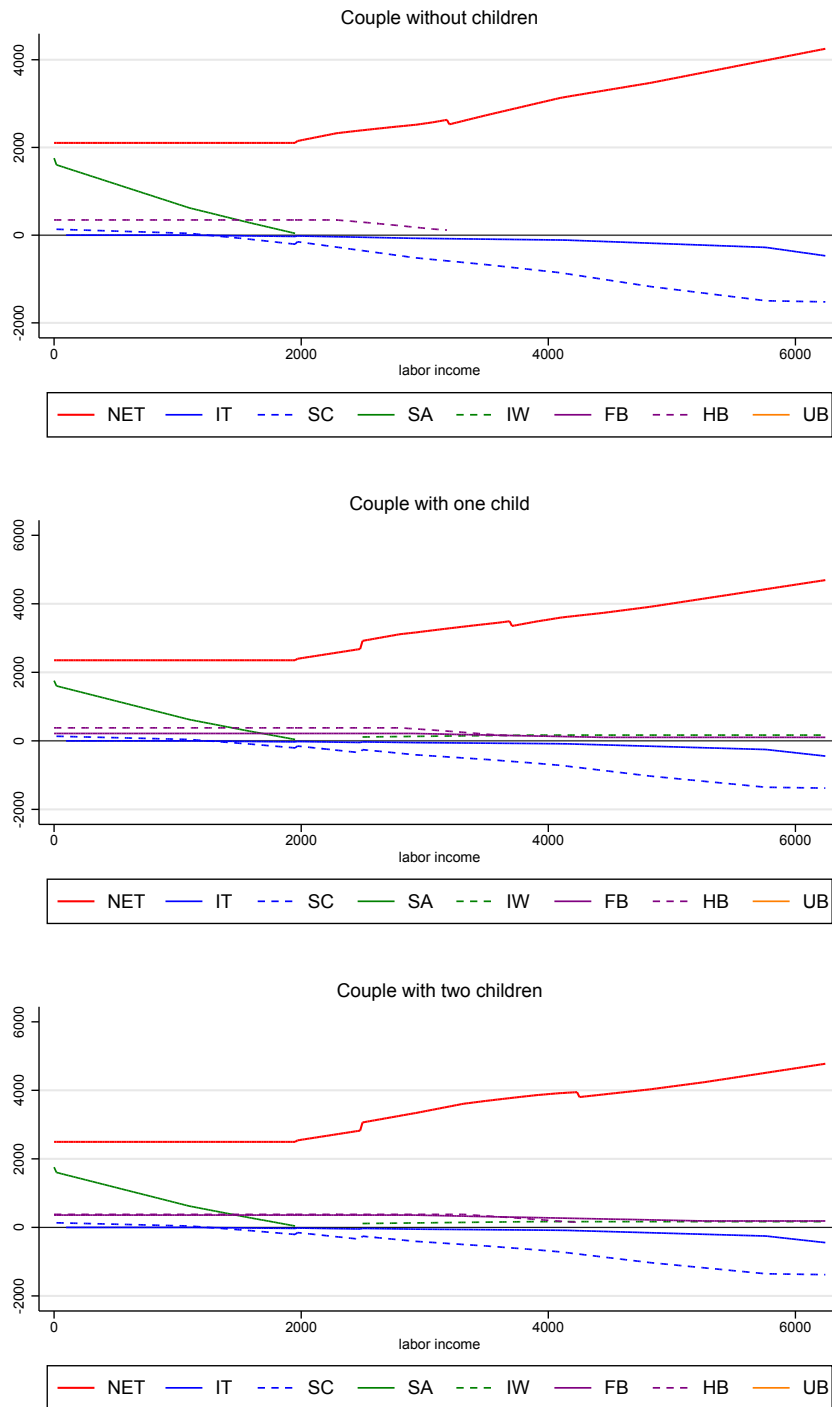
NL (2013)



All values in USD per month.

Figure F.15: Budget curve decomposition for single households: NL

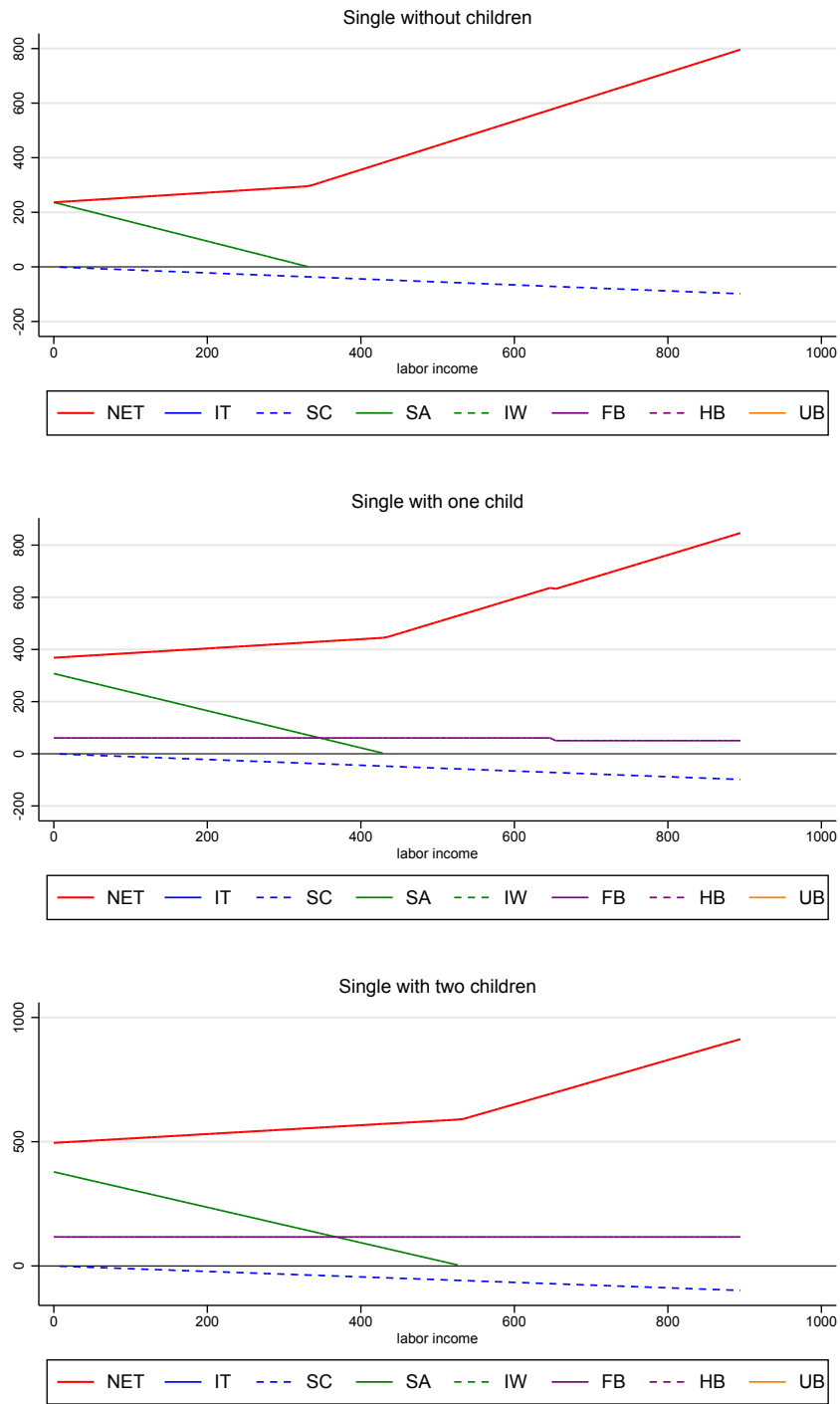
NL (2013)



All values in USD per month.

Figure F.16: Budget curve decomposition for couple households: NL

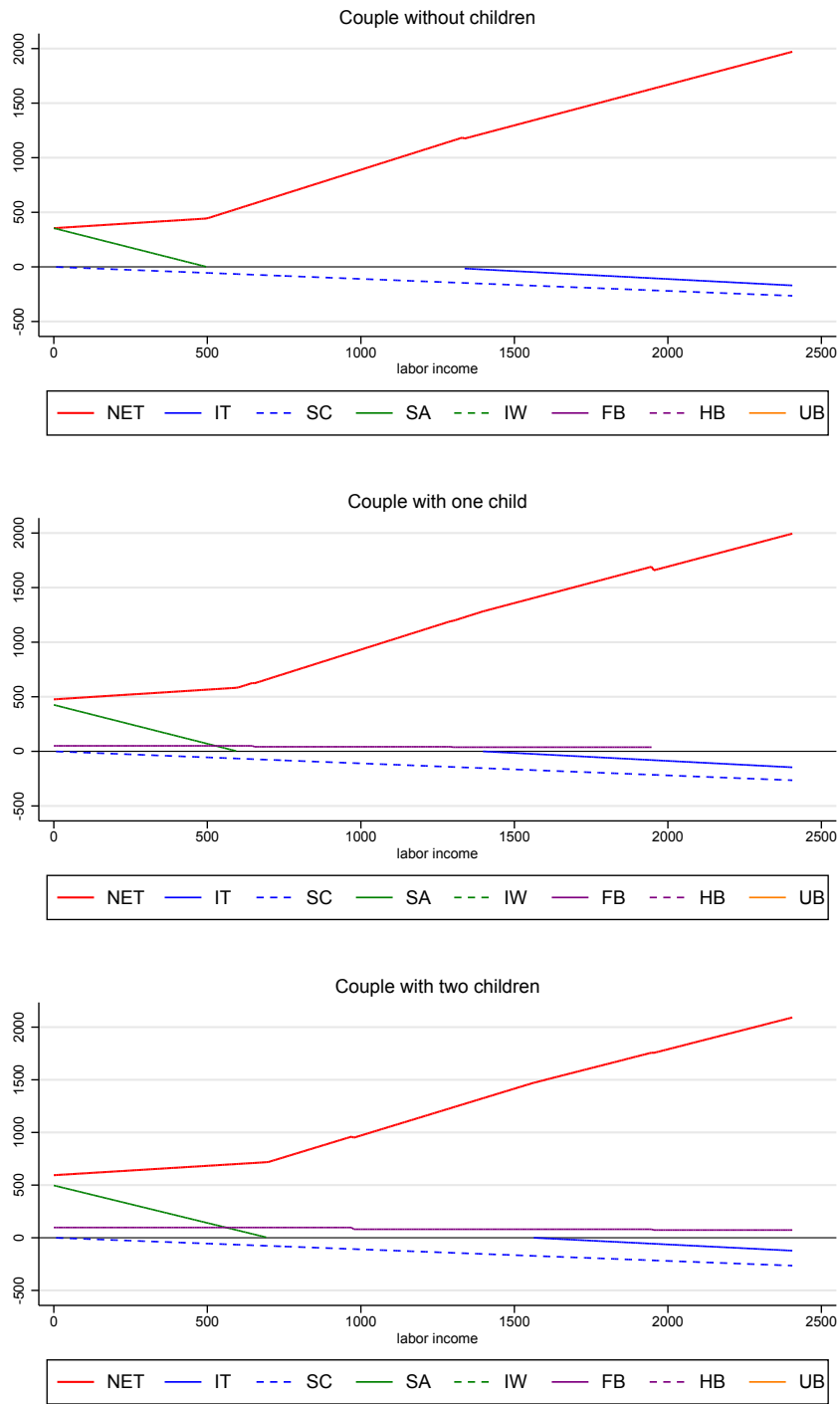
PT (2013)



All values in USD per month.

Figure F.17: Budget curve decomposition for single households: PT

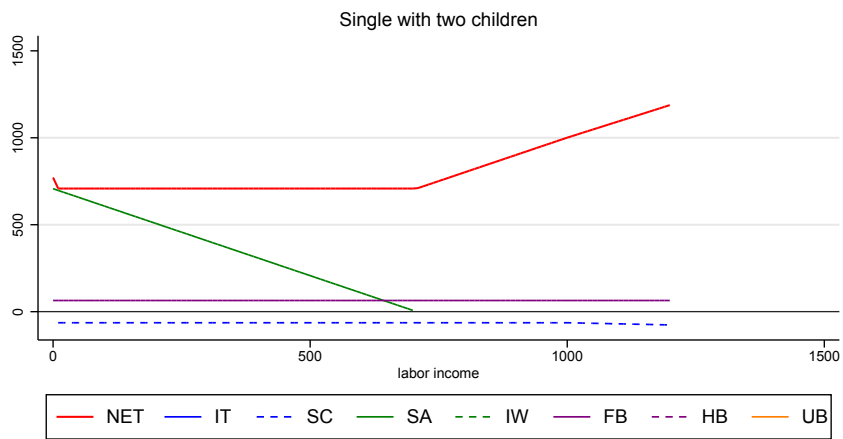
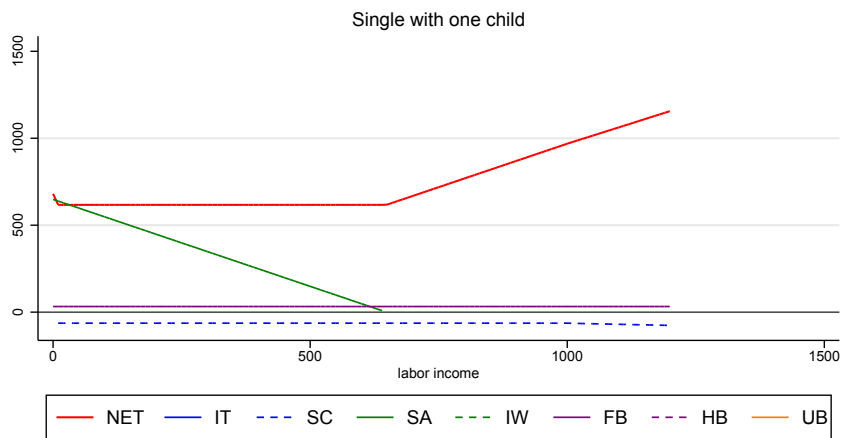
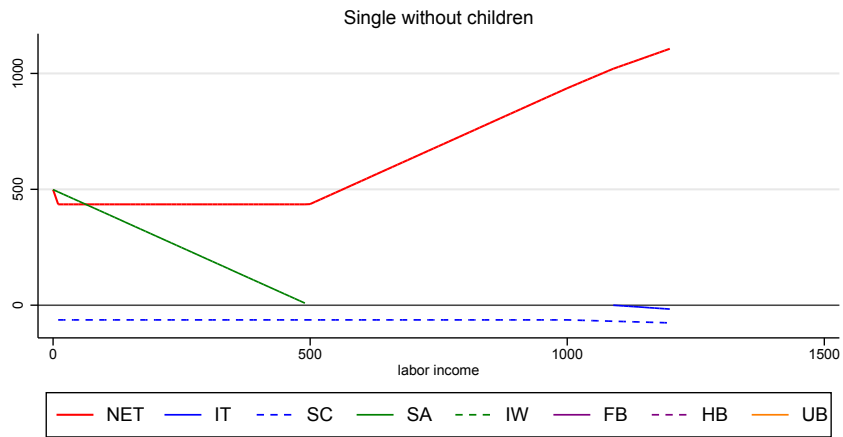
PT (2013)



All values in USD per month.

Figure F.18: Budget curve decomposition for couple households: PT

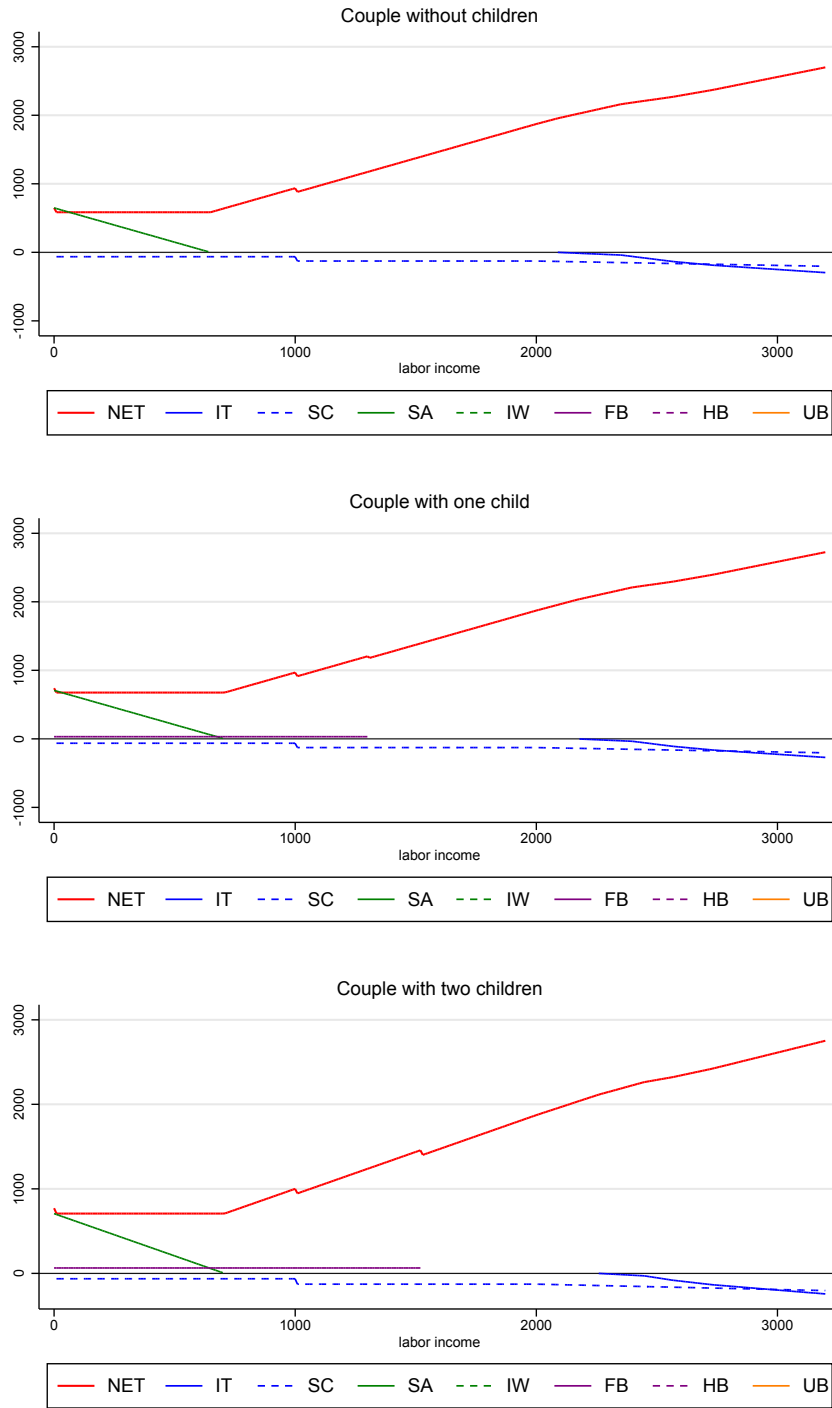
SP (2013)



All values in USD per month.

Figure F.19: Budget curve decomposition for single households: SP

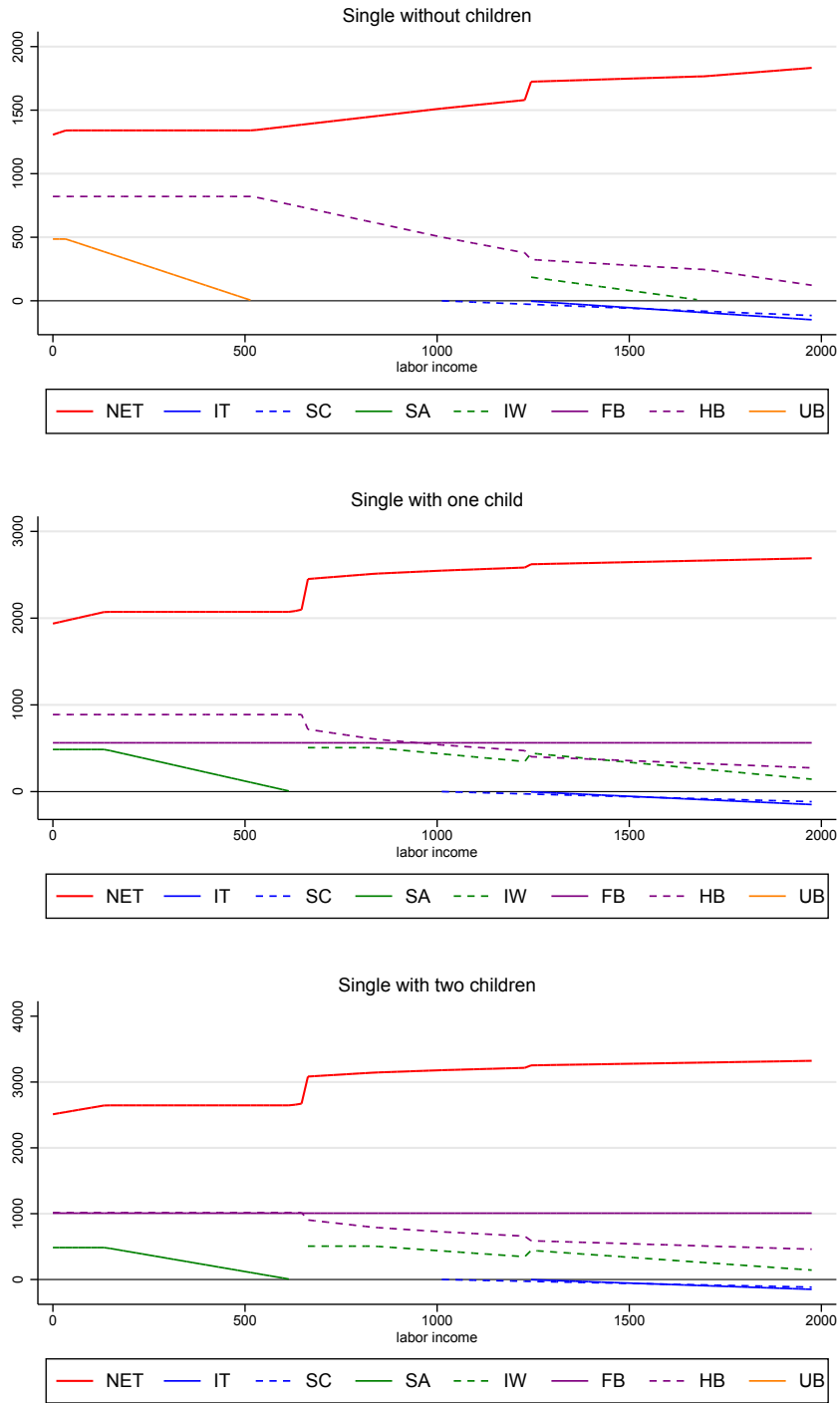
SP (2013)



All values in USD per month.

Figure F.20: Budget curve decomposition for couple households: SP

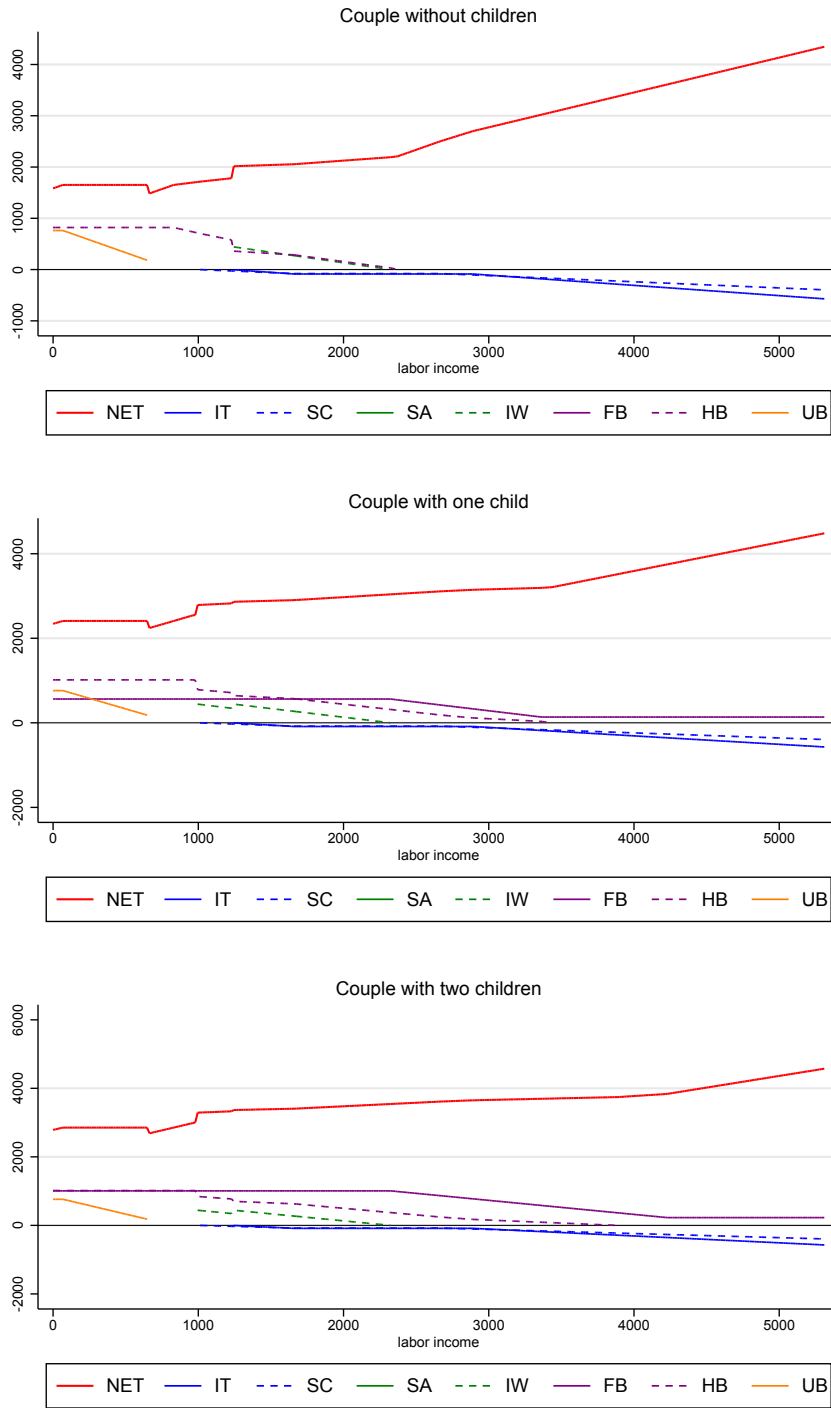
UK (2013)



All values in USD per month.

Figure F.21: Budget curve decomposition for single households: UK

UK (2013)



All values in USD per month.

Figure F.22: Budget curve decomposition for couple households: UK

F.2 Measuring and decomposing social welfare

Tables F.1 to F.6 show separately for each household type the measure of social welfare derived in the paper and its components. They correspond to table 1 in the paper.

For the sake of completeness, we repeat the description of the statistics from the paper. The first column of each table shows W_{\min}^p , the measure of social welfare according to social preferences R^{lex} , as percentage of a full-time job. The second column shows the pre-tax income corresponding to this measure, $W_{\min}^p w_m$. The next columns of the tables decompose that key statistic into the three policy parameters that determine it. The first one is the basic income, b , that is, the disposable income of those who do not earn anything. It gives us the *level* of the opportunity set available to those who do not work. The second one is the rate τ at which low incomes are effectively taxed. That is, given any additional dollar earned, how much of it is taken away by the tax-transfer system, on average, below the minimum wage. This tool gives us a summary of the *shape* of the opportunity set of low-skill individuals, that is, of how their labor is rewarded. The third one is the minimum wage itself, w_m , but its effect on our key statistic is best seen when it is expressed as a percentage of the poverty line, $\frac{w_m}{p}$, which is done in the last column. A level below 100% indicates that the level of the minimum wage is below that of the poverty line and that in this case, a household will not be able to reach the poverty line without additional benefits. The contrary is the case for a level above 100%.

If the marginal tax rate were constant over low incomes at τ , then our measure of social welfare would satisfy the equation $p = b + W_{\min}^p w_m (1 - \tau)$, which gives us

$$W_{\min}^p = \frac{p - b}{w_m (1 - \tau)},$$

illustrating how the combination of the three policy parameters, b , τ and w_m determine social welfare and how they can be used to increase it. Social assistance, family benefits and housing benefits typically determine b . How these benefits fade out when gross income increases, in-work transfers, income tax and social security payments together determine τ . Finally, w_m is a direct policy instrument.

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
US	70.10	886.69	200.05	27.92	1,264.96	971.11	130.26
BE	80.00	1,595.65	1,064.26	70.38	1,994.57	1,427.77	139.70
FR	83.91	1,593.77	948.37	67.62	1,899.48	1,391.12	136.54
GE	35.97	697.39	1,055.84	79.45	1,938.84	1,297.89	149.38
GR	73.92	671.31	0.00	16.50	908.10	556.27	163.25
IR	0.00	0.00	1,469.93	78.68	1,941.48	1,266.01	153.35
LU	13.10	325.96	1,932.25	84.17	2,489.11	2,211.35	112.56
NL	0.00	0.00	1,609.45	84.03	1,951.51	1,383.48	141.06
PT	82.08	616.80	236.60	42.48	751.48	542.99	138.40
SP	97.12	971.05	498.77	49.67	999.86	897.99	111.34
UK	0.00	0.00	1,306.87	80.11	1,659.93	1,241.38	133.72

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.1: Social welfare and its decomposition for **single households without children**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
US	52.09	658.92	770.21	29.20	1,264.96	1,465.41	86.32
BE	90.00	1,795.11	1,750.35	86.05	1,994.57	1,856.11	107.46
FR	57.94	1,100.55	1,336.09	68.37	1,899.48	1,808.45	105.03
GE	3.06	59.35	1,639.35	77.67	1,938.84	1,687.25	114.91
GR	90.89	825.34	102.58	16.59	908.10	723.16	125.57
IR	0.00	0.00	1,885.58	68.73	1,941.48	1,645.81	117.96
LU	15.00	373.37	2,557.23	85.74	2,489.11	2,874.76	86.59
NL	0.00	0.00	2,143.99	74.69	1,951.51	1,798.53	108.51
PT	97.92	735.86	368.34	53.01	751.48	705.89	106.46
SP	121.90	1,218.85	680.61	64.49	999.86	1,167.39	85.65
UK	0.00	0.00	1,937.19	77.68	1,659.93	1,613.79	102.86

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.2: Social welfare and its decomposition for **single households with one child**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
US	51.13	646.72	1,018.28	7.02	1,264.96	1,739.71	72.71
BE	97.95	1,953.65	2,128.09	84.42	1,994.57	2,284.44	87.31
FR	97.00	1,842.41	1,571.74	62.58	1,899.48	2,225.79	85.34
GE	0.00	0.00	2,116.80	68.25	1,938.84	2,076.62	93.37
GR	107.09	972.47	182.87	12.58	908.10	890.04	102.03
IR	0.00	0.00	2,353.30	75.37	1,941.48	2,025.62	95.85
LU	15.95	397.07	3,195.76	84.76	2,489.11	3,538.16	70.35
NL	0.00	0.00	2,321.35	74.69	1,951.51	2,213.57	88.16
PT	112.99	849.07	495.40	61.36	751.48	868.79	86.50
SP	146.97	1,469.54	771.64	70.32	999.86	1,436.79	69.59
UK	0.00	0.00	2,510.71	77.68	1,659.93	1,986.20	83.57

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.3: Social welfare and its decomposition for **single households with two children**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
US	46.46	1,175.48	367.10	23.74	2,529.92	1,373.36	184.21
BE	56.54	2,255.40	1,419.01	53.56	3,989.13	2,141.66	186.26
FR	62.55	2,376.38	1,274.58	52.87	3,798.95	2,086.68	182.06
GE	34.95	1,355.21	1,573.80	67.20	3,877.68	1,946.83	199.18
GR	50.51	917.30	0.00	8.15	1,816.20	834.41	217.66
IR	0.00	0.00	2,516.93	41.68	3,882.97	1,899.02	204.47
LU	10.95	545.23	2,848.63	68.20	4,978.22	3,317.03	150.08
NL	0.00	0.00	2,104.17	74.78	3,903.02	2,075.22	188.08
PT	61.04	917.39	354.90	36.75	1,502.96	814.49	184.53
SP	74.06	1,481.06	648.40	33.00	1,999.72	1,346.99	148.46
UK	37.47	1,243.80	1,583.69	58.99	3,319.85	1,862.06	178.29

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.4: Social welfare and its decomposition for **couple households without children**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
US	31.51	797.21	1,018.28	35.96	2,529.92	1,844.28	137.18
BE	64.49	2,572.48	1,689.31	54.05	3,989.13	2,569.99	155.22
FR	75.00	2,849.21	1,495.78	57.27	3,798.95	2,504.01	151.71
GE	23.98	929.85	2,045.72	71.75	3,877.68	2,336.19	165.98
GR	57.47	1,043.74	44.12	5.13	1,816.20	1,001.29	181.39
IR	0.00	0.00	3,093.50	62.26	3,882.97	2,278.82	170.39
LU	14.05	699.32	3,406.62	71.99	4,978.22	3,980.43	125.07
NL	54.95	2,144.52	2,352.93	73.45	3,903.02	2,490.27	156.73
PT	70.00	1,052.07	476.51	41.15	1,502.96	977.39	153.77
SP	87.46	1,749.03	739.43	36.53	1,999.72	1,616.39	123.72
UK	0.00	0.00	2,342.26	76.70	3,319.85	2,234.48	148.57

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.5: Social welfare and its decomposition for **couple households with one child**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
US	30.06	760.60	1,265.34	33.28	2,529.92	2,095.33	120.74
BE	69.49	2,771.94	2,006.01	53.33	3,989.13	2,998.33	133.05
FR	87.45	3,322.04	1,769.34	62.99	3,798.95	2,921.35	130.04
GE	22.45	870.50	2,446.80	73.08	3,877.68	2,725.56	142.27
GR	64.56	1,172.49	65.94	1.00	1,816.20	1,168.18	155.47
IR	0.00	0.00	3,504.06	70.04	3,882.97	2,658.62	146.05
LU	15.00	746.73	4,031.64	75.99	4,978.22	4,643.84	107.20
NL	64.01	2,498.36	2,497.10	71.10	3,903.02	2,905.31	134.34
PT	79.48	1,194.56	594.23	44.60	1,502.96	1,140.29	131.81
SP	101.01	2,019.89	771.64	36.53	1,999.72	1,885.79	106.04
UK	0.00	0.00	2,787.53	76.48	3,319.85	2,606.89	127.35

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.6: Social welfare and its decomposition for **couple households with two children**

F.3 Extended cross-country comparison

In figures F.23 to F.28, we draw the entire budget curves for all countries over the relevant income span, separately for each household type. They correspond to figure 8 in the paper. Country-specific budget curves are made comparable by rescaling the axes such that all minimum wages (resp. poverty lines) correspond to coordinate 1 along the horizontal (resp. vertical) axis.

Budget schemes - single without children (2013)

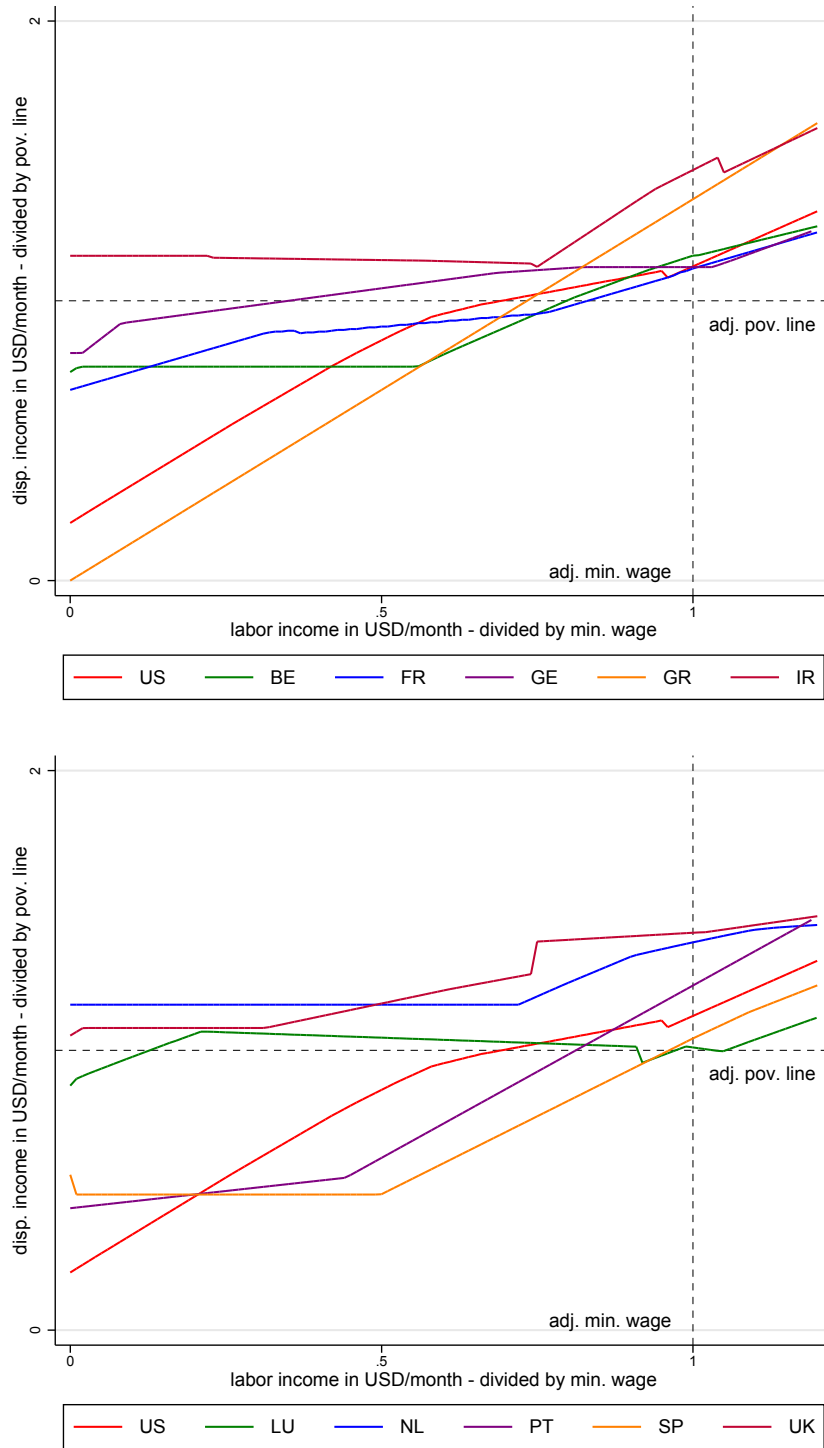


Figure F.23: Cross-country comparison of entire budget sets for **single households without children**

Budget schemes - single with one child (2013)

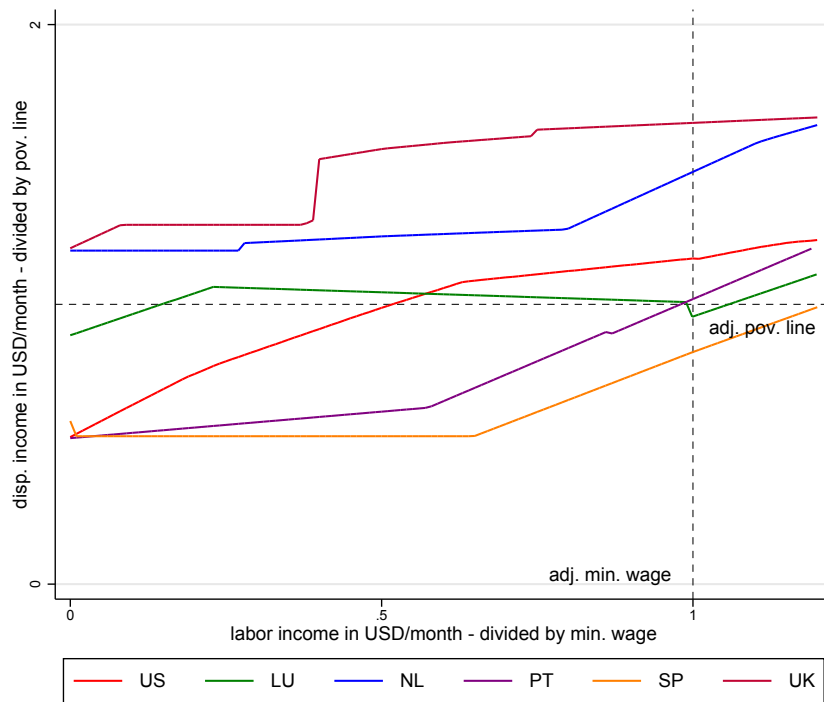
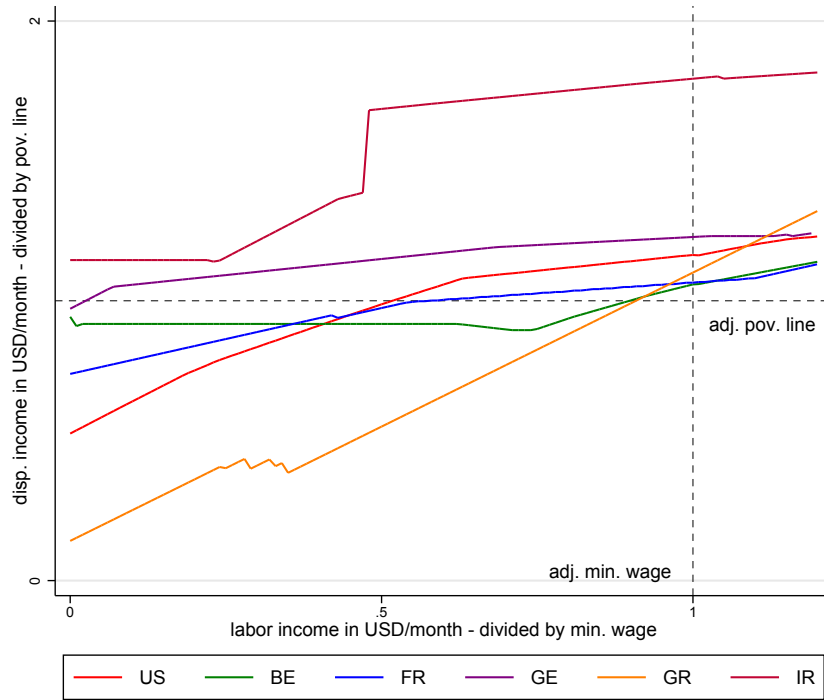


Figure F.24: Cross-country comparison of entire budget sets for **single households with one child**

Budget schemes - single with two children (2013)

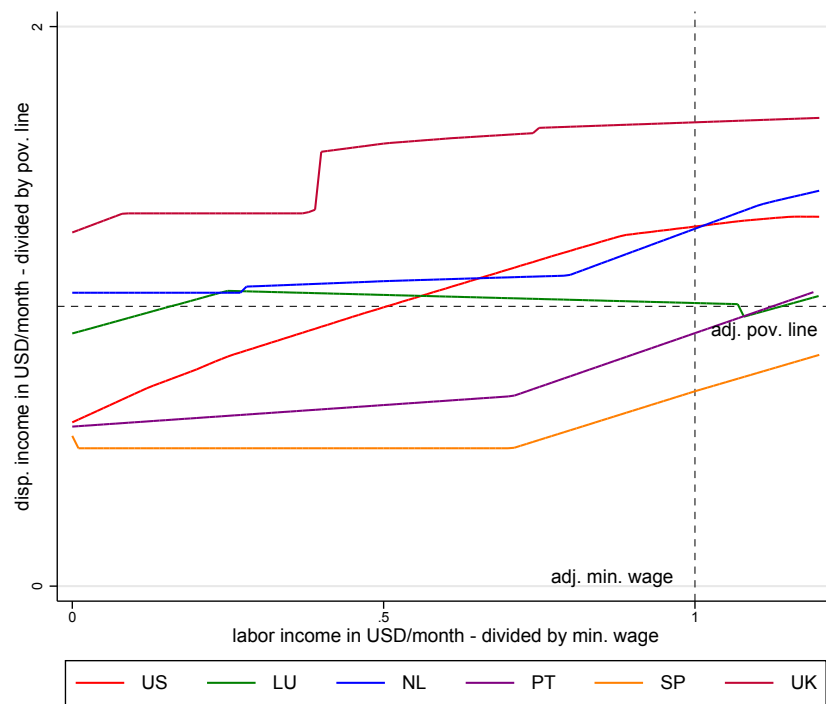


Figure F.25: Cross-country comparison of entire budget sets for **single households with two children**

Budget schemes - couple without children (2013)

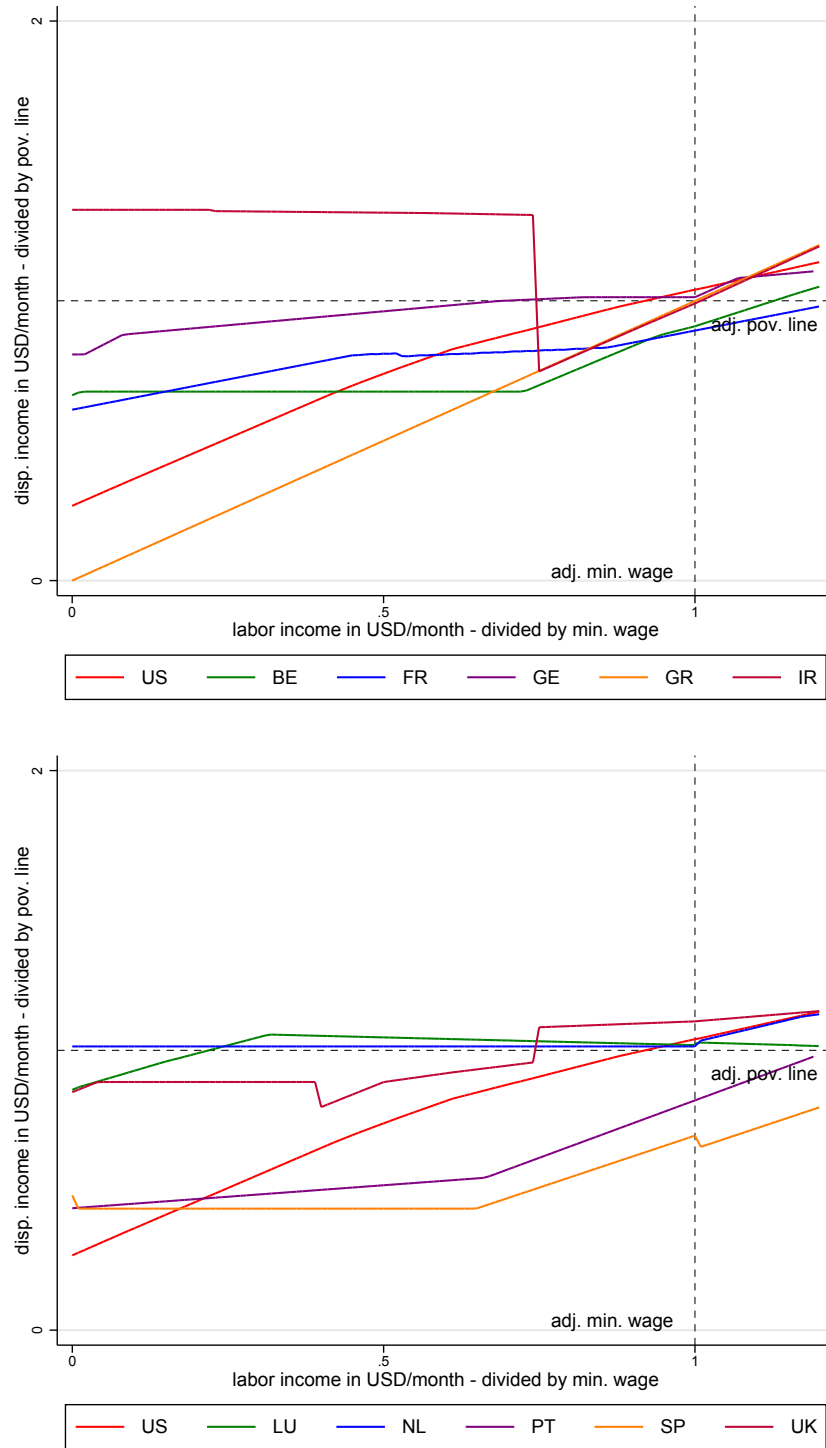


Figure F.26: Cross-country comparison of entire budget sets for **couple households without children**

Budget schemes - couple with one child (2013)

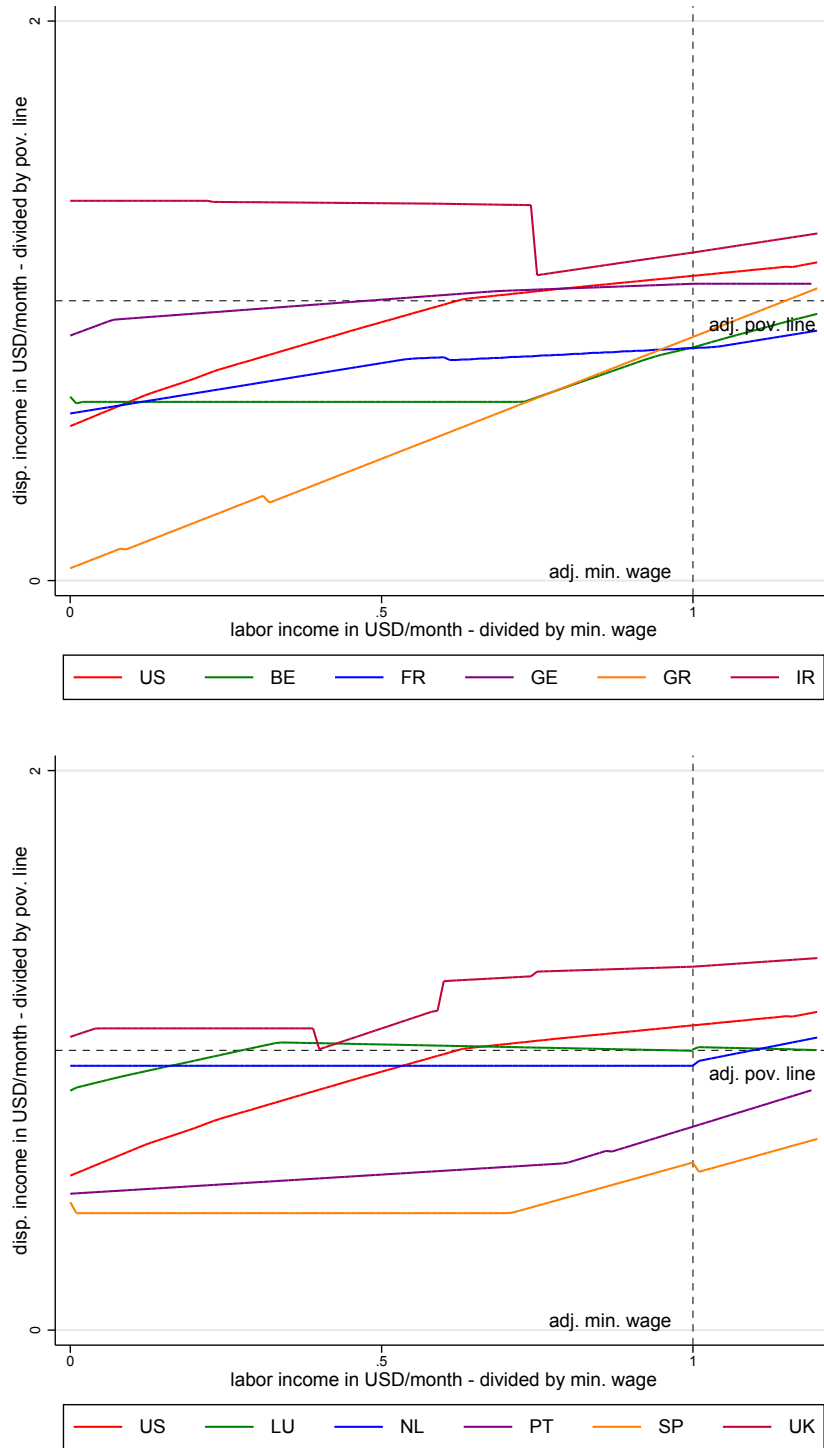


Figure F.27: Cross-country comparison of entire budget sets for **couple households with one child**

Budget schemes - couple with two children (2013)

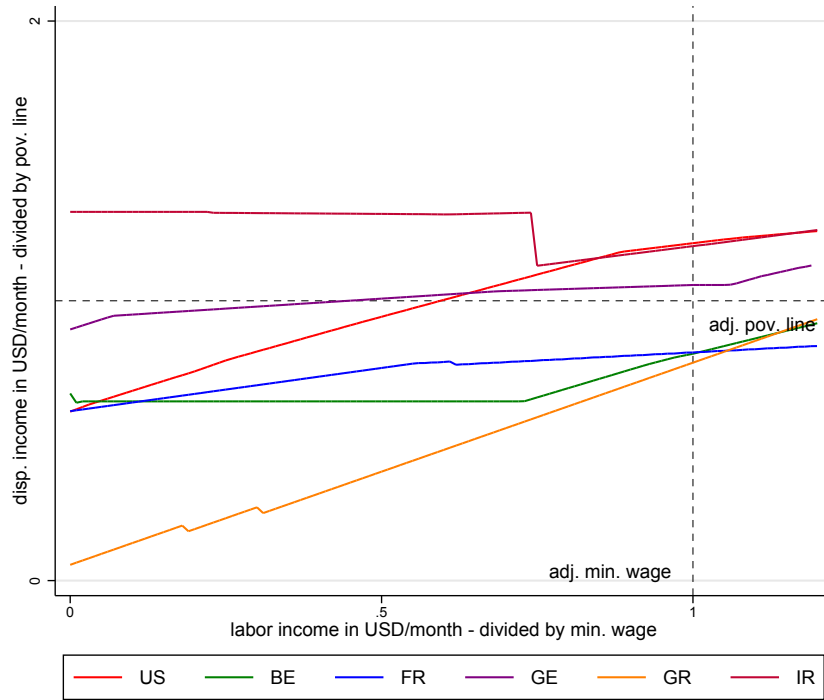
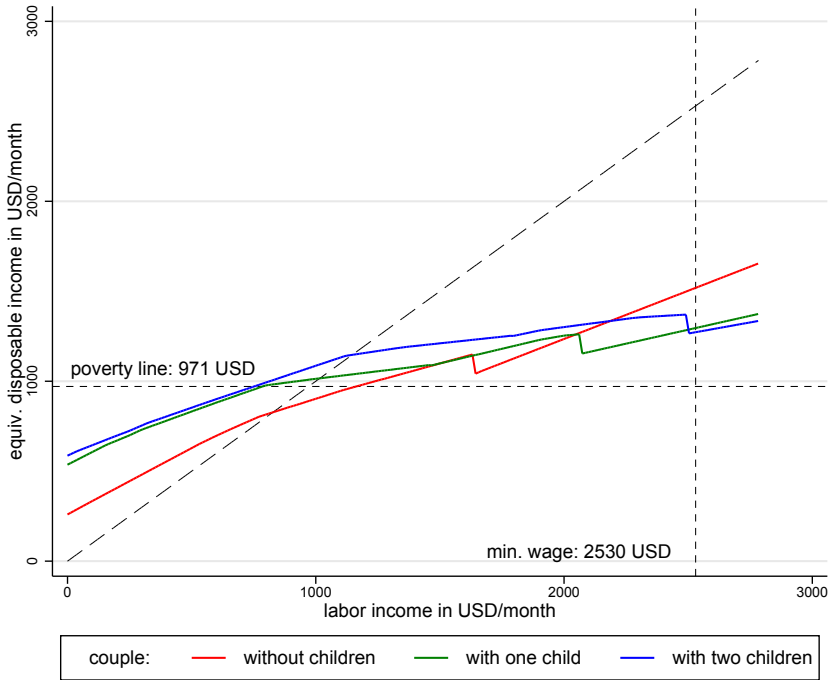
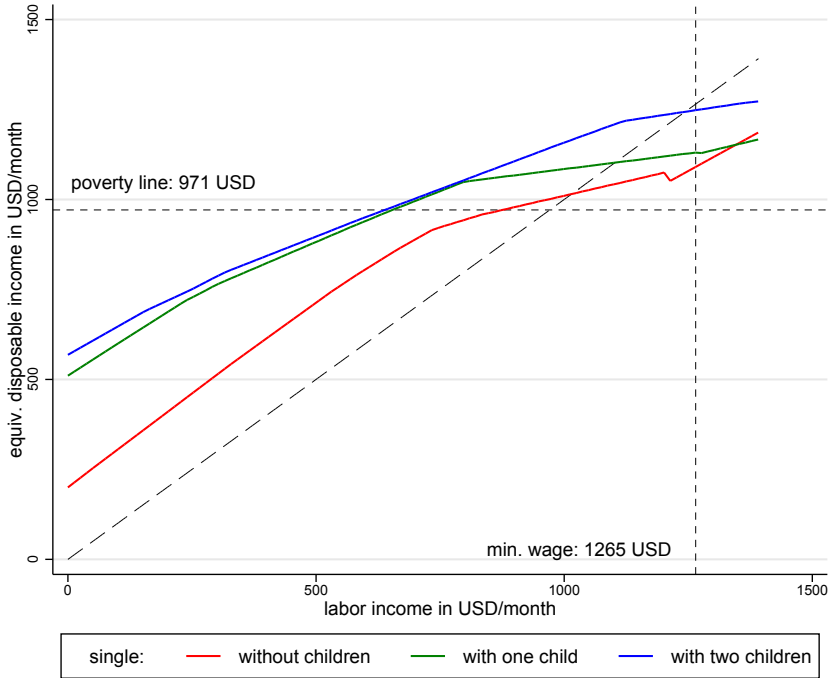


Figure F.28: Cross-country comparison of entire budget sets for **couple households with two children**

F.4 Does it help to have children?

Figures F.29 to F.39 compare separately for each country the budget curves for households of singles at the top and couples at the bottom, with zero, one and two children. The figures correspond to figures D.1 to D.3 in appendix D.

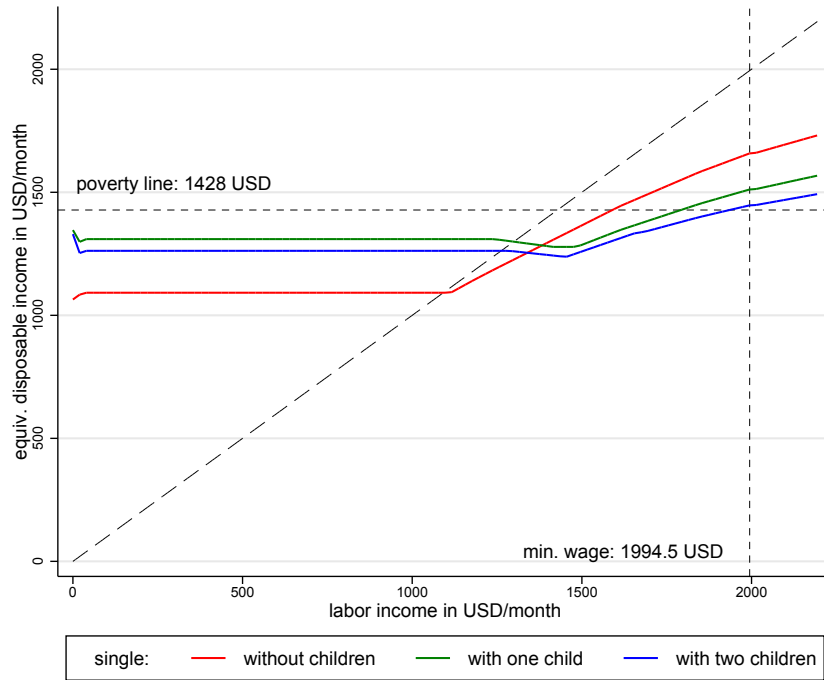
US (2013)



Wage = 31.1% of AW (= legal minimum wage).

Figure F.29: Budget curves for single and couple households with zero, one or two children: US

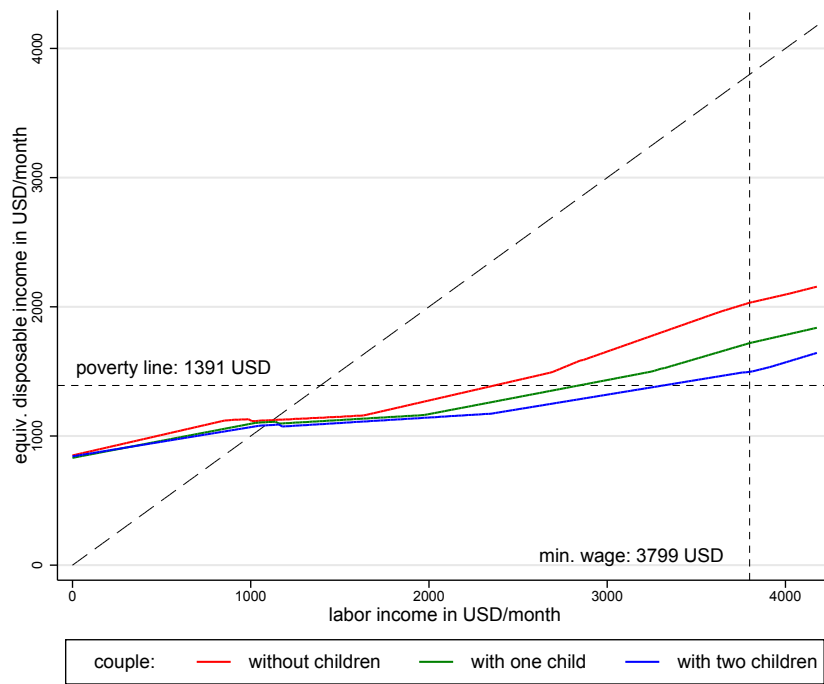
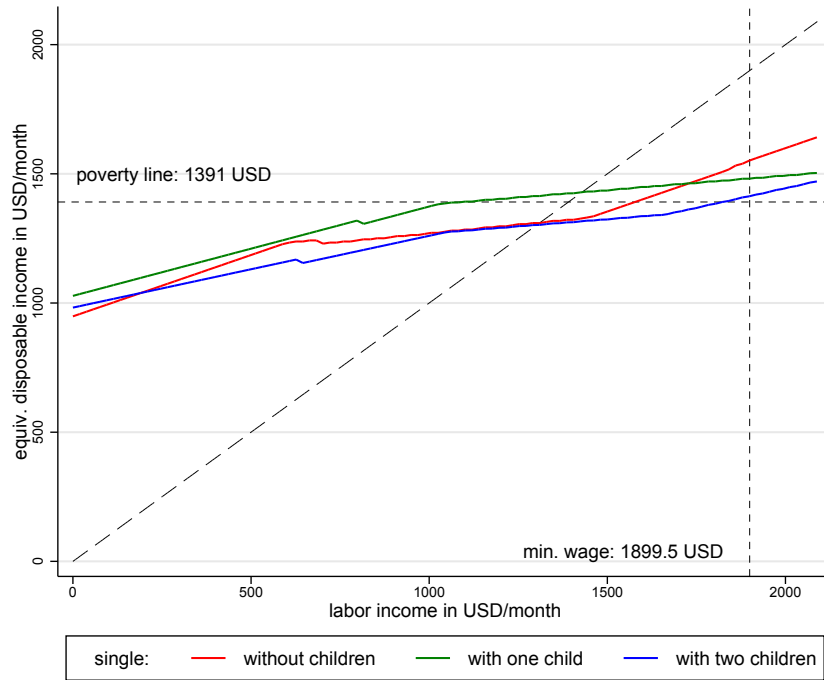
BE (2013)



Wage = 39% of AW (= legal minimum wage).

Figure F.30: Budget curves for single and couple households with zero, one or two children: BE

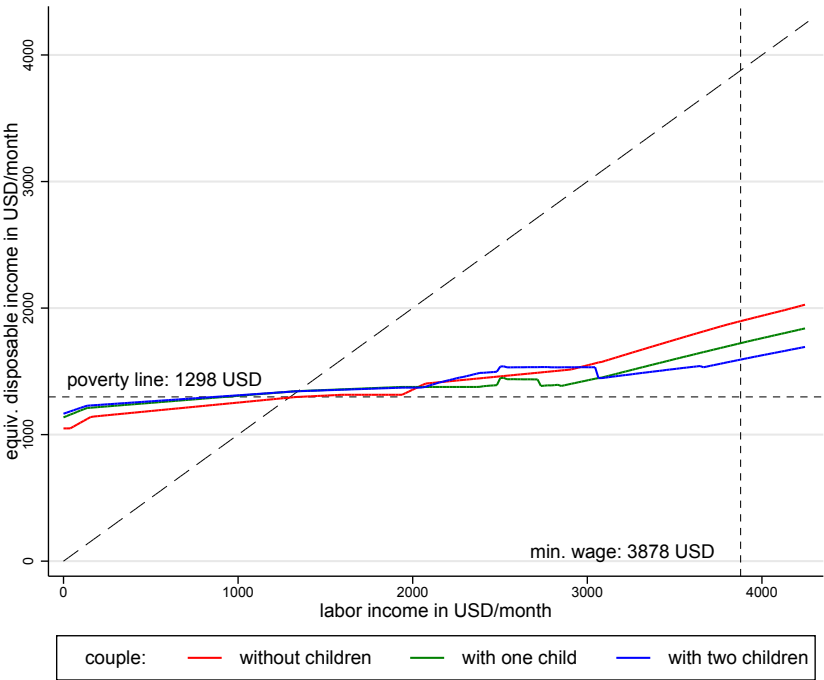
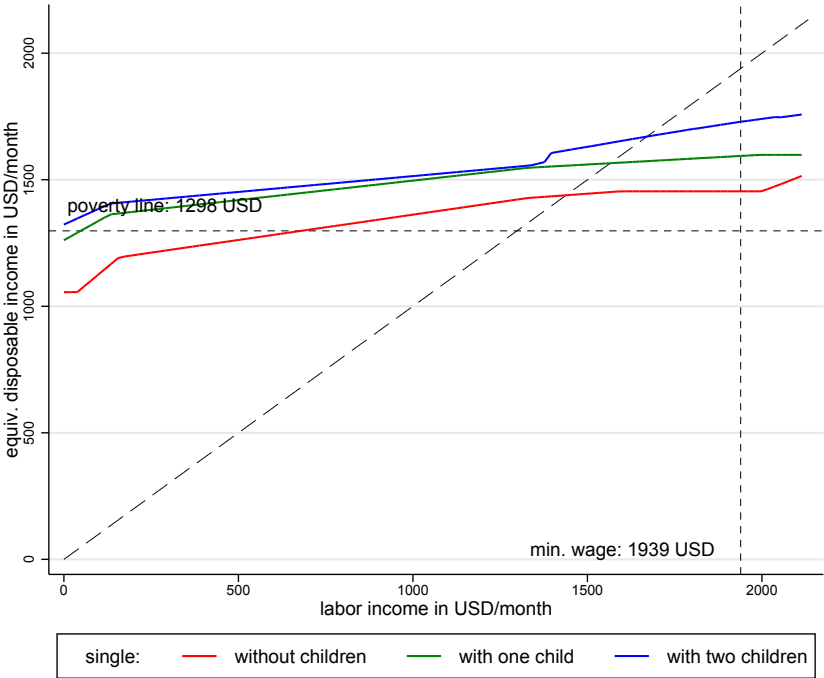
FR (2013)



Wage = 46.6% of AW (= legal minimum wage).

Figure F.31: Budget curves for single and couple households with zero, one or two children: FR

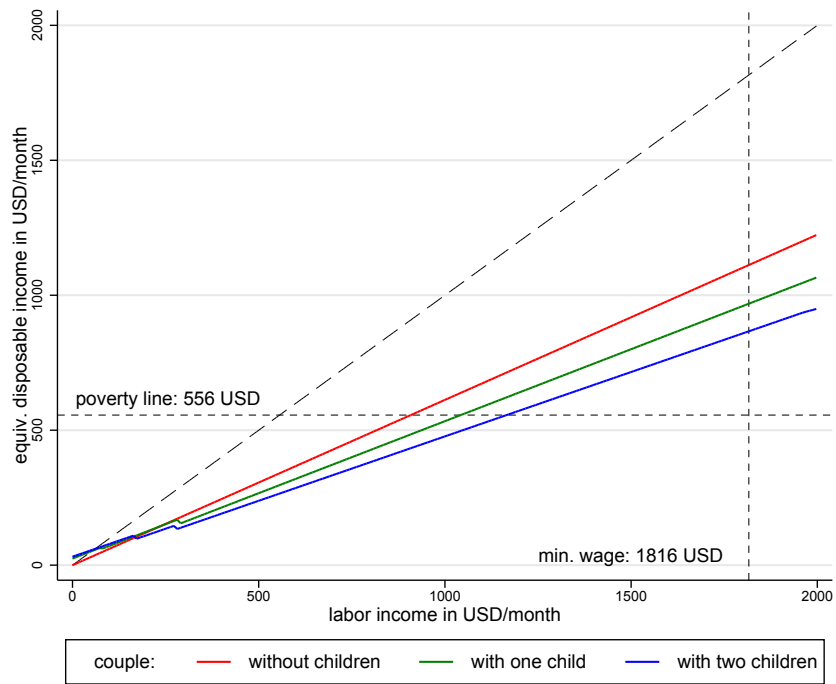
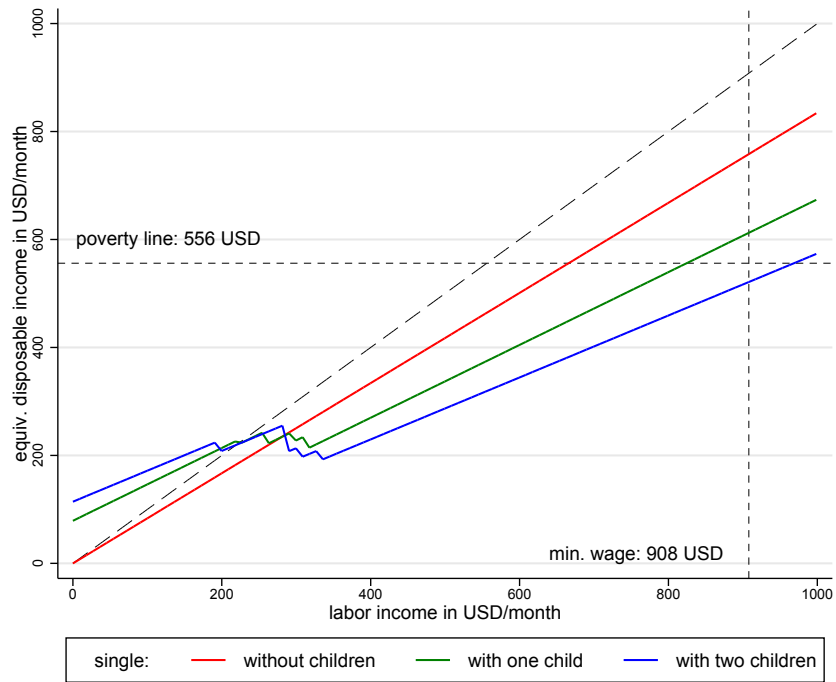
GE (2013)



Wage = 39.2% of AW (= legal min. wage of 2015 deflated to 2013).

Figure F.32: Budget curves for single and couple households with zero, one or two children: GE

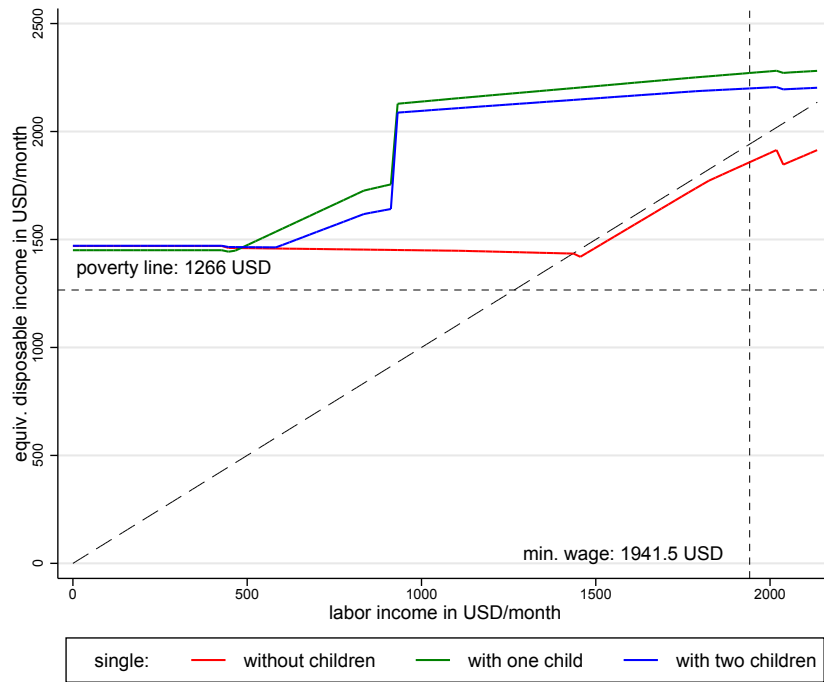
GR (2013)



Wage = 39.5% of AW (= legal minimum wage).

Figure F.33: Budget curves for single and couple households with zero, one or two children: GR

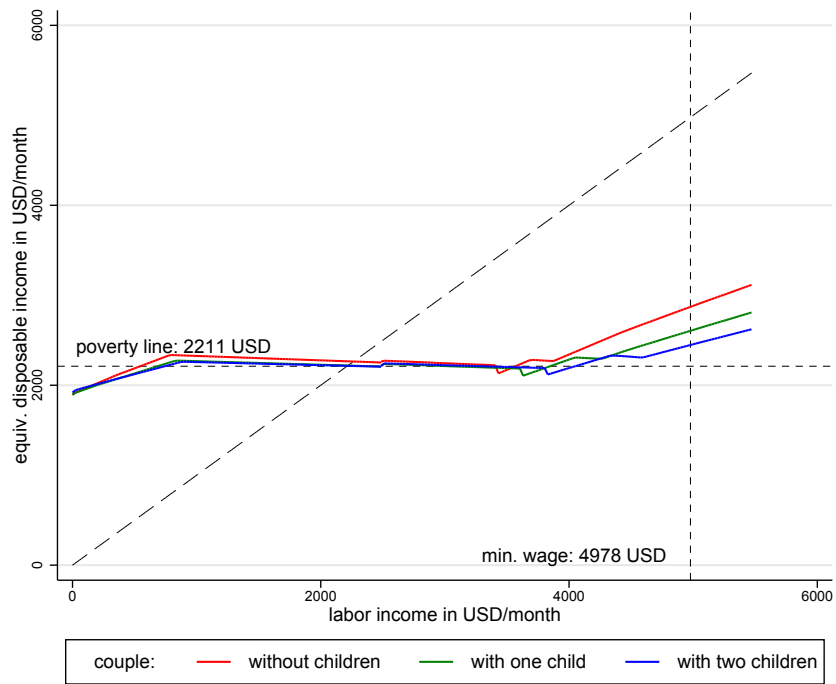
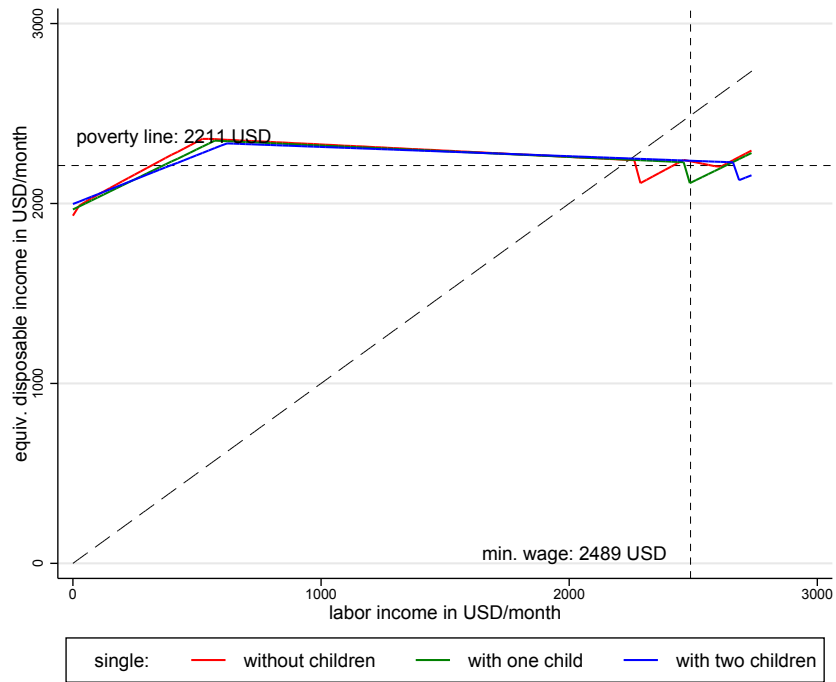
IR (2013)



Wage = 52.9% of AW (= legal minimum wage).

Figure F.34: Budget curves for single and couple households with zero, one or two children: IR

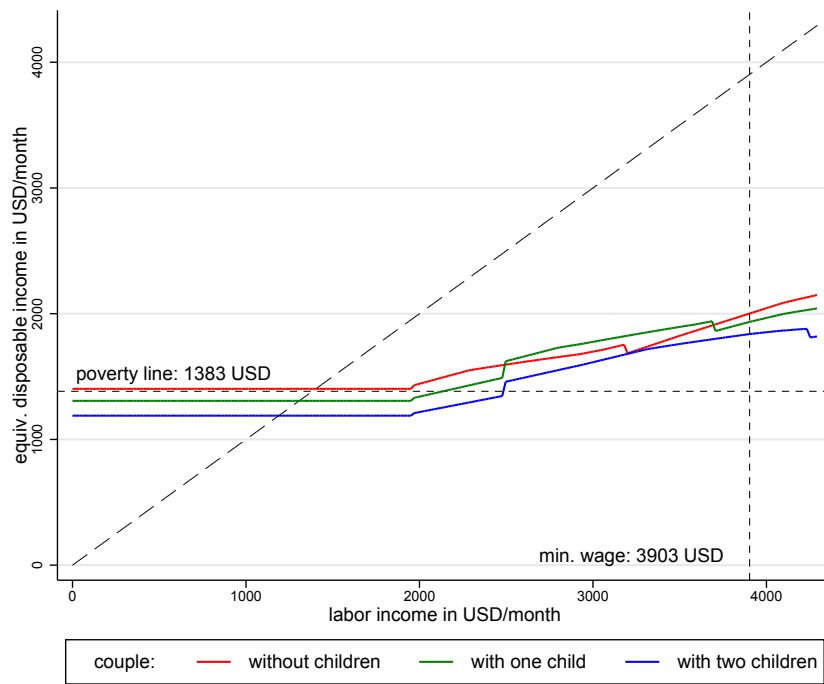
LU (2013)



Wage = 42% of AW (= legal minimum wage).

Figure F.35: Budget curves for single and couple households with zero, one or two children: LU

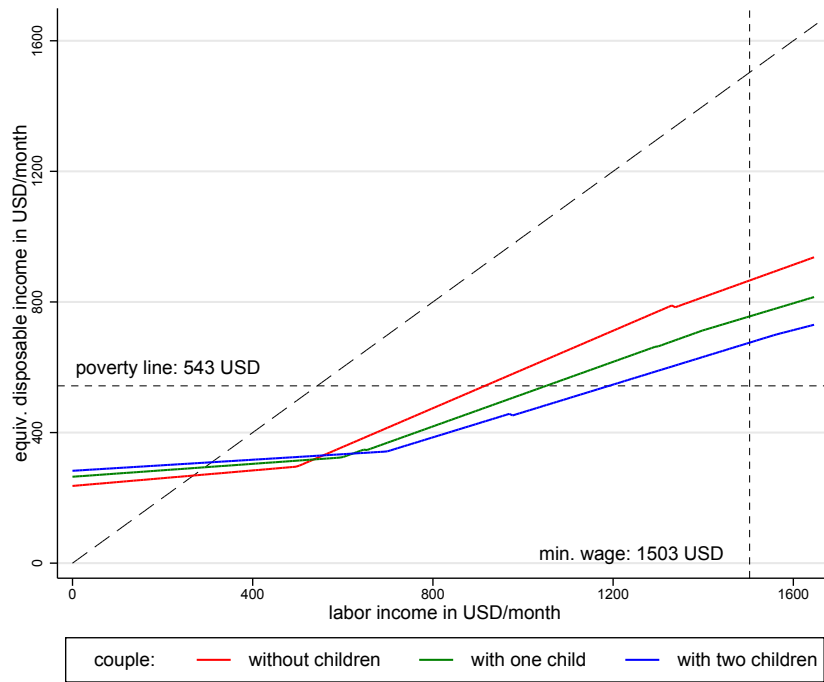
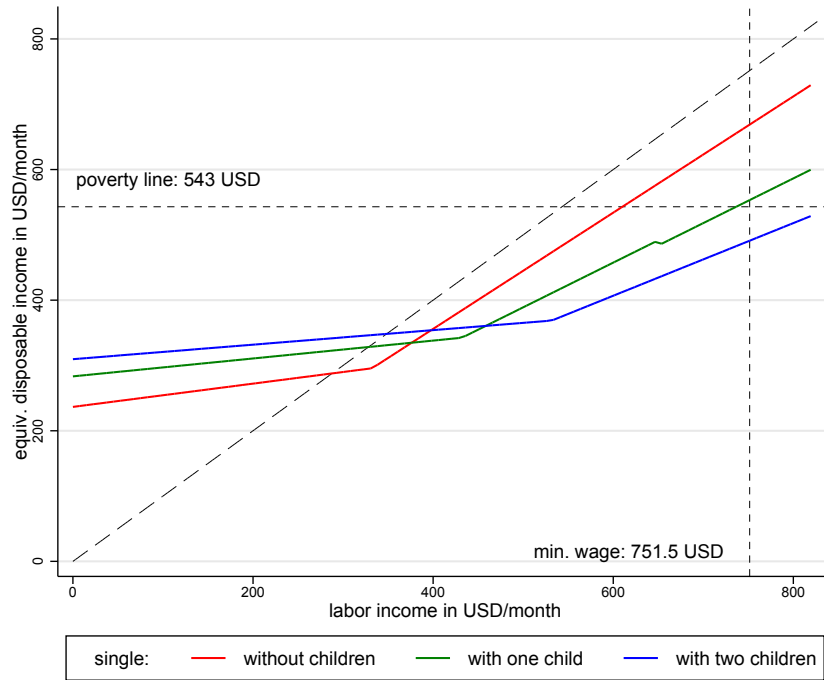
NL (2013)



Wage = 36.4% of AW (= legal minimum wage).

Figure F.36: Budget curves for single and couple households with zero, one or two children: NL

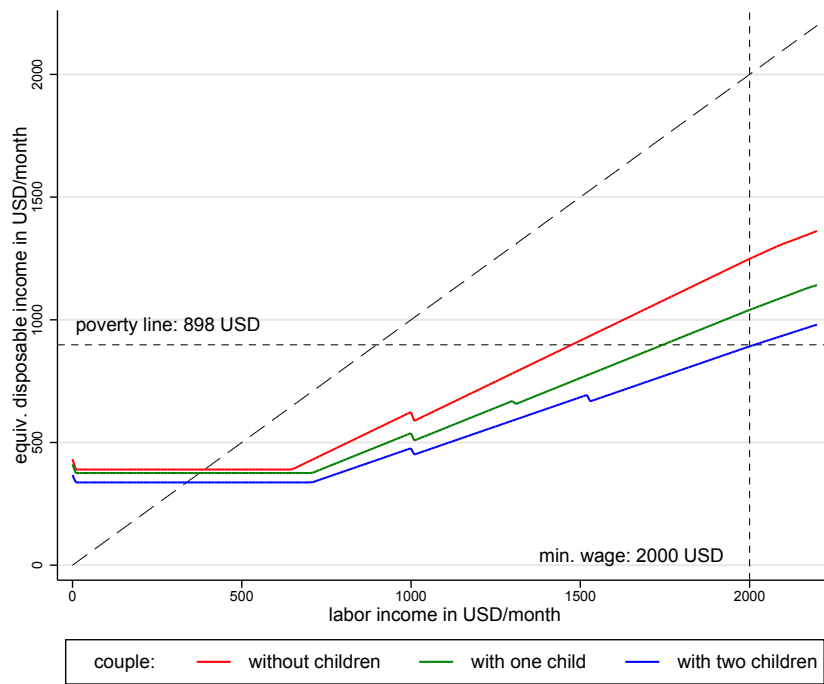
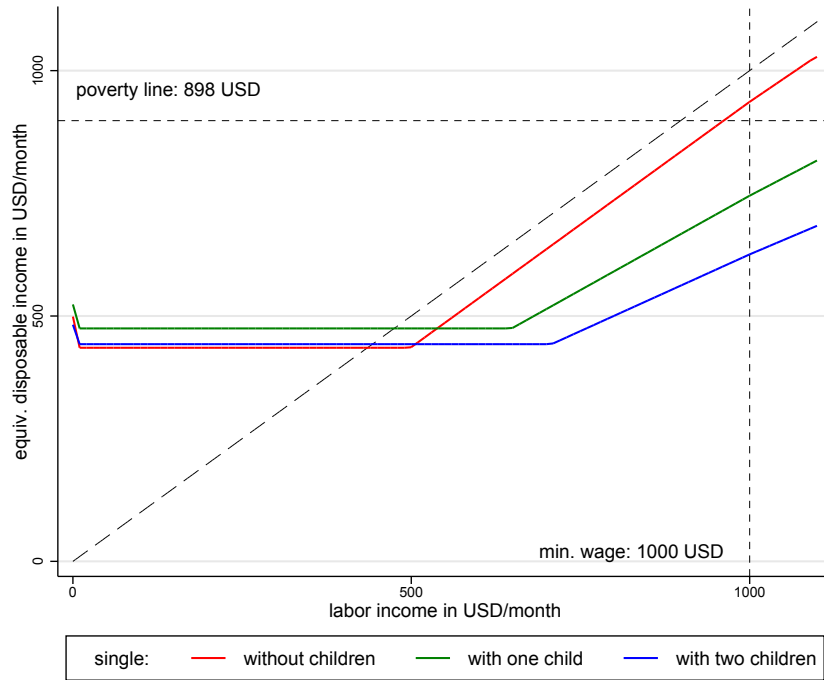
PT (2013)



Wage = 38.5% of AW (= legal minimum wage).

Figure F.37: Budget curves for single and couple households with zero, one or two children: PT

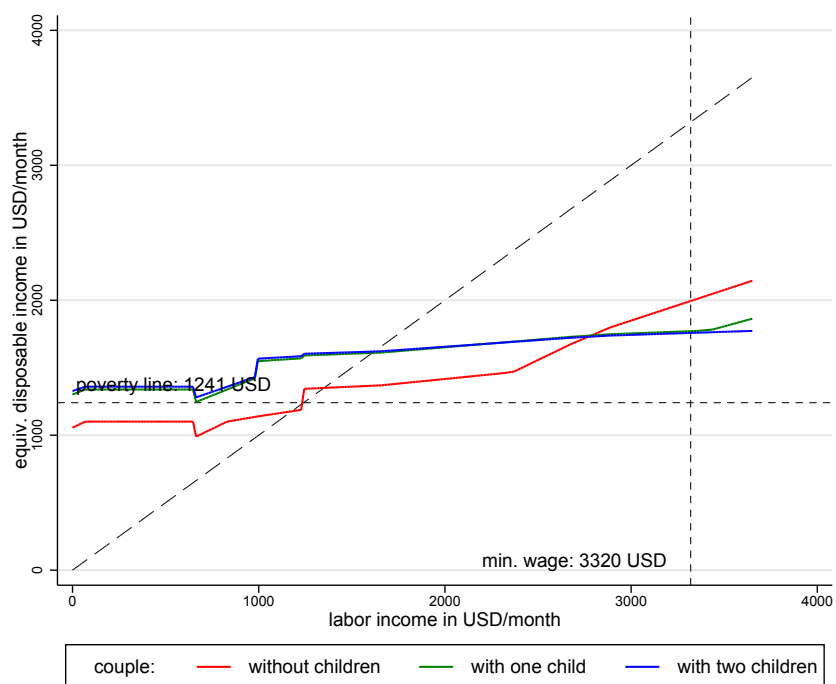
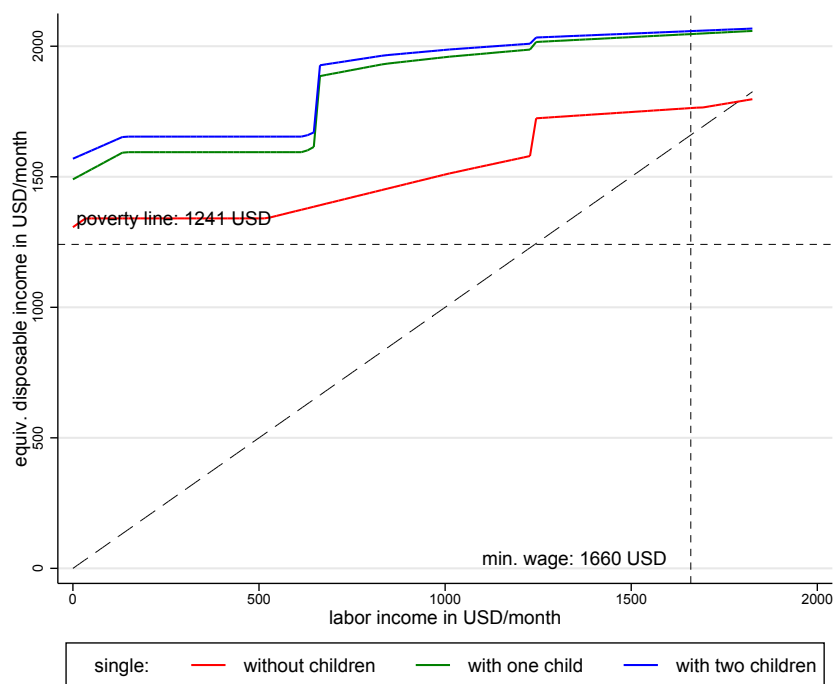
SP (2013)



Wage = 34.7% of AW (= legal minimum wage).

Figure F.38: Budget curves for single and couple households with zero, one or two children: SP

UK (2013)



Wage = 36.3% of AW (= legal minimum wage).

Figure F.39: Budget curves for single and couple households with zero, one or two children: UK

F.5 Mean income poverty lines

Figures F.40 to F.45 correspond to figure E.1 in appendix E.1 and are variants of the figures in appendix F.3 when the vertical axis is rescaled to take country mean income into account.

Budget schemes - single without children (2013)

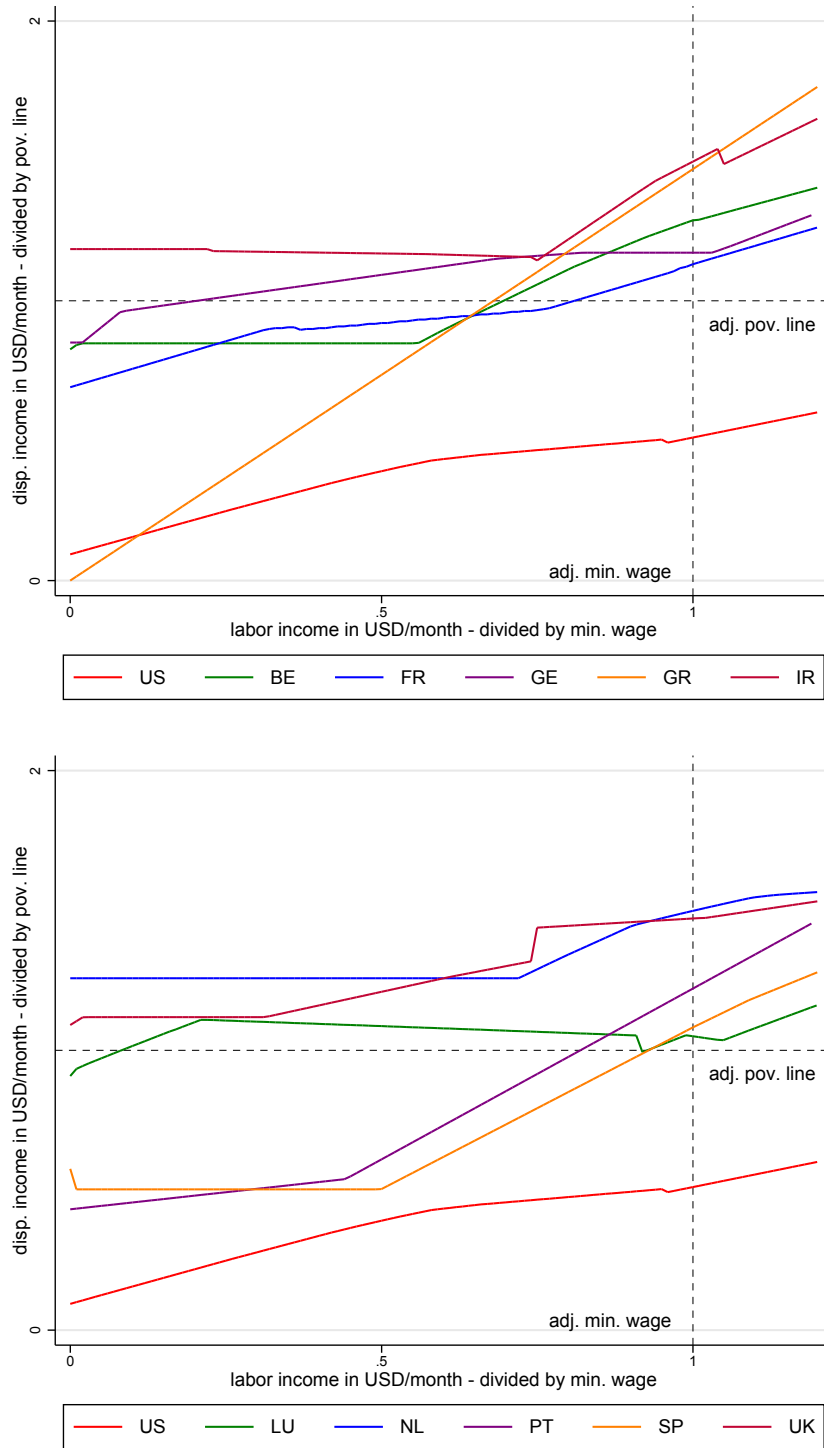


Figure F.40: Cross-country comparison of entire budget sets with 50% of mean income poverty line for **single households without children**

Budget schemes - single with one child (2013)

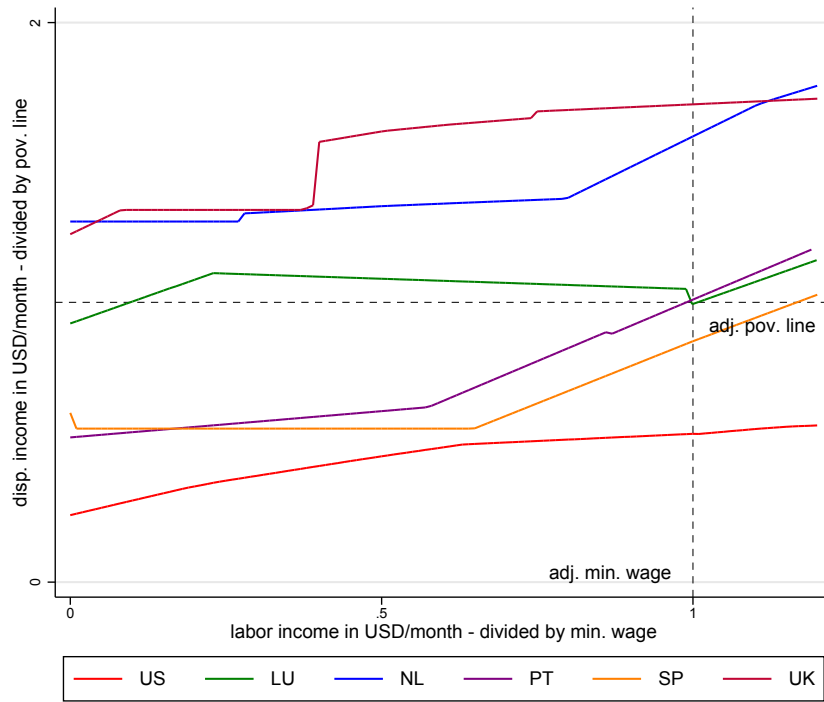
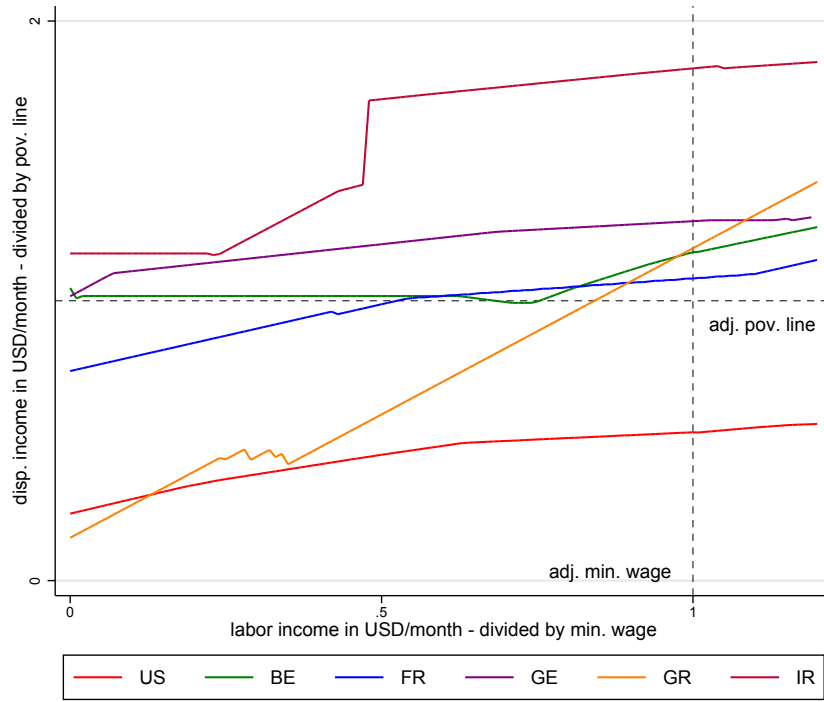


Figure F.41: Cross-country comparison of entire budget sets with 50% of mean income poverty line for **single households with one child**

Budget schemes - single with two children (2013)



Figure F.42: Cross-country comparison of entire budget sets with 50% of mean income poverty line for **single households with two children**

Budget schemes - couple without children (2013)

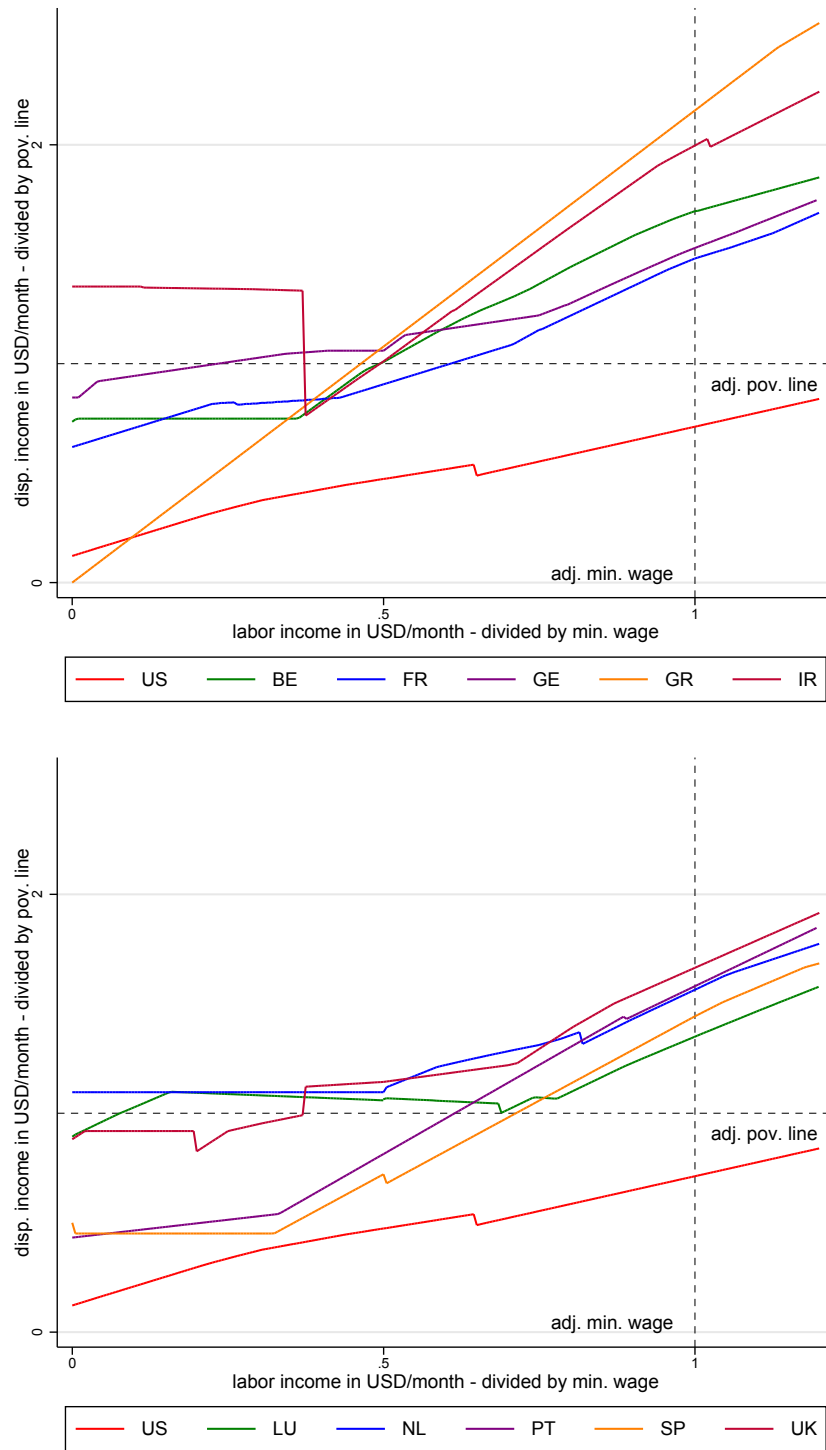


Figure F.43: Cross-country comparison of entire budget sets with 50% of mean income poverty line for **couple households without children**

Budget schemes - couple with one child (2013)

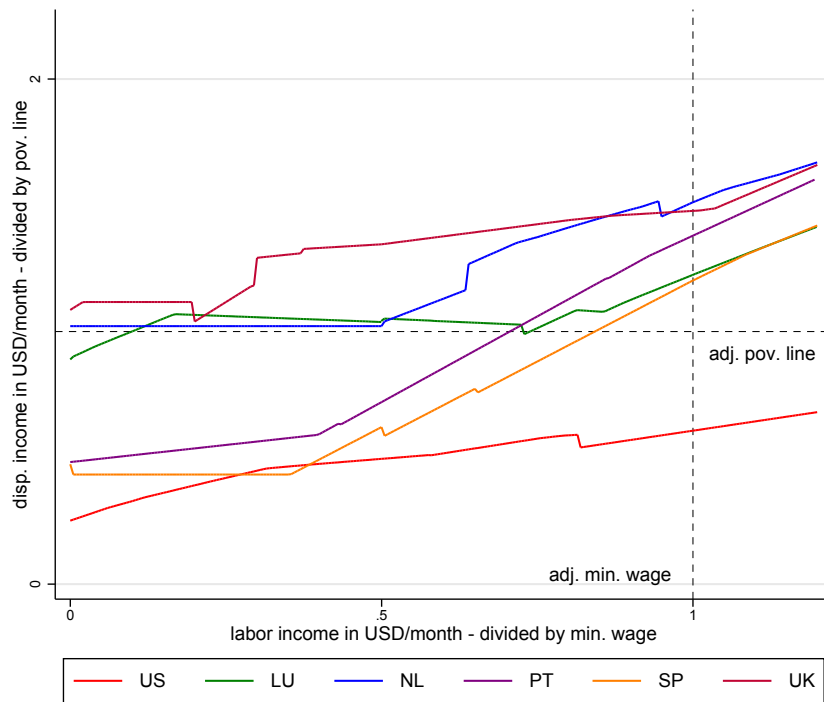


Figure F.44: Cross-country comparison of entire budget sets with 50% of mean income poverty line for **couple households with one child**

Budget schemes - couple with two children (2013)

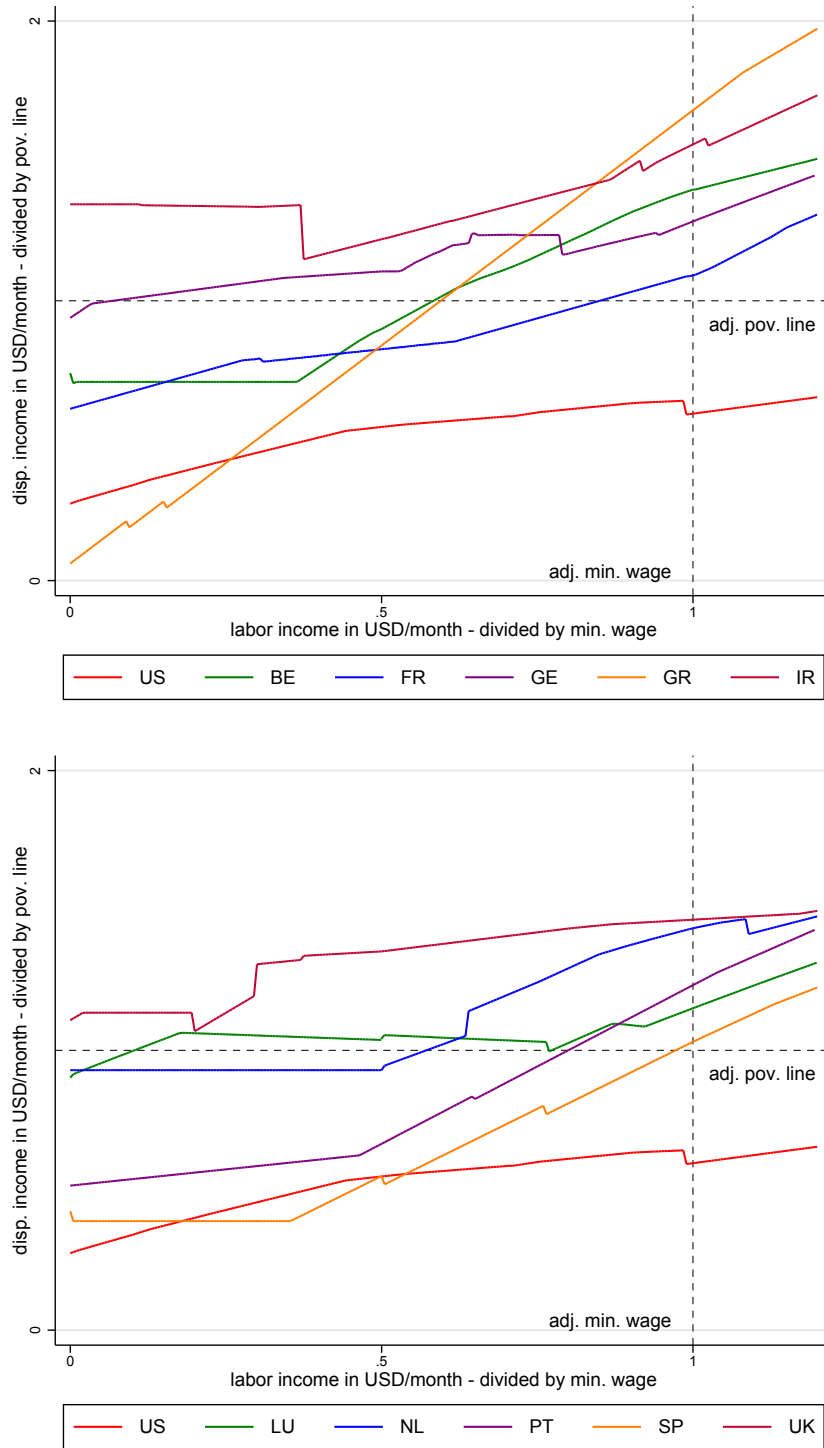


Figure F.45: Cross-country comparison of entire budget sets with 50% of mean income poverty line for **couple households with two children**

F.6 Removing housing benefits

Tables F.7 to F.12 correspond to table E.1 in appendix E.2 and reproduce the tables from appendix F.2 for the six countries under analysis that provide housing benefits (HB) when the eligibility to HB is assumed away.

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
FR	83.91	1,593.77	658.66	52.75	1,899.48	1,391.12	136.54
GE	90.05	1,745.95	507.33	52.79	1,938.84	1,297.89	149.38
IR	66.92	1,299.22	1,070.45	58.87	1,941.48	1,266.01	153.35
LU	20.95	521.53	1,793.90	83.52	2,489.11	2,211.35	112.56
NL	84.07	1,640.56	1,230.48	80.81	1,951.51	1,383.48	141.06
UK	74.93	1,243.80	485.88	49.14	1,659.93	1,241.38	133.72

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.7: Social welfare and its decomposition when eligibility for housing benefits is removed, for **single households without children**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
FR	93.99	1,785.34	987.99	53.18	1,899.48	1,808.45	105.03
GE	82.91	1,607.46	1,039.71	55.45	1,938.84	1,687.25	114.91
IR	11.91	231.22	1,426.11	45.55	1,941.48	1,645.81	117.96
LU	21.90	545.23	2,399.54	85.29	2,489.11	2,874.76	86.59
NL	28.02	546.85	1,797.57	74.69	1,951.51	1,798.53	108.51
UK	39.94	663.06	1,048.94	58.52	1,659.93	1,613.79	102.86

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.8: Social welfare and its decomposition when eligibility for housing benefits is removed, for **single households with one child**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
FR	119.10	2,262.25	1,185.59	53.18	1,899.48	2,225.79	85.34
GE	67.09	1,300.80	1,337.20	45.10	1,938.84	2,076.62	93.37
IR	13.99	271.59	1,770.27	45.89	1,941.48	2,025.62	95.85
LU	24.05	598.57	3,038.07	84.76	2,489.11	3,538.16	70.35
NL	87.91	1,715.61	1,941.74	74.69	1,951.51	2,213.57	88.16
UK	39.94	663.06	1,494.22	58.52	1,659.93	1,986.20	83.57

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.9: Social welfare and its decomposition when eligibility for housing benefits is removed, for **single households with two children**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
FR	62.55	2,376.38	987.99	45.49	3,798.95	2,086.68	182.06
GE	60.97	2,364.20	916.39	49.21	3,877.68	1,946.83	199.18
IR	50.47	1,959.83	1,788.69	41.68	3,882.97	1,899.02	204.47
LU	15.00	746.73	2,701.55	67.85	4,978.22	3,317.03	150.08
NL	63.46	2,476.92	1,757.74	68.47	3,903.02	2,075.22	188.08
UK	54.96	1,824.55	762.71	40.97	3,319.85	1,862.06	178.29

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.10: Social welfare and its decomposition when eligibility for housing benefits is removed, for **couple households without children**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
FR	75.00	2,849.21	1,185.59	49.26	3,798.95	2,504.01	151.71
GE	59.44	2,304.85	1,266.12	49.54	3,877.68	2,336.19	165.98
IR	24.01	932.21	2,132.84	55.94	3,882.97	2,278.82	170.39
LU	77.50	3,858.12	3,262.66	71.46	4,978.22	3,980.43	125.07
NL	64.01	2,498.36	1,973.32	67.23	3,903.02	2,490.27	156.73
UK	39.53	1,312.39	1,325.76	56.16	3,319.85	2,234.48	148.57

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.11: Social welfare and its decomposition when eligibility for housing benefits is removed, for **couple households with one child**

	$-W_{\min}^p$	$-W_{\min}^p w_m$	b	τ	w_m	p	$\frac{w_m}{p}$
FR	87.45	3,322.04	1,383.19	53.08	3,798.95	2,921.35	130.04
GE	58.55	2,270.23	1,563.62	48.62	3,877.68	2,725.56	142.27
IR	24.01	932.21	2,477.00	64.42	3,882.97	2,658.62	146.05
LU	81.55	4,059.62	3,887.93	75.41	4,978.22	4,643.84	107.20
NL	72.94	2,846.85	2,117.49	67.23	3,903.02	2,905.31	134.34
UK	37.47	1,243.80	1,771.04	56.16	3,319.85	2,606.89	127.35

Note: $-W_{\min}^p$ in % of full-time. $\frac{w_m}{p}$ in %. All other values in monthly USD.

Table F.12: Social welfare and its decomposition when eligibility for housing benefits is removed, for **couple households with two children**

F.7 Taking unemployment rates into account

Figures F.46 to F.51 correspond to figure E.2 in appendix E.3 and are variants of the figures in appendix F.3 when the horizontal axis is rescaled to take country-specific unemployment rates of low-skill individuals into account.

Unemployment rates for low-skill individuals are given in table F.13, taken from the OECD. Low skill means not having completed high school.

	Unemp. rate
US	0.13
BE	0.14
FR	0.14
GE	0.12
GR	0.29
IR	0.20
LU	0.09
NL	0.09
PT	0.17
SP	0.33
UK	0.10

Table F.13: Unemployment rates for low-skill individuals (below upper secondary education) aged 25-64

Budget schemes - single without children (2013)

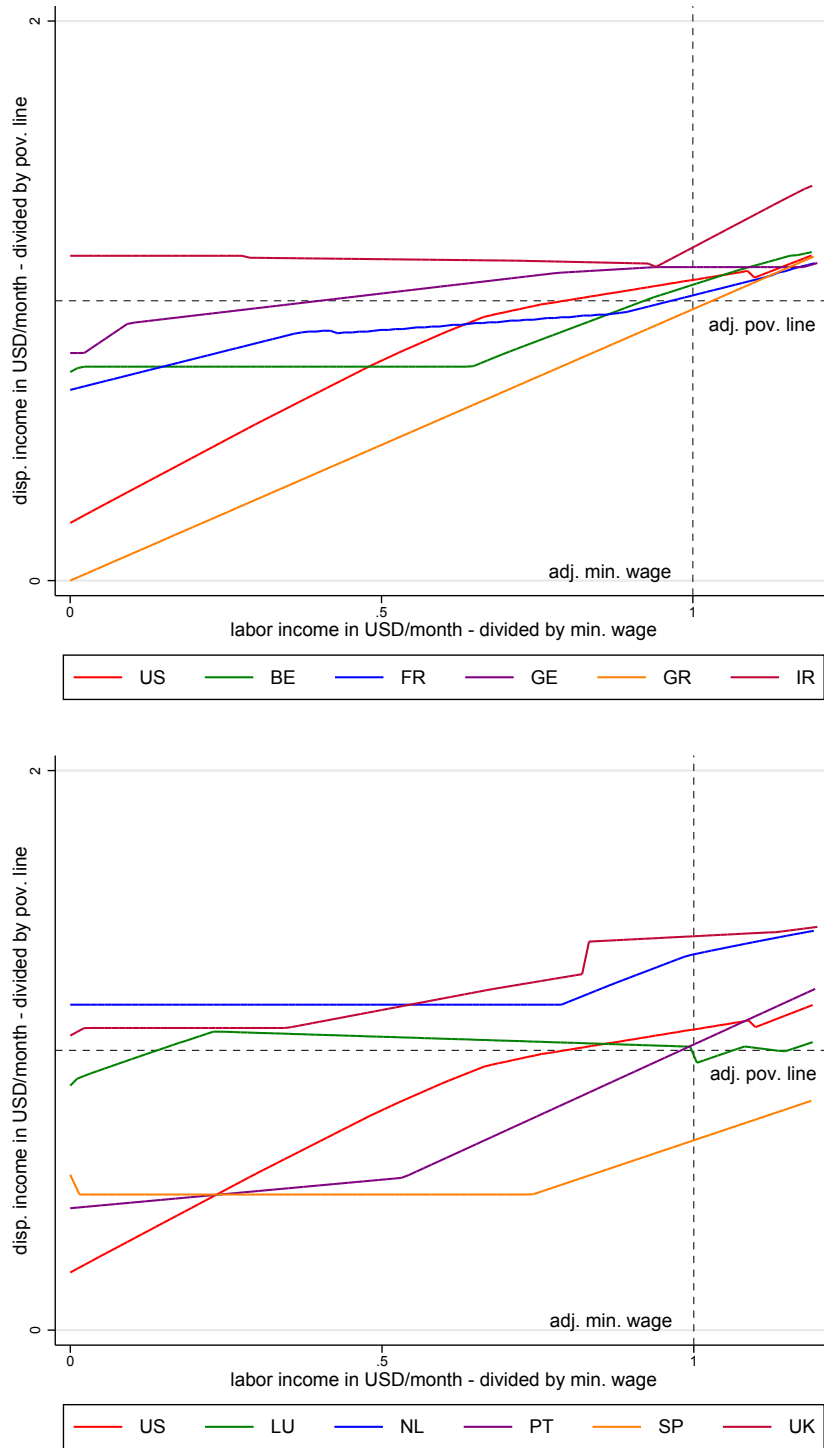


Figure F.46: Cross-country comparison of entire budget sets when minimum wages are adjusted for unemployment rates, for **single households without children**

Budget schemes - single with one child (2013)

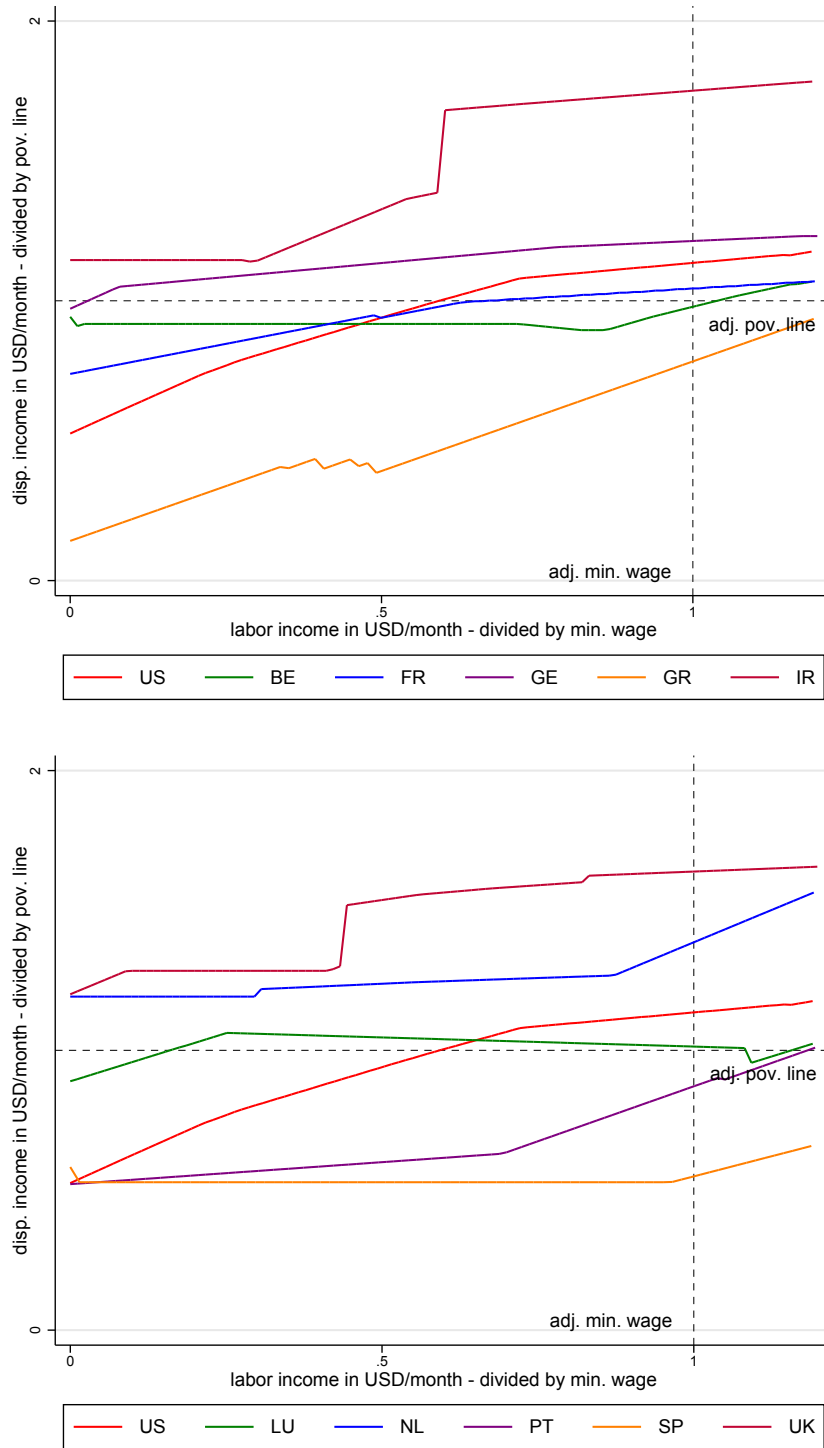


Figure F.47: Cross-country comparison of entire budget sets when minimum wages are adjusted for unemployment rates, for **single households with one child**

Budget schemes - single with two children (2013)

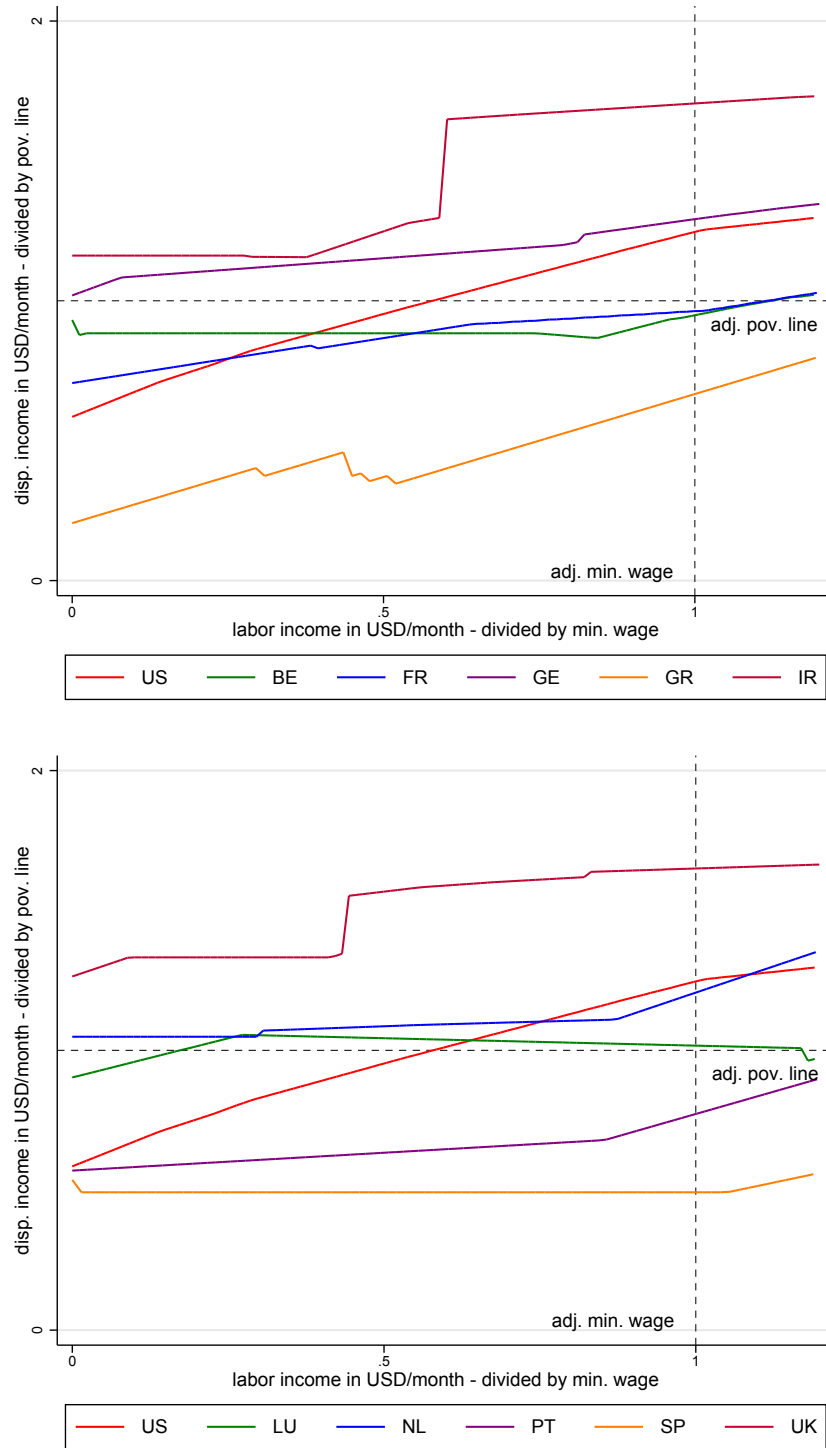


Figure F.48: Cross-country comparison of entire budget sets when minimum wages are adjusted for unemployment rates, for **single households with two children**

Budget schemes - couple without children (2013)

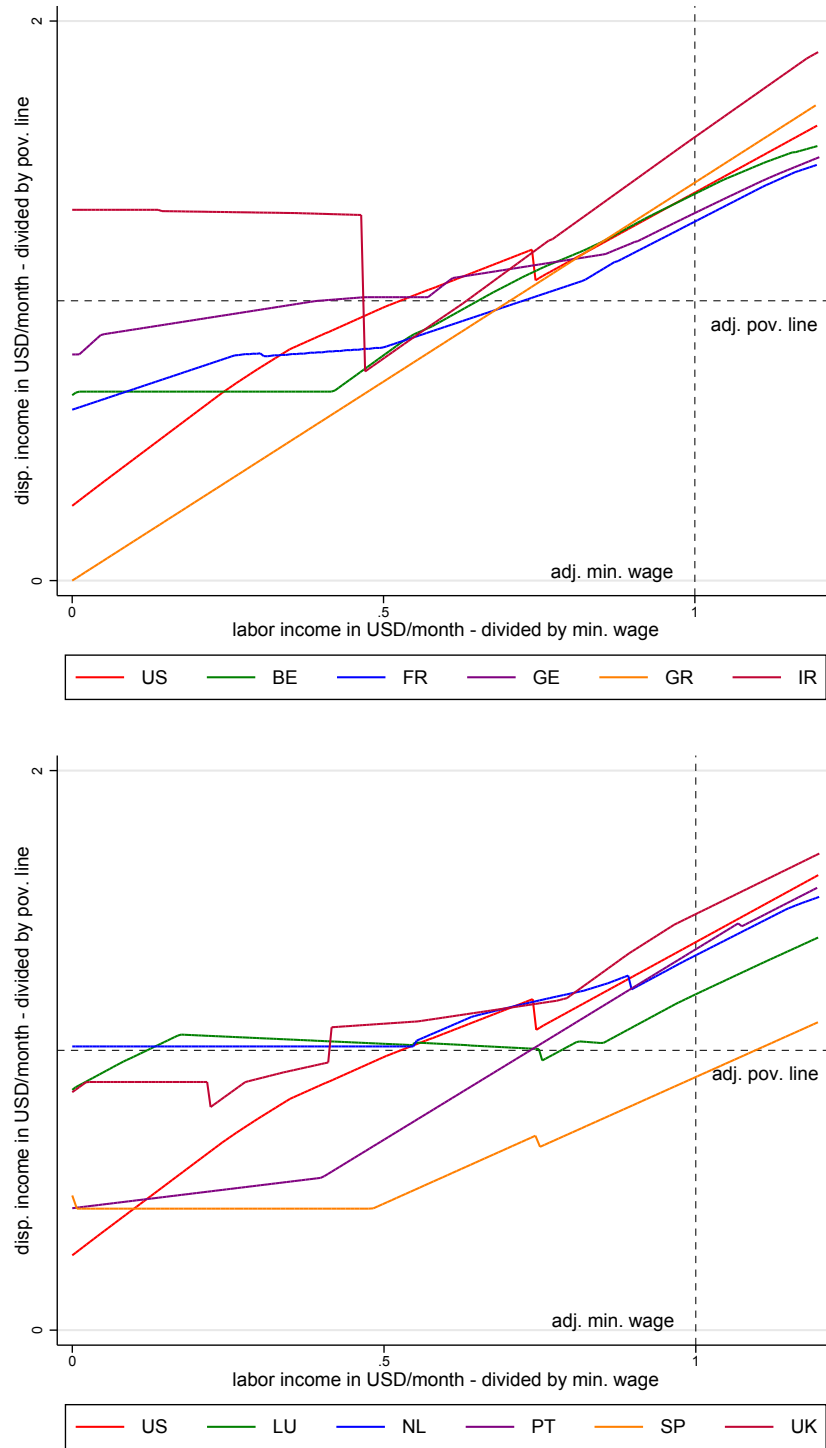


Figure F.49: Cross-country comparison of entire budget sets when minimum wages are adjusted for unemployment rates, for **couple households without children**

Budget schemes - couple with one child (2013)

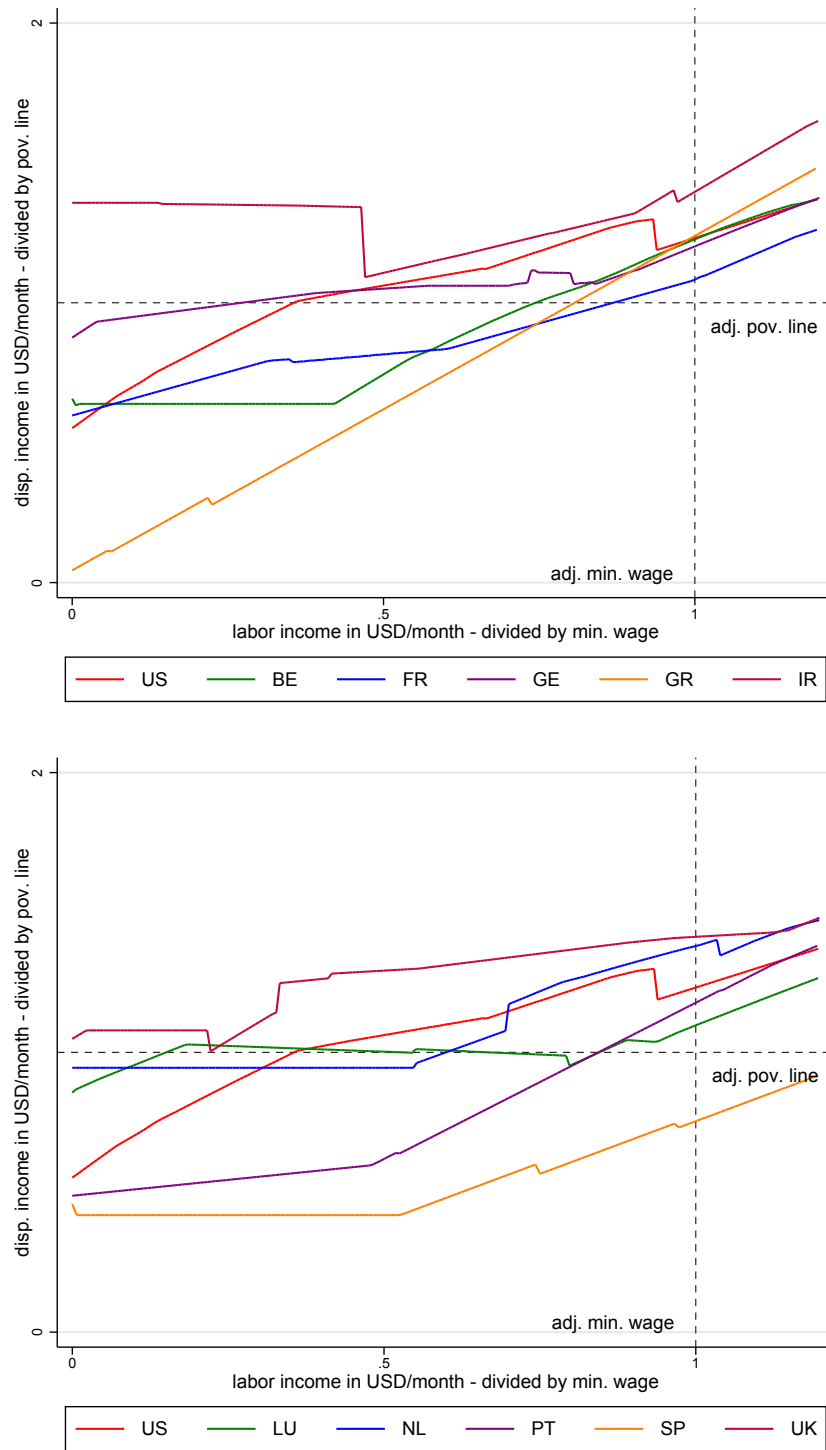


Figure F.50: Cross-country comparison of entire budget sets when minimum wages are adjusted for unemployment rates, for **couple households with one child**

Budget schemes - couple with two children (2013)

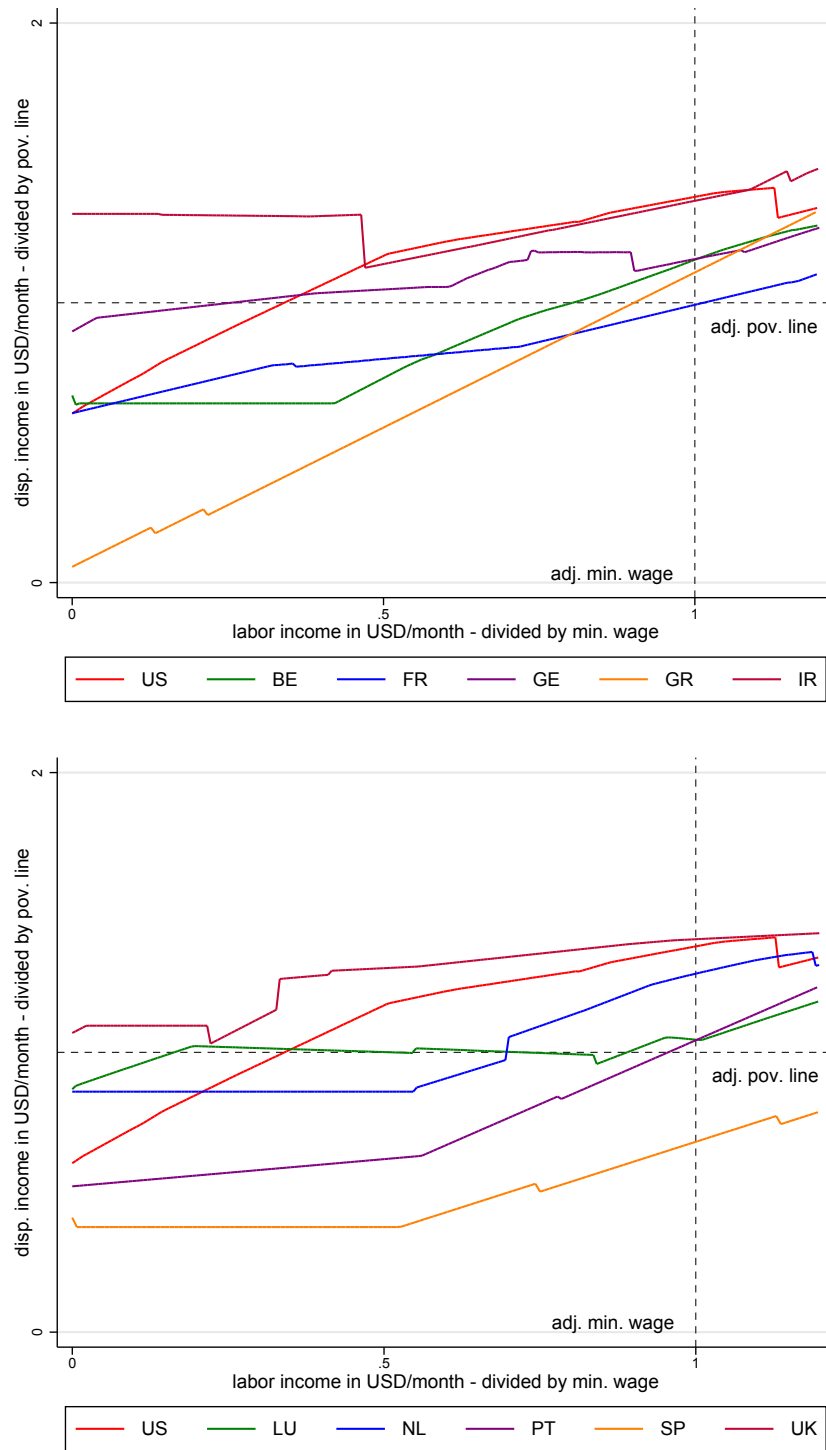


Figure F.51: Cross-country comparison of entire budget sets when minimum wages are adjusted for unemployment rates, for **couple households with two children**

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