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Working Paper

Labour supply responses to fiscal reforms in Portugal: An illustration with recent PIT and child benefit reforms

JRC Working Papers on Taxation and Structural Reforms, No. 6/2024

Provided in Cooperation with:

Joint Research Centre (JRC), European Commission

Suggested Citation: Narazani, Edlira; Riscado, Sara; Wemans, Lara (2024) : Labour supply responses to fiscal reforms in Portugal: An illustration with recent PIT and child benefit reforms, JRC Working Papers on Taxation and Structural Reforms, No. 6/2024, European Commission, Joint Research Centre (JRC), Seville

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Labour supply responses to fiscal reforms in Portugal

An illustration with recent PIT and child benefit reforms

JRC Working Papers on Taxation and Structural Reforms No. 6/2024

Narazani, E., Riscado, S., Wemans, L.

2024

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Sevilla: European Commission, 2024

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How to cite this report: European Commission, Joint Research Centre, Narazani, E., Riscado, S. and Wemans, L., *Labour supply responses to fiscal reforms in Portugal*, European Commission, Sevilla, 2024, JRC137400.

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Abstract

In the last decade, two major disruptions – the Great Recession and the Covid sanitary crisis – hit the world economy and gave rise to a battery of government measures. In Portugal, after the fiscal consolidation efforts implemented to tackle the severe sovereign debt crisis that accompanied the Great Recession, some restrictive fiscal measures were reversed. Throughout and after the pandemic crisis, fiscal measures maintained their expansionary nature, with reinforcements to child benefits and income tax cuts. This paper quantifies the distributional and labour market impacts of policy changes implemented on the income tax system and on the child benefit in Portugal in 2022 and 2023. First-order effects of these measures, quantified using the EUROMOD microsimulation model, reveal that changes to the income tax schedule exhibit a regressive pattern, whereas those affecting the minimum untaxed income were more evenly distributed. In contrast, the child benefit reinforcements show a progressive impact. Employing EUROLAB, a behavioural labour supply and demand model, we find that labour supply responses are relatively modest, due to the small direct impacts of the measures on disposable income. Overall, labour supply, both in terms of hours of work and participation, reacts positively to the tax breaks but negatively to the reinforcement of the child benefit, with this negative reaction being concentrated on specific income and gender groups, such as single parents with children or families in lower income quintiles.

Acknowledgements

The authors would like to thank the participants of the 1st Welfare and Policy Conference (Bordeaux, May 2023) and of the Annual EUROMOD Research Workshop (Seville, September 2023) for their valuable comments and suggestions.

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Executive Summary

In the last decade, the Portuguese economy faced major economic disruptions, the last one being the Covid-19 sanitary crisis in 2020. These gave rise to the announcement and implementation of fiscal measures of different nature and often with different aims. This paper focuses on recent fiscal measures regarding PIT and the child benefit, implemented in 2022 or announced in that year to be fully implemented by 2024, and assesses the labour supply responses and overall employment effects potentially produced. This analysis brings forward three main contributions. First, to our knowledge, this study, based on a structural labour supply model, is unique for Portugal and sets the path for more focused studies on labour supply behaviour of Portuguese households. The second contribution is that it provides a real time assessment of potential effects of fiscal reforms that can guide the policymakers to improve the design and the purpose of the fiscal policy tools to better target the needs of specific segments of populations that can be more responsive. The third contribution is that it provides a unique set of labour supply elasticities for the Portuguese households that can be used by researchers to calibrate parameters for other policy reforms or in a general equilibrium modelling context.

Two PIT reforms and one child benefit reform are analysed. The first PIT-related reform consists in the increase in the number of PIT brackets, from seven to nine, combined with the update of these brackets and the reduction of the tax rate on the second bracket. This first set of measures benefited proportionally more the households with higher PIT incidence. The second PIT reform regarded the minimum untaxed income – i.e., the market income exempted from PIT – aimed at correcting the 100% marginal PIT taxation for wages just above the minimum wage. Regarding the child benefit, a multitude of changes to this social transfer have taken place in 2022, all increasing its generosity. Firstly, a minimum amount was introduced for children below an extreme poverty bracket, which benefited children above three. Secondly, a complementary transfer for families with children was created ensuring that, between the child benefit and the PIT child deduction, every family receives a minimum amount per child. Thirdly, the amounts transferred to older children in the first and second brackets of the benefit were reinforced. Finally, the top limit of the third bracket was extended to include more families.

We quantify first and second order effects of the above-mentioned reforms using the EUROMOD and EUROLAB models. EUROMOD is the microsimulation model for European Union countries, which allows to implement with detail tax and benefit reforms and to obtain “morning-after” effects of the simulated policy changes. To provide an overview of the labour supply responses to the above-mentioned fiscal reforms we use the behavioural model EUROLAB. In a nutshell, EUROLAB is a multidimensional discrete choice model that estimates individual changes in supplied hours of work and participation as a reaction to a reform, often referred to in the literature as “second-order” effects. Furthermore, the model allows for the quantification of demand-side effects of a labour market that, depending on how elastic it is, would lead to different employment levels and wage rates at the equilibrium. The EUROLAB model relies on EUROMOD to simulate the counterfactual disposable income (as a proxy for consumption) in the different labour supply alternatives considered, to estimate a set of behavioural parameters. We run these two models upon the Portuguese module of Statistics Income and Living Survey (EU-SILC) for 2020, produced by the Eurostat and that is representative of the Portuguese population.

The results show that labour supply elasticities in Portugal are relatively small, higher for females than males, and especially rigid in the intensive margin. This reflects the specificities of the Portuguese labour market, characterized by high participation (including female participation) and low prevalence of part time jobs in the European context. Regarding the distributional first order effects of the different policy shocks on households’ disposable income, these are rather diverse. The changes to the PIT tax schedule are clearly regressive, while the reform of the minimum untaxed income has a flatter profile across the income distribution. The child benefit reform, targeting only families with children, has a strong progressive nature. None of these reforms has a strong impact on disposable income, but small changes to the tax and transfers design may, nevertheless, have relevant effects on labour market incentives, especially for some household groups. Our findings indicate that overall effects on hours worked and participation are also small, with PIT reforms producing positive effects on both labour margins and child benefit changes having the opposite effect. Women in couples and single fathers seem to be the most affected groups by the PIT schedule reforms, while the minimum untaxed income policy change has opposing effects in different population groups (overall having a negligible effect on the aggregate). As expected, the child benefit reinforcement impacts more negatively the labour supply response of single parents. In terms of income groups, the positive effects of the change in the PIT schedule are evenly distributed, while those related to the minimum untaxed income change are declining as income increases (it targets mainly low-income families). Finally, child benefit negative impacts seem to be relevant for both men and women, being especially concentrated in the first quintile.

1 Introduction

In the last decade, the Portuguese economy faced two major economic disruptions – the Great Recession, which translated into a sovereign debt crisis, and the Covid-19 sanitary crisis. These gave rise to the announcement and implementation of fiscal measures of different nature and often with different aims. In the aftermath of the sovereign debt crisis, the Portuguese Government implemented a series of fiscal consolidation measures. The first set of such measures, implemented in 2010, included changes to the child benefit, reducing the amounts transferred to younger children and eliminating the benefits paid to families with higher incomes. During the Portuguese Financial Assistance Programme, signed in 2011, several changes to the personal income tax (PIT) were implemented, including a reduction of the number of tax brackets, in 2013. Following this period, several consolidation measures were reverted and, in 2018, the number of PIT brackets was increased back. Between 2017 and 2019, the child benefit was extended to cover more families and its amounts were reinforced with a focus on younger children and single-parent families. During the pandemic crisis, the fiscal measures kept their expansionary nature, aimed mostly at supporting employment. From 2021 onwards, reinforcements of the child benefit and changes of the PIT schedule were announced, including also measures to mitigate the impact of the rising inflation in 2022.

Given this prolific policy background, this paper focuses on the recent fiscal measures regarding PIT and the child benefit, implemented in 2022 or announced in that year to be fully implemented by 2024, and assesses the labour supply responses and overall employment effects potentially produced. Two PIT reforms and one child benefit reform are analysed. The first PIT-related reform consists in the increase in the number of PIT brackets, from seven to nine, combined with the update of these brackets and the reduction of the tax rate on the second bracket. This first set of measures benefited proportionally more the households with higher PIT incidence. The second PIT reform regarded the minimum untaxed income – i.e., the market income exempted from PIT – aimed at correcting the 100% marginal PIT taxation for wages just above the minimum wage. Regarding the child benefit, a multitude of changes to this social transfer haven taken place in 2022, all increasing its generosity. Firstly, a minimum amount was introduced for children below an extreme poverty bracket, which benefited children above three. Secondly, a complementary transfer for families with children was created ensuring that, between the child benefit and the PIT child deduction, every family receives a minimum amount per child. Thirdly, the amounts transferred to older children in the first and second brackets of the benefit were reinforced. Finally, the top limit of the third bracket was extended to include more families.

We quantify first and second order effects of the above-mentioned reforms using the EUROMOD and EUROLAB models. EUROMOD is the microsimulation model for European Union countries, which allows to implement with detail tax and benefit reforms and to obtain “morning-after” effects of the simulated policy changes.¹ To provide an overview of the labour supply responses to the above-mentioned fiscal reforms we use the behavioural model EUROLAB (see Narazani et al., 2023). In a nutshell, EUROLAB is a multidimensional discrete choice model that estimates individual changes in supplied hours of work and participation as a reaction to a reform, often referred to in the literature as “second-order” effects. Furthermore, the model allows for the quantification of demand-side effects of a labour market that, depending on how elastic it is, would lead to different employment levels and wage rates at the equilibrium. The EUROLAB model relies on EUROMOD to simulate the counterfactual disposable income (as a proxy for consumption) in the different labour supply alternatives considered, to estimate a set of behavioural parameters. We run these two models upon the Portuguese module of Statistics Income and Living Survey (EU-SILC) for 2020, produced by the Eurostat and that is representative of the Portuguese population. It has detailed information on socio-demographic characteristics at the individual and household level that allows us to study labour supply responses of different types of households. Furthermore, SILC data contain information on individuals’ job search efforts such as active job search in the last four weeks and availability for work, that allows to distinguish unemployment from voluntary non-participation.²

The distributional first order effects of the different policy shocks on households’ disposable income are rather diverse. The changes to the PIT tax schedule are clearly regressive, while the reform of the minimum untaxed

1 The EUROMOD model is maintained and developed by the European Commission Joint Research Centre. For further details on the model visit <https://euromod-web.jrc.ec.europa.eu/> and see Sutherland and Figari (2013).

2 For more details on EU-SILC see <https://ec.europa.eu/eurostat/web/microdata/european-union-statistics-on-income-and-living-conditions>.

income has a flatter profile across the income distribution. The child benefit reform, targeting only families with children, has a strong progressive nature. None of these reforms has a strong impact on disposable income, but small changes to the tax and transfers design may, nevertheless, have relevant effects on labour market incentives, especially for some household groups. Also, as small incremental reforms occur more frequently than fundamental tax changes, estimating these effects is a policy relevant issue. Our findings indicate that overall effects on hours worked and participation are also small, with PIT reforms producing positive effects on both labour margins and child benefit changes having the opposite effect. Women in couples and single fathers seem to be the most affected groups by the PIT schedule reforms, while the minimum untaxed income policy change has opposing effects in different population groups (overall having a negligible effect on the aggregate). As expected, the child benefit reinforcement impacts more negatively the labour supply response of single parents. In terms of income groups, the positive effects of the change in the PIT schedule are evenly distributed, while those related to the minimum untaxed income change are declining as income increases (it targets mainly low-income families). Finally, child benefit negative impacts seem to be relevant for both men and women, being especially concentrated in the first quintile.

This paper has three main contributions. First, to our knowledge, this analysis, based on a structural labour supply model, is unique for Portugal and sets the path for more focused studies on labour supply behaviour of Portuguese households. The second contribution is that it provides a real time assessment of potential effects of fiscal reforms that can guide the policymakers to improve the design and the purpose of the fiscal policy tools to better target the needs of specific segments of populations that can be more responsive. The third contribution is that it provides a unique set of labour supply elasticities for the Portuguese households that can be used by researchers to calibrate parameters for other policy reforms or in a general equilibrium modelling context.

The paper is organized as follows. Section 2 describes the Portuguese labour market context and the policy changes analysed, while Section 3 provides a description of the modelling tools used in the analysis. Section 4 discusses the estimates of utility parameters and labour supply elasticities. Section 5 presents and discusses the direct impacts on households' disposable income and the labour supply effects triggered by the policy changes. Section 6 concludes.

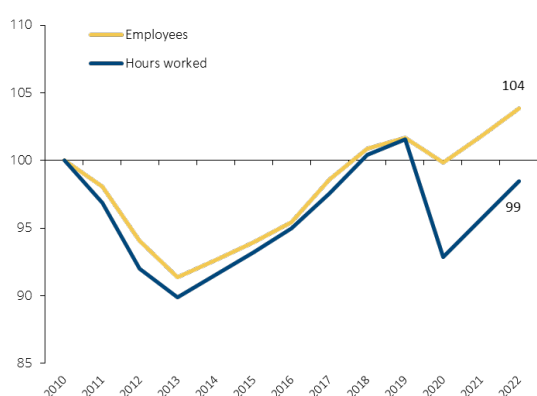
2 The Portuguese case

2.1 The labour market

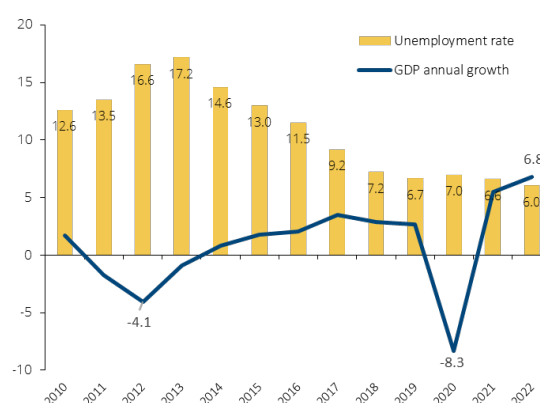
The evolution of the Portuguese labour market in the last decade was marked by two major crises: the Great Recession that followed the 2008 financial crisis and, more recently, the pandemic crisis of 2020. Both events meant drastic GDP drops – 4.1% in 2012, and 8.3% in 2020 – which translated into quite different patterns in terms of employment and unemployment evolution, as can be observed in Figure 1. In the latter crisis, the employment decline was heavily contained by employment support measures, such as job retention schemes, and its rebound was much faster. By the end of 2021, the number of employees reached its pre-pandemic level. Moreover, the unemployment rate has been steadily declining since the peak reached in 2013, registering only a slight increase in 2020. On the other hand, hours worked dropped dramatically in 2020 and recovered slower, but their levels were close to the ones registered in 2019 already by the end of 2022. This contrasts greatly with the employment recovery after the financial and sovereign debt crisis. It took around five years, from the 2012 trough, to reach back the 2010 levels.

Figure 1: Evolution of selected labour market indicators for Portugal, between 2010 and 2022

Panel A: Number of employees and hours worked (index, 2010=100)



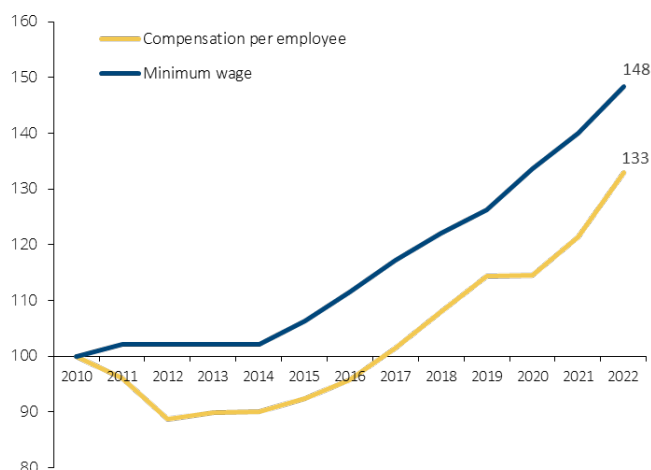
Panel B: Unemployment rate and GDP annual growth (%)



Source: Statistics Portugal.

The low unemployment rate combined with the strong rebound of the Portuguese economy in the aftermath of the pandemic crisis gave rise to a tight labour market. This has been accompanied by a sustained growth of remunerations, after the severe and long adjustment that took place during the Great recession period, as we can observe in Figure 2. The successive increases in the Portuguese minimum wage have also contributed to this positive trend.

Figure 2: Evolution of nominal remunerations and minimum wage (Index 2010=100)

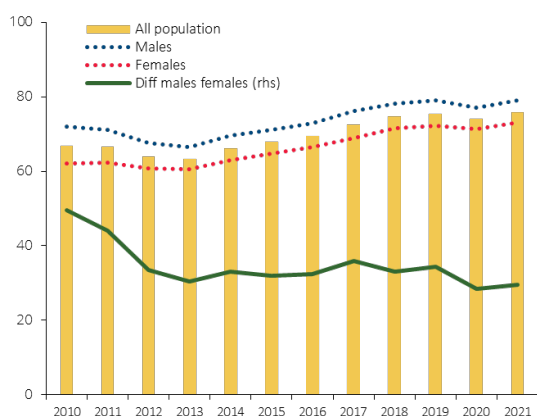


Source: Eurostat and Pordata. Note: The nominal growth of 2022 should be contextualized against an inflation that reached 8.1% in this year.

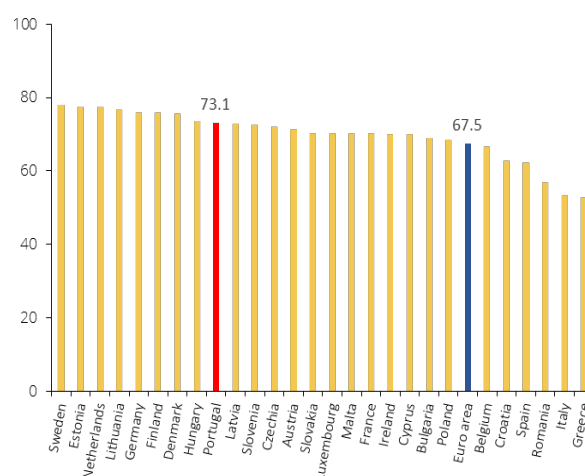
It is also worth to look at other dimensions of the Portuguese labour market that assume particular importance in this analysis, such as female employment and part-time work. From Figure 3A we observe that male and female employment rates evolved similarly between 2010 and 2021, registering a declining pattern up to 2013, more marked in the case of males, and growing steadily after until 2020. On average, these rates were 73% and 66%, respectively, over that period. Despite this significant difference, the gender employment gap, measured as the difference between the female and the male rate, has narrowed down, reaching 6 p.p. in 2021 (10 p.p. in 2010). In the European context, female employment rates in Portugal were also well above the euro area average in 2021, as presented in Figure 3B, confirming the pattern of historically high female labour market participation in this country vis-à-vis its European peers.

Figure 3: Employment rates

Panel A: Population average and by gender (%), between 2010 and 2021



Panel B: Female employment rates in Europe (%), in 2021

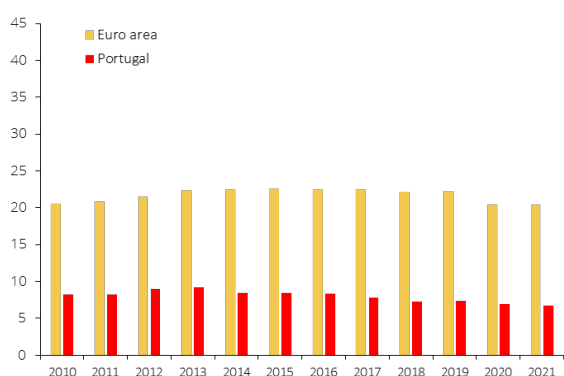


Source: Eurostat. Note: Individuals aged between 20 and 64 years old.

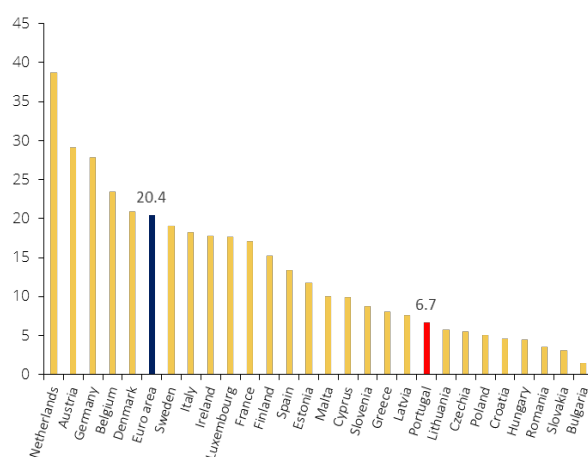
Portugal also stands out for having a very low share of employees on part-time work. Figure 4A shows that part-time occupations have been historically low in Portugal, when compared with the euro area average. In 2021, the share of employees in part-time jobs was only 6.7% while the euro area average reached 20.4%, three times higher. This places Portugal as one of the countries in the European Union with the lowest part-time rates, as can be observed from Figure 4B.

Figure 4: Part-time work

Panel A: Employees in part-time work rates in Portugal and the euro area (%), between 2010 and 2021



Panel B: Employees in part-time work rates in Europe (%), in 2021



Source: Eurostat. Note: Individuals aged between 20 and 64 years old.

2.2 Policy changes

In the aftermath of the sovereign debt crisis, the Portuguese Government implemented a series of fiscal consolidation measures³. The first set of consolidation measures, implemented in 2010, included changes to *abono de família*, the Portuguese child benefit, reducing the amounts transferred to younger children and eliminating the benefits paid in the fourth- and fifth-income brackets of the benefit. During the Portuguese Financial Assistance Programme, signed in 2011, several changes to the PIT were implemented, including a reduction of the number of tax brackets from eight to five, in 2013.

Following this period, several consolidation measures were reverted, and the number of PIT brackets was increased to seven in 2018. Between 2017 and 2019, the fourth bracket of the child benefit was reinstated, and this transfer was significantly reinforced with a significant focus on younger children (those below three years-old) and single-parent families. In the following years, more expansionary fiscal measures regarding PIT and the child benefit were announced and put in place. In 2022, the number of PIT brackets was increased to nine and a reduction of the second bracket tax rate together with an update of tax brackets by 5.1% were announced to be implemented in 2023 (Figure 5A). Moreover, from 2022 to 2023 a series of changes to the tax rebate ensuring a minimum untaxed income to all taxpayers were gradually introduced. The change to the tax rebate was meant to avoid 100% marginal tax rates which were applied to workers close to the minimum

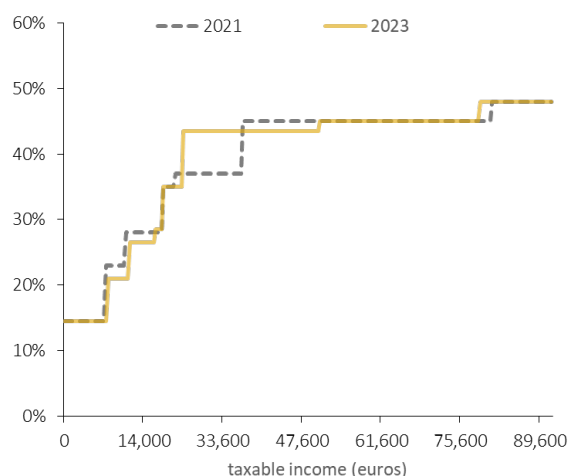
³ See Rodrigues et al. (2016) for a comprehensive description of these measures.

wage (10,640 euros per year in 2023). Although some changes would only have full effects as of 2024, they were fully implemented in our reform scenarios.

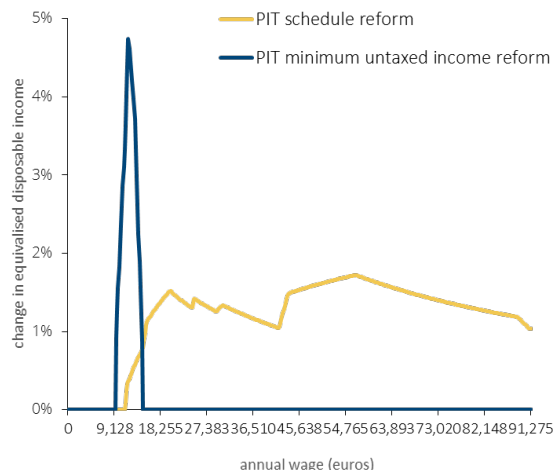
In the case of a single earner without children, the benefits from the reform in brackets and rates in 2022 and 2023 increase up to a monthly gross wage of around twice the Portuguese minimum wage in 2023, with an impact on disposable income waiving around 1.5% after that threshold (Figure 5B). On the contrary, the minimum untaxed income reform benefits individuals earning wages between 9,500 and 14,600 euros yearly, covering a significant part of the wage distribution in Portugal.

Figure 5: PIT reforms

Panel A – Marginal PIT rates in 2021 and 2023



Panel B – Reforms impact for a single earner



Sources: PIT legislation (panel A) and authors' calculations based on EUROMOD simulations using the hypothetical household tool (Panel B). Notes: The simulations behind the results presented on panel B are obtained using the EUROMOD hypothetical household tool (Hufkens et al., 2019) and assuming a rented house at 250 euros per month. The equivalized disposable income is computed using the OECD-modified scale, in which the first adult of the household is counted as 1, additional individuals aged 14 or above count 0.5 and children up to 14 years-old count 0.3.

As to the child benefit, there were four main changes in 2022 and 2023 (Table 1): i) a minimum amount of 100 euros per children per month was introduced for families below an extreme poverty bracket set at 35% of the Social Support Index (2,172 euros per year in 2022), which benefited children above three years old; ii) the amounts transferred to children in the first and second bracket were increased to 50 euros per month, with the most significant increases for children above six years old; iii) the top limit of the third bracket was increased by 13.3% to 10,548 euros per year; and iv) a complementary transfer for families with children was created ensuring that, in the sum of the child benefit with the PIT child tax deduction, every family receives a minimum monthly amount of 50 euros per child, benefiting those families above the third bracket, with insufficient PIT liability to fully benefit from the child tax deduction.

Table 1: Child benefit reforms – changes to the monthly baseline transfer per child

	maximum reference income		Up to 2 years		3 to 6 years		above 6 years	
	2021	2023	2021	2023	2021	2023	2021	2023
Extreme poverty bracket	3102	2172	149.9	161.0	50.0	100	37.5	100
First bracket		3102				50.0		50
Second Bracket	6205	6205	123.7	132.9	41.2	50	30.9	50
Third bracket	9307	10548	97.3	104.6	32.55	34.9	28.0	30.1
Fourth bracket	15512	15512	58.4	62.8	19.46	20.91	0	0

Source: Child benefit legislation. Notes: The reference income values are annual amounts and differs from the actual reference values for 2023, as we do not model in our simulations the update of IAS, the social support index. One of the changes introduced in the child benefit - the complementary transfer ensuring that every family receives a minimum amount per child - is not displayed in the table, as it depends also on the PIT child tax credit.

3 The microeconometric model EUROLAB

The behavioural labour supply-demand model adopted in this analysis, EUROLAB, follows closely Narazani et al. (2023) and relies on a large body of literature on discrete choice analysis (Van Soest, 1995; Aaberge et al., 1995) that constructs the budget sets from a set of mutually exclusive and collective exhaustive alternatives of hours or jobs. Under the principle of random utility maximization (McFadden, 1974), the discrete choice approach implies that a rational individual chooses the alternative available in the market that maximizes his utility. More formally, households are assumed to choose within a set of alternatives Ω . Some alternatives are a market job (employment), some consists of job-search (unemployment), some other are non-market activities (non-participation). In this exercise alternatives are characterized by the double (H, w) where H stands for hours of work and w is the wage rate.⁴ If the alternative is a market job, then H can take five possible values in the ranges [1-5], [6-18], [19-31], [32-44] and [44-57]. If the alternative is job-search (while unemployed), then H is assigned a random value drawn from the interval [1 - 5] (interpreted as time devoted to job search). In this case, w is equal to the unemployment subsidy. If the alternative is a non-market activity (non-participation), then $H = 0$. In what follows we use the index j to identify the different types of alternatives.

The utility attained by household i when choosing type j is:

$$U_{ij} = V(C_{ij}, T - h_j; \gamma_i) + \varepsilon_{ij} \quad (1)$$

where $V(\cdot)$ is the deterministic part of the utility function and ε_{ij} the unexplained component, where $\varepsilon \sim \text{Gumbel}(0,1)$ is a random variable that accounts for unobserved factors affecting utility. The deterministic part of the utility function depends on disposable income, leisure and a set of parameters that represent household preferences. More specifically:

$C_{ij} = \tau(w_{ij}h_j, I_i)$ is the disposable income computed according to the tax-transfer rule τ as a function of labour income $w_{ij}h_j$ and other exogenous income I_i ;

T is total available time, $T - h$ is “leisure” and h stands for the hours worked;

γ_i is a vector of parameters that characterize the preferences of household i .

Household choices are modelled as solutions of the problem:

$$\begin{aligned} & \max_j U_{ij} \\ & s.t. \\ & j \in \Omega \end{aligned} \quad (2)$$

The assumption of the Gumbel distribution for the random component ε leads to the following probability that household i is willing to accept an alternative of type k characterized by the double (h, w) (Colombino, 2013):

$$P(w_i, h, \tau; \gamma_i, \delta_i) = \frac{\exp\{V(w_i, h, \tau; \gamma_i)\}}{\sum_H \exp\{V(w_i, h, \tau; \gamma_i)\}} \quad (3)$$

⁴ In its general setting, EUROLAB offers the possibility of characterizing further the set of alternatives, in terms of sectors of activity – distinguishing essential from non-essential sectors (following the classification of Narazani and Colombino, 2021) – and employment status – distinguishing employees from self-employed (as in Moscarola et al., 2020).

A common procedure to improve the fitting performance of the model consists of adding alternative-specific dummies that contribute to better characterize the alternatives considered (Van Soest, 1995; Aaberge et al. 1995, 1999):

$$P(w_i, h, \tau; \gamma_i, \delta_i) = \frac{\exp\{V(w_i, h, \tau; \gamma_i) + D_i(h)' \delta_i\}}{\sum_H \exp\{V(w_i, h, \tau; \gamma_i) + D_i(h)' \delta_i\}} \quad (4)$$

The D'_{ij} are vectors of (0, 1) dummy variables, capturing the fact that the different types of alternatives are not equally available in the labour market. For instance, some employment alternatives, like part-time jobs, may be of limited availability in the labour market. Also, the (involuntary) unemployment alternative (or “job search” alternative) is not fully available in the labour market, reflecting a nature which is closer to an external negative shock hitting the worker, than to a choice. In this way, the dummy coefficient δ is defined as a function of the degree of the “job” availability – e.g., as a function of the percentage of job types over total number of jobs – or, in the case of the unemployment alternative, a function of the probability of being unemployed.

As explained before, unemployment is modelled as a “job” (Colombino et al. 2010), that pays a “wage” (unemployment benefits or social security assistance) and requires some “hours” for job search or confirmation of willingness to work (e.g., through the participation in active labour market programmes like re-training or motivational activities). These activities related to job search are modelled by imputing a random value from the interval [1 – 5]. The number of available unemployment “jobs” and the level of their “wages” can be explicitly represented in the model in the same way as we do with market jobs and market wages (i.e., through the “dummy” terms).

Assuming that J , available in the market, depends on the wage rate, w , and on a certain elasticity of labour demand (assumed equal to 0.5 in the current analysis), we can establish the labour market equilibrium for a certain policy change adjustment v as follows (see Colombino, 2013 and Colombino and Narazani, 2021):

$$\sum_i \sum_{h>0} P(w_i(v^*), h, \tau'; \gamma, \delta(v^*)) = J(v^*) \quad (5)$$

Condition (5) equalizes the desired labour supply in terms of jobs that households are willing to accept to the available jobs, i.e., to labour demand, through the adjustment of the wage. By including this condition, EUROLAB allows the assessment not only of potential labour supply effects but also of equilibrium effects in response to a policy change.

The specification chosen in EUROLAB for the deterministic part of the utility function is a quadratic specification in income and leisure, as shown in (6), where C accounts for couple, M for male and F for female.

$$V(C, T - h; \gamma) = \gamma_C C + \gamma_{CC} C^2 + \gamma_F (T - h_F) + \gamma_{FF} (T - h_F)^2 + \gamma_M (T - h_{MM}) + \gamma_{MM} (T - h_M)^2 + \gamma_{FM} (T - h_F)(T - h_M) \quad (6)$$

The preference parameters assigned to linear terms such as income and leisure are allowed to differ by some individual and household characteristics such as age, age squared, number of children aged 0 to 3 years old (defined as numch_3), number of children aged 3 to 6 years old (defined as numch_6), total number of children (defined as numch) and household size (defined as hhsz) as showed in (7). Additionally, we interact leisure with three dummy variables indicating respectively whether the decision-making unit is a migrant (defined as *Migrant*), in order to account for labour market integration constraints; or holds a mortgage liability (defined as *Mortgage*), to control for other economic constraints like financial ones; or lives in the capital (defined as *Capital*), to account for location effects of living in a highly urbanized area with access to more diversified labour market and public services.

$$\gamma_C = \beta_C h hsz$$

$$\gamma_M = \beta_{M1}numch_3 + \beta_{M2}numch_6 + \beta_{M3}numch + \beta_{M4}age + \beta_{M5}age^2 + \beta_{M6}Migrant + \beta_{M7}Mortgage + \beta_{M8}Capital$$

$$\gamma_F = \beta_{F1}numch_3 + \beta_{F2}numch_6 + \beta_{F3}numch + \beta_{F4}age + \beta_{F5}age^2 + \beta_{F6}Migrant + \beta_{F7}Mortgage + \beta_{F8}Capital$$

(7)

The decision-making unit is composed by the head of the household unit, with and without a partner. In the first case, the decision-making unit is made of two persons who take collective decisions about their participation in the labour market and where the household head is defined as the member with highest labour earnings⁵. In the second case, the decision unit is the individual. Once the decision-making unit is identified, individuals are selected according to their age – from 19 to 66 years old – so that we build a sample of individuals whose labour supply behaviour is endogenous. Complex intra-household bargaining processes are not modelled. Similarly, the labour behaviour of students, pensioners and people with disability is not modelled as their choice set should be expanded on other decision dimensions, e.g., education, pension or early retirement schemes.

The tax and benefit microsimulation model EUROMOD⁶ is used to construct the counterfactual budget constraint at each alternative of the choice set. EUROMOD is a complex calculator that simulates cash benefit entitlements, direct taxes and social insurance contributions and, consequently, disposable incomes, for all EU countries based on the information available in the underlying micro-datasets and in line with the country tax-benefit rules. Non-simulated benefits, like contributory pensions, as well as market incomes are taken directly from the input datasets. EUROMOD computes the household disposable income as follows. For each alternative in the choice set, characterized by positive working hours, a wage rate is needed to compute labour income earned. As wage information is only available for the working individuals, the hourly wage rate has been estimated for the non-working sample. The wage equation is specified as a logarithmic function of observed wage rates and depends linearly on a set of conventional explanatory variables such as education, work experience, work experience squared, education level and some regional dummies. To control for the possibility of non-random selection of non-employed, EUROLAB model follows the Dubin and McFadden (1984) approach, which is based on two assumptions: (1) a linear relationship between the error terms in the wage selection equations, and (2) a correlation equation between the two error terms sum to zero (see Narazani et al., 2023, for details on the wage prediction procedures applied by EUROLAB). In the case of the unemployment alternative, unemployment benefits are simulated according to the rules applied in the country. According to the Portuguese law and abstracting from additional eligibility conditions, the unemployment benefit amounts in general to 65% of the monthly wage earned in the previous year.⁷ In the case of the inactivity alternative, the monthly wage is set to 0 and allocated to the selected individuals. Once the (predicted) wage is set, EUROMOD considers it together with any other source of family income and the characteristics of the whole tax and benefit system to derive the disposable income of the individual and the household under each alternative, considering the household characteristics.

Finally, the data used both for estimating the utility function parameters, labour supply elasticities and running EUROMOD comes from the European Union Survey on Income and Living Conditions (EU-SILC), produced by Eurostat. This is a harmonized dataset of cross-sectional and longitudinal data, covering all EU countries. It is an annual survey that collects information at the individual and at the household level about income sources – wages, social contributions, taxes and pensions and other social transfers – and living conditions. EU-SILC also includes individuals' demographic and socio-economic characteristics such as gender, age, marital status and parenthood, education, labour market status, among others. In this study, we use only the 2020 cross-sectional version of this survey for Portugal (with the reference period for income being 2019), consisting of a representative sample of 27,638 individuals, corresponding to 11,367 households. Although the 2021 survey data is already available, it is affected by the pandemic shock by focusing on 2020 income.

⁵ In the case of equality of earnings, the age criterion is used.

⁶ EUROMOD version I4.62+, January 2021.

⁷ See EUROMOD Country report for Portugal for a complete description of the unemployment benefit simulation for this country.

4 Empirical specification and estimation results

4.1 Utility parameters

After running EUROMOD and simulating the budget constraints for each counterfactual choice set, EUROLAB estimates the parameters characterising preferences for labour and income for three household types: couples, single women, and single men⁸ as described in Section 3. Household type-specific utility estimates are reported in Table 2 and are satisfactory overall in terms of statistical and economic significance. Utility parameters with respect to the availability of the various job opportunities point out to a pronounced concentration around the full-time hours' alternative, while the take up of part-time jobs appears insignificant, which seems to be reflecting the Portuguese labour market structure and working-time patterns shown in Section 2. The unemployment option is not statistically significant, indicating that unemployment is an irrelevant alternative among the choice set of individuals. Nevertheless, the inclusion of the unemployment alternative dummy among the explanatory variables of the conditional logit model is important to account for the weight of this option. Preference parameters for the marginal utility of leisure are positive and declining with additional amounts of leisure enjoyed, both for couples and singles. In addition, the utility parameter related to the interaction of leisure among partners ("in couple" households) is also statistically significant and positive, indicating that partners prefer to spend leisure time together. This implies that the labour supply effects of the fiscal reforms of partnered individuals are affected also by the indirect or cross effects of their partners. The other parameters related to the interactions of leisure and socio demographic characteristics (age, education level, country of birth, existence of a mortgage and living in the capital) show different levels of significance among men and women. It is interesting to note that the interaction of leisure with variables capturing the number of children (younger than three years old result and more than two children) is insignificant, a finding that indicates that the presence of young children doesn't penalize the preferences for work among parents, not even for mothers. This finding is corroborated by the high employment rates (higher than 80%) among fathers, but also mothers, in the presence of children, in Portugal, which reveals a high preference for work even among mothers with more than 2 children.⁹ It is interesting to note that the estimated parameters do not support the evidence for different preferences for work among natives and migrants. There is evidence of a greater preference for working among mortgage holders, which may indicate the importance of financial constraints in determining labour supply behaviour. Similarly, individuals living in the capital seem to have a higher preference for work and the difference is statistically significant for all decision-making units except for single women.

Table 2: Conditional logit estimation results

	Couples	Single Women	Single Men
In-work dummy - Male	-9.327*** (-7.23)		-7.563*** (-5.02)
Part-time dummy - Male	0.827 (1.91)		0.462 (0.89)
Full-time dummy - Male	2.058*** (15.01)		2.165*** (12.30)
Over-time dummy - Male	0.278* (2.12)		0.256 (1.56)
Unemployment dummy - Male	-19.27 (-0.03)		-19.34 (-0.03)
In-work dummy - Female	-4.359*** (-7.99)	-3.478*** (-7.26)	
Part-time dummy - Female	0.0545 (0.27)	0.129 (0.65)	
Full-time dummy - Female	2.072***	2.116***	

8 Note that distinguishing for further types of households, such as adult child living with parents, is desirable for a better identification of the sample, as well as for performing specific policy analysis. However, the representativeness of additional types of households is not adequate in EU-SILC data to perform such an analysis.

9 See Figure A.1 in the Appendix.

	(17.84)	(17.19)	
Over-time dummy - Female	-0.0988	-0.335*	
	(-0.73)	(-2.33)	
Unemployment dummy - Female	-19.23	-18.55	
	(-0.03)	(-0.04)	
Leisure - Male	0.251***		0.141*
	(3.96)		(2.12)
Leisure square - Male	-0.00366***		-0.00208*
	(-5.09)		(-2.44)
Leisure x age - Male	-0.00225		-0.00224*
	(-1.53)		(-2.39)
Leisure x age square - Male	0.0000367*		0.0000287**
	(2.32)		(2.68)
Leisure x #children < 3 year - Male	0.00792		-0.0162*
	(1.58)		(-2.01)
Leisure x #children 2+ - Male	-0.00120		0.0147
	(-0.14)		(1.24)
Leisure x Migrant - Male	0.0208		-0.0133
	(1.64)		(-1.04)
Leisure x Living in Lisbon - Male	-0.0206***		-0.00990*
	(-3.74)		(-2.16)
Leisure x Mortgage - Male	-0.000450**		-0.000642***
	(-2.88)		(-3.31)
Leisure - Female	0.198***	0.163***	
	(4.50)	(4.12)	
Leisure square - Female	-0.00187***	-0.00121***	
	(-5.13)	(-3.56)	
Leisure x age - Female	-0.00221	-0.00332**	
	(-1.70)	(-3.05)	
Leisure x age square - Female	0.0000287*	0.0000423***	
	(2.03)	(3.53)	
Leisure x #children < 3 year - Female	0.00573	-0.00372	
	(1.29)	(-0.47)	
Leisure x #children 2+ - Female	0.0124	0.00108	
	(1.61)	(0.08)	
Leisure x Migrant - Female	-0.00555	0.00361	
	(-0.47)	(0.31)	
Leisure x Living in Lisbon - Female	-0.0103*	0.00176	
	(-2.19)	(0.42)	
Leisure x Mortgage - Female	-0.000656***	-0.000698***	
	(-4.67)	(-4.07)	
Leisure Male x Leisure Female	0.000278*		
	(2.43)		
Net income	0.0136***	0.0133***	0.00521**
	(6.59)	(7.13)	(2.96)
Net income square	-	-0.000000745	-0.000000268
	0.00000213		
	**		
	(-3.03)	(-0.71)	(-0.27)
Net income x household size	0.000315	0.0000846	0.00127***
	(1.06)	(0.22)	(3.43)
Net income x Leisure - Male	0.0000384**		0.0000571***
	(3.18)		(4.34)
Net income x Leisure - Female	-	0.0000218*	
	0.00000132		
	(-0.13)	(2.15)	
Observations	102636	13956	10722
ll	-4884.9	-2103.1	-1737.6

r2_p	0.522	0.495	0.457
aic	9837.8	4242.1	3511.2
bic	10162.1	4377.9	3642.2

Source: Own calculations based on EUROLAB. Notes: *t* statistics in parentheses. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

4.2 Labour supply elasticities

Before presenting the behavioural effects of the policy reforms, we first examine the labour supply elasticities. These estimates can provide valuable insights into the potential repercussions of fiscal reforms on labour supply. They are presented for the entire population and categorized based on key socio-demographic factors such as gender, presence of children, marital status, age, education level, migration status and income level. The process of computing labour supply elasticities involves: i) increasing gross wages by 1%, ii) computing the probability of each choice and the resulting new labour supply, and iii) averaging across the relevant sample. Additionally, we calculate labour supply elasticities at both the extensive (weekly working hours) and the intensive margin (labour market participation). Selected results are showcased in Figures 6A and 6B¹⁰.

As depicted in Figure 6A, the overall labour supply elasticity estimated for the entire population is approximately 0.25, indicating that a 1% increase in gross wages would result in a 0.25% increase in the total labour supply. We observe a notably higher responsiveness among women compared to men, with values of 0.28 and 0.22, respectively, which is consistent with the related labour supply literature (see Blundell et al (2011) and, for surveys, McClelland and Mok (2012) and Bargain et al (2014)). The figure also shows variations in these elasticities based on age, education level and income level. Younger, less educated, and low-income individuals display higher elasticities, implying a greater likelihood of responsiveness to policy reforms affecting their disposable income. Interestingly, an age profile of elasticities reveals a U-shaped pattern. Singles exhibit higher elasticities than partnered individuals, and parents demonstrate higher elasticities than those without children. Furthermore, the analysis exhibit distinctions between genders and migration status. In the case of men, migrants exhibit labour supply elasticities similar to natives. However, migrant women show lower elasticities compared to natives.

Figure 6B breaks down the overall labour supply elasticity into its extensive and intensive margins. Notably, there is a significant contrast in the responses to a wage increase concerning participation and hours worked, with the later exhibiting greater rigidity. Particularly, single men display heightened reactivity to changes in gross wages in the extensive margin, whereas the opposite holds true when considering hours of work. In this last scenario, single men exhibit the lowest elasticity among the various gender and marital status combinations examined. In fact, it appears, that singles, in general, display greater elasticity than couples, and women in couples also appear to be more elastic than men in similar situations.

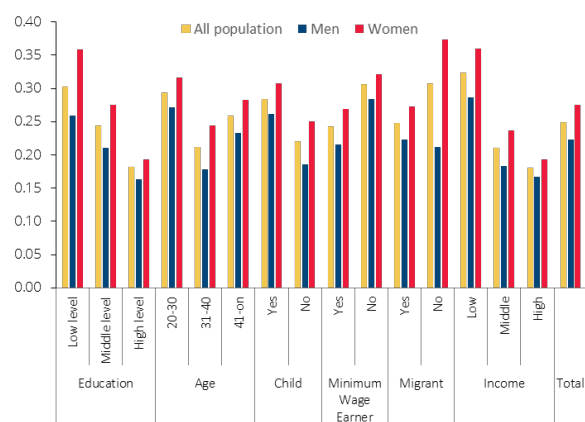
Drawing a direct comparison between the elasticities presented in this study and those found in the existing literature poses a challenge primarily owing to the limited number of publications featuring Portugal. Additionally, variations in modelling frameworks, the influence of the tax-benefit system, and disparities in micro data can lead to significant differences in elasticity values. Notably, the elasticities reported in this paper, especially the ones on the extensive margin, appear to be higher than those documented in Bargain et al. (2014)¹¹. This contrast may arise from variations in estimation methodology (including utility form, wage prediction method and the calculation of outside options such as the unemployment benefit), the computation of hourly wage and definition of the time unit. Furthermore, our research relies on one of the most recent SILC waves, intended to capture the latest labour market conditions, while the labour supply elasticities reported by Bargain et al. (2014) for Portugal are derived from the 2001 European Community Household Panel.

¹⁰ See also Table A.1 in the Appendix.

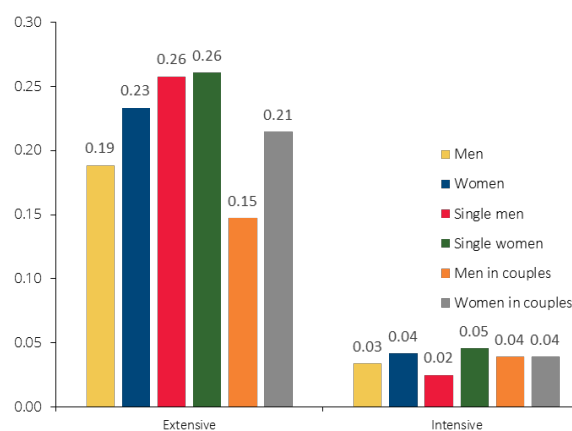
¹¹ See Table A.2 in the Appendix.

Figure 6. Labour supply elasticities

Panel A: Total elasticity by gender and individual characteristics (%)



Panel B: Intensive and extensive margin, by gender and marital status (%)



Source. Own calculations based on EUROLAB.

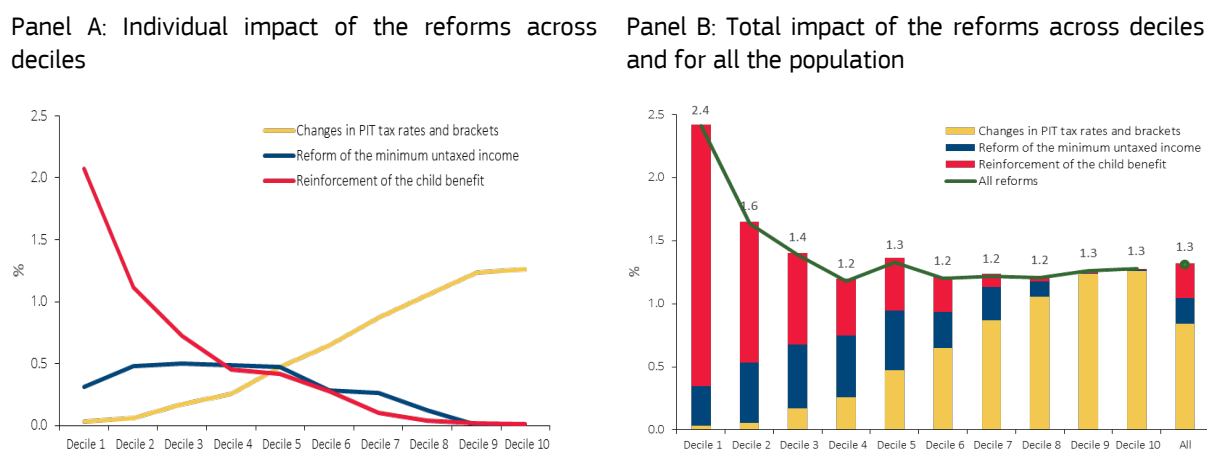
5 Policy reforms effects

In this section, we examine the behavioural and non-behavioural impacts of the policy reforms under consideration. We begin with the discussion of the non-behavioural effects, often referred to as the “next morning” or “day after” reform effects. Following this, we delve into the potential effect on labour supply across various household types and income quintiles. Additionally, we address the employment effects, taking into consideration the demand side of the labour market.

5.1 Non behavioural effects

The three simulated reforms target different income groups (Figure 7A). The tax schedule reform primarily focuses on families located in the second half of the income distribution and it represents nearly a 1.3% increase for the top decile. The minimum untaxed income reform, on the other hand, targets the lower to middle segments of the income distribution, resulting in a disposable income increase of between 0.3% and 0.5% up to the seventh decile. The child benefit reform leads to a 2.1% income rise in the first decile, 1.1% in the second and 0.7% in the third, having negligible effects beyond that. When considered collectively, these reforms establish a progressive pattern, as depicted in Figure 7B, with the first decile emerging as the primary beneficiary. This is largely attributed to the reinforcement of the child benefit, contributing to a substantial 2.4% increase in disposable income for the lower income group, nearly doubling the aggregated average increase observed overall.

Figure 7: Impact of the fiscal shocks on household disposable income by income deciles (%)



Source: Authors’ calculations based on EUROMOD simulations and EU-SILC. Note: Decile groups rank the individuals according to their equivalised disposable income in the baseline scenario. For the computation of the equivalised disposable income, we follow the OECD-modified scale, in which the first adult is counted as 1, additional individuals aged 14 or above 0.5 and children up to 14 years-old 0.3.

5.2 Behavioural effects

The EUROLAB behavioural model generates potential labour supply effects for the selected reforms, as outlined in Table 3 and Figure 9.

From Table 3, the labour supply responses, in the intensive and extensive labour margins, categorized by gender and family situation, are evident for the different reform scenarios. Concerning the PIT schedule reform, overall effects are relatively modest, with a 0.18% increase in hours worked and 0.10% increase in labour market

participation. Additionally, this reform appears to elicit greater labour supply responses from women in couples and single fathers. The minimum untaxed income reform generates overall negligible effects, with positive impacts in some groups compensating the negative effects in others. In this context, childless women in couples are more inclined to reduce working hours, while single women without children show a willingness to increase them. This pattern is mirrored in the behaviour of men but at a lesser extent. Conversely, the reinforcement of the child benefit is expected to decrease labour participation and total working hours by 0.20% and 0.17%. Unsurprisingly, this reform has nil (or virtually nil) effects on those individuals without children. However, it produces stronger negative effects on single parents, for whom the strengthening of the benefit would make working less attractive. Although lower, it also has an important negative effect on the labour supply of parents in couples. Means-testing child benefits that phase out when family income exceeds an income threshold raise the marginal tax rate, in particular for secondary earners, and create higher labour disincentives for those who belong to these families. In fact, as Figure 9 shows, the work disincentives effects of the child benefit reform, although relevant for both men and women, are stronger for the first two quintiles of the income distribution, more likely to have a family income close to the withdrawal threshold.

Table 3: Labour supply changes in the intensive and extensive margins, by gender and household type, all population

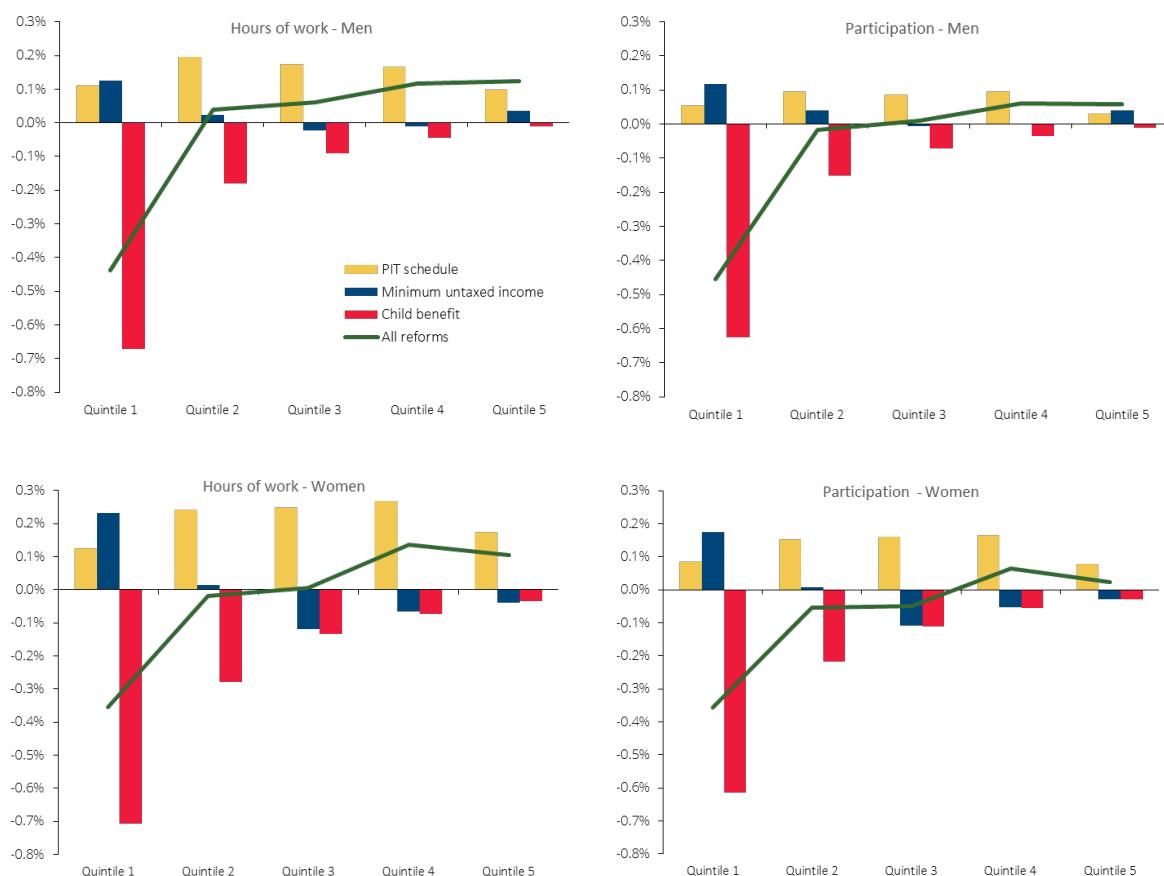
		Baseline	% change after PIT schedule reform	% change after minimum untaxed income reform	% change after child benefit reform	% change after all reforms
Hours of work						
Men	In couple - with children	39.92	0.16%	-0.02%	-0.26%	-0.11%
	In couple - without children	37.68	0.15%	-0.11%	0.00%	0.04%
	Single - with children	37.55	0.26%	0.24%	-0.42%	0.07%
	Single - without children	34.59	0.14%	0.23%	-0.03%	0.33%
	Total	37.66	0.15%	0.03%	-0.18%	-0.01%
Women	In couple - with children	35.01	0.26%	-0.02%	-0.34%	-0.10%
	In couple - without children	34.02	0.23%	-0.31%	0.00%	-0.06%
	Single - with children	34.78	0.17%	0.07%	-0.40%	-0.16%
	Single - without children	33.43	0.16%	0.34%	-0.01%	0.47%
	Total	34.14	0.22%	-0.01%	-0.22%	0.00%
All	Total	35.85	0.18%	0.01%	-0.20%	-0.01%
Participation						
Men	In couple - with children	0.94	0.07%	-0.01%	-0.23%	-0.17%
	In couple - without children	0.90	0.07%	-0.11%	0.00%	-0.03%
	Single - with children	0.89	0.17%	0.26%	-0.36%	0.06%
	Single - without children	0.83	0.08%	0.25%	-0.02%	0.29%
	Total	0.90	0.07%	0.04%	-0.17%	-0.06%
Women	In couple - with children	0.89	0.17%	-0.02%	-0.29%	-0.14%
	In couple - without children	0.87	0.16%	-0.30%	0.00%	-0.12%
	Single - with children	0.88	0.07%	0.07%	-0.31%	-0.17%
	Single - without children	0.86	0.07%	0.31%	-0.01%	0.35%
	Total	0.87	0.13%	-0.01%	-0.18%	-0.06%
All	Total	0.88	0.10%	0.01%	-0.17%	-0.06%

Source: Own calculations based on EUROLAB. Note: Children are defined as son-daughter of the decision-making unit. They are not older than 18 years, or if older, in education. Inactivity includes both voluntary and involuntary unemployment.

Figure 8 illustrates the labour supply effects for men and women across income quintiles. The results align with the intended target population of the reforms. The reform on the PIT schedule demonstrates positive effects on labour supply throughout the disposable income distribution, particularly pronounced in the middle-income range. Regarding the minimum untaxed income reform, the positive labour supply effects diminish with higher income up to the third quintile and then (slightly) increase again, exhibiting a U-shape pattern, with women experiencing a stronger positive effect (0.23% in hours worked and 0.17% on participation in the first quintile). The child benefit reform is expected to generate labour disincentives, particularly for households in the first quintile (around 0.7% in hours worked for men and women), diminishing as income rises. It is noteworthy that

the policy reforms are expected to induce labour disincentives in the lower income range primarily due to the impact of the child benefit reform. Conversely, these reforms are predicted to generate positive labour responses, primarily influenced by the PIT reform, which enhances the disposable income. The combined effect of the three reforms is nevertheless modest, generating a drop in hours work and participation of less than 0.5% for the groups more affected by the disincentives produced by some of the measures (the low-income families).

Figure 8: Labour supply changes in the intensive and extensive margins, by gender and income quintiles



Source: Own calculations based on EUROLAB. Note: Children are defined as son-daughter of the decision-making unit. They are not older than 18 years, or if older, in education. Income quintiles are constructed based on equivalized disposable income under the pre-reform system.

Moreover, we assess the outcomes of the reforms by employing a social welfare criterion that assigns equal welfare weights to households regardless of their income status. The findings, as presented in Table 4, indicate that all the reforms are expected to result in a modest increase in social welfare, primarily attributable to their capacity to reduce inequality and enhance overall income. Altogether, the reforms produce around 90% of winners, meaning that almost all individuals experience an increase in their disposable income, with a marginal cost of public funds close to zero.

Table 4: Welfare and efficiency indicators

	Baseline	PIT schedule reform	Minium untaxed income reform	Child benefit reform	All the reforms
Social Welfare	790	795	792	793	801
Gini index	0.298	0.300	0.297	0.296	0.297
Marginal Cost of Public Funds		0.11	-0.03	-0.27	0.01
Winners		0.70	0.24	0.22	0.88

Source: Own calculations based on EUROLAB. Notes: Social Welfare is computed as the product of the average disposable income of all households and the Gini index; the Gini index is computed on the equivalized disposable income; the marginal cost of public funds is calculated as 1 minus the ratio between the change in net revenues with behavioural effect on the change in net revenues without behaviour; the winners is the share of the sample experience an increase in the equivalized disposable income due to the reform.

5.3 Employment effects

As referred in the methodological section, EUROLAB is also able to project potential changes in employment, inactivity and unemployment by considering the demand side of the labour market. We present the results of this analysis in Table 5. Assuming a labour demand elasticity of -0.5, we determine the value of the change in average wage – parameter v , Section 4 – that aligns with a new labour market equilibrium status following the reform.¹² The PIT reform is expected to shift the desired labour supply curve to the right, resulting in a 0.24% increase in total employment. However, to ensure consistency between the available jobs and the desired labour supply through adjustment along the demand curve and wage rate, wage decreases 0.3% the final employment increase is dampened to 0.16%. Inactivity is expected to decrease by 0.46% and unemployment is expected to drop by 0.66%, in equilibrium. Conversely, the reform related to child benefit is expected to reduce labour supply by 0.42%, shifting the labour supply curve to the left. A new labour market equilibrium is established, resulting in a 0.56% increase in the wage rate and a less substantial decline in employment of 0.28%. The employment effects associated with the minimum untaxed income reform are estimated to be generally minimal, mirroring the small change in labour supply.

Table 5: Changes in employment, inactivity and unemployment, in equilibrium

	Employment	Inactivity	Unemployment	Wage % change
Baseline	3004003	371412	477302	
% change after PIT schedule reform				
No equilibrium	0.24%	-0.73%	-0.13%	
Equilibrium	0.16%	-0.46%	-0.66%	-0.3
% change after minimum untaxed income reform				
No equilibrium	0.04%	-0.11%	-0.13%	
Equilibrium	0.02%	-0.07%	-0.09%	0.0
% change after child benefit reform				
No equilibrium	-0.42%	1.39%	1.54%	
Equilibrium	-0.28%	0.92%	1.05%	0.6
% change after all reforms				
No equilibrium	-0.14%	0.53%	0.45%	
Equilibrium	-0.09%	0.38%	0.29%	0.2

Source: Own calculations based on EUROLAB. Notes: Only the individuals in the behavioural sample are considered in these calculations.

¹² See Narazani and Colombino (2021) for details on the optimization procedure used.

6 Conclusions

This paper examines the effects of recent tax and benefit reforms in Portugal on labour supply. The study used a discrete labour supply model, EUROLAB, and data from the EU-SILC to estimate labour supply elasticities and the EUROMOD microsimulation model to quantify the direct effects of the policy changes.

The results show that labour supply elasticities in Portugal are relatively small, higher for females than males, and especially rigid in the intensive margin. This reflects the specificities of the Portuguese labour market, characterized by high participation (including female participation) and low prevalence of part time jobs in the European context. The study also finds that lower labour supply elasticities do not reduce the importance of considering the effects of fiscal reforms on the labour market, as even small reforms might have a relevant impact on the outcomes for specific segments of the population. While the higher labour supply for women seems to be in line with the related literature, the overall more elastic supply of labour at the extensive margin, when compared with Bargain et al. (2014), may result from some limitation in the simulation of the outside option of unemployment (either because of the reduced number of unemployed in the behaviour sample or due to the computation of the unemployment subsidy itself). In further analysis, we plan to improve the simulation of the counterfactual unemployment alternative, by using a more sophisticated tool to transit individuals from employment to unemployment.

The study also finds that recent changes to the PIT tax schedule in Portugal are regressive, while the ones affecting the minimum untaxed income have a flatter profile. On the contrary, the child benefit reform has a progressive nature. Labour supply responses to these policy changes are overall of small magnitude. As expected, hours of work and participation are affected positively by the tax schedule reform and negatively by the child benefit reinforcement. These negative labour supply effects of the child benefit reform are, however, concentrated on certain groups, being higher for single parents or for those in the bottom half of the income distribution. Knowing the groups most at risk of leaving the labour market might be useful for policy makers to design targeted active labour market policies to mitigate these impacts. Nevertheless, all the reforms are assessed as social welfare increasing.

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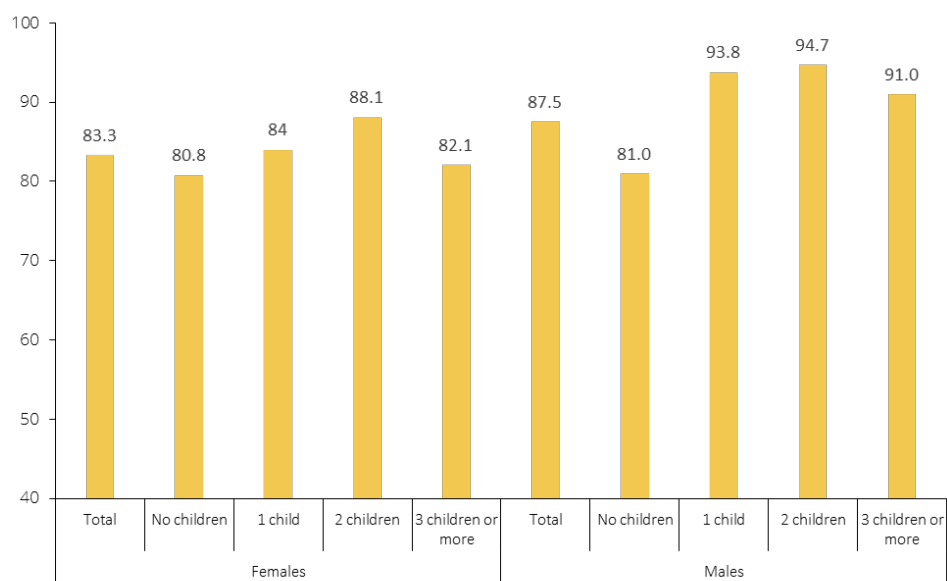
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Appendix

Figure A.1: Employment rate of adults by sex and number of children (%) in 2021



Source: Eurostat.

Table A.1. Labour supply elasticities, by individual characteristics, at the intensive and extensive margins

All population		All			Couples			Singles		
		Total	Extensive	Intensive	Total	Extensive	Intensive	Total	Extensive	Intensive
Education	Low level	0.30	0.27	0.03	0.28	0.24	0.03	0.34	0.31	0.03
	Middle level	0.24	0.21	0.04	0.21	0.17	0.04	0.30	0.26	0.03
	High level	0.18	0.13	0.05	0.16	0.11	0.05	0.23	0.18	0.05
Age	20-30	0.29	0.27	0.03	0.26	0.22	0.03	0.33	0.30	0.02
	31-40	0.21	0.18	0.03	0.19	0.16	0.03	0.26	0.23	0.03
	41-on	0.26	0.22	0.04	0.23	0.19	0.04	0.30	0.26	0.04
Child	Yes	0.28	0.25	0.03	0.26	0.22	0.04	0.30	0.27	0.03
	No	0.22	0.18	0.04	0.20	0.16	0.04	0.28	0.23	0.05
Minimum Wage Earner	Yes	0.24	0.20	0.04	0.21	0.17	0.04	0.29	0.25	0.04
	No	0.31	0.28	0.03	0.29	0.26	0.02	0.33	0.30	0.03
Migrant	Yes	0.25	0.21	0.04	0.22	0.18	0.04	0.30	0.26	0.04
	No	0.31	0.27	0.04	0.31	0.28	0.04	0.30	0.26	0.04
Income	Low	0.32	0.29	0.03	0.30	0.26	0.03	0.36	0.32	0.03
	Middle	0.21	0.18	0.03	0.19	0.15	0.04	0.25	0.22	0.03
	High	0.18	0.13	0.05	0.14	0.09	0.05	0.25	0.19	0.05
Total		0.25	0.21	0.04	0.22	0.18	0.04	0.30	0.26	0.04
Men										
Education	Low level	0.26	0.23	0.03	0.23	0.19	0.03	0.31	0.29	0.02
	Middle level	0.21	0.18	0.03	0.17	0.13	0.04	0.28	0.25	0.02
	High level	0.16	0.12	0.05	0.13	0.08	0.05	0.22	0.19	0.03
Age	20-30	0.27	0.25	0.02	0.16	0.14	0.02	0.34	0.33	0.02
	31-40	0.18	0.15	0.03	0.15	0.11	0.04	0.24	0.21	0.02
	41-on	0.23	0.20	0.04	0.20	0.16	0.04	0.29	0.26	0.03
Child	Yes	0.26	0.24	0.02	0.23	0.20	0.03	0.29	0.27	0.02
	No	0.19	0.14	0.04	0.17	0.12	0.04	0.27	0.23	0.04
Minimum Wage Earner	Yes	0.22	0.18	0.04	0.18	0.14	0.04	0.28	0.25	0.03
	No	0.28	0.26	0.02	0.25	0.23	0.02	0.32	0.30	0.02
Migrant	Yes	0.22	0.19	0.03	0.19	0.15	0.04	0.29	0.26	0.02
	No	0.21	0.18	0.04	0.22	0.19	0.04	0.20	0.16	0.04
Income	Low	0.29	0.26	0.03	0.25	0.22	0.04	0.33	0.31	0.02
	Middle	0.18	0.15	0.03	0.15	0.12	0.04	0.24	0.21	0.02
	High	0.17	0.12	0.05	0.13	0.07	0.05	0.25	0.22	0.03
Total		0.22	0.19	0.03	0.19	0.15	0.04	0.28	0.26	0.02
Women										
Education	Low level	0.36	0.32	0.04	0.35	0.32	0.03	0.37	0.33	0.04
	Middle level	0.28	0.24	0.04	0.25	0.22	0.03	0.31	0.27	0.04
	High level	0.19	0.14	0.05	0.17	0.12	0.05	0.23	0.17	0.06
Age	20-30	0.32	0.28	0.04	0.32	0.29	0.04	0.31	0.27	0.04
	31-40	0.24	0.21	0.03	0.22	0.20	0.03	0.28	0.25	0.03
	41-on	0.28	0.24	0.05	0.26	0.22	0.04	0.31	0.26	0.05
Child	Yes	0.31	0.26	0.04	0.29	0.24	0.04	0.32	0.28	0.04
	No	0.25	0.21	0.04	0.24	0.20	0.04	0.28	0.23	0.05
Minimum Wage Earner	Yes	0.27	0.23	0.04	0.25	0.21	0.04	0.30	0.25	0.05
	No	0.32	0.29	0.03	0.31	0.28	0.03	0.34	0.30	0.04
Migrant	Yes	0.27	0.23	0.04	0.25	0.21	0.04	0.30	0.26	0.05
	No	0.37	0.33	0.04	0.36	0.32	0.04	0.40	0.35	0.05
Income	Low	0.36	0.32	0.04	0.34	0.31	0.03	0.38	0.34	0.04
	Middle	0.24	0.20	0.04	0.22	0.18	0.04	0.26	0.22	0.04
	High	0.19	0.14	0.06	0.15	0.10	0.05	0.24	0.18	0.06
Total		0.28	0.23	0.04	0.25	0.21	0.04	0.31	0.26	0.05

Source: Own calculations based on EUROLAB.

Table A.2: Elasticities comparison – Bargain et al. (2014) vs Eurolab

categories	Total			Extensive			Intensive		
	Bargain et al. 2014	Eurolab	difference	Bargain et al. 2014	Eurolab	difference	Bargain et al. 2014	Eurolab	difference
men in couples	0.04	0.17	0.13	0.03	0.16	0.13	0.01	0.02	0.01
single men	0.03	0.39	0.36	0.04	0.38	0.34	-0.02	0.01	0.03
women in couples	0.14	0.24	0.10	0.11	0.21	0.10	0.05	0.03	-0.02
with child	0.16	0.29	0.13	-	-	-	-	-	-
no child	0.10	0.22	0.12	-	-	-	-	-	-
single women	0.08	0.31	0.23	0.05	0.29	0.24	0.04	0.03	-0.01
with child	0.07	0.31	0.24	-	-	-	-	-	-
no child	0.10	0.33	0.23	-	-	-	-	-	-

Source: Own calculations based on EUROLAB and Bargain et al. (2014).

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