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PORSIM: a Portuguese Microsimulation Model Using Administrative Data

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Resumo

The evaluation of the impact of policy measures benefits greatly from the potential of using administrative micro-data, particularly in relation to survey data such as the EU-SILC.

In this context, PORSIM, a microsimulation model, was developed that runs on anonymized administrative data and allows for the ex-ante and ex-post evaluation of changes to the personal income tax (PIT). This model makes it possible to assess the impact of tax measures in budgetary terms, on household disposable income and on various indicators of inequality, poverty and progressivity.

Using the model and administrative microdata from the 2022 Portuguese income tax declarations, an ex-post analysis was carried out of the impact of changes to the Personal Income Tax that year: changes to the number of brackets and the Young Personal Income Tax (IRS Jovem), extension of the deduction per dependent and the reform of the net income guarantee.

The results obtained from the ex-post analysis of the measures contained in 2022 State Budget confirm the simulations carried out ex-ante, which were the first simulations using PORSIM. On the other hand, the impact of the reform of the net income guarantee was higher than estimated, which may be related to the fact that PORSIM was not yet fully developed at the time.

Palavras-Chave: *Simulation Model; Administrative Data; Personal Income; Inequality.*

JEL Classification: C63, C81, H24, D31

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[1] GPEARI: Office for Economic Policy and International Affairs – Ministry of Finance.

PORSIM: a Portuguese Microsimulation Model Using Administrative Data

1. Introduction

The PORSIM is a microsimulation model, developed in the Portuguese Ministry of Finance by GPEARI[2], whose main purpose is to assess the impact of changes to the Personal Income Tax (PIT) in budgetary terms, households' net income and indicators of inequality, poverty and progressivity. The model allows to assess the impact of for example (i) changes in the income brackets, (ii) changes in the tax rates, (iii) changes in the values and limits of tax allowances and deductions and tax benefits, (iv) changes in the income-splitting system ("quociente familiar") and (v) changes in the rules concerning the incomes currently able to be opt out of the declaration.

In previous years, the model has been employed to evaluate the ex-ante impact of some policy changes to support the Government in the decision-making process, namely, in the 2022 State Budget for the reform of the income brackets and tax rates, in the 2023 State Budget for the reform of the net income guarantee and in the 2024 State Budget for the changes in the tax rates.

Using administrative data from 2022 income, an ex-post assessment will be made of the impact of the 2022 State Budget PIT reforms and the reform of the net income guarantee, comparing this impact with the results of the ex-ante simulations.

The structure of the article is as follows: Section 2 gives a brief overview of the Portuguese PIT system, Section 3 covers the data sources of the model, Section 4 explains the functioning of the model, Section 5 presents the results of the reforms in PIT in 2022 and Section 6 concludes.

2. Personal Income Tax in Portugal

The personal income tax ("Imposto sobre o Rendimento das Pessoas Singulares") is paid by residents in Portugal and by non-residents receiving income in Portugal and is represented by a semi-dual system which applies to the total income obtained in Portugal and abroad (total gross income).

The total gross income aggregates the income from six categories:

- Category A: labour income;
- Category B: self-employment income;
- Category E: capital income;
- Category F: property income;
- Category G: net worth increases;
- Category H: pensions.

Labour income, self-employment income and pensions are taxed at progressive rates while most of capital and property incomes are taxed at a flat tax3. These latter incomes could also be taxed at progressive rates instead of a flat tax depending on the option selected by taxpayers in the income declaration.

It is subtracted the tax allowance, specific to each income category, and the tax deduction related to the net income guarantee (to those whose income is below a specified threshold) from the income subject to progressive rates to obtain the taxable income.

Taxation is performed at the individual level, and so when taxpayers are married or under civil partnership and they opt for joint taxation, the household income is divided by two to determine the progressive rate to be applied.

By applying the tax rate to the taxable income, it is obtained the gross tax liability. In the case of joint

[2] GPEARI: Office for Economic Policy and International Affairs.

[3] Generally, the flat tax rate applied is 28%.

taxation, the resulting tax is multiplied by two to obtain the total tax liability of the household. The final tax liability is obtained by deducting to the gross tax liability the tax credits, which represent deductions related to dependent children or ascendants, disability of some members of the household and related to Ayala, Pérez Y Prieto Alaiz (2021), insurance premiums and household general expenses, being restricted by a maximum limit defined in the legislation and by the tax liability. The tax credits are not applied to the tax liability obtained by flat taxation (essentially capital and property income).

3. Data

In this section, it is firstly reviewed the literature on the administrative and survey data to highlight the main differences between these two data sources.

Then, it is compared the administrative and survey data available in Portugal for 2022.

Lastly, it is rigorously presented the data sources used as the model's input as well as its treatment to be then used in the model.

3.1. Literature Review on Administrative and Survey Data

According to (Ayala, Pérez, & Prieto-Alaiz, 2021), administrative data has been increasingly used because compared to survey data it allows the access to a larger sample (in extreme to the entire population) with a better coverage of higher incomes. On the other hand, as (Medalia, Meyer, O'Hara, & Wu, 2019) mentioned, administrative data may not be able to capture low incomes because those who earn income below a threshold may not be compliant to fill the tax record.

Similarly, survey data may not properly measure the income of those in the extremes, either very high or very low incomes due to reporting errors. This situation, as (Yonzan, Milanovic, Morelli, & Gornick, 2021) posited, derives from individuals self-reporting their incomes and households. Higher incomes "typically have higher rates of survey non-response and, among those who respond, higher rates of income under-reporting".

Additionally, as mentioned in (Johnson & Moore, 2008), administrative data can represent a more reliable data source in terms of timeliness of the data being produced at a predictable frequency. However, the use of administrative data for research purposes must take into account data privacy, hence it is "often restricted to uses within the scope of an agency's mission and must be conducted by persons working for the agency".

3.2. Administrative and Survey Data in Portugal

In Portugal, the survey data is retrieved from EU-SILC (EU Statistics on Income and Living Conditions), a survey on income, poverty, social exclusion and living conditions, providing both cross-sectional and longitudinal anonymised data.

EUROMOD runs on microdata from the EU-SILC and is a tax-benefit microsimulation model for the European Union that enables researchers and policy analysts to calculate, in a comparable manner, the effects of taxes and benefits on household incomes and work incentives for the population of each country and for the EU as a whole.

Despite the richness of the EU-SILC data, some limitations were found, namely: (i) the data timeliness lag (about 3 years, in 2024 we only have data available for 2021 income); (ii) are only classified by NUTS I;

(iii) doesn't contain all categories of income (doesn't contain information on capital income) or deductible expenses for tax assessment purposes.

Although administrative data doesn't contain as much information on households, such as qualifications, entry into the labour market or hours worked, it does overcome the limitations of EU-SILC: a shorter time lag (data on 2023 incomes will be available at the end of 2024); it is possible to disaggregate the data to municipality level; it contains income from all categories and deductible expenses for tax calculations.

Figure 1 – Some differences between EUROMOD and PORSIM

Dimensions	EUROMOD	PORSIM
Timeliness	Lag of 3 years (latest available 2021)	Lag of 2 years (latest available 2022)
Region	**NUTS1**	**Municipality level**
Strenghts	Inclusion of relevant variables such as qualifications, job market entry date, social benefits; Faster performance of simulation.	Inclusion of all income types as well as expenses; Simulations more reliable and accurate.
Weaknesses	**No consideration of some income types (capital income) and expenses.**	**Slower performance of simulation; Simulation of social benefits not yet available.**

An important consideration is the adjustment of survey data to administrative data. Despite not intending exhaustively analyse the adjustment of survey data, it is presented some comparative data between them, as well as the respective density functions.

It was used data from 2022 income and the assessment were made separately for labour income and for pensions (all pensions, contributory and non-contributory, were taken into account).

Figure 2 - Administrative data vs Survey data (2022)

	Labour income			Pensions		
	Admin. data	Survey data	Dif.	Admin. data	Survey data	Dif.
Households (no.)	5 031 129	4 524 698	-506 431	2 957 673	2 967 108	9 435
Total income (M€)	79 071	86 674	7 603	33 973	33 474	-499
Average income (€)	15 716	19 156	3 440	11 486	11 282	-204
Median income (€)	11 267	13 514	2 247	7 669	7 280	-389

Figure 3 - Labour Income Distribution

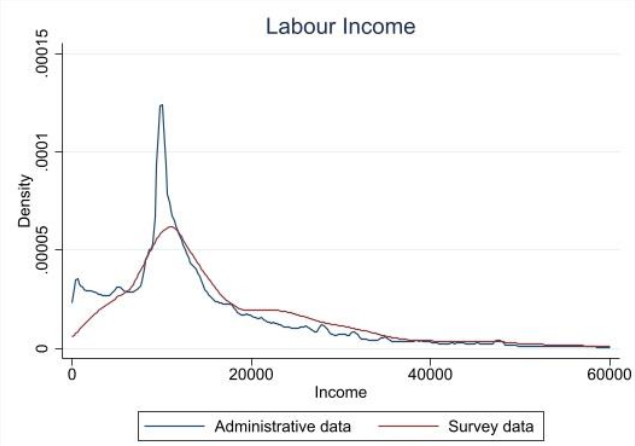
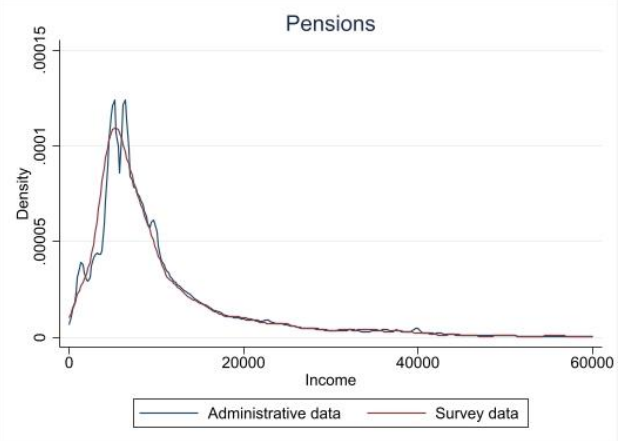


Figure 4 - Pensions Income Distribution



The results show a low adjustment of the survey data for labour income, with an under-representation of the population with this income category (around 10%), leading to a fairly significant increase in the mean and median in the survey data.

3.3. Data Sources of the Model

PORSIM relies on anonymised administrative data provided by the Tax Authority ("Autoridade Tributária", AT)[4].

The model makes use of six sources:

- Personal Income Tax Declaration ("Declaração Modelo 3: Declaração de IRS"): annual declaration submitted with households' income;
- Monthly Statement of Labour Income ("Declaração Mensal de Remunerações", DMR): monthly declaration submitted by companies referring the paid labour income, taxes withheld and social security contributions;
- Declaration on other income of residents ("Declaração Modelo 10: rendimentos e retenções – residentes"): annual declaration submitted mainly by companies indicating the paid self-employment income, property income and taxes withheld;
- Declaration on capital income ("Declaração Modelo 39: rendimentos e retenções a taxas liberatórias"): annual declaration submitted by companies referring paid capital income and taxes withheld;
- E-Fatura: data on households' expenses grouped by category;
- Individual registration data: data relating to age and gender.

The data retrieved from the PIT declaration covers all individuals who have submitted the declaration. However, according to Article 58.º of the PIT Code5, it is not mandatory to submit the declaration for households who:

- have received only capital income to be liable to flat taxation and chose not to be taxed at progressive rates;
- have received pension or labour income below the threshold €8,500 and not subject to withholdings.

This declaration comprises eleven annexes, excluding the cover page, but the model relies on the data from eight annexes:

- Annex A: labour income and pensions;
- Annex B: self-employment income (simplified regime);
- Annex C: self-employment income (organized accounting regime);
- Annex D: regime of fiscal transparency6;
- Annex E: capital income;
- Annex F: property income;
- Annex H: tax benefits, deductions and exempted income;
- Annex J: income received from abroad.

The remaining annexes are not considered in the model either because they represent extraordinary income (Annex G and G1: net worth gains) or because its treatment is still under development (Annex L: income from non-residents).

In appendix, figure A.1, it is possible to check the correspondence between annexes and income categories.

In fact, this data source presents five main shortcomings:

[4] The administrative data are obtained under a collaborative protocol established between GPEARI and AT in 2022 with a view of transmitting annually anonymised administrative data related to personal income tax. In the last quarter of each year, it is made available the data of the previous year.

[5] Decreto-Lei No. 442/88, of 30/11.

[6] Fiscal transparency refers to a regime under which it is mandatory the imputation of companies' profits to the shareholders according to their share, regardless of the distribution of those profits.

i. Individuals who only receive capital income may not declare it due to being subject to flat taxes;

ii. Individuals who only receive labour income and/or pensions below a specified threshold (€8,500) are not mandatory to submit the PIT declaration;

iii. Individuals who do not fill the PIT declaration despite being mandatory to submit them;

iv. Individuals who don't receive any income or only receive social benefits are not able to submit the PIT declaration;

v. Individuals are not required to declare their expenses to calculate the tax credits (Annex H).

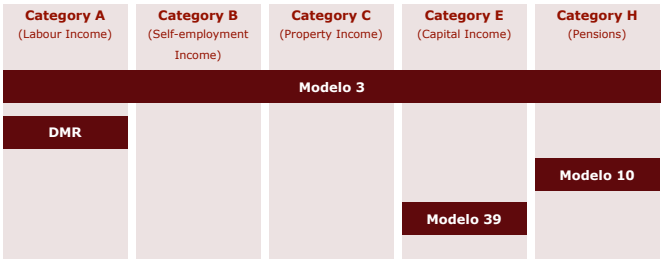
As a result, in the PIT declaration it is not included neither all income and all deductible expenses nor all households. Nevertheless, in the PORSIM it was possible to overcome four shortcomings:

- To tackle (i), it is included data retrieved from "Modelo 39";
- To tackle (ii) and (iii), it is incorporated data retrieved from DMR and "Modelo 10" for labour income and pensions, respectively;
- To tackle (v), it is retrieved data from "E-Fatura" to assess the individual expenses to obtain the tax credits.

When households fill the PIT declaration with the income mentioned above, it is assumed that the income in this declaration prevail, only adding capital income not declared.

When households do not fill the PIT declaration, it is added the household and corresponding income. So, PORSIM allows to have data on all types of income and on all households with income and pensions.

Figure 5 - Data Sources



3.4. Data Treatment

The first stage of the model consists in the treatment of the beforementioned anonymised data input. This treatment consists in creating datasets more easily available and informative from the data received with respect to the annexes of PIT declaration as well as to merge with the data coming from the remaining sources. This stage is only required when the data corresponding to a year is received or updated.

This module requires setting up some parameters and once these are configured, the treatment of the input data follows these steps:

1. The treatment begins with the merge of the annexes of the PIT declaration and individual data;
2. It is introduced the income not declared from other declarations ("DRM", "Modelo 10" and "Modelo 39");
3. It is included the expenses from "E-Fatura" when they are not declared in Annex H of the PIT declaration.

For an ex-post assessment, it is used the treated data of the corresponding year while for an ex-ante analysis it is additionally required to uprate the data.

The uprating module allows the data input to be updated for a future policy year to assess the ex-ante impact of new policies in following years.

The uprating for year N is performed according to the following rules:

- Category A:
  - Income[7] below minimum wage of N-1 increases at the growth rate of the minimum wage;
  - Income above the minimum wage of N-1 and below the minimum wage of N increases at the growth rate of the national wage bill, with the minimum value equal to the minimum wage of N;
  - Remaining income increases at a rate such that the overall growth rate of labour income equals the national wage bill growth.
- Category B grows at the inflation rate;
- Category F grows according to the rent update coefficient produced by Statistics Portugal;
- Category H grows at the rate of pensions according to the rules defined by legislation[8];
- Category E is not uprated;
- Social Support Index (IAS) grows at the rate according to the rules defined by legislation[9].

Therefore, the uprating for a future year N requires setting the necessary parameters, namely of the expected minimum wage, the expected inflation rate, wage bill growth rate and average income growth rate.

Nevertheless, these rules are not definitive as it is possible change them prior to running the uprating module.

4. PORSIM

In this section, it is firstly briefly presented an overview of the model, followed by a description of its functioning, detailing the main purpose, modules and outputs.

4.1. Overview

PORSIM is a static and non-behavioural microsimulation model because it is not considered potential behavioural reactions of individuals, and the socio-demographic characteristics of the population are assumed to be fixed over time.

PORSIM was developed in the Office for Economic Policy and International Relations (GPEARI), using STATA. The model is based on the Portuguese fiscal system, running on administrative data.

PORSIM is employed to assess the impact of public policies concerning the personal income tax (PIT), both ex-ante and ex-post, providing the impact on the disposable income, fiscal revenue and inequality and progressivity indicators.

The impact of the policies can be measured in several dimensions: by household type, by income category, by age and by administrative region.

4.2. Tax Simulator Module

The tax simulator represents the core module of PORSIM, which operates after the data treatment to obtain the baseline scenario or to obtain shock scenarios.

In the case of simulating a baseline, the tax simulator runs entirely, following the rules of the PIT:

1. For each income category, it is computed the gross income, as well as the specific tax

[7] It is not considered the totality of this income category, as some kinds of income are excluded from uprating, such as in-kind income.
[8] Lei No. 52/2007, of 31/08
[9] Lei No. 53-B/2006, of 29/12

allowances and deductions such as disability deduction or youth PIT;

2. It is compiled all income categories to get the total gross income (income subject to progressive and flat taxation and exempt income);
3. To the income subject to progressive taxation, it is subtracted the tax allowance relative to the net income guarantee to obtain the total taxable income for each household;
4. It is applied the tax schedule referring to the households' residence (mainland Portugal, Madeira or Azores) to the taxable income calculated previously to obtain the gross tax liability;
5. It is calculated the final tax liability by deducting the tax credits to the gross tax liability.

In the case of simulating a shock, the tax simulator considers the baseline calculations, only running the necessary do-files to perform the changes required by the shock.

Due to the several possibilities in the fiscal system, the model is equipped with a tool named "rational option", which is used in ex-ante analysis. This tool is only possible because married couples or couples under civil partnership who fill their declaration under individual taxation are required to indicate their spouse or civil partner in their tax return, allowing to join all the household members.

This tool performs a combination of the following taxation options[10]:

- Declaration under the joint taxation or under individual taxation for married couples and couples under civil partnership;

Taxation of property income at progressive rates or at flat rate.

The tool then computes the lowest tax liability, which is assumed to be the one chosen by households if they were faced with the proposed scenario. This "rational option" may not accurately represent the option chosen by households, because net worth increases are not considered in the calculations or because households may have other reasons to choose differently.

4.3. Comparison Module

The last module allows the comparison either between two scenarios or between multiple scenarios. The output differs when more than one scenario is being compared to the comparison basis.

PORSIM identifies whether it is the case of a single comparison (only one scenario is selected for comparison) or of a multiple comparison (more than one scenario is selected), running the corresponding do-files.

This module produces an Excel file, comprising three pages:

- Fiscal and inequality: fiscal impact, affected households (winners and losers), inequality and progressivity indicators;
- Redistribution: net average income and number of impacted households by household's type, by age interval and by gender, gross income, net average income, number of impacted households, effective

[10] At maximum, this tool compares four different scenarios.

tax rate, average impact by income by decile and income bracket;

- Poverty: overall poverty rate and poverty rate by gender, by age interval and by household's type.

In the individual outputs, households that haven't filled their declaration aren't taken into account because there is not enough information on some individual data, namely age and gender.

These outputs were developed based on the outputs produced by EUROMOD.

5. Changes in the PIT in 2022: an ex-post assessment

Following the description of the functioning of the model, it is relevant to provide an example to have a better understanding of how the model operates. Therefore, in this section it is presented an ex-post assessment of the policy measures in the PIT in 2022.

This ex-post assessment for the year 2022 is very relevant since PORSIM, was used for the first time to assess the ex-ante impact of these policy measures.

5.1. Population

Considering the latest data available, corresponding to the year of 2022, the model includes data on a total of 10,6 million taxpayers. Around 7,3% of the taxpayers did not submit a PIT declaration.

Figure 6 - Distribution of taxpayers

	Number
Taxpayers (total)	10 634 672
Taxpayers who submitted the PIT declaration	9 855 240
Taxable person	*7 866 759*
Dependents	*1 988 481*
Taxpayers who did not submit the PIT declaration	779 432
Labour income	*243 388*
Pension	*463 028*
Employment income and pension	*4 138*
Capital income (exclusively)	*68 878*

Considering the households who submitted their PIT declaration, the model has a total of 5,6 million households.

It is possible to observe that both married households and households in civil partnership mainly opt to submit their PIT declarations jointly (95% and 94% of households, respectively)

Figure 7 - Distribution of households

	Number
Families (total)	5 648 640
Married	2 009 923
Joint taxation	*1 906 316*
Individual taxation	*103 607*
Civil partnership	246 662
Joint taxation	*230 306*
Individual taxation	*16 356*
Other	3 392 055

5.2. Changes introduced in 2022

In 2022, it was introduced four main policy changes in PIT:

- It was added 2 new tax brackets (the third and fifth brackets were broken down in two brackets) and the tax bracket limits and rates were changed;

- It was changed the tax credit referring to dependents: 300 e 150 euros to the second and following children younger than three years old; and 150 e 75 euros to the second and following children between three and six years old;
- It was changed the young PIT regime: (i) self-labour income became eligible, (ii) the age limit was extended to 30 years old in case of PhD, (iii) the duration was extended from 3 to 5 years and (iv) the exemption percentage were changed (from 30%, 20% and 10% to 30%, 30%, 20%, 20% and 10%);
- It was entirely changed the rules of the net income guarantee (NIG): previously calculated after tax liability, it is now calculated as a tax allowance.

In Appendix, figure A.2, the legislative changes are more detailed.

5.3. Fiscal impact

The policy measures introduced in 2022 were subject to an ex-ante assessment, using PORSIM for the first time.

The ex-ante impact of the measures was calculated at two different times:

- The impact of the measures, excluding the NIG, was calculated for the 2022 State Budget Plan. For this purpose, using administrative data from 2019 and PORSIM, the impact of the measures was estimated at 185M€.
- Using administrative data from 2021 and PORSIM, Paulo Renato Costa (2024) estimated the impact of the reform of the NIG at 99M€.

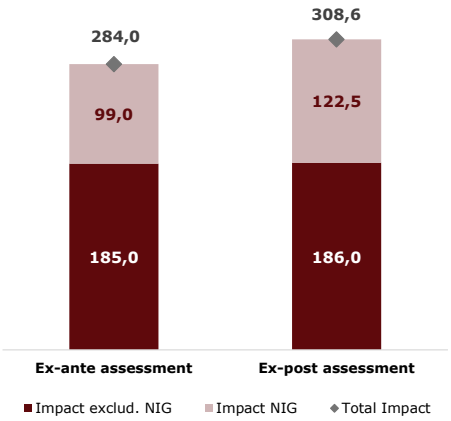
As the assessment of the impact of the NIG has already been calculated using the rules of the PIT reform approved by 2022 State Budget, the total value of the impact of the reforms is cumulative and was estimated by PORSIM at 284M€.

Using 2022 administrative data, it was assessed the ex-post impact of the PIT reforms, obtaining a total impact of 309M€, a difference of 25M€.

To better compare the ex-post results with the ex-ante estimates, we carried out separate assessments of the reform, obtaining the following results:

- The impact of the measures, excluding the NIG, the 2022 States Budget measures (SB22), was 186M€, a difference of 1M€ when compared to the ex-ante impact.
- The impact of the NIG reform was 123M€, a difference of 24M€ when compared to the ex-ante impact.

Figure 8 - Fiscal Impact



It should be pointed that the difference in the impact ex-ante and ex-post of the NIG is essentially due to two factors:

- The ex-ante analysis used the 2021 data which was still affected by the Covid-19 pandemic, meaning that many individuals, due to lay-off, declared incomes lower than the value of NIG, so they had no impact with the change in the rule, which would not have been in the case if there had been no lay-off.

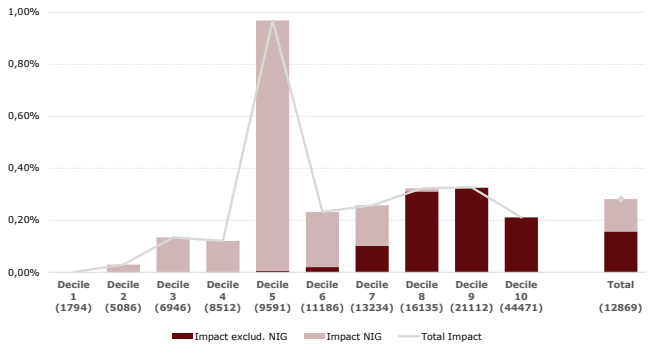
- The rule of NIG is very sensitive to the way in which married households or households in civil partnership fill their tax declarations, jointly or separately. In the case of previous rule, many households with the possibility of filling jointly, had a lower tax if they filed separately, so they made that choice, while with the new rule, in general, the best option is to file jointly. When the ex-ante analysis was carried out, the "rational option" had not yet been developed, so the declared form of submission was considered rather than the most advantageous one, meaning that the impact on these households was lower, or even zero, when compared to the real impact.

If the ex-ante analysis had been carried out using data that was not affected by the lay-off and the "rational option" had been used, the difference between ex-ante and ex-post would have been negligible.

5.4. Distributive impact

In terms of the distributive impact, the policy changes were reflected in an increase of 0,28% of the mean equivalised disposable income11. The highest impact was seen in decile 5, with an average increasing of 0,97% in the disposable income, due to the reform of the NIG. Analysing the decomposition of the total impact by deciles, the reform in the NIG impacts mainly the lower deciles, while the SB22 measures affect largely the upper deciles.

Figure 9 - Mean disposable income by equivalent adult[12]



When it comes to the main progressivity and inequality indicators, it is possible to not only compare the total change between 2021 and 2022, but also to assess the change resulting from the measures excluding NIG (comparison between 2021 rules and 2022 State Budget rules) and from the NIG reform (comparison between 2022 State Budget rules and 2022 rules).

Overall, the policy changes improved the progressivity by 0,07 p.p., totally driven by the NIG reform (the NIG reform increased the progressivity by 0,8 p.p. while the SB22 measures decreased it by 0,1 p.p.) while redistribution remained unchanged.

The Gini index also remained unchanged, due to the opposing effect of the measures in the SB22 and of the NIG reform (the SB22 increased the Gini index by 0,05 and decreased de redistribution index by the same value while NIG reform decreased the Gini index by 0,04 and increased the redistribution index by the same value).

The ratios also showed an increased in the S90/S10 and S80/S20 by 0,05 and 0,02, respectively, due to SB22 measures.

On the other hand, the poverty rate increased slightly by 0,02 p.p. due to the increase in the poverty threshold.

[11] Disposable income of a household, divided by the number of household members converted into equalized adults, using the modified OECD equivalence scale.

[12] in brackets the average disposable income, by decile, before the reforms

The effective tax rate decreased by 0,22 p.p., due to the combined effect of the SB22 measures (0,13 p.p.) and the NIG reform (0,9 p.p.).

Figure 10 - Inequality Indicators

Indicators	2021 Rules	SB22 Rules	2022 Rules
Progressivity	11,43	11,42	11,51
Redistribution	8,83	8,88	8,84
Gini	41,76	41,81	41,76
S90/S10	24,11	24,16	24,16
S80/S20	9,59	9,62	9,61
P90/P10	6,69	6,71	6,71
P50/P10	2,75	2,75	2,76
Poverty Rate	21,26	21,38	21,28
Effective Tax Rate	12,08	11,95	11,85

In Appendix, it is possible to analyse the outputs produced by PORSIM in the ex-post assessment.

6. Concluding Remarks

In this article it is presented a new Portuguese microsimulation model using administrative data, named PORSIM. The model is based on the Portuguese fiscal system, running on six data inputs provided by AT under a collaborative protocol established between GPEARI and AT. As a result, in 2022, PORSIM included data on a total of 10,6 million taxpayers.

PORSIM can be employed to assess the ex-ante and/or ex-post impact of public policies concerning the personal income tax, providing the impact on the disposable income, fiscal revenue and inequality and progressivity indicators.

PORSIM was used for the first time to simulate the ex-ante impact of the tax reform in 2022. For this reform, which was carried out in two phases, the ex-ante simulation estimated a total impact on revenue of 284M€ (185M€ from the impact of the reforms contained in 2022 State Budget and 99M€ from the reform of the NIG).

Using 2022 administrative data, the ex-post impact of the reform was estimates at 309M€, more 25M€ than the ex-ante estimate.

While the impact of the measures contained in 2022 State Budget was in line with the ex-ante estimate, the same was not true of the NIG reform, with the real impact being 24M€ higher than estimated. This difference was due to the fact that the NIG is very sensitive to the way in which married households or households in civil partnership submit their PIT declarations (joint or separate filing) and at the time of the ex-ante simulation the "rational option" was not yet available, which determines which option results in the lowest tax collection.

Additionally, the 2022 reform allowed for an increase of 0,28% in the mean disposable income by equivalent adult the poverty rate increased 0,02 p.p., the Gini index remained unchanged but the S90/S10 and S80/S20 ratios increased by 0,05 and 0,02, respectively.

Although PORSIM, in its current version, only calculates the impacts of PIT, it is being improved to calculate reforms in social benefits by incorporating them into the model, either by incorporating administrative data on social benefits or by simulating them.

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Appendix:

Figure A.1 – Correspondence between annexes and income categories

Category A	Category B	Category E	Category F	Category H
Annex A	Annex B	Annex E	Annex F	Annex A
Annex H	Annex C	Annex J	Annex J	Annex J
Annex J	Annex D			
	Annex H			
	Annex J			

Figure A.2 – Legislative changes in 2022

<table>
<tr><th>2021</th><th>2022</th></tr>
<tr><td colspan="2">Tax Brackets and Rates | Article 68.º</td></tr>
<tr><td>
<table>
<tr><th>Taxable Income</th><th>Rate (%)</th></tr>
<tr><td>Up until €7,112</td><td>14,5</td></tr>
<tr><td>Between €7,112 and €10,732</td><td>23</td></tr>
<tr><td>Between €10,732 and €20,322</td><td>28,5</td></tr>
<tr><td>Between €20,322 and €25,075</td><td>35</td></tr>
<tr><td>Between €25,075 and €36,967</td><td>37</td></tr>
<tr><td>Between €36,967 and €80,882</td><td>45</td></tr>
<tr><td>More than €80,882</td><td>48</td></tr>
</table>
</td><td>
<table>
<tr><th>Taxable Income</th><th>Rate (%)</th></tr>
<tr><td>Up until €7,116</td><td>14,5</td></tr>
<tr><td>Between €7,116 and €10,736</td><td>23</td></tr>
<tr><td>Between €10,736 and €15,216</td><td>26,5</td></tr>
<tr><td>Between €15,216 and €19,696</td><td>28,5</td></tr>
<tr><td>Between €19,696 and €25,076</td><td>35</td></tr>
<tr><td>Between €25,076 and €36,757</td><td>37</td></tr>
<tr><td>Between €36,757 and €48,033</td><td>37</td></tr>
<tr><td>Between €48,033 and €75,009</td><td>45</td></tr>
<tr><td>More than €75,009</td><td>48</td></tr>
</table>
</td></tr>
<tr><td colspan="2">Tax Credits' Limit | Article 78.º</td></tr>
<tr><td>7 - (...)
a) (...)

b) For taxpayers whose taxable income is higher than the value of the 1st bracket and equal to or lower than the value of the last bracket in Article 68, the limit resulting from the application of the following formula:

€1,000 + [(€2,500 - €1,000) × (Value of the last bracket - Taxable Income) / (Value of the last bracket - Value of the first bracket)</td><td>7 - (...)
a) (...)

b) For taxpayers whose taxable income is higher than the value of the first bracket of Article 68 and equal to or lower than the minimum value of the first bracket of Article 68 A, the limit resulting from the application of the following formula:

€1,000 + [(€2,500 - €1,000) × (Min. value 1st bracket art. 68 A - Taxable Income)/ (Min. value 1st bracket art. 68 A - Value of first bracket)</td></tr>
<tr><td colspan="2">Tax Credits Dependent | Article 78.º A</td></tr>
<tr><td>3 - In the case provided for in a) of the previous paragraph, the amounts are €300 and €150, respectively, for the second and subsequent dependents, regardless of the age of the first dependent.</td><td>3 - When there is more than one dependent, the following amounts shall be added to the deduction provided for in a) and b) of no. 1:

€300 and €150, respectively, for the second and subsequent dependents who do not exceed three years of age by December 31st of the year to which the tax relates, regardless of the age of the first dependent;

€150 and €75, respectively, for the second and subsequent dependents who are over three years old but not over six years old by December 31 of the year to which the tax relates, regardless of the age of the first dependent.</td></tr>
</table>

2021	2022
Youth PIT | Article 12.º A	
1 - Category A income earned by taxpayers between the ages of 18 and 26 who are not considered dependents shall be partially exempt from personal income tax for the first three years of earning income from work after the year of completion of a course of study equal to or higher than level 4 of the National Qualifications Framework, by means of an option in the tax return referred to in Article 57.	1 - Category A and B income earned by taxable persons between the ages of 18 and 26 who are not considered dependents shall be partially exempt from personal income tax for the first five years of earning income from work after the year of completion of a course of study equal to or higher than level 4 of the National Qualifications Framework, by means of an option in the tax return referred to in Article 57.
2 - The provisions of the previous paragraph determine the aggregation of exempt income, for the purposes of no. 4 of Article 22.	2 - The age for opting for the scheme provided for in the previous paragraph is extended up to and including the age of 30 if the cycle of studies completed corresponds to level 8 of the National Qualifications Framework.
3 - The exemption referred to in paragraph 1 shall apply to taxable persons whose taxable income, including exempt income, is equal to or less than the upper limit of the fourth bracket of no.1 of Article 68.º, being 30% in the first year, 20% in the second year and 10% in the third year, with limits of 7.5 times the SSI, 5 times the SSI and 2.5 times the SSI, respectively.	3 - The exemption provided for in paragraph 1 applies: a) In the first year of earning an income after completing the study cycle and for the following four years, provided that the option is exercised up to the maximum age referred to in the previous paragraphs; b) In consecutive or interpolated years, provided that the taxable person's maximum age does not exceed 35 years.
4 - The exemption provided for in the previous paragraphs can only be used once by the same taxable person.	4 - The provisions of paragraph 1 determine the aggregation of exempt income, for the purposes of the provisions of paragraph 4 of article 22.
5 - The tax identification of taxable persons who complete one of the levels of study referred to in no. 1 each year shall be communicated to the Tax and Customs Authority under terms to be defined by joint decree of the members of the Government responsible for the areas of finance, higher education and education.	5 - The exemption referred to in paragraph 1 is 30% for the first two years, 20% for the following two years and 10% for the last year, with limits of 7.5 times the SSI, 5 times the SSI and 2.5 times the SSI, respectively.
	6 - The exemption provided for in the previous paragraphs can only be used once by the same taxable person.
	7 - The tax identification of taxable persons who complete one of the levels of study referred to in paragraph 1 each year shall be communicated to the Tax and Customs Authority under terms to be defined by order of the members of the Government responsible for the areas of finance, science, technology and higher education and education.
	8 - The Tax and Customs Authority shall make available, in the automatic income declaration referred to in Article 58 A or by pre-filling the income declaration referred to in Article 57, to taxable persons who, according to the information received under the previous paragraph, meet the requirements for this purpose, information that they may benefit from the exemption provided for in this article.

2021	2022
Net Minimum Guarantee| Article 70	
1 - The application of the rates set out in Article 68.º shall not result in a net taxable income of less than 1.5 x 14 x (SSI) for holders of income predominantly derived from dependent work, from activities set out in the table approved in the annex to Ministerial Order no. 1011/2001, of August 21, with the exception of code 15, or from pensions.	1 - When calculating taxable income, for holders of gross income predominantly derived from dependent work, from activities set out in the table in annex e to Ministerial Order no. 1011/2001, of August 21, with the exception of code 15, or from pensions, an amount per minimum period of existence is deducted, per holder, as follows:
2 - The rates established in Article 68 shall not apply: a) The taxable income of a household with three or four dependents whose amount is equal to or less than € 11,320; b) The taxable income of a household with five or more dependents whose amount is equal to or less than €15,560.	a) For holders whose total gross income is equal to or less than €9870, the amount of the rebate is equal to the positive difference between €9870 and the sum of the specific deductions with (General expenses / 1* bracket rate);
3 - In the case of married and unmarried couples, if they do not opt for joint taxation, the amounts referred to in the previous paragraph are halved per taxpayer.	b) For individuals whose total gross income is greater than €9870, the amount of the rebate is equal to the positive difference between 9870 - 3 x (Gross income - €9870) and the sum of the specific deductions with (General expenses / Rate of 1st bracket);
4 - The net taxable income referred to in no. 1 may not be less than the annual value of the minimum monthly wage per taxpayer.	c) The amount of the minimum existence allowance is zero and may not exceed the difference between gross income and the specific deductions.
	2 - The rebate referred to in the previous paragraph does not apply to any of the holders when the sum of the gross incomes of all the holders exceeds €11,620 multiplied by the number of taxable persons.
	3 - For the purposes of this article, the following shall be considered: a) "Gross income" means the sum of all income for the year, even if exempt or excluded from taxation, from all categories, declared in the declaration referred to in Article 57 of the PIT Code, considering, in the case of capital gains, the balance calculated between capital gains and capital losses, when positive, and in the case of property income, the respective positive result; b) "Specific deductions" means the total amount of specific deductions from which the income holder benefits, as provided for in Articles 25, 27, 53 and 54 of the PIT Code, and those resulting from paragraph 1 b) and paragraphs 2 and 10 of Article 31 of the PIT Code; c) "General expenses" means the amount of the deduction from taxable income for general expenses to which the taxpayer is entitled, as defined in no. 1 of Article 78 B of the PIT Code, with a value of zero in the case of dependent taxpayers; d) "1 bracket rate" means the normal rate of the 1st PIT bracket, in percentage, as defined in no.1 of Article 68 of the PIT Code.
	4 - The regime provided for in this article applies to income obtained in 2022, unless its application results in an amount of tax higher than that which would result from the application of the provisions of Article 70 of the PIT Code, in the wording prior to the entry into force of this law, in which case the latter shall apply.

Figure A.3 – PORSIM output: Fiscal impact

2022 Reform

1. Fiscal Impact and Inequality Indicators

1.A. PIT Revenue and Households

	2021	2022	Difference
Total PIT revenue (M€)	16 438	16 129	-309
Average tax liability (€)	4 579	4 651	72
Households paying PIT	3 589 694	3 468 059	-121 635
ɬouseholds w/ lower tax liability		626 986	
ouseholds w/ higher tax liability			

1.B. Inequality, Redistribution e Progressivity

	2021	2022	Difference
Gini	41,73	41,73	0,00
Relative redistribution (%)	17,53	17,52	-0,01
Absolute redistribution	8,87	8,87	0,00
Vertical	11,09	11,09	0,00
Progressivity	11,53	11,60	0,07
Tax dimension	0,96	0,96	-0,01
Horizontal	-2,22	-2,22	-0,01

1.C. Shares

	2021	2022	Difference
Bottom 40%	15,99	15,98	-0,01
Bottom 50%	23,00	22,99	-0,01
Middle 40%	44,83	44,85	0,02
Top 10%	32,17	32,15	-0,02
Top 1%	9,35	9,33	-0,02

1.D. Ratios

	2021	2022	Difference
S90/S10	24,11	24,16	0,05
S80/S20	9,60	9,62	0,02
P90/P10	6,69	6,71	0,02
P90/P50	2,42	2,42	0,00
P50/P10	2,76	2,77	0,01

Figure A.5 – PORSIM output: Distributive impact

2022 Reform

2. Distributional Impact (by equivalised household)

2.A. Mean disposable income by household type

	Mean income			Households (number)	
	2021	2022	Difference	ousehold (total)	Positive impact Negative impact
1 adult <65, w/o dependents	11 686	11 729	42	2 118 509	1 103 928
Female	11 382	11 424	43	916 123	471 533
Male	11 919	11 961	42	1 202 386	632 395
1 adult >=65, w/o dependents	14 892	14 927	34	844 173	417 384
Female	13 900	13 933	33	613 352	288 050
Male	17 528	17 567	39	230 821	129 334
1 adult w/ dependents	10 020	10 038	19	432 246	185 016
Female	9 102	9 118	16	339 976	128 110
Male	13 401	13 430	29	92 270	56 906
2 adults <65, w/o dependents	16 759	16 820	61	556 585	348 766
2 adults >=65, w/o dependents	18 025	18 073	48	774 371	414 068
2 adults, w/ 1 dependents	15 248	15 279	31	494 581	279 090
2 adults, w/ 2 dependents	15 385	15 428	43	363 518	175 326
dults, w/ 3 or more dependents	14 852	14 893	40	64 642	24 234

Note: Dependent represents dependents below 26 years old.

2.D. Mean disposable income by age group (individual)

	Mean income			Individuals (number)		
	2021	2022	Difference	Individuals (total)	Positive impact	Negative impact
0 - 14	13 506	13 541	35	1 243 732	543 031	
15 - 25	11 941	11 971	30	1 140 977	518 230	
26 - 49	13 352	13 394	41	3 192 125	1 710 433	
50 - 64	15 749	15 795	46	2 053 302	1 167 692	
65 - 79	17 775	17 821	46	1 610 266	875 399	
80+	14 526	14 561	35	650 299	295 657	

2.E. Mean disposable income by gender (individual)

	Mean income			Individuals (number)		
	2021	2022	Difference	Individuals (total)	Positive impact	Negative impact
Female	14 244	14 284	39	5 098 703	2 578 655	
Male	14 780	14 821	42	4 791 998	2 531 787	

2.B. Income by decile

	Gross income		Mean equivalised disposable income			% of total disposable income		Effective tax rate			% of total PIT revenue		Households (number)	
	Minimum	Mean	2021	2022	Difference	2021	2022	2021	2022	Difference	2021	2022	Positive impact	Negative impact
Decile 1	0,00	1936,44	1793,84	1793,85	0,01	1,72	1,72	0,30	0,30	0,00	0,03	0,03	151	
Decile 2	4094,91	5378,23	5086,23	5087,73	1,50	4,43	4,42	0,22	0,19	-0,02	0,06	0,06	4 239	
Decile 3	6464,79	7394,62	6945,54	6954,84	9,29	5,60	5,59	0,43	0,31	-0,12	0,16	0,12	36 699	
Decile 4	8320,41	9191,94	8511,87	8522,14	10,27	7,15	7,14	0,52	0,42	-0,10	0,25	0,21	53 371	
Decile 5	9921,31	10754,06	9590,64	9683,52	92,88	7,64	7,69	2,74	2,02	-0,71	1,51	1,13	398 372	
Decile 6	11703,72	12779,61	11185,57	11211,52	25,95	8,37	8,37	4,05	3,81	-0,23	2,58	2,48	433 118	
Decile 7	13970,28	15441,44	13233,74	13267,79	34,05	9,37	9,37	6,00	5,76	-0,24	4,52	4,42	476 426	
Decile 8	17176,71	19523,81	16134,79	16186,85	52,06	11,01	11,02	8,98	8,72	-0,27	8,43	8,34	502 782	
Decile 9	22371,43	26890,03	21112,18	21181,08	68,90	14,20	14,21	13,11	12,85	-0,26	16,85	16,83	517 629	
Decile 10	32975,45	61766,65	44471,13	44565,05	93,93	30,50	30,48	22,03	21,88	-0,15	65,60	66,39	539 921	
Total	0,00	15838,45	12869,40	12905,59	36,20	100,00	100,00	11,91	11,69	-0,22	100,00	100,00	2 962 708	

2.C. Income by income bracket (household)

	Mean income		% of total disposable income			Effective tax rate			% of total PIT revenue		Households (number)			
	2021	2022	2022	2021	2022	2021	2022	Difference	2021	2022	2021	2022	Positive impact	Negative impact
<10.640	5 947	5 949	3 319 586	23,97	23,80	1,20	0,94	-0,26	1,94	1,53	3 334 311	3 319 586		
10.640 - 20.000	13 635	13 637	2 185 660	35,88	35,93	7,52	7,21	-0,32	22,21	21,66	2 176 684	2 185 660	414 976	
20.000 - 30.000	24 123	24 121	544 356	15,77	15,83	15,46	15,20	-0,26	22,62	22,74	540 895	544 356	1 697 756	
30.000 - 50.000	37 087	37 100	277 347	12,36	12,40	20,35	20,12	-0,23	24,41	24,68	275 771	277 347	501 045	
50.000 - 100.000	65 190	65 156	82 157	6,42	6,45	22,43	22,33	-0,10	13,96	14,26	81 485	82 157	257 486	
100.000 - 150.000	119 501	119 483	11 109	1,60	1,60	23,00	22,94	-0,06	3,46	3,52	11 078	11 109	75 348	
>= 150.000	420 988	420 755	7 857	3,99	3,98	29,15	29,14	-0,01	11,39	11,61	7 848	7 857	9 809	
Total	12 869	12 906	6 428 072	100,00	100,00	11,91	11,69	-0,22	100,00	100,00	6 428 072	6 428 072	6 288	

Figure A.5 – PORSIM output: Poverty impact

2022 Reform

3. Impact on Poverty

3.A. At Risk of Poverty Rate (individual)

	2021	2022	Difference
Poverty rate	21,37	21,39	0,02
Poverty line	6242,25	6257,81	15,56

3.B. At Risk of Poverty Rate (household)

	2021	2022	Difference
Poverty rate	21,48	21,51	0,03
Poverty line	5779,07	5792,05	12,98

3.C. At Risk of Poverty Rate (by gender)

	2021	2022	Difference
Female	17,55	17,57	0,01
Male	16,97	16,97	0,01

3.D. At Risk of Poverty Rate (by age group)

	2021	2022	Difference
0 - 14	22,68	22,76	0,09
15 - 25	24,38	24,43	0,05
26 - 49	19,03	19,03	0,00
50 - 64	17,25	17,18	-0,08
65 - 79	8,27	8,30	0,04
80+	8,15	8,19	0,05

3.E. At Risk of Poverty Rate (by household type)

	2021	2022	Difference
1 adult <65, w/o dependents	21,24	21,20	-0,04
Female	21,25	21,18	-0,06
Male	21,23	21,21	-0,02
1 adult >=65, w/o dependents	7,96	8,00	0,04
Female	7,90	7,94	0,04
Male	8,13	8,16	0,03
1 adult w/ dependents	29,17	29,35	0,18
Female	32,59	32,78	0,19
Male	16,58	16,75	0,17
2 adults <65, w/o dependents	11,77	11,76	-0,01
2 adults >=65, w/o dependents	5,63	5,65	0,02
2 adults, w/ 1 dependents	10,87	10,92	0,05
2 adults, w/ 2 dependents	12,08	12,13	0,05
2 adults, w/ 3 or more depender	23,75	23,86	0,11