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Working Paper

The tax structure of an economy in crisis: Greece 2009-2017

EUROMOD Working Paper, No. EM21/19

Provided in Cooperation with:
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Suggested Citation: Leventi, Chrysa; Picos, Fidel (2019) : The tax structure of an economy in crisis: Greece 2009-2017, EUROMOD Working Paper, No. EM21/19, University of Essex, Institute for Social and Economic Research (ISER), Colchester

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EUROMOD WORKING PAPER SERIES

EM 21/19

The tax structure of an economy in crisis: Greece 2009-2017

Chrysa Leventi and Fidel Picos

December 2019

The tax structure of an economy in crisis: Greece 2009-2017*

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Abstract

The 2010 Economic Adjustment Programme initiated a period of strict international supervision with respect to tax policy in Greece. The country implemented a large-scale fiscal consolidation package, aiming to reduce its public deficit below 3% of GDP by 2016. Since the beginning of the crisis, the provisions of the 'Greek Programme' have been revised several times, and personal income tax reform has figured prominently on almost each of the revision agendas. This paper aims to provide an assessment of the effects of the four major structural reforms that took place in Greece during and in the aftermath of the economic crisis; using microsimulation techniques, we simulate the (ceteris paribus) first-order impact of these reforms on the distribution of incomes, the state budget and work incentives, while also trying to identify the main gainers and losers of these policy changes. Our results suggest that all reforms had a revenue-increasing rationale, with the one of 2011 being designed to have the largest fiscal gains. The latter also strengthened redistribution and achieved the highest decrease in income inequality. The 2013 reform went to the opposite direction by reducing both the redistributive strength and the progressive nature of the Greek tax system. The striking discrepancies in the ways in which different household categories have been affected by the four reforms call for a deeper investigation of the possibility of moving towards more uniform personal income tax rules.

JEL: H24, H23, I32

Keywords: personal income tax, reform, Greece, redistribution, work incentives

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* The results presented here are based on EUROMOD version I1.0+. EUROMOD is maintained, developed and managed by the Institute for Social and Economic Research (ISER) at the University of Essex, in collaboration with national teams from the EU member states. We are indebted to the many people who have contributed to the development of EUROMOD. We are also grateful to the participants of the 7th IMA World Congress, the 2019 EUROMOD Research Workshop and research seminars at the EC's Joint Research Centre and the Greek Council of Economic Advisors. The process of extending and updating EUROMOD is financially supported by the European Union Programme for Employment and Social Innovation 'Easi' (2014-2020). We make use of microdata from the EU Statistics on Incomes and Living Conditions (EU-SILC) made available by Eurostat (259/2018-EU-SILCLFS) together with national variables provided by the Greek national statistical office. The views expressed are purely those of the authors and may not in any circumstances be regarded as stating an official position of the European Commission or the Council of Economic Advisors.

The Tax Structure of an Economy in Crisis: Greece 2009-2017[1]

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The 2010 Economic Adjustment Programme initiated a period of strict international supervision with respect to tax policy in Greece. The country implemented a large-scale fiscal consolidation package, aiming to reduce its public deficit below 3% of GDP by 2016. Since the beginning of the crisis, the provisions of the 'Greek Programme' have been revised several times, and personal income tax reform has figured prominently on almost each of the revision agendas. This paper aims to provide an assessment of the effects of the four major structural reforms that took place in Greece during and in the aftermath of the economic crisis; using microsimulation techniques, we simulate the (ceteris paribus) first-order impact of these reforms on the distribution of incomes, the state budget and work incentives, while also trying to identify the main gainers and losers of these policy changes. Our results suggest that all reforms aimed at increasing state revenues, with the one of 2011 being designed to have the largest fiscal gains. The latter also strengthened redistribution and achieved the highest decrease in income inequality. The 2013 reform went to the opposite direction by reducing both the redistributive strength and the progressive nature of the Greek tax system. The striking discrepancies in the ways in which different household categories have been affected by the four reforms call for a deeper investigation of the possibility of moving towards more uniform personal income tax rules.

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1. Introduction

The year 2009 marks the start of a period of tremendous transformations in the Greek economy. After a decade of fast growth, the country faced the worst financial crisis in living memory. In 2009-2013 the economy shrank by an astonishing 23.9 percent. The recovery that followed was sluggish, with the number of employed workers in 2017 still lagging 7.8 percentage points behind its 2009 level (Eurostat, 2019).

In 2009-2017 the Greek personal income tax (PIT) system underwent four major structural reforms. This is in stark contrast to the previous years of robust economic growth (1995-2008), during which the tax system of the country had remained impressively stable (Ioannidis, 2015). These reforms completely transformed the system and sometimes even went against the general taxation trends of its European counterparts; after the initial phase of the global financial crisis and the tendency to raise taxes and reduce public spending, the majority of OECD countries introduced growth-driven tax reforms. Greece may be among the several EU countries that have introduced radical tax reforms, but it is the only one among them that continued to increase taxes on labour even in the aftermath of the economic crisis (OECD, 2017).

What was the distributional effect of these policy changes? Who have been the main gainers and losers of the PIT reforms of this period? How have they affected work incentives? What was their intended fiscal effect? The aim of this paper is to provide some answers to these policy-relevant questions. The impact of each reform is measured using the Greek component of the EU-wide tax-benefit microsimulation model EUROMOD. The (ceteris paribus) first-order distributional effects of policy changes are approximated by simulating a series of hypothetical scenarios. These scenarios are equivalent to assuming that the only change that takes place in the Greek economy between two consecutive years is the PIT reform.

Our results confirm that all four tax reforms went into the direction of increasing state revenues, with the 2011 reform being designed to have the largest fiscal gains. We find that all but the 2013 PIT reform had been inequality-reducing. By abolishing the zero-tax bracket and introducing a tax credit for employment and pension incomes instead, this reform caused a more than 3% decrease in the disposable income of the poorest decile. The 2016 reform only slightly mitigated this result, by increasing the disposable income of the first decile by a mere 0.5%.

According to our estimates, the most inequality-reducing tax reform had been the one of 2011. The decrease in the zero-tax bracket, the abolition of several tax credits and the introduction of new levies on high pensions caused a more than 4% drop in the disposable income of the richest 40% of the population, much more than the corresponding fall in the income of the poorest decile.

While this reform reinforced the redistributive capacity of the income tax system, the downward compression of the income distribution also caused a mild increase in child and working-age poverty.

The 2013 PIT reform was found to have the highest poverty-increasing effect, with most of the burden falling on the working-age population. Households headed by self-employed were affected disproportionately more by it: more than 60% of them were estimated to lose 5% of disposable income or more, whereas only 5% (1%) of households headed by employees (pensioners) experienced similar losses. The 2013 reform also had the largest negative impact on the work incentives faced by the poorest part of the population, both at the extensive and the intensive margin of labour supply.

The structure of the paper is the following. Section 2 presents the main aspects of the personal income tax reforms. Section 3 explains the methodology and presents the data of the study. Section 4 shows our tentative estimates of the fiscal, distributional, and labour market incentive effects of the PIT reforms. Section 5 concludes by summarising the most important findings and reflecting on the policy implications of this work.

2. Overview of income tax reforms

The 2010 Economic Adjustment Programme which was agreed with the European Commission, the European Central Bank and the International Monetary Fund (IMF) initiated a period of strict international supervision with respect to tax policy -among many other policy areas- in Greece. The country implemented a large-scale fiscal consolidation programme, aiming to reduce its public deficit below 3% of GDP by 2016. Since 2010, the provisions of what is often referred to as 'the Greek Programme' have been revised several times, and personal income tax reform was one of the items that figured prominently on almost each of the revisions.

Indeed, the scope for strengthening redistribution while improving public revenues via the personal income tax system was considerable. In 2010 the IMF welcomed its first major revision, stating that "revenue measures have been designed to broaden tax bases, improve the structure and equity of the tax system, and limit the impact on growth" (IMF, 2010). However, despite the progress made, in 2013 the IMF was still insisting on the need to do more, as "the rich and self-employed are simply not paying their fair share, which has forced an excessive reliance on across-the-board expenditure cuts and higher taxes on those earning a salary or a pension" (IMF, 2013).

In 2009-2017 the Greek personal income tax (PIT) system underwent four major structural reforms: in April 2010, affecting incomes earned in 2010 (hereafter called the '2010 reform'); in

October 2011, affecting incomes earned in 2011 and 2012 ('2011 Reform'); in December 2012, touching upon incomes earned in 2013-2015 ('2013 Reform'); and in April 2016, which had an impact on incomes earned from 2016 onwards ('2016 Reform').[2] By 'PIT' we refer to the following policies: personal income tax, solidarity contribution, self-employed and liberal professions contribution, and pensioners' solidarity contributions. A short description of these policies and of the most important changes introduced by these reforms are provided in Table 1.

Table 1 Reforms in direct income taxes (2009-2017)

	2009 system	**2010 reform**	**2011 reform**	**2013 reform**	**2016 reform**
personal income tax bands	5	9	8	different for various income sources	4
maximum tax rate	40% (for annual incomes over €75,000)	45% (for annual incomes over €100,000)	no change	different for various income sources	45% (for annual incomes over €40,000)
zero tax bracket	€12,000 for employees and pensioners; €10,500 for all others	€12,000 for all	€9,000 for persons aged below 30/ above 65; €5,000 for all others	abolished	n/a
increase in zero tax bracket due to children	1st child: €1,000 2nd child: €2,000 3rd child: €10,000	1st child: €1,500 2nd child: €3,000 3rd child: €11,500	1st child: €2,000 2nd child: €4,000 3rd child: €7,000	abolished	n/a
increase in zero tax bracket due to disability	€2,400	no change	no change	turned into tax credit	no change
tax allowances (TA) / tax credits (TC)	spending on private insurance, installation of eco-friendly energy systems: eligible for TA	spending on private insurance, installation of eco-friendly energy systems: eligible for TC	TCs: 50% reduced TAs: abolished	most TCs: abolished; introduction of employment & pensions income TC	changes in employment & pensions income TC
	social insurance contributions (SIC): fully deducted from taxable income	SIC: no change	SIC for self-employed: provided as a 10% TC	SIC: fully deducted from taxable income	SIC: no change

[2] Apart from these structural reforms, the PIT system also underwent some smaller, parametric changes during this period.

solidarity contribution	n/a	paid by individuals with annual taxable incomes above €12,000	no change	no change	reformed
self-employed & liberal professions' contribution	n/a	€300 per year	€500 per year (in 2011) €650 per year (in 2012)	no change	no change
pensioners' solidarity contributions	n/a	main pensions exceeding €1,400 per month taxed from 3% to 14%	reformed & also applied to supplementary pensions	no change	no change

Notes: 1. In 2009 a further €1,000 increase in the lowest income bracket is applicable for each subsequent child after the 3rd. In 2010 (2011-12) a further €2,000 (€3,000) increase in the lowest income bracket is applicable for each subsequent child after the 3rd.
2. Since 2010 (2014) the tax base was extended to include unemployment benefits, large family benefits and non-contributory disability benefits, when taxable income exceeded €30,000 (€10,000) a year.

The 2013 reform brought about major amendments to personal income taxation. A new tax schedule with three brackets was introduced for income deriving from employment and pensions. The maximum tax rate was set to 42% for annual incomes over €42,000. Self-employment income deriving from the provision of independent services either through the exercise of a liberal profession, or via a personal commercial enterprise, was taxed by a separate tax schedule with two tax brackets, with a maximum tax rate of 33% for annual incomes over €50,000. Separate tax schedules for rental and farming income were also introduced. In 2013 farming income was taxed according to the employment and pension tax schedule; in 2014-2015 it was taxed at 13%. Property income was taxed at 10% (33%) for incomes below (above) €12,000 per year.

The 2016 reform prompted more significant changes to personal income tax. A new tax schedule with four tax brackets was introduced for the sum of income deriving from employment, pensions and (non-farming) self-employment. Farming income was taxed separately but according to the same schedule. Property income was also taxed separately, using a different tax schedule with three brackets and a maximum rate of 45% for annual incomes above €35,000.

After the abolition of the zero tax bracket in 2013, an 'employment and pensions income tax credit' was established. The tax credit was equal to €2,100 for employment and pensions income up to €21,000 per year. It was capped to the amount of people's actual tax liability and was decreased by €100 for each additional €1,000 of employment and pensions' income over €21,000. Since 2016 this tax credit applies to the sum of employment, pensions and farming income (EPF incomes). It

is equal to €1,900/€1,950/€2,000/€2,100 for taxpayers with zero/one/two/three or more dependent children and EPF incomes up to €20,000 per year, and it is capped to the amount of people's actual tax liability. The tax credit is decreased by €10 for each additional €1,000 of EFP incomes over €20,000.

Solidarity contribution was first established in 2010 as a 1%-4% tax levied on individuals with taxable incomes above €12,000 per year, and with its top rate being applicable on annual incomes exceeding €100,000. During the period in question its schedule was revised twice (in 2015 and 2016). Since 2016 it consists of seven brackets and has a maximum rate of 10% for annual incomes above €220,000. The 2016 tax rates apply marginally to the income part exceeding the bracket threshold, whereas previously they were applicable to the entire amount of income.

Self-employed and liberal professions' contribution is a lump-sum tax on self-employed and liberal professionals aged less than 63, also initiated in 2010. The tax was initially set to €300 per year. In 2012 the amount was raised to €650 per year for all self-employed and liberal professionals living in areas with more than 500 inhabitants.

Pensioners' solidarity contributions are taxes on main (supplementary) pensions exceeding €1,400 (€300) per month; in 2010 their rates varied from 3% to 10%. Since the 2011 reform they vary from 3% to 24%.[3]

3. Methodology and data

In this work we make use of the Greek component of EUROMOD, the tax-benefit microsimulation model of the EU. EUROMOD enables us to estimate in a comparable manner the effects of taxes and benefits on the income distribution as well as on work incentives. The model simulates direct personal tax and social insurance contribution liabilities as well as cash benefit entitlements for all EU member states based on the national tax-benefit policy rules of a given year and the information available in the underlying microdata. EUROMOD has been validated both at micro and macro level and has been extensively used to address a wide range of economic and social policy research questions (see Figari et al. (2015) and Sutherland and Figari (2013)). One of most important advantages of microsimulation in general, and EUROMOD in particular, is attribution. The model can be used to isolate the effects of each policy (or policy bundle), taking into account the complex ways in which policies interact with each other.

[3] Detailed information about each of these tax policies is available in the EUROMOD Country Reports for Greece: https://www.euromod.ac.uk/using-euromod/country-reports/

The underlying microdata for Greece are drawn from the European (UDB) and the national (PDB) versions of the European Union Statistics on Income and Living Conditions (EU-SILC). The level of detail encompassed in the PDB allows us to simulate the vast majority of the complex direct taxation rules with a high degree of accuracy.

The choice of the microdata's income reference period is crucial for the distributional assessment of policy reforms. In this research several SILC data waves were used to best capture the actual impact of PIT changes over this long period. The impact of the 2010 reform is assessed using EUROMOD input data based on SILC 2010; the 2011 and 2013 reforms using microdata based on SILC 2012; and the 2016 reform using data based on SILC 2016. Moreover, in order to capture the intended effect of policy changes we make use of EUROMOD's Hypothetical Household Tool (HHoT). The latter is a state-of-the-art application for designing hypothetical households ('model families') and generating data according to the chosen characteristics (Gasior and Recchia, 2018). This hypothetical data can then be used to estimate the effects of tax-benefit reforms on household disposable income. Model families allow us to abstract from the complexity of the whole population structure and illustrate the intended effect of policy changes for individuals and households with specific characteristics of interest.

Income under-reporting for the purposes of tax evasion is known to be rife in Greece (Agapitos & Mavraganis, 1995; Artavanis et al., 2015; Schneider, 2011). In order to enhance the credibility and accuracy of our estimates, an effort has been made to address this issue. In accounting for tax evasion, we assume that individuals reveal their real net income to EU-SILC interviewers, but not necessarily in their tax returns. Focusing on three income sources (employment income, farming income and self-employment income) and building on the findings of previous research, we separate the reported from the unreported part of gross income by applying rates of income under-reporting by source, equal to 5 per cent for employment incomes, 35 per cent for self-employment incomes and 80 per cent for farming incomes (Leventi et al., 2013). EUROMOD treats the former as subject to income taxes and social insurance contributions and adds the latter to individual disposable income.

Household disposable income is a function of individual and household characteristics, market incomes and the tax-benefit system. For the estimation of the effect of tax-benefit policy changes on household incomes between two points in time, these changes need to be disentangled from any changes in population characteristics and market incomes. We thus approximate the first-order, ceteris paribus distributional effects of policy changes by simulating a series of hypothetical

scenarios. More formally, the counterfactual scenario used to assess the distributional impact of a PIT reform between two consecutive years, t and t-1, is constructed on the basis of:

(i) market incomes as in year t;

(ii) PIT policies (and the corresponding parameters) as in year t-1;

(iii) all other tax-benefit policies as in year t.

This is compared to the baseline scenario where all variables are set as in year t. The comparison is equivalent to assuming that, between these two years, the only change that took place in the economy was the PIT reform.[4]

The design of personal income taxes plays a crucial role in the incentives to take up or resign from a job (i.e. incentives at the extensive margin of labour supply) as well as to the incentives to work/earn more or less (i.e. incentives at the intensive margin of labour supply). The participation tax rate (PTR) is a commonly used indicator of the former whereas marginal effective tax rates (METRs) are frequently computed for the assessment of the latter.

Following the methodology developed by Jara et al. (2017), for the calculation of PTRs we move people currently in work in the microdata into unemployment and then use EUROMOD to re-calculate their disposable income, thus capturing the implications of the tax-benefit system under their new labour market status. The PTR can be thus interpreted as the proportion of initial earnings kept in the form of newly awarded benefits or reduced taxes and social insurance contributions. This indicator is calculated for both the baseline and the counterfactual scenarios; a positive (negative) difference between the two suggests that the rewards to work are becoming relatively smaller (larger) due to the PIT reform.

METRs are calculated for all individuals with earned income, taking account of the effect of a marginal increase of such income on their household disposable income.[5] Formally, the METR measures the proportion of this earnings' increase that will be 'taken away' due to additional taxes and social insurance contributions, and loss of means-tested benefits. Detailed information about the calculation of METR can be found in Jara and Tumino (2013).

This research adds to the existing literature in the following ways. To the best of our knowledge, it is the first study that looks at the work (dis)incentive effect of each of the tax reforms of this

[4] Note that in our counterfactual scenario we do not allow for monetary parameters of taxes to change from one year to another (by using for example CPI or growth in average market incomes), since no official indexation was applicable during the period considered in Greek PIT policies.

[5] The marginal increase of 3% in earnings roughly corresponds to an extra hour of work for a person working 40 hours per week.

troubled period. Moreover, while microsimulation has been extensively used as a tool for assessing the effects of the recent economic downturn, most studies discuss the distributional impact of tax reforms based on one single underlying micro dataset (Avram et al., 2013; Leventi & Matsaganis, 2016) we extend the analysis and improve the methodology by using multiple waves of EU-SILC that best describe the income distribution on which these reforms were applied. Finally, the novel use of hypothetical data serves as a magnifying glass that enables us to have a closer look at the intended effects of policy changes in a set of family types with specific characteristics.

4. Results

This section focuses on the analysis of the effects of the 2009-2017 PIT reforms on inequality, poverty and work incentives. It also attempts to identify the main gainers and losers of these policy reforms, as well as their budgetary effects.

4.1 Fiscal effects

Table 2 presents the envisaged budgetary effects of the four PIT reforms. Although the rationale of all reforms has been in the direction of increasing state revenues, their intended revenue impact and the means to achieve it varied widely. The 2010 reform, by increasing the zero tax band for self-employed and farmers and enlarging the tax allowance for children, has a decreasing impact on personal income tax revenues. However, this result is more than offset by the introduction of the three solidarity contributions. The 2011 PIT reform was designed to have, by far, the largest fiscal effects. The spectacular decrease in the zero tax bracket (from €12,000 to €5,000 per year for all taxpayers aged 30-65), combined with the reduction/abolition of tax credits/tax allowances and the increase in pensioners' solidarity contribution could yield approximately €3.1 billion of extra revenue, ceteris paribus (i.e. if applied to two populations with exactly the same incomes and personal characteristics). The 2013 PIT reform, which only affected the personal income tax policy, had intended effects of around €1 billion of additional revenue. The extra revenue was meant to be mostly derived from the changes in the band rates of personal income tax and the abolition of the tax allowance for children. Finally, the 2016 PIT reform, which also mainly touched upon the tax bands and rates of the personal income tax policy, was designed to have a relatively smaller positive impact on state revenues.

Table 2 Changes in envisaged tax revenue (million EUR)

	2010 PIT reform	2011 PIT reform	2013 PIT reform	2016 PIT reform
Personal income tax	-543	2,664	976	374
Solidarity contribution	984	27	0	38
Self-employed contribution	211	97	0	0
Pensioners' solidarity contribution	132	447	0	0
Total	782	3,245	985	412

Notes: 1. The table shows the change (in million EUR) between the counterfactual value of tax revenues if PIT policies had remained as in year t-1 relative to their actual, simulated value after the implementation of the PIT policies in year t. Actual changes in tax revenue usually move towards the same direction and are close to the envisaged ones in the case of reforms that do cause severe second-order effects. In the case of reforms that inflict significant behavioural responses, actual changes in tax revenue can also move towards the opposite direction.
2. The change in revenues by the solidarity contribution in 2011 is due to changes in the calculation of the tax base.

Source: Own calculations using EUROMOD version I1.0+.

4.2 Distributional effects

Table 3 shows how relative poverty was affected as a result of each of the four PIT reforms. Results are shown by gender, age, area, tenure, and employment status of the household head. The poverty line is set at 60% of the median equivalised household disposable income of each baseline scenario.[6]

Our results suggest that the 2011 and 2013 PIT reforms had poverty-increasing effects, with the latter being the most pronounced. The 2016 and especially the 2010 PIT reforms seem to have had a very limited impact on poverty.

With respect to age, the deterioration brought by the 2013 PIT reform was more apparent for persons aged 30-44 (+1.3 percentage points) and children aged 0-15 (+1.1 percentage points). This suggests that the rise in poverty is affecting working-age individuals and families with children more than other household types (households of pension age, in particular). The household types that are more severely affected by the PIT reforms are more likely to live in rented/mortgaged accommodation rather than owing a dwelling.

Looking at poverty rates by employment status, it seems that households with self-employed as a head suffered an alarming increase in poverty, by almost 5 percentage points. The rise in poverty was also substantial for households headed by farmers, liberal professions and unemployed. The main reason behind this development was the fact that with the 2013 PIT reform these population categories became eligible for income taxation from the first euro earned. The 2016 PIT reform

[6] In order to reflect differences in household size and composition, the total disposable household income is divided by the number of 'equivalent adults' using the OECD-modified scale. This scale assigns a value of 1 to the household head, 0.5 to each additional household member aged 14 and over and 0.3 to each child aged under 14.

only slightly mitigated this poverty increase for self-employed and farmers by lowering the tax rates for self-employment incomes less than €20,000 per year (from 26% to 22%) and extending the 'employment and pensions income tax credit' to also include farming incomes.

Table 3 Poverty effects of PIT reforms (changes in percentage points)

	2010 reform	2011 reform	2013 reform	2016 reform
all	0.1	0.4	0.8	-0.1
gender				
men	0.1	0.4	0.8	-0.1
women	0.1	0.4	0.8	-0.1
age				
0-15	0.0	0.4	1.1	-0.2
16-29	0.3	0.4	0.9	0.1
30-44	0.0	0.4	1.3	-0.2
45-64	0.1	0.5	1.0	-0.1
65+	0.0	0.1	-0.2	0.0
tenure				
rent / mortgage	0.0	0.2	0.7	-0.1
owned outright	0.1	0.5	0.9	-0.1
household head is				
unemployed	0.0	0.0	0.7	0.2
employee (public sector incl. banking)	0.1	0.3	0.0	0.5
employee (private sector excl. banking)	0.2	0.4	0.1	0.2
liberal profession	0.0	0.0	1.6	0.0
self-employed	0.0	0.4	4.7	-1.1
farmer	0.0	0.1	2.3	-1.0
pensioner	0.0	0.6	-0.5	0.1
other	0.0	0.1	0.2	0.0

Notes: The poverty line is set at 60% of the median equivalised household disposable income of each baseline scenario. The table shows the change (in percentage points) between the counterfactual value of the AROP rate if the PIT policies had remained as in year t-1 relative to its baseline value after the implementation of the policies in year t. The head is the person with the highest level of gross market income in the household. The baseline poverty levels for 2010, 2011, 2013 and 2016 are 19.4%, 23.3%, 20.8% and 20.2% respectively.

Source: Own calculations using EUROMOD version I1.0+.

To assess inequality effects, we use two indicators. The first is the Gini coefficient, taking values ranging from 0 (total equality) to 1 (total inequality). The second indicator is the S80/S20 income quintile share ratio, measuring the equivalised disposable income received by the richest 20% of the population divided by that received by the poorest 20% of the population. The two inequality indicators are complementary, in the sense that the Gini coefficient is more sensitive to inequalities in the middle of the income distribution, whereas the S80/S20 is only sensitive to changes that affect the two ends of the distribution.

The estimated effect of PIT reforms on income inequality is shown in Table 4. All PIT reforms but the 2013 are estimated to have modest inequality-reducing effects, with the 2011 reform achieving the highest decrease in both the Gini and S80/S20. The 2013 PIT reform had a small inequality-increasing effect, causing the Gini coefficient to rise by almost 1 percent and S80/S20 by 1.5%.

Table 4 Inequality effects of PIT reforms (% change)

	2010 PIT reform	2011 PIT reform	2013 PIT reform	2016 PIT reform
Gini index	-1.0	-1.5	0.9	-1.0
S80/S20 income quintile share ratio	-1.1	-3.5	1.5	-1.7

Note: The table shows the change (in percentage points) between the counterfactual value of the inequality indices if the PIT policies had remained as in year t-1 relative to their actual value after the implementation of the policies in year t.

Source: Own calculations using EUROMOD version I1.0+.

Table 5 presents the percentage changes in the progressivity and redistribution of the PIT system caused by the four reforms. The redistributive impact of reforms is measured using the Reynolds-Smolensky (1977) index, which is equal to the difference between the Gini coefficient of pre-tax income and the Gini coefficient of post-tax income. The progressivity of the tax system in terms of departure from proportionality is measured using the Kakwani (1977) index, calculated as the difference between the concentration coefficient of taxes and the Gini of pre-tax income. These two indices are related through the Kakwani decomposition: the Reynolds-Smolensky index is the product of the Kakwani index times the net average tax rate (total revenues divided by total after tax income) minus a (usually small) re-ranking term.

Table 5 Progressivity and redistributive effect of PIT reforms (% change)

	2010 PIT reform	2011 PIT reform	2013 PIT reform	2016 PIT reform
Reynolds-Smolensky	12.0	18.2	-4.2	11.2
Kakwani index	-0.7	-23.4	-17.4	3.7
Net average tax rate	13.1	55.4	19.0	6.0

Note: The table shows the change (in percentage points) between the counterfactual value of the indices if the PIT policies had remained as in year t-1 relative to their actual value after the implementation of the policies in year t.

Source: Own calculations using EUROMOD version I1.0+.

The estimated changes in the Kakwani index suggest that the 2010 and 2011 PIT reforms have reduced the progressivity of the system. However, since they also significantly increased net average tax rates (and hence, revenues), the redistributive power of the system was reinforced. The

2013 reform, on the other hand, decreased both the progressivity and the redistribution of the tax system. Finally, the 2016 PIT reform had a positive impact on both indicators.

4.3 Gainers and losers

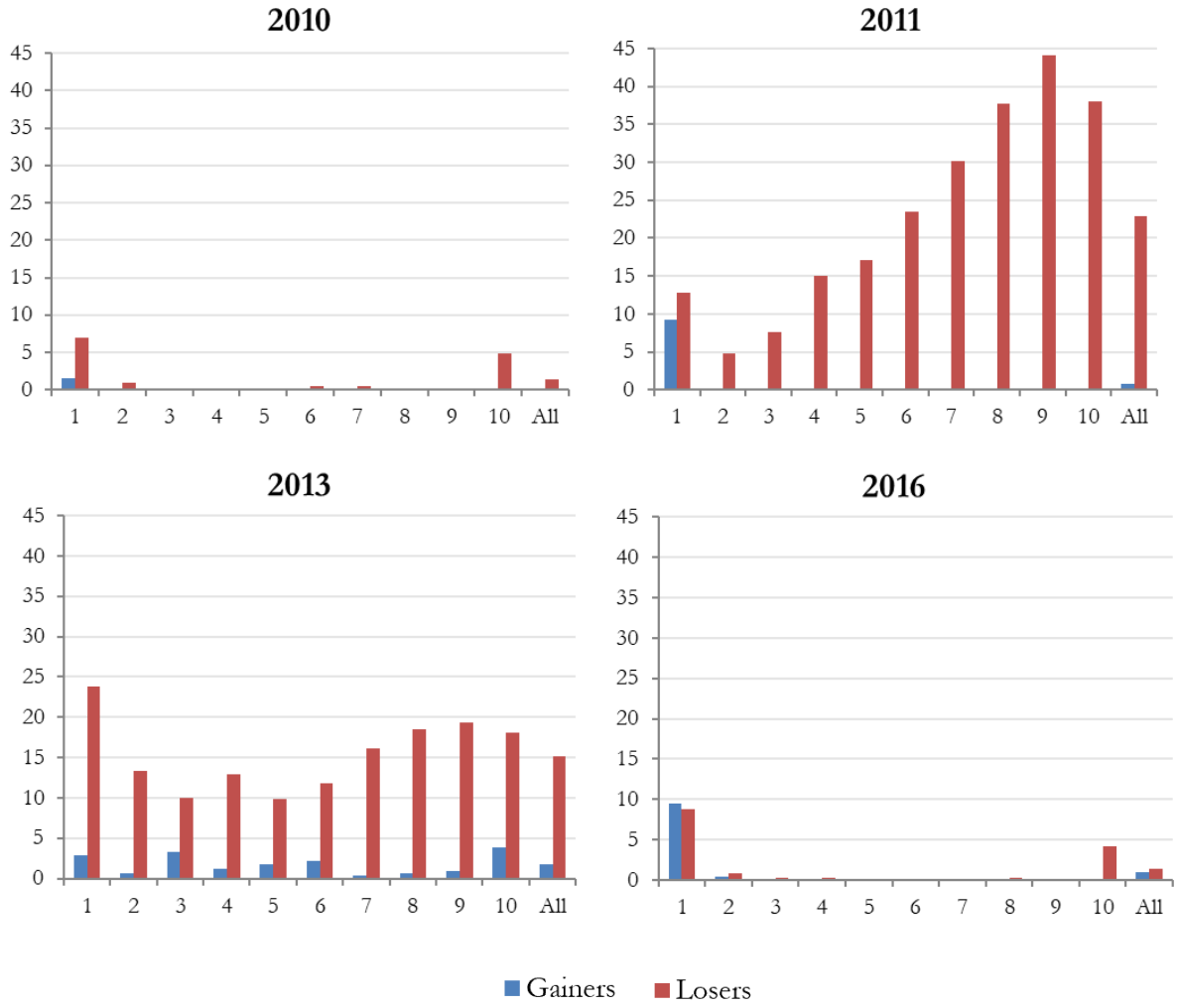
Figure 1 compares the four PIT reforms in terms of the percentage of households in each income decile group[7] seeing an income gain or loss of 5% of disposable income or more. The figure confirms the expansionary rationale of the tax reforms, as only a very small proportion of the households is positively affected by them. However, it is worth noting that the (few) gainers of the 2010, 2011 and 2016 PIT reforms are located at the poorest decile of the income distribution.

Focusing on households with losses of 5% of income or more, Figure 1 shows that the 2011 reform affected rich households much more than poor; only 5% of households belonging to the second poorest decile of the distribution are estimated to experience income losses of this magnitude whereas approximately half of the households belonging to the second richest decile of the distribution are estimated to experience such losses.

The inequality-increasing effects of the 2013 PIT reform also become apparent by looking at this figure. Our results suggest that the poorest income decile is the one with the highest percentage of households experiencing considerable income losses (24% of households). The equivalent percentage of households belonging to deciles 8-10 is around 18%.

[7] Decile groups are constructed separately for each reform, by using equivalised disposable incomes of the counterfactual scenario.

Figure 1 Percentage of households gaining or losing 5% of disposable income or more from PIT reforms by income decile



Source: Own calculations using EUROMOD version I1.0+.

How does the pattern of substantial gainers and losers vary across the income distribution by household type, in terms of characteristics such as the main income source of the household head and in terms of circumstances such as the existence of children? The percentage of gainers and losers in each of these groups are presented in the Appendix (Tables A1-A2).[8]

Looking at the (limited) cases of gainers, we find that in the 2010, 2011 and 2013 PIT reforms most of them come from households headed by pensioners. In the 2016 reform, the majority of gainers have been households headed by self-employed. Interestingly, this type of households also constitutes the main pool of losers from this reform, and in particular those belonging to the

[8] In interpreting these patterns one must be aware that the underlying number of households to which some of these percentages apply is sometimes small – for example, there are not many households headed by farmers towards the top of the income distribution.

richest decile of the population. This is due to the increase in the tax rates for self-employment incomes exceeding €20,000 per year. The 2013 PIT reform also fell heavily upon households headed by self-employed; more than 60% of them were estimated to be negatively affected, and with an almost uniform way across all income deciles. With respect to family types, the impact of this reform was more pronounced for families with children; in total, 25% of them saw their disposable income decreasing by 5% or more. The corresponding percentage of households with no children was a bit less than 12%. Moving to the 2010 PIT reform, we see that once again, self-employed comprised most of the losers. The main reason is the introduction of the lump-sum "self-employed & liberal professions contribution", which had an adverse effect on almost a fifth of the self-employed-headed households belonging to the poorest income decile.

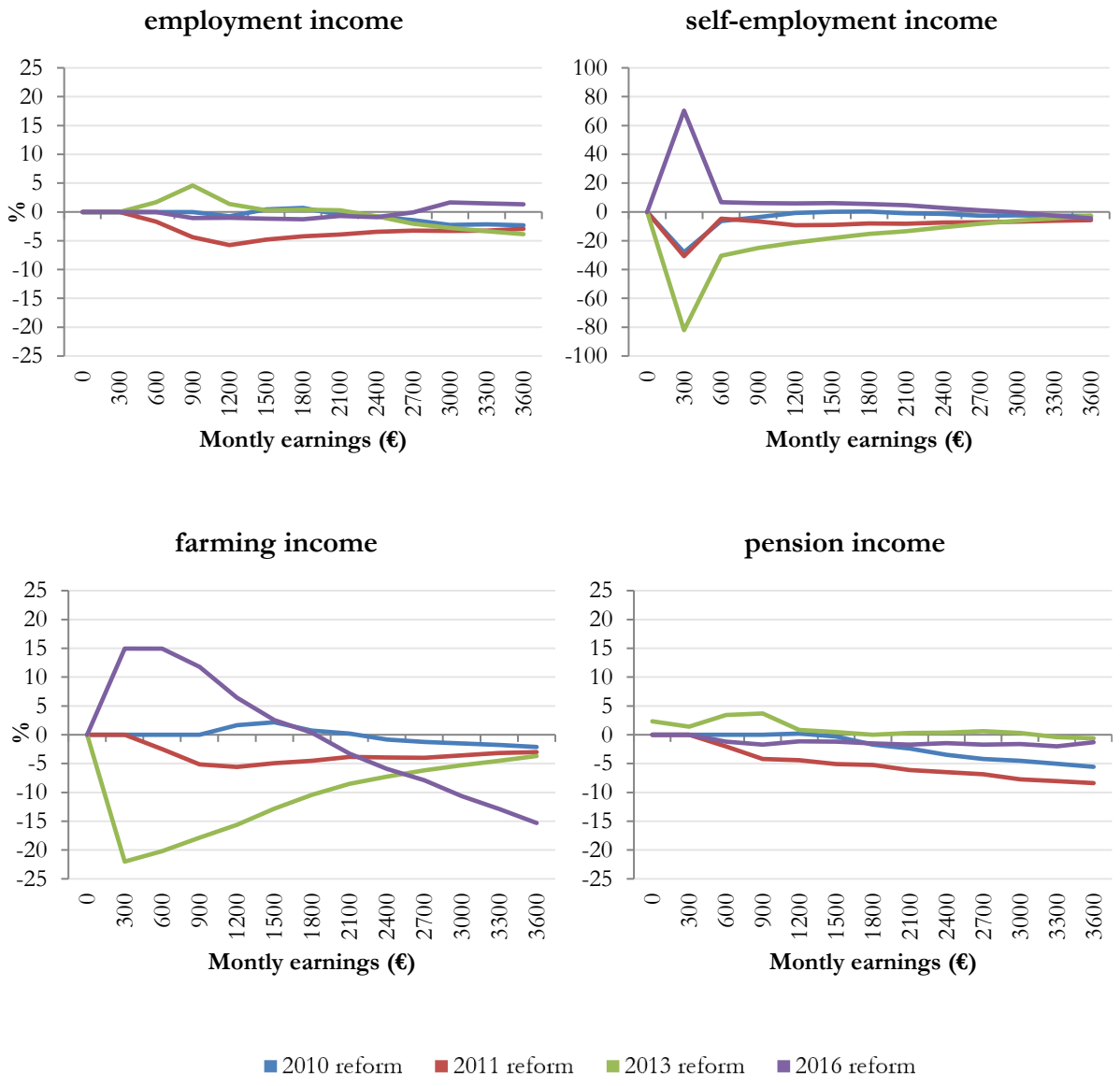
Our estimates suggest that the majority of losers of the 2011 PIT reform were households headed by pensioners. This result is related to the significant increase in pensioners' solidarity contributions; on average, half of this category of households located in deciles 5-10 experienced income losses of 5% or more. Approximately 23% (21%) of households headed by self-employed (employees) also experienced equivalent income losses, with most of the losers being located at the richest 40% of the distribution. Households with children were almost equally negatively affected to childless households.

The high percentages of households that were subject to income losses and the different ways in which different categories of households were affected by these reforms call for a deeper investigation of this issue. With the help of EUROMOD's Hypothetical Household Tool we generated four hypothetical households: (a) a household with one adult, aged 40, with employment income; (b) a household with one adult, aged 40, with self-employment income; (c) a household with one adult, aged 40, with farming income and (d) a household with one adult, aged 65, with pension income. The monthly income range of these households varied from 0 – €3,600 (i.e. approximately 0 – 200% of average earnings depicted in SILC 2010). Household (d) is supposed to also be in receipt of a supplementary pension equal to €200 (i.e. close to the real average value of supplementary pensions in 2010). These hypothetical households were then used as an input dataset for EUROMOD to assess how the four PIT reforms have affected their disposable income. The (percentage) changes in disposable income by income source, income level and PIT reform are presented in Figure 2.

This figure clearly confirms both the severity and the regressive character of the 2013 PIT reform for individuals with self-employment and farming income. The monthly income taxes paid by the self-employed gaining €600 per month increase from €54 to €153. The respective increase in

income taxes paid by the farmer is €106 (from €12 to €118). On the other hand, the employee and the pensioner see their income taxes decrease by €8 and €10 per month respectively (from €8 and €10 to zero). The 2016 PIT reform only slightly mitigates this tax hike for the self-employed, as the latter see his taxes being reduced from €153 to €138. On the other hand, the 2016 reform fully annihilates the results of the previous one for the farmer, who ends up paying zero income tax.

Figure 2 Changes in disposable income of single-member household by income source, income level and PIT reform (%)



Notes: (1) The figure shows the change (in %) between the counterfactual value of disposable income if the PIT policies had remained as in year t-1 relative to its actual value after the implementation of the PIT policies of year t. (2) The gridlines are *not* the same for the case of the individual with self-employment income.

Source: Own calculations using EUROMOD version I1.0+.

4.4 Work incentives

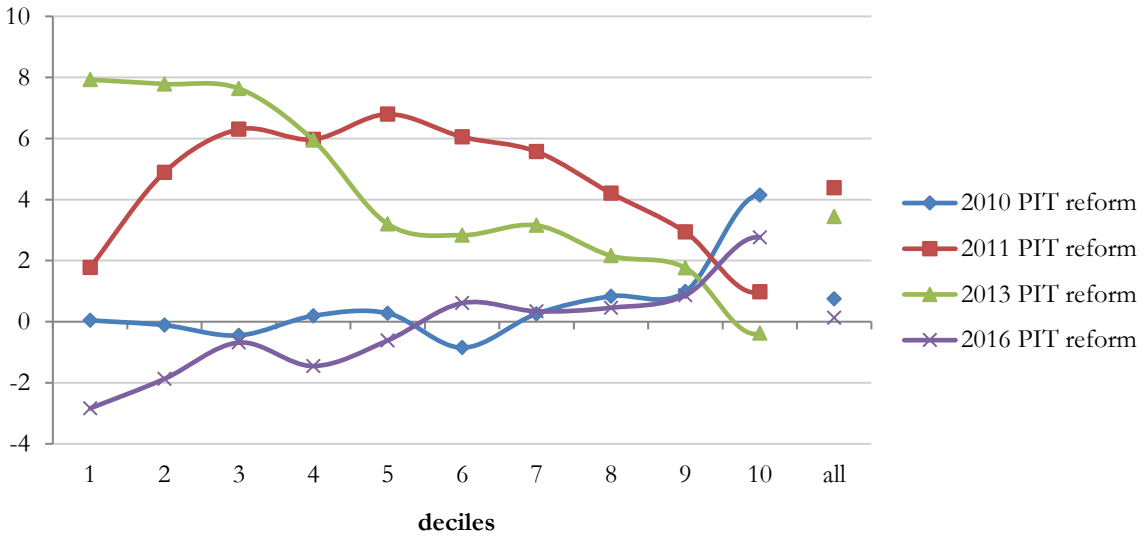
As mentioned in Section 2, the incentive for those in work to increase their earnings is measured by calculating the marginal effective tax rate (METR) for each person in work. In EUROMOD, this is calculated by applying a 3% increase in individual earnings and recalculating the household's net income, applying the rules of the tax-benefit systems both in the baselines and in each of the counterfactual scenarios. The exact formula used for the calculation is:

$$METR_i = 1 - \left(\frac{Y_{HH}^1 - Y_{HH}^0}{E_i^1 - E_i^0}\right)$$

where the numerator measures the change in household disposable income before and after the increase in individual earnings, and the denominator is equal to the increase in earnings itself. A METR of 0 means that individuals get to keep all the earnings increase whereas a METR of 100 means that the total earnings increase is taken away due to higher taxation, additional social insurance contributions or loss of benefit entitlements.

Figure 3 shows that the 2010 PIT reform left incentives to work relatively unaffected for all income deciles apart from the richest. For the latter, incentives were worsened by 4 percentage points (from 33% to 37%). This means that, individuals who previously got to keep €67 of a €100 earnings' increase end up keeping €63 after the reform. The 2011 PIT reform had an inverse U-shape impact on work incentives: it worsened them by 4 percentage points on average, with the highest disincentive falling on the middle part of the distribution. The reform that had the largest negative impact on the work incentives of the poorest part of the population was the one of 2013; the METRs of the two poorest income deciles went up by approximately 8 percentage points (from 11% and 18% to 19% and 26% respectively). The 2016 PIT reform moved towards the opposite direction and slightly improved work incentives for the poorest half of the population.

Figure 3 Change in mean marginal effective tax rates (in percentage points)



Source: Own calculations using EUROMOD version I1.0+.

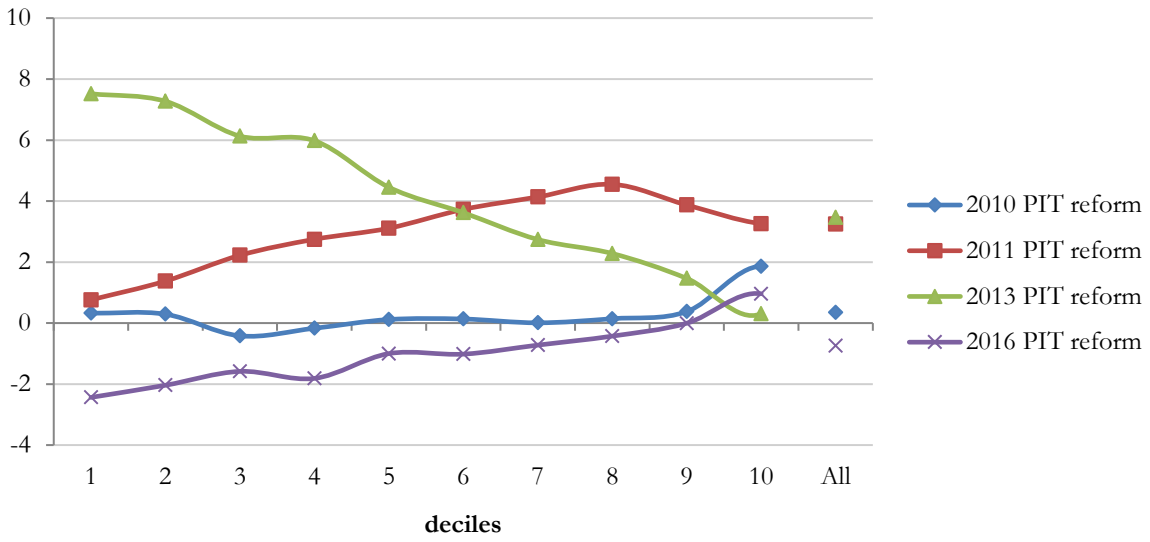
The incentive to remain in work has been measured by calculating the participation tax rate (PTR) for each person in work. The exact formula used is:

$$PTR_i = 1 - \left(\frac{HDI_{wi} - HDI_{nwi}}{E_{wi}}\right)$$

where the numerator is the difference in total household net income if an individual *i* is working as opposed to not working and the denominator is the earnings of individual *i*. The higher the value of PTR, the smaller the gain from working and the weaker the incentive to continue to do so. A PTR equal to 100 means that, in the event of unemployment, the individual's disposable income would be the same as when she was at work.

Most of the patterns that we observe in Figure 4 are similar to the METR results discussed above. The main difference is related to the 2011 PIT reform, which seems to be causing a smaller deterioration in the incentives to remain in work for those in the middle of the income distribution than the deterioration it brought to the incentives to work more in the same part of the population. Another difference is that the 2016 PIT reform is slightly improving the incentives to remain to work not just for the poorest part of the distribution but also for higher income deciles (up to decile 8), whereas the improvement to the incentives to work more was estimated to fade out already in decile 5. The impact of the 2013 PIT reform on PTRs is very similar to the one on METRs; the participation tax rate of the poorest income decile goes up by almost 8 percentage points, from 69% to 77%, significantly reducing the incentives of individuals at the extensive margin of labour supply.

Figure 4 Change in mean participation tax rates (in percentage points)



Source: Own calculations using EUROMOD version I1.0+.

5. Conclusions

The aim of this research has been to shed light on the fiscal, distributional and work incentive effects of the personal income tax reforms that took place during and in the aftermath of the recent economic crisis in Greece. In less than a decade, the Greek PIT system underwent four major structural reforms that completely reshaped its character and intended results. The isolated impact of each reform is measured using microsimulation techniques; using the Greek module of the EU-wide tax-benefit microsimulation model EUROMOD we construct a series of hypothetical scenarios where the only parameters that change between two consecutive years are PIT policies.

The most important findings of this research can be summarized as follows. All four tax reforms aimed at achieving higher state revenues, with the 2011 PIT reform being designed to have the largest fiscal gains. The gains were mainly due to the large decrease in the zero tax bracket, the reduction in several tax credits, the abolishment of tax allowances and the increase in pensioners' solidarity contribution. This reform also achieved the highest decrease in both the Gini index and S80/S20. Our results suggest that only 5% of households belonging to the second poorest decile experienced income losses of 5% of disposable income or more, whereas approximately 50% of the households belonging to the second richest decile of the distribution experienced such losses.

The 2013 PIT reform was estimated to have the largest poverty-increasing effects, especially for persons aged 30-44 and children aged 0-15. Looking at differences by employment status, we find that households headed by self-employed suffered an alarming increase in poverty, by almost 5

percentage points. This reform was also the only one with an estimated inequality-increasing effect. The analysis of gainers and losers confirms that more than 60% of households headed by self-employed were negatively affected by it, and with an almost uniform way across income deciles. The 2016 PIT reform partly mitigated some of these adverse effects, by lowering the tax rates for self-employment incomes less than €20,000 per year.

As far as work incentives are concerned, the 2010 reform had a negative impact on the incentives faced by the richest income decile; the 2011 reform had an inverse U-shape impact on work incentives, mostly reducing them for individuals located at the middle part of the distribution; the 2013 reform had the largest negative impact on the poorest part of the population; the 2016 reform slightly improved work incentives for the five poorest deciles. These results highlight the importance of considering the whole distribution of MTRs/PTRs rather than just focusing on their average/median values.

Summing up, the example of the 2011 reform suggests that PIT reforms can improve public revenues while strengthening redistribution. With this reform the marginal personal income tax schedule steepened and was made more redistributive by including different elements of income under a single harmonized personal income tax base.

The 2013 PIT reform moved to the opposite direction by excluding several income sources from the main personal income tax base and making them subject to alternative schedules. The erosion of the tax base reduced both the redistributive strength and the progressive nature of the tax system. Moreover, the principle of neutrality, which ensures that tax systems impose similar tax burdens on similarly situated individuals, was severely hampered. Even though there may be good reasons for deviating from this principle (for example, behavioural responses of individual workers and their willingness to engage in tax avoidance/evasion), the magnitude of differences in direct taxes paid by individuals with self-employment income versus individuals gaining income from other sources is hard to justify. The finding that the tax system is negatively affecting the incentives for those in work to increase their earnings can also be interpreted as an increased disincentive for self-employed individuals to declare a higher part of their profits. Hence, policies that uniformly treat all self-employed as tax evaders can create even stronger incentives for hiding income.

The striking discrepancies in the ways in which different household categories have been affected by the four PIT reforms call for a deeper investigation of the possibility of moving towards more uniform personal income tax rules. Examples of policies with embedded differential treatments (and thus high potential for equity-enhancing reforms) are the self-employed and liberal

professions contribution, the employment and pensions income tax credit and the separate tax schedules for certain income sources.

A certain amount of caution is called for when interpreting our results. The main issues, to do either with our approach or with our assumptions, are briefly discussed below.

First, this paper has solely focused on the evolution of the Greek direct income tax system. The evolution of other important parts of the tax-benefit system, such as property and capital taxes, indirect taxation, social insurance contributions and social benefits fall outside the scope of analysis. In fact, during the highly turbulent period every one of these policy areas has been subject to substantial structural reforms that call for a deeper investigation.

Second, changes in the tax system can also lead to behavioural responses. For example, the introduction of additional taxes on self-employment or farming income might lead to changes in the employment patterns of these population categories. The 2013 personal income tax reform constitutes a good example of such a reform, where due to a combination of increased behavioural adjustments and declining incomes in the overall economy, actual changes in tax revenue moved towards the opposite than the intended direction. However, we still now too little to quantify ex-ante the size and direction of the second-order effects of such policy reforms. More research into this direction would enable us to identify policies that promote both growth and equality, even in situations where the room for fiscal manoeuvre is limited.

Keeping in mind the above-mentioned caveats, this research offers a sound approximation of the first-order distributional, fiscal and labour incentive effects of these major reforms. The findings of this work highlight the need for a cautious and socially sensitive design of tax reforms aiming at fiscal consolidation. They also suggest that, despite the indisputable progress made during the last decade, there is still scope and need for reforms that will allow to share the burden of fiscal consolidation -or the gains of fiscal expansion- in a more equitable way.

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Appendix

Table A1 Percentage of households gaining 5% or more from PIT reforms by household type and income decile

	all	no children	with children	household head is:		
				employee	self-employed	farmer
			2010 PIT reform			
Decile						
1	1.6	1.6	1.7	0.0	0.6	6.5
2	0.0	0.0	0.0	0.0	0.0	1.6
3	0.0	0.0	0.0	0.0	0.0	7.5
4	0.0	0.0	0.0	0.0	0.0	2.3
5	0.0	0.0	0.0	0.0	0.0	2.1
6	0.0	0.0	0.0	0.0	0.0	4.1
7	0.0	0.0	0.0	0.0	0.0	1.4
8	0.0	0.0	0.0	0.0	0.0	0.7
9	0.0	0.0	0.0	0.0	0.0	0.8
10	0.0	0.0	0.0	0.0	0.0	7.4
All	0.2	0.1	0.2	0.0	0.1	3.2
			2011 PIT reform			
Decile						
1	2.9	2.6	3.4	1.5	2.1	6.5
2	0.7	0.9	0.1	0.5	0.0	1.6
3	3.3	4.7	0.0	0.6	0.0	7.5
4	1.2	1.8	0.0	1.0	0.0	2.3
5	1.7	2.2	0.0	0.0	0.0	2.1
6	2.2	2.6	0.0	0.0	0.0	4.1
7	0.4	0.5	0.0	0.0	0.0	1.4
8	0.6	0.8	0.0	0.6	0.0	0.7
9	0.9	1.2	0.3	0.9	0.0	0.8
10	3.8	4.4	2.2	3.1	2.7	7.4
All	1.8	2.2	0.7	0.9	0.7	3.2

	all	no children	with children	household head is:		
				employee	self-employed	farmer
			2013 PIT reform			
Decile						
1	2.9	2.6	3.4	1.5	2.1	6.5
2	0.7	0.9	0.1	0.5	0.0	1.6
3	3.3	4.7	0.0	0.6	0.0	7.5
4	1.2	1.8	0.0	1.0	0.0	2.3
5	1.7	2.2	0.0	0.0	0.0	2.1
6	2.2	2.6	0.0	0.0	0.0	4.1
7	0.4	0.5	0.0	0.0	0.0	1.4
8	0.6	0.8	0.0	0.6	0.0	0.7
9	0.9	1.2	0.3	0.9	0.0	0.8
10	3.8	4.4	2.2	3.1	2.7	7.4
All	1.8	2.2	0.7	0.9	0.7	3.2
			2016 PIT reform			
Decile						
1	9.5	12.3	4.8	1.7	13.2	2.3
2	0.4	0.2	0.7	0.0	1.6	0.0
3	0.2	0.2	0.1	0.0	0.9	0.0
4	0.1	0.1	0.0	0.0	0.4	0.0
5	0.0	0.0	0.0	0.0	0.2	0.0
6	0.0	0.0	0.0	0.0	0.0	0.0
7	0.0	0.1	0.0	0.0	0.1	0.0
8	0.1	0.1	0.0	0.0	0.4	0.0
9	0.0	0.0	0.2	0.1	0.0	0.0
10	0.0	0.0	0.0	0.0	0.0	0.0
All	1.0	1.0	0.7	0.1	2.2	0.1

Table A2 Percentage of households losing 5% or more from PIT reforms by household type and income decile

	all	no children	with children	household head is:		
				employee	self-employed	farmer
			2010 PIT reform			
Decile						
1	7.0	5.1	9.9	0.7	17.3	2.9
2	1.0	1.4	0.0	0.0	4.2	0.3
3	0.0	0.0	0.0	0.0	0.0	0.6
4	0.2	0.3	0.0	0.0	0.0	1.0
5	0.2	0.2	0.0	0.3	0.0	0.2
6	0.4	0.5	0.1	0.0	0.0	1.2
7	0.5	0.7	0.0	0.1	0.0	0.0
8	0.2	0.2	0.0	0.1	0.0	0.0
9	0.1	0.1	0.1	0.0	0.0	0.8
10	4.9	4.4	6.3	4.4	6.3	0.6
All	1.4	1.3	1.9	0.6	4.1	0.6
			2011 PIT reform			
Decile						
1	12.8	17.3	7.3	9.2	7.5	11.9
2	4.8	5.6	2.6	3.8	0.5	2.9
3	7.6	8.5	5.5	8.9	6.7	10.4
4	15.1	11.5	25.4	19.1	8.6	17.1
5	17.0	15.0	24.8	22.9	15.2	15.8
6	23.5	25.0	19.6	14.6	18.8	33.6
7	30.1	30.7	28.7	19.6	44.3	41.6
8	37.7	37.0	39.6	31.5	43.6	45.4
9	44.0	48.3	34.8	33.9	62.3	67.5
10	38.0	41.9	26.7	21.8	45.1	59.9
All	22.9	23.6	21.0	21.3	22.8	27.4

	all	no children	with children	household head is:		
				employee	self-employed	farmer
			2013 PIT reform			
Decile						
1	23.8	26.5	19.9	2.0	65.4	2.9
2	13.3	11.4	18.8	1.5	53.0	0.3
3	9.9	7.1	17.1	1.5	46.5	0.6
4	12.9	8.2	23.9	2.6	59.7	1.0
5	9.9	5.4	26.7	4.4	60.4	0.2
6	11.8	6.8	34.8	7.0	65.0	1.2
7	16.1	13.8	22.4	5.7	76.9	0.0
8	18.5	12.2	34.5	6.6	82.6	0.0
9	19.4	14.3	33.5	4.7	79.7	0.8
10	18.1	16.4	22.3	10.0	40.1	0.6
All	15.2	11.6	25.0	5.3	61.4	0.6
			2016 PIT reform			
Decile						
1	8.7	12.4	2.4	2.6	4.8	5.5
2	0.8	1.2	0.1	0.0	0.2	1.2
3	0.3	0.2	0.6	0.1	0.8	0.0
4	0.2	0.1	0.5	0.1	0.4	0.2
5	0.1	0.0	0.4	0.0	0.5	0.0
6	0.2	0.2	0.2	0.1	0.0	0.0
7	0.0	0.0	0.3	0.0	0.4	0.0
8	0.2	0.3	0.0	0.1	0.0	0.3
9	0.0	0.1	0.0	0.0	0.0	0.0
10	4.2	3.4	6.4	1.0	11.3	2.9
All	1.4	1.5	1.1	0.3	2.6	0.5