OECD Taxation Working Papers No. 15

Average Personal Income Tax Rate and Tax Wedge Progression in OECD Countries

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https://dx.doi.org/10.1787/5k4c0vhzsq8v-en

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ABSTRACT

Average personal income tax rate and tax wedge progression in OECD countries

The statutory progressivity of the income taxes paid by wage earners, net of the standard cash benefits they receive, depend on the design and interaction of personal income taxes, social security contributions (SSCs) and cash benefits. In order to capture their combined impact, this paper presents statutory tax progressivity indicators for the 34 OECD member countries on the basis of average effective income tax rates and tax wedges which are calculated using the OECD's Taxing Wages framework. The analysis shows a decreasing pattern of tax progressivity across income levels. In some countries, the tax system becomes regressive when the SSC ceiling has been reached. Also, child benefits increase progressivity (especially at low income levels) and their effect is larger than the flattening impact of SSCs, except at top income levels. Reductions in SSCs targeted at low-incomes and dependant spouse allowances increase progressivity in some OECD countries. Income-splitting systems typically have the opposite effect.

JEL classification: H24, H55

Keywords: tax progressivity, personal income tax, social security contributions.

RÉSUMÉ

Progression des taux moyens de l'impôt sur le revenu des personnes physiques et du coin fiscal dans les pays de l'OCDE

La progressivité légale des impôts sur le revenu payés par les salariés, après déduction des prestations en espèces qu'ils perçoivent, dépend de la conception des impôts sur le revenu des personnes physiques, des cotisations de sécurité sociale (CSS) et des prestations en espèces ainsi que de leurs interactions. Afin de déterminer leur effet combiné, cette étude présente des indicateurs de la progressivité légale des impôts pour les 34 pays membres de l'OCDE, en s'appuyant sur les taux moyens effectifs de l'impôt sur le revenu et sur les coins fiscaux calculés en utilisant le modèle établi par la publication de l'OCDE « Les impôts sur les salaires ». L'analyse révèle que la progressivité diminue à mesure que les niveaux de revenu augmentent. Dans certains pays, le système fiscal devient régressif lorsque le plafond des CSS est atteint. De même, les allocations familiales augmentent la progressivité (surtout pour les bas revenus), et leur incidence est supérieure à l'effet d'atténuation des CSS, sauf pour les hauts salaires. Les réductions de CSS ciblant les bas revenus et les indemnités pour conjoint à charge augmentent la progressivité dans certains pays de l'OCDE. En général, le régime du quotient familial produit l'effet inverse.

Classification JEL: H24, H55

Mots clés: progressivité de l'impôt, impôt sur le revenu des personnes physiques, cotisations de sécurité sociale.

FOREWORD

This paper is also published as the Special Feature of the 2013 edition of *Taxing Wages* (www.oecd.org/ctp/taxingwages). Dominique Paturot provided statistical assistance. The paper also draws on input from Delegates to Working Party No. 2 on Tax Policy Analysis and Tax Statistics of the Committee on Fiscal Affairs of the OECD.

AVERAGE PERSONAL INCOME TAX RATE AND TAX WEDGE PROGRESSION IN OECD COUNTRIES

Dominique Paturot, Kirsti Mellbye and Bert Brys[1]

Introduction

Progressive income taxes play an important role in achieving a more equal distribution of income after than before taxation. This paper calculates structural tax progressivity measures at different income levels and for different families using the Taxing Wages country calculation models and results. The paper also provides comparisons across OECD countries.

Progressivity can be defined in a number of ways. In this paper, a tax is progressive if the average tax rate increases with income or, equivalently, if the marginal tax rate is higher than the average tax rate at a particular income level. A tax is proportional or regressive if the average tax rate is constant or decreases with income.

The progressivity of the taxes on wage earnings depends on the design and interaction of the personal income tax (PIT) system, social security contributions (SSCs) and the benefit system. First, the progressivity of the PIT depends on the progressivity of the statutory PIT rate schedule, which depends on the number and width of the tax brackets and on the difference between the tax rates and especially between the top and bottom tax rate. Second, the progressivity also depends on the specific design of PIT provisions that reduce the taxpayer's tax liability. Provisions can take the form of allowances, deductions, exemptions and credits and may depend on the level of income (e.g. in-work tax credits and other make-work-pay provisions) and/or specific family characteristics (e.g. the number of children, a dependent spouse, etc.).

Third, in addition to PIT, wage earnings are also subject to employee and employer SSCs and possibly payroll taxes. As these are often levied at flat rates, they tend to reduce the progressivity of the tax system. SSC ceilings may even result in regressive taxes on wage earnings. SSC ceilings will typically have an impact on the social security benefits that can be received, but a discussion of this impact goes beyond the scope of this paper. On the other hand, provisions in social security contributions, which are typically targeted at low-income earners, may (locally) increase the tax system's progressivity.

Also, taxpayers may receive direct benefits, which are typically targeted at lower income households and especially families with children. These benefits make the tax system more progressive as a given benefit will reduce the average tax burden more for low income households. If benefits are reduced with income, as often is the case, they also result in higher marginal tax rates for families with income in the tapering interval.

In order to capture the impact and interaction of all features of the tax and benefit system, this paper focuses on the average-rate progression indicator, which measures the change in the average tax rates over a particular income interval and for different family types. As average PIT rates and average tax wedges are (amongst) the key indicators included in the OECD's Taxing Wages report, the tax progressivity indicators that are presented in this paper have been built within the Taxing Wages framework.

This paper is organised as follows. Section 2 provides an overview of the main tax progressivity indicators, which can be found in the literature. Section 3 briefly focuses on the tax progressivity indicators

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which are included in the Taxing Wages report. Section 4 provides more information on the assumptions underlying the average-rate progression indicator which is calculated in this paper. Numerical results for tax progressivity in OECD countries are presented and discussed in Section 5. Section 6 concludes.

2. Different ways to measure tax progressivity

In their seminal paper, Musgrave and Thin (1948) present several progressivity indicators. They distinguish between structural progressivity indicators and effective progressivity indicators, sometimes also referred to as local and global progressivity measures, respectively.

2. 1 Structural versus effective tax progressivity indicators

The main difference between the two types of progressivity indicators is that structural indicators measure progressivity based on statutory tax schedules, while effective indicators measure progressivity based on some measure of before- and after-tax inequality, usually the Gini index. As indicated by the terms local and global progressivity, structural indicators measure progressivity at a particular income level or income interval, while effective indicators measure overall progressivity by estimating how the tax (and benefit) system affects the distribution of income across the entire population.

Effective tax progressivity indicators

Effective progressivity indicators require data on the before- and after-tax distribution of all types of income and ideally take the effect of the PIT system as well as employee and employer social security contributions, indirect taxes, and cash and in-kind benefits into account. The data used for calculating effective indicators is mainly collected from household surveys. It is thus an advantage that estimations of effective indicators are based on real data. However, the use of household survey data for estimating tax progressivity is not without its limitations.

One main limitation is that household surveys are based on a sample of households, which will not perfectly represent the entire population. Household surveys also tend to be biased at both ends of the income scale. High-income households will often under-report their income or do not respond to surveys, and very low-income households might not be reached or they do not respond, although they also might understate benefit income as well as income earned in the informal sector. Overall, however, inequality tends to be underestimated. In addition, differences in the quality and scope of household surveys may reduce the comparability of the progressivity estimates they provide. First, non-response rates as well as the degree of misreporting may vary across countries and surveys. Second, social security contributions paid by employers are often not included while social security contributions paid by households typically are. Moreover, particular income components may not be treated consistently across household surveys. Thus, calculations based on different household surveys can yield different tax progressivity estimates. Another limitation is that varying natures of tax systems across countries may affect cross-country progressivity comparisons. For instance, the extent to which entrepreneurs declare income under the PIT or CIT may differ across countries.

Recent OECD work has analyzed the effective progressivity of the tax/benefit system in OECD countries and their overall redistributional impact (see the OECD "Divided We Stand: Why Inequality Keeps Rising" report and the OECD working papers "Less Income Inequality and More Growth – Are They Compatible?").[2] See also Tomarelli and Acciari (2011) for an analysis of the redistributive impact of the personal income tax system in Italy.

[2] The 8 working papers and accompanying policy notes can be found at: http://www.oecd.org/document/47/0,3746,en_2649_34113_49331311_1_1_1_1,00.html.

Structural tax progressivity indicators

Structural tax progressivity indicators are calculated using statutory tax rate schedule information instead of actual taxpayer data. Relying on statutory tax schedules improves the comparability of tax progressivity estimates across countries. However, also this approach faces some limitations.

First, the calculated statutory tax liabilities will typically differ from the actual taxes paid, for instance because only standard allowances and benefits are included in the analysis (as is currently the case in Taxing Wages). The omission of non-standard allowances, which are typically used more by richer than poorer households, may overestimate the tax liabilities at higher income levels, thereby leading to biased structural tax progressivity measures.

Second, structural indicators are often used to estimate the progressivity of one tax in isolation, as for instance PIT, thereby not taking into account that the progressivity of a particular tax might be mitigated or strengthened by other taxes as, for instance, VAT and other consumption taxes. This limitation, however, also applies to effective progressivity indicators as household surveys typically do not take consumption taxes into account either.

Third, statutory tax rate schedule information does not provide information on the number of taxpayers who actually face the different tax rates, and can thus not be used to calculate a tax system's overall progressivity. Ideally, the structural indicators would be combined with information on the actual distribution of income. While the calculation of effective progressivity indicators requires information on both the before- and after-tax income distribution, structural progressivity indicators only require information on the before-tax income distribution.

Recent empirical work has estimated structural progressivity without relying on data of the actual income distribution. Joumard et. al. (2012), for instance, uses Taxing Wages data and imposes a fixed income distribution between countries by applying fixed weights to income ranges as multiples of the average wage. These weights then allow calculating overall labour tax progression indicators by weighting the tax progression values over the income ranges (per family type, country and year).

Which indicator to choose?

Both effective and structural progressivity indicators have strengths and weaknesses, and the choice for a particular type of progressivity indicator will depend on the objectives of the analysis. In fact, effective and structural progressivity indicators are not substitutes but rather complements as they provide insights into different aspects of tax progressivity and the redistribution of income. While effective indicators are best suited to measure the overall progressivity of the tax and benefit system, structural indicators can be used to measure progressivity of certain taxes in isolation and to provide estimates of progression rates along the income scale. Structural indicators can also help standardize cross-country comparisons.

This paper complements previous OECD work and analyzes in more detail structural labour income tax progressivity in OECD countries, building on the Taxing Wages framework.

2. 2 Overview of main structural tax progressivity indicators

This section provides an overview of the most commonly used structural tax progressivity indicators (following Musgrave & Musgrave, 1989):

- Average-rate progression: $(T_1/Y_1 - T_0/Y_0)/(Y_1 - Y_0)$

- Liability progression[3]: $((T_1-T_0)/T_0) * (Y_0/(Y_1-Y_0))$

- Residual income progression: $[((Y_1-T_1) - (Y_0-T_0))/(Y_0 - T_0)] * [Y_0/(Y_1-Y_0)]$

Where Y_0 and Y_1 represent the lower and higher levels of income and T_0 and T_1 are the corresponding tax liabilities.

The *average-rate progression* indicator measures the ratio of change in the effective tax rate associated with a change in income. The value of this indicator is zero, and hence the slope of the average effective tax rate curve is flat, in case of a proportional tax. A progressive tax is reflected by a positive value of the indicator, and a regressive tax by a negative value. The higher is the value of this indicator, the higher is the increase in the average tax rate with income and therefore the more progressive is the tax system. (Average tax rates that increase with income or marginal tax rates that are higher than average tax rates at any income level are similar definitions of tax progressivity.)

The *liability progression* indicator measures the elasticity of tax payable with respect to income, i.e. the percentage increase (decrease) in tax liability when before-tax income increases (decreases) by 1 currency unit. This indicator equals 1 for a proportional tax, exceeds 1 if a tax is progressive, and is below 1 when a tax is regressive.

The *residual income progression* indicator measures the elasticity of after-tax income with respect to pre-tax income, i.e. the percentage increase (decrease) in after-tax income when before-tax income increases (decreases) by 1 currency unit. It thus measures responses in disposable income to changes in pre-tax income. This indicator will also equal 1 for a proportional tax. However, progressivity will now be identified by a coefficient less than 1 and a regressive tax by a coefficient exceeding 1. The residual progressivity indicator is the structural indicator that is closest related to the concept of effective progression and distribution of income, as it reflects not only the way the tax burden is distributed but also the distribution of after-tax income.

These three indicators will respond differently to a given tax change. Also, increases or decreases in income levels will have a different impact on progressivity measured by the different indicators. The impact of changes in income and/ or tax liabilities (ignoring the actual underlying tax system) on the values of the progression rates are illustrated in Table 1.

The liability progression indicator has the particular feature that progressivity stays constant if all liabilities or income levels are changed by the same percentage; this is not the case for the average-rate and the residual income indicators. If all income levels increase by the same percentage, the average progression indicator will decrease and the residual income progression indicator will increase, thereby indicating that progressivity has decreased. If all tax liabilities increase by the same percentage, the average progression indicator will increase and the residual income progression indicator will decrease, thereby indicating that progressivity has increased.

If income levels as well as tax liabilities change by the same percentage, progression calculated both by the liability progression indicator and the residual income progression indicator remain unchanged. The average-rate progression indicator, however, decreases. For the average-rate progression indicator the starting point is exactly 5 per cent higher than the new progression level after all income levels and tax liabilities have been increased by 5 per cent.

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[3] This indicator can also be calculated as the marginal effective tax rate divided by the average effective tax rate, evaluated at a particular income level.

Table S.1: Changes in progression rates for the different structural indicators when all income levels or/and tax liabilities increase by 5 per cent

	Starting point	Income levels increase by 5% (but tax liability does not change)	Tax liabilities increase by 5% (but income does not change)	Income levels and tax liabilities increase by 5%
Income level 0	100	105	100	105
Income level 1	101	106.05	101	106.05
Tax liability 0	30	30	31.5	31.5
Tax liability 1	30.5	30.5	32.025	32.025
Average rate progression	0.0020	0.0018	0.0021	0.0019
Liability progression	1.6667	1.6667	1.6667	1.6667
Residual income progression	0.7143	0.7333	0.6934	0.7143

3. Tax progressivity measures included in the main Taxing Wages report

The Taxing Wages report presents measures of labour tax progressivity in tables I.8 and I.9. Both tables measure residual income progression for the eight family types included in the report, where the income changes considered are for the principal earner of the family.

Table I.8 shows the percentage increase in net income when gross wage earnings increase by 1 currency unit, i.e. the elasticity of after-tax income with respect to pre-tax gross wage income. The elasticities are calculated as (1-METR) / (1-AETR) where METR is the marginal PIT rate plus employee SSCs less cash benefits and AETR is the average PIT rate plus employee SSCs less cash benefits. Under a proportional tax system, the elasticity is equal to 1. The more progressive is the system – at the income level considered – the lower this elasticity will be.

Table I.9 show similar results, but the focus is on the average tax wedge, i.e. the difference between total labour costs to the employer and the corresponding net take-home pay of the employee as a percentage of total labour costs. The calculations thus also include employer social security contributions, payroll taxes and cash benefits. The table shows the percentage increase in net income when labour costs (i.e. gross wage earnings plus employer social security contributions and payroll taxes) rise marginally as a result of a 1 currency unit increase in gross wage earnings. The elasticities are calculated as (1-METR) / (1-AETR) where METR is the marginal tax wedge and AETR the average tax wedge.

The Taxing Wages Report also briefly discusses progressivity in section II.5 which compares the average PIT burden faced by single persons earning 67 per cent of the average wage with the tax burden faced by single persons earning 167 per cent of the average wage (comparing Table II.1.b with Table II.3.b). This is thus a simple expression of average-rate progression. This paper will further develop this approach by comparing the average tax burden at several multiples of the average wage.

4. The average PIT rate and average tax wedge progression indicator

This paper presents results for the average personal income tax (PIT) rate and average tax wedge progression indicator, which are calculated as:

$$(AETR_{X2\%\ AW} - AETR_{X1\%\ AW}) / (X2\%AW - X1\%AW)$$

$AETR_{X1\%AW}$ and $AETR_{X2\%AW}$ are the average effective tax rates or wedges corresponding to two different income levels X1 and X2, respectively. The income levels are expressed as multiples of the average wage (AW). The indicator measures how the average PIT rate/ tax wedge increases per percentage point increase in income, measured as a multiple of the AW, over the X2%AW – X1%AW income range.

The indicator will be calculated using i) average PIT rates in order to capture the progressivity of the PIT system in isolation and ii) average tax wedges in order to take into account the effect on progressivity of employee and employer social security contributions, payroll taxes and cash benefits.

The following example shows how to interpret the progression rates. An average personal income tax rate progression of 0.4 over the 50%-67% of the AW income interval means that the personal average tax rate increases with 0.4 percentage points per percentage point increase in the AW over the 50%-67% income level. The increase in the average PIT rate at 67% of the AW compared to the rate at 50% of the AW then equals 0.4 multiplied by 17, i.e. 6.8 percentage points.

This example shows that values of progression rates are dependent on the level of the average tax burden. Information on progression rates should therefore be complemented with levels of average effective tax rates. This information is included in the main Taxing Wages report.[4] It implies that no normative conclusions should be drawn from the tax progression results presented in this paper. Whether it would be feasible to construct a measure which would take the progression as well as the level of the tax burden into account is left for future work.

Progression rates will be calculated for 4 different household types: singles without children, one-earner married couples without children, single parents with 2 children and one-earner married couples with 2 children. The year of reference is 2011, which is the most recent year for which updated models were available at the time this paper was prepared. The calculations will distinguish between the following 5 income intervals, which are defined as intervals between two multiples of the average wage:

- First (bottom) interval: 50%-67% of the AW
- Second interval: 67%-100% of the AW
- Third interval: 100%-133% of the AW
- Fourth interval: 133%-167% of the AW
- Fifth (top) interval: 167%-200% of the AW

The start and end income levels of these intervals are the income levels which are used throughout the Taxing Wages report. A different choice of income levels, however, might have an impact on the progression results presented in this paper, although the effect is expected to be relatively small because the progression indicators are based on average rather than marginal ETRs.

The analysis does not focus on income levels above 200% of the AW in order to limit the number of data points to be included in the figures. In many countries, however, the top statutory PIT rate only hits at

4. The average rate progression results for the year 2011 which are presented in this paper have been calculated on the basis of the country calculation models and parameters underlying the results presented in the 2011 edition of the Taxing Wages report. These models and parameters (and especially the value of the AW) may slightly differ from the ones that have been used to calculate the 2011 results presented in the current edition of the Taxing Wages report. This approach has been followed as the updated 2011 models and parameters where not yet available when this paper was written.

earnings exceeding 200% of the AW. Future work may therefore extend the analysis in this paper by focusing on earnings up to 400% of the AW, for instance.

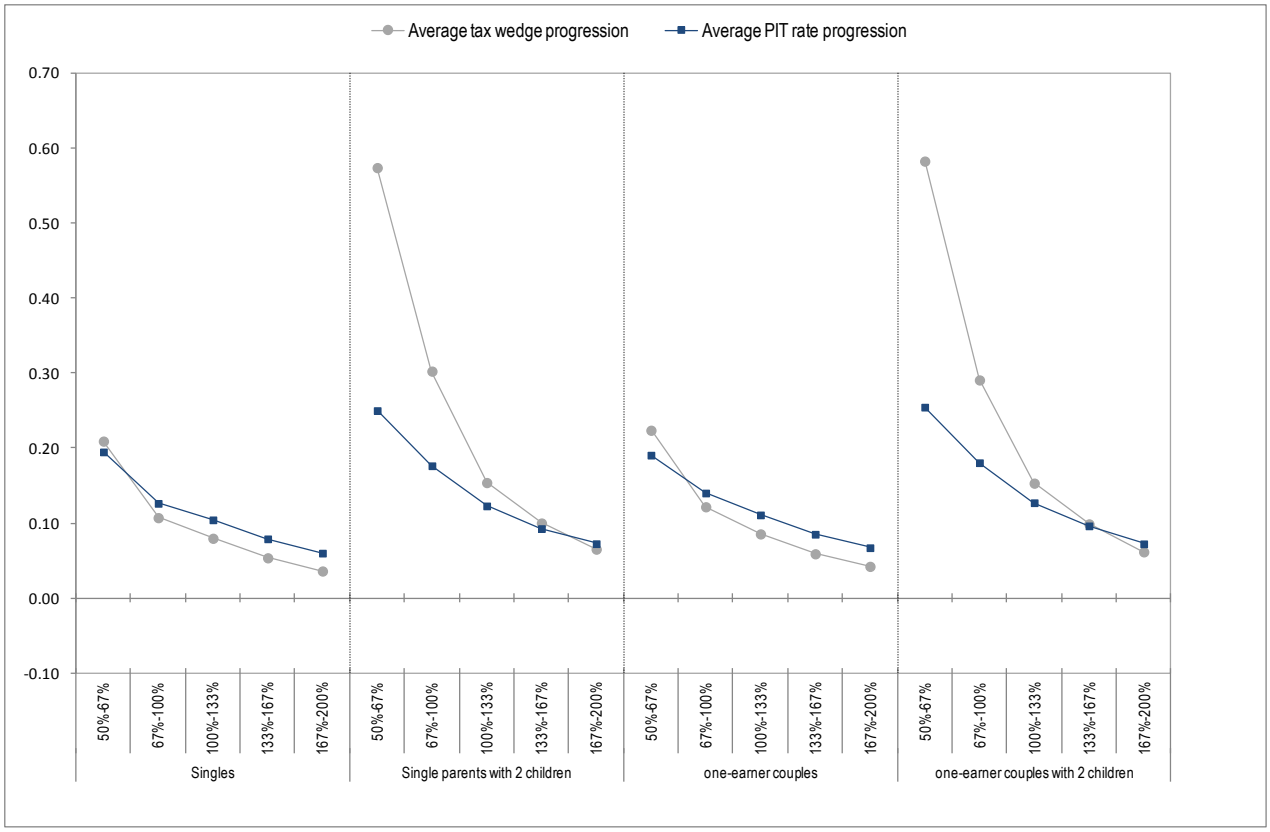
The overall progression rate for the 50%-200% of the AW income interval is also presented in this paper. Countries with a similar overall PIT rate progression over the 50%-200% of the AW income interval may nevertheless show great disparity when it comes to how progression rates vary over the 5 income intervals. This variation is captured by the standard deviation in the progression rates over the 5 income intervals.

5. PIT progressivity in 2011

Figure S.1 shows average PIT rate and tax wedge progression on average across the OECD for the four family types and the five income intervals that are considered in the analysis. The graph indicates that when only PIT is considered, the OECD average progression rate is the highest at the bottom income interval and that it decreases with income regardless of the family situation. The average tax wedge progression, which takes social security contributions and cash transfers into account, shows a similar pattern. However, some differences between the two indicators can be observed. First, the average tax wedge progression is lower than the average PIT rate progression for households without children except at the bottom income interval. As families without children usually do not receive benefits, this result shows that SSCs tend to reduce tax progressivity because they are typically levied at flat rates (and in some cases because ceilings apply). The higher tax wedge progression at the bottom income interval is the result of SSC provisions targeted at lower income levels. Second, the average tax wedge progression is higher than the average PIT rate progression for households with children, except at the top income interval. Thus, for households with children, the effect of cash benefits, which reduce the tax wedge, and the fact that these benefits are typically phased out when income increases, result in an increase in tax progressivity. This effect tends to be stronger than the flattening effect from social security contributions, except at the top income interval.

Figure S.1: Average PIT rate and tax wedge progression on average across the OECD

For 4 household types, by income intervals



5.1. Personal income taxes

5.1.1. Single taxpayers without children

The highest average PIT rate progression

For single taxpayers without children, Figure S.1 shows that, on average across the OECD, the average PIT rate progression reaches its highest level (0.195) at the bottom income interval; it decreases for each higher income interval and reaches its lowest level (0.060) at the top income interval. This pattern of progression for singles without children is observed in 13 OECD countries (Australia, Austria, Belgium, Czech Republic, Estonia, Germany, Iceland, Israel, Luxembourg, Poland, Slovak Republic, Switzerland and Turkey), although the level of progression differs across countries (see Figure S.A.1 in Annex A). There are 12 other countries where the highest average PIT rate progression for singles without children is found at the bottom income interval, but in these countries progression does not continuously decrease over the higher income intervals. These countries are Canada, Denmark, Finland, France, Hungary, Ireland, Italy, Mexico, Norway, Slovenia, Spain and the United States.

Amongst these 25 countries, the highest progression rates are observed in Spain (0.435), Ireland (0.356), France (0.353), Australia (0.339), Slovenia (0.332), Iceland (0.323) and Austria (0.321) In Spain, Ireland and France, for instance, the high bottom average PIT rate progression is caused by income dependent tax provisions targeted at low income workers. In Spain, workers with earnings below about 60% of the AW benefit from an income-tested work-related tax deduction. In Ireland, the value of the basic tax credit and the employee tax credit drops from 20% of gross earnings for workers earning 50% of the

AW to 15% for workers earning 67% of the AW. In France, workers earning 50% of the AW benefit from a special tax rebate as well as from an employment tax credit (the 'Prime Pour l'Emploi') which are exhausted for workers earning 67% of the AW. In France, the high PIT rate progression is also caused by an increase in the statutory PIT rate which hits at 45% of the AW. These examples show that high bottom PIT rate progression is typically caused by PIT provisions that lower the tax burden on especially low-income workers because i) they are fixed amounts such that they reduce the average tax rates for low-income workers more strongly than for other workers and/ or ii) because these provisions are reduced when income increases. This effect may also be strengthened by increases in statutory PIT rates.

In the other 9 OECD countries, the highest PIT rate progression is reached at higher income intervals; i.e. at the second income interval in Greece (0.121), Korea (0.087), the Netherlands (0.327) and Portugal (0.216); at the third income interval in New Zealand (0.106) and Sweden (0.210) and at the fourth income interval in Chile (0.024), Japan (0.086), and the United Kingdom (0.131). In the Netherlands, the PIT rate progression is relatively low in the bottom income interval compared to the PIT rate progression in the second income interval. Workers earning between 50% and 67% of the AW remain within the same income bracket, whereas workers that have earnings within the 67%-100% of the AW income range face an increase in their statutory PIT rate from 10.8% to 42% at about 70% of the AW. In Chile, the PIT rate progression is zero over the first three income intervals as a result of a general basic allowance which exceeds the AW income level combined with deductions for pension and unemployment insurance contributions, thereby exempting the workers from PIT on income below 134% of the AW.

The lowest average PIT rate progression

In 23 OECD countries, the lowest PIT rate progression is found at the top income interval. In addition to the 13 countries that follow the OECD average declining progression pattern shown in Figure S.1, the lowest progression is observed at the highest income interval also in Denmark, France, Greece, Ireland, Italy, Mexico, the Netherlands, New Zealand, Norway, Portugal and the United States. The lowest PIT rate progression at the top income interval is observed in France (0.048), Mexico (0.046), the United States (0.044), Turkey (0.037), the Czech Republic (0.024), the Slovak Republic (0.022), Estonia (0.011) and Poland (0.006).

In the other 11 countries, the lowest average PIT rate progression is observed at lower income intervals; i.e. at the bottom income interval in Korea (0.030) and Chile (0); at the second income interval in Sweden (0.083) and the United Kingdom (0.065); at the third income interval in Slovenia (0.073) and Japan (0.044); and at the fourth income interval in Hungary (0), Canada (0.078), Spain (0.077) and Finland (0.079). In Hungary, where a single tax rate is levied on labour income, the tax structure becomes fully proportional as from earnings at around 120% of the AW onwards when the employee tax credit is completely exhausted.

Top PIT rates

When the top PIT rate is reached, the effect of the rate structure on progressivity is exhausted. Disregarding other provisions that may affect progressivity, progression rates will thus tend to decline when the top rate is reached. Table S.2 lists the OECD countries where the top statutory PIT rate is reached within the 50%-200% of the AW income range. For most countries not included in the list, the top statutory tax rate is reached at higher income levels. The exceptions are the Czech Republic, Estonia and the Slovak Republic, which have flat PIT systems and where the top rate is reached at lower income levels (see Table I.7 of the OECD Tax Database). Amongst these countries, the PIT rate progression is declining once the top statutory PIT rate has been reached, but not in Denmark, Finland and Slovenia, where the PIT rate progression increases after the top statutory PIT rate has been reached.

Table S.2: Countries where the top statutory PIT rate is reached within the 50% to 200% of the AW income range in 2011

Country	Top statutory PIT rates[1]	
	Top tax rates	Threshold (expressed as percentage of the average wage)
(1)	(2)	(3)
Belgium	53.7%	102.5%
Denmark	52.2%	111%
Finland	49.2%	177%
Hungary	16.0%	82.5%
Iceland	46.2%	152.5%
Ireland	48.0%	100%
Netherlands	52.0%	120.5%
New Zealand	33.0%	142%
Norway	40.0%	157%
Slovenia	41.0%	136%
Sweden	56.6%	149%

1. Top statutory PIT rate - Top tax rates: These are the top statutory tax rates for the combined central and sub-central governments, for a single person without dependants based on the earnings level where the top statutory PIT rate first applies. The results, which use tax rates applicable to the tax year, take into account basic/standard income tax allowances and tax credits.

Overall PIT rate progression (for the 50%-200% of the AW income interval) and standard deviation

Figure S.2 shows the overall PIT rate progression level over the 50% to 200% of the AW income interval. The highest overall PIT progression is observed in Ireland (0.191) and the Netherlands (0.189) while the lowest overall PIT rate progression is observed in Estonia (0.037), Poland (0.021) and Chile (0.009).

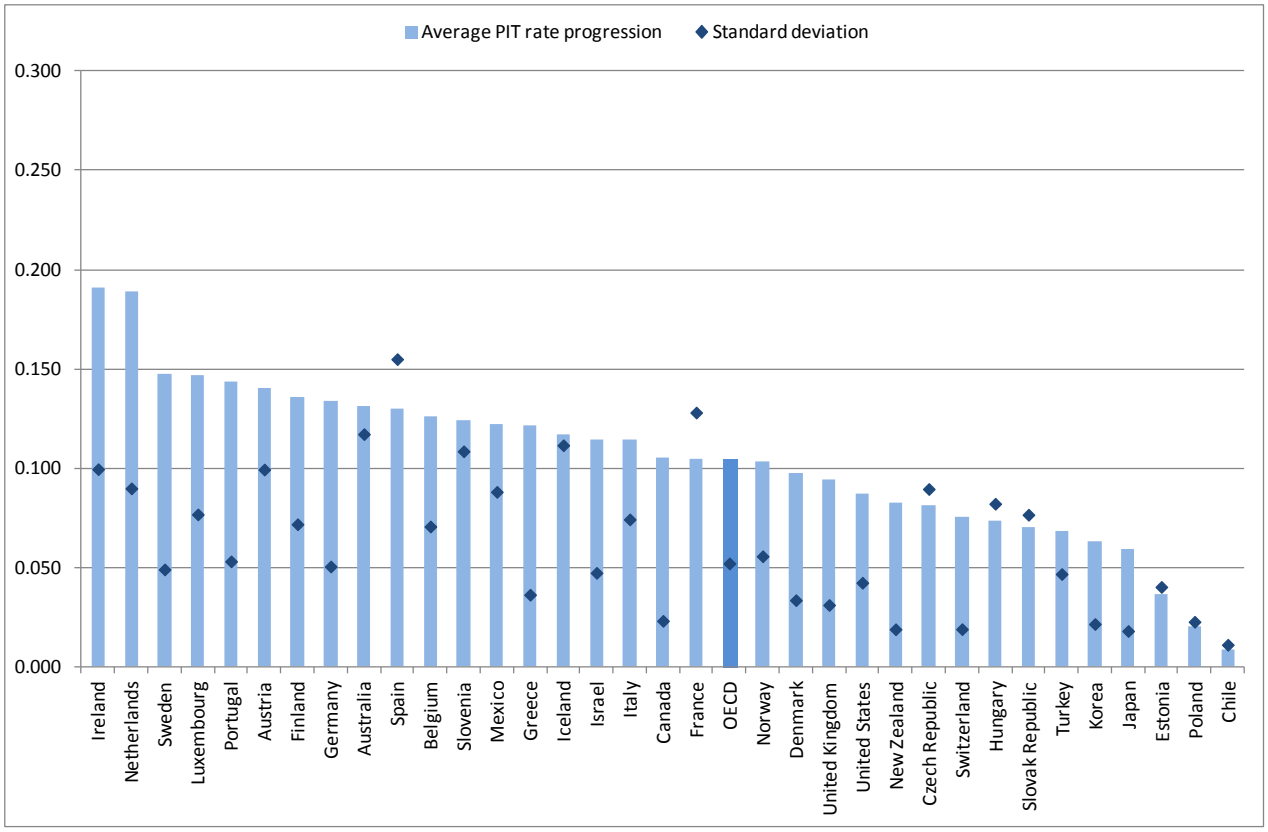
The standard deviations in Figure S.2[5] show the degree of variation in the PIT rate progression across the five income intervals for each country. Countries with similar overall PIT rate progression (over the 50% to 200% of the AW income range) may differ considerably in their rate progression across the five income intervals. France and Canada, for instance, face almost the same overall PIT rate progression for earnings ranging from 50% to 200% of the AW (around 0.105), but the PIT rate progression is relatively more constant across income intervals in Canada than it is in France (see also Figure S.A.1).

The smallest variation in PIT rate progression across income intervals (i.e. the lowest standard deviation in Figure S.2) can be found in Canada, Chile, Denmark, Estonia, Germany, Greece, Israel, Japan, Korea, New Zealand, Poland, Sweden, Switzerland, Turkey, the United Kingdom and the United States. The largest variation in PIT rate progression across income intervals (i.e. the highest standard deviation in Figure S.2) is found in the Czech Republic, France, Iceland, Ireland, Italy, Slovenia and Spain (see also Figure S.A.1).

[5] The calculations of the standard deviations give equal weight to the five income intervals, even though the first interval is smaller than the other 4 income intervals. Applying different weights would not strongly affect the values.

Figure S.2 Overall average PIT rate progression and standard deviation across income intervals[1]

For single taxpayers without children, income ranging from 50% to 200% of the AW



1. The standard deviation indicates the level of variation in the average PIT rate progression across the five income intervals for each country.

5.1.2. One-earner married couples without children

Figure S.1 shows that on average across the OECD, average PIT rate progression for one-earner married couples without children – as is the case for single workers without children – is the highest at the lowest income interval and decreases for each higher income interval. This pattern of PIT rate progression for one-earner married couples without children can be observed in 14 OECD countries: Australia, Austria, Belgium, Estonia, France, Germany, Greece, Iceland, Israel, Italy, Norway, Poland, Switzerland and Turkey.

The highest PIT rate progression is found at the bottom and the lowest PIT rate progression is found at the top income interval in a majority of OECD countries. In addition to the 14 countries mentioned above, the highest PIT rate progression is observed at the bottom income interval in another 11 countries: Canada, Denmark, Finland, Hungary, Japan, Mexico, Portugal, Slovenia, Spain, the United Kingdom and the United States. In these countries, however, the progression does not follow the decreasing pattern across income intervals as shown in Figure S.1. In the 10 remaining countries, the highest PIT rate progression is found at one of the three income intervals between the bottom and the top. Thus, there is no country where the highest PIT rate progression can be found at the top income interval.

Among these countries the highest progression rates are found in Iceland (0.486), Canada (0.416), Australia (0.342), Belgium (0.327), Italy (0.326), Austria (0.321) and Spain (0.309). As a comparison, the average PIT rate progression at the bottom interval, on average across the OECD, is 0.191.

In 20 OECD countries, the lowest PIT rate progression for one-earner married couples is found at the top income interval. These include the 14 countries which follow the OECD average progression pattern shown in Figure S.1 plus Denmark, Hungary, Mexico, the Netherlands, New Zealand and Portugal. Among these, the lowest progression rates can be found in Hungary (0), Poland (0.011), Estonia (0.022), France (0.024) and Turkey (0.039).

PIT rate progression for one-earner married couples compared to single taxpayers without children

Figure S.1 shows that the OECD average PIT rate progression pattern for one-earner married couples without children is similar to the pattern for singles without children. On average, however, progression rates are higher for one-earner couples at all income intervals, although the differences are very small. The higher tax progressivity is typically the result of tax reliefs for dependant spouses, which are tapered out with income or which reduce the average effective tax rate more for lower income earners (e.g. in case of a lump-sum tax credit).

The PIT rate progression for one-earner married couples is higher than or equal to the rates for singles at all income intervals in 21 countries: Australia, Austria, Belgium, Canada, Chile, Denmark, Estonia, Finland, Greece, Hungary, Iceland, Israel, Italy, Mexico, the Netherlands, New Zealand, Norway, Poland, Sweden, Turkey and the United Kingdom. In some of these countries (Canada, Denmark, Greece, Iceland, Italy, the Netherlands, Norway, Poland, Turkey and the United Kingdom) the most notably higher rate progression can be found at the bottom income interval(s). This is also the case in Japan. The difference in PIT rate progression at the bottom income interval is the largest in Canada as a result of the working income tax credit which is more generous for couples than for singles without dependants. In 8 of these countries (Austria, Chile, Finland, Hungary, Israel, Mexico, New Zealand and Sweden), the PIT rate progression for one-earner married couples and for singles is exactly the same at all income intervals, implying that no special provisions are granted for dependent spouses.

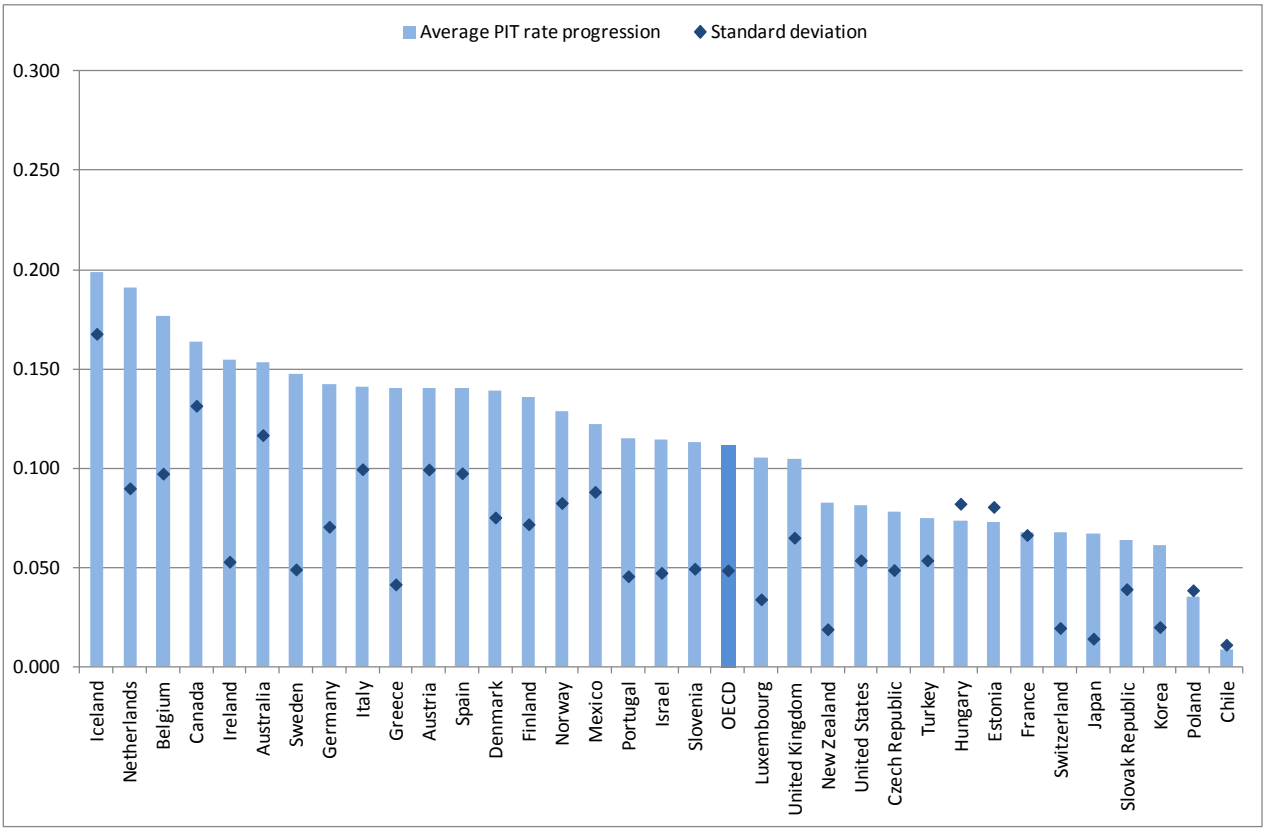
In 13 countries (the Czech Republic, France, Germany, Ireland, Japan, Korea, Luxembourg, Portugal, the Slovak Republic, Slovenia, Spain, Switzerland and the United states) PIT rate progression is lower for one-earner couples than for singles at one or several income intervals. In the Czech Republic, France, Ireland, Korea, Luxembourg, Portugal, Slovak Republic, Slovenia and Switzerland, the PIT rate progression is lower for one-earner couples than for singles at the lowest income interval(s). Only two countries, France and Portugal, have significantly lower progression for one-earner couples than for singles at the top income interval. In both countries, the reduction in progressivity also at higher income levels is the result of i) the joint taxation system which allows the total household income to be split between the partners and ii) the fact that we focus on one-earner couples.

Overall PIT rate progression (for the 50%-200% of the AW income interval) and standard deviation

Figure S.3 shows the overall PIT rate progression over the 50%-200% of the AW income interval for one-earner married couples without children as well as the standard deviation across income intervals for each country. In line with previous observations, we find that the OECD average overall PIT rate progression is somewhat larger for one-earner couples without children (0.111) than for singles without children (0.104), while the OECD average standard deviation is slightly lower (0.49 versus 0.52).

Figure S.3: Overall average PIT rate progression and standard deviation across income intervals[1]

For one-earner married couples without children, income ranging from 50% to 200% of the AW



1. The standard deviation indicates the level of variation in the average PIT rate progression across the five income intervals for each country.

The position of countries in Figures S.2 (for single tax payers) and S.3 (for one-earner married couples) is very similar, with a few notable exceptions. The largest difference in the overall PIT rate progression for singles and one-earner couples for the 50%-200% of the AW income interval can be found in Iceland – the rates are 0.117 for singles and 0.199 for one-earner couples – because of the standard marital status relief which allows principal earners in married couples to use their spouse's unutilized basic tax credit. The overall PIT rate progression is also significantly higher for one-earner couples than for singles in Belgium (0.173 versus 0.126) and Canada (0.163 versus 0.106). In Belgium a notional amount of income can be transferred between spouses if one of them earns no more than 30% of the couples' combined income. Also, for taxpayers with dependent spouses a larger amount of income is exempt from income tax. Canada provides a tax credit for dependent spouses (or other eligible dependants) which is decreasing in the income of the dependant; in addition, the province used for calculations (Ontario) has a low-income tax reduction that is more generous for taxpayers with dependent spouses than for those with no dependents.

A few countries have notably higher PIT rate progression over the 50%-200% of the AW income interval for singles than for one-earner couples. In Luxembourg, the overall PIT rate progression is 0.147 for singles without children and 0.106 for one-earner couples without children. In France, these figures are respectively 0.105 and 0.068. Both these countries have joint taxation for spouses, and the tax liability for one-earner couples without children is calculated in a similar way; the statutory tax rate schedule is applied to one half of total household income, and the resulting tax liability is then doubled. As both countries have progressive rate schedules, the marginal tax rate will be lower for one-earner couples than for singles with

the same income. In Ireland the overall PIT rate progression is 0.191 for singles without children and 0.155 for one-earner couples without children. The lower progression for married couples in Ireland, which also taxes spouses jointly, is the result of the higher amount of taxable income which is taxed at the bottom statutory PIT rate.

Many of the countries for which the difference in overall PIT rate progression between singles and one-earner married couples without children is relatively large are also characterized by large differences in standard deviations. The largest difference in standard deviations can be found in Canada (standard deviation of 0.023 for singles versus 0.131 for one-earner couples without children). Large differences in standard deviations also exist in France and Slovenia.

5.1.3. One-earner married couples with children and single parents

Figure S.1 shows that the OECD average PIT rate progression pattern for single parents is very similar to the pattern for one-earner couples with children, and that progression rates are higher for households with children than for singles without children. As for families without children, the OECD average PIT rate progression for households with children is the highest at the bottom income interval and then decreases for each higher income interval.

As is the case for households without children, the highest level of PIT rate progression for households with children is found at the bottom income interval in a majority of OECD countries. This is the case in 21 countries: Australia, Austria, Belgium, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Iceland, Israel, Italy, Japan, Mexico, Norway, Slovak Republic, Switzerland, Turkey and the United States.

A pattern of decreasing rates of progression over the 5 income intervals for one-earner married couples with children is observed in 15 countries: Australia, Austria, Belgium, Czech Republic, Estonia, Germany, Greece, Iceland, Israel, Italy, Norway, Slovak Republic, Switzerland, Turkey and the United States. These countries have a similar decreasing pattern for single parents, except for Israel and the United States.

PIT rate progression for households with children compared to singles without children

The OECD average PIT rate progression for households with children is higher than for singles without children mainly because many OECD countries provide tax reliefs for children. There are 16 countries where the PIT rate progression for one-earner married couples with children is higher than for singles without children at all income intervals. These countries are Australia, Austria, Belgium, Canada, Denmark, Estonia, Germany, Iceland, Israel, Italy, Japan, the Netherlands, Norway, Turkey, the United Kingdom and the United States. In 4 countries (Chile, Finland, Mexico and Sweden), the level of PIT rate progression for one-earner couples with children is the same as for singles without children at all income intervals. These countries have no PIT reliefs for dependent children; they do have (except for Mexico) cash transfers for children, which will be reflected in higher tax wedge progression (see below).

A comparison of PIT rate progression for single parents versus single taxpayers without children shows that in 14 countries (Australia, Austria, Belgium, Canada, Czech Republic, Estonia, Greece, Germany, Italy, Japan, Norway, Slovak Republic, Turkey and the United Kingdom), the PIT rate progression is higher for single parents at all income intervals, while in 6 countries (Chile, Denmark, Finland, Iceland, Mexico and Sweden) the progression rates are the same at all income intervals. Only Switzerland has lower progression for single parents than for singles without children at all income intervals. In New Zealand the PIT rate progression is lower for single parents at the two lowest income intervals while there is no difference in progression rates at the remaining intervals.

The largest increase in progression rates for households with children relative to singles without children can be found in the two first income intervals. This reflects that in many countries tax reliefs for children are tapered with income, but also that lump sum provisions contribute to progressivity because they reduce average tax rates more for low-income households.

The largest increase in PIT rate progression for households with children compared to singles without children can be found in the United Kingdom and the United States. In these countries, the PIT rate progression for singles without children at the bottom income interval is 0.130 and 0.154, respectively. In the United Kingdom the comparable rates for one-earner married couples with children and single parents are 1.036 and 0.975 respectively. In the United States the rate is 1.258 for both household types with children. The higher progression rates for households with children in the United Kingdom are the result of the Child Tax Credit (CTC), which is a non-wastable tax credit available to low- and middle-income families. Low-income workers with children in the United States are also entitled to a tax credit that is tapered with income. Unlike the CTC in the United Kingdom, which is granted solely based on household income, the tax credit in the United States also depends on marital status.

In two other countries (Estonia and Germany), the PIT rate progression is at least twice as high for households with children than it is for singles without children. In Estonia, the PIT rate progression at the bottom interval is 0.109 for singles without children, 0.218 for single parents and 0.237 for one-earner married couples with children. These figures are respectively 0.220, 0.524 and 0.554 in Germany. Both countries have lump-sum tax allowances/credits for children. In addition, in Greece and Israel progression is more than twice as high for one-earner couples, but not for single parents. The PIT rate progression at the bottom interval in Israel is 0.197 for singles without children and 0.482 for one-earner couples with children. In Greece these figures are 0.120 and 0.265, respectively.

However, in some countries the PIT rate progression at the bottom interval is lower for households with children than for singles without children. The largest decrease in progression for households with children compared to singles without children can be found in Slovenia (0.332 for singles without children, 0.002 for single parents and 0 for one-earner couples with children), where the family allowance is based on the number of children and not on household income, thereby avoiding high marginal ETRs while strongly reducing the average ETR. There is also a large decrease in Spain (from 0.435 for singles without children to 0.133 for single parents and 0 for one-earner couples with children), where single parents and one-earner married couples do not have to pay income tax on earnings below 63% and 68% of the AW, respectively, as a result of the combined effect of joint taxation allowances, tax provisions for children and a work related tax credit.

Ireland is among the countries with the highest PIT rate progression for singles without children (rate of 0.356) in the bottom income interval, while the PIT rate progression for one-earner couples with children and single parents at the same income interval is amongst the lowest (0.066 and 0.062, respectively). This is because of a wider bottom rate taxable income band for families with children.

In Hungary and Poland, the PIT rate progression at the bottom income interval is positive for singles without children, but it is zero for both household types with children. Also, in Luxembourg the PIT rate progression at the bottom income interval is positive for singles without children, but zero for single parents (but not for one-earner couples with children). In these countries, tax reliefs related to marital status and/or children are large enough to ensure that the households with children pay no income tax throughout the entire bottom income interval.

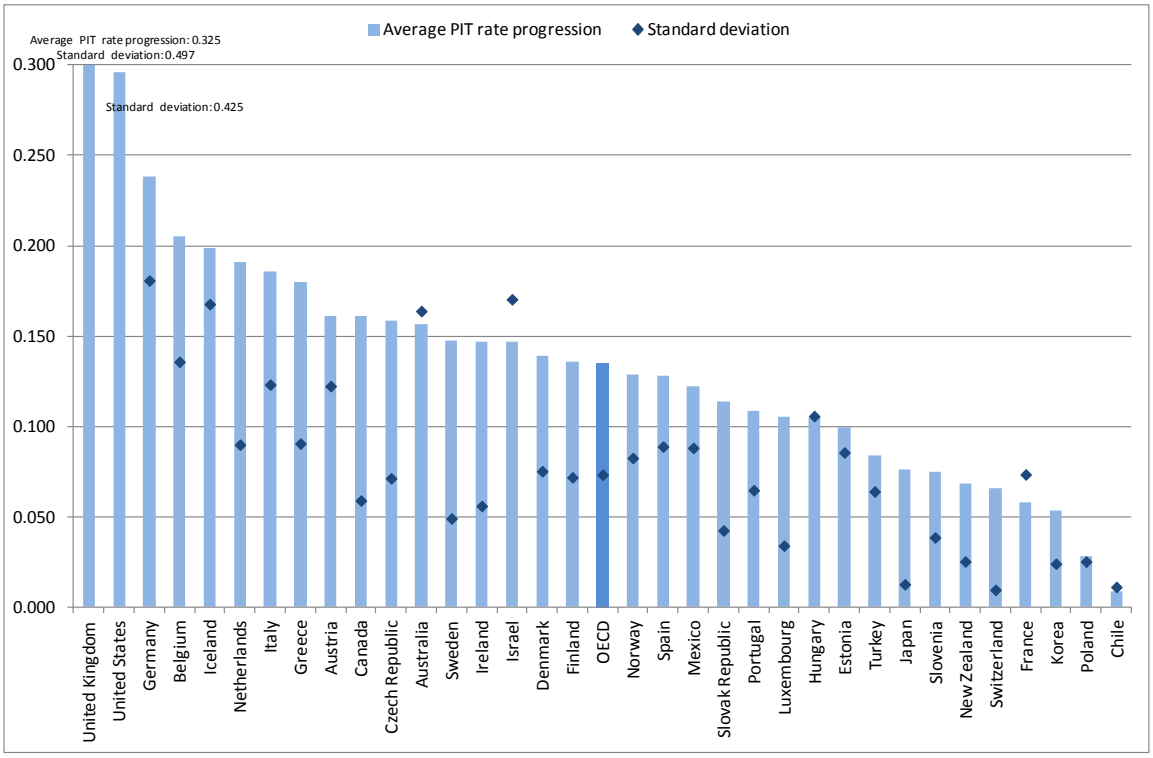
Overall PIT rate progression (for the 50%-200% of the AW income interval) and standard deviation

Figures S.4 a) and b) show that the overall PIT rate progression over the 50%-200% of the AW income interval is higher for single parents (0.131) and one-earner couples with children (0.135) than for singles without children (0.104). Overall progression is at least twice as high for households with children than for singles without children in Estonia, the United Kingdom and the United States. Some countries are characterized by lower overall progression for households with children; this is the case in France, Ireland, Korea, New Zealand, Slovenia and Switzerland. In Luxembourg, Portugal and Spain, the overall progression for one-earner couples with children is lower than for singles without children.

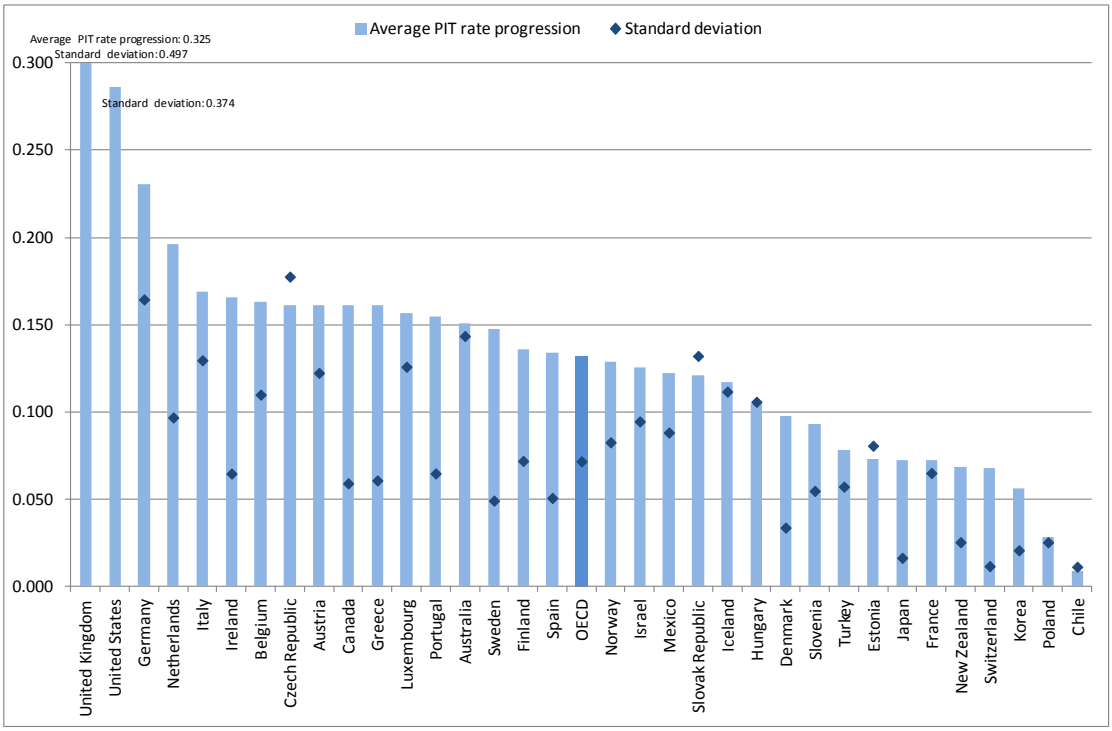
The OECD average standard deviations for single parents (0.072) and one-earner married couples with children (0.073) are higher than for singles without children (0.052). Countries in which the overall progression for households with children is higher than for singles without children also tend to have higher standard deviations – this is especially the case in the United Kingdom, the United States and Germany – but there are some exceptions. In the Czech Republic, Japan and the Slovak Republic, the overall progression for one-earner couples with children exceeds the level for singles without children, but the standard deviations are smaller. This is also the case in France and Spain when comparing overall progression and standard deviations for single parents and singles without children. New Zealand, on the other hand, has a lower overall progression for both household types with children than for singles without children, but the standard deviation is slightly higher. This also holds for one-earner couples with children in Portugal.

Figure S.4: Overall average PIT rate progression and standard deviation across income intervals[1]

a) For one-earner married couples with 2 children, income ranging from 50% to 200% of the AW



b) For single parents with 2 children, income ranging from 50% to 200% of the AW



1. The standard deviation indicates the level of variation in the average PIT rate progression across the five income intervals for each country.

5.2. Tax Wedge

This section focuses on the average tax wedge progression across the five income intervals. In addition to the progressivity of the PIT system, the average tax wedge progression also takes the impact of employee and employer social security contributions as well as cash transfers on tax progressivity into account.

Figure S.1 shows that the OECD average tax wedge progression follows the same pattern as the OECD average PIT rate progression. The highest OECD tax wedge progression is observed at the bottom income interval; it decreases over higher income intervals and reaches its lowest level at the top income interval regardless of the taxpayer's family situation. However, the level of progression differs considerably. For households *without children*, the average tax wedge progression is lower than the average PIT rate progression except at the bottom income interval. In contrast, for households *with children*, the average tax wedge progression is higher than the average PIT rate progression except at the top income interval.

5.2.1. Single taxpayers

Highest and lowest tax wedge progression levels

In line with the OECD average, the tax wedge progression decreases over higher income intervals in 16 countries: Australia, Austria, Belgium, the Czech Republic, Estonia, France, Germany, Iceland, Israel, Luxembourg, the Netherlands, Poland, the Slovak Republic, Spain, Switzerland and Turkey. In these countries and in 10 other countries (Canada, Finland, Hungary, Ireland, Italy, Mexico, Norway, Slovenia, the United Kingdom and the United States), the highest tax wedge progression is found at the bottom income interval. Among those countries, the highest tax wedge progression is found in France (0.701),

Ireland (0.641), Belgium (0.534), Israel (0.339), Spain (0.335), Australia (0.320), the Netherlands (0.318) (see Figure S.A.1).

In the countries that do not follow the OECD average decreasing tax wedge progression pattern, the highest tax wedge progression is observed either at the second income interval – in Portugal (0.175), Greece (0.0.94) and Korea (0.079)), at the third income interval – in Sweden (0.134), New Zealand (0.106) and Denmark (0.096), or at the fourth income interval – in Japan (0.052) and Chile (0.024), but not at the top income interval.

The lowest tax wedge progression is found at the top income interval in the 16 countries which follow the OECD average progression pattern and also in Greece, Ireland, Italy, Japan, Mexico, New Zealand, Norway, Portugal, the United Kingdom and the United States. The tax wedge progression turns negative at the top income interval (i.e. the tax system becomes regressive) in Spain (-0.022), Germany (-0.031) and Austria (-0.041). These countries have an income ceiling for employee and employer SSCs which is reached at around 150% of the AW. In other words, while the income tax continues to increase with income, the amount of SSCs does not increase for earnings exceeding the SSC ceiling, resulting in decreasing average tax wedges.

Comparing tax wedge with PIT rate progression

For single taxpayers without children, on average across the OECD, the average tax wedge progression is lower than the average PIT rate progression except at the bottom income interval (see Figure S.1). With respect to individual countries, this result can be observed in Belgium, Ireland and the Netherlands (see Figure S.A.1). In Canada and France, the tax wedge progression is lower than the PIT rate progression from the third income interval onwards. For the United Kingdom, it falls below the PIT rate progression at the fourth income interval. In Israel, the tax wedge progression remains higher than the PIT rate progression across the five income intervals. All of these countries implement special provisions that reduce employee and/ or employer SSCs for low incomes.

In the other 25 countries, the tax wedge progression is lower than (or in a few cases equal to) the PIT rate progression at all income levels. In Hungary the tax wedge and PIT rate progression are zero at the 2 last income intervals because of a flat average effective tax rate at higher income levels. In Chile and New Zealand, the tax wedge progression is equal to the PIT rate progression for each income interval. New Zealand does not levy SSCs and SSCs in Chile are only levied on earnings exceeding 3 times the AW.

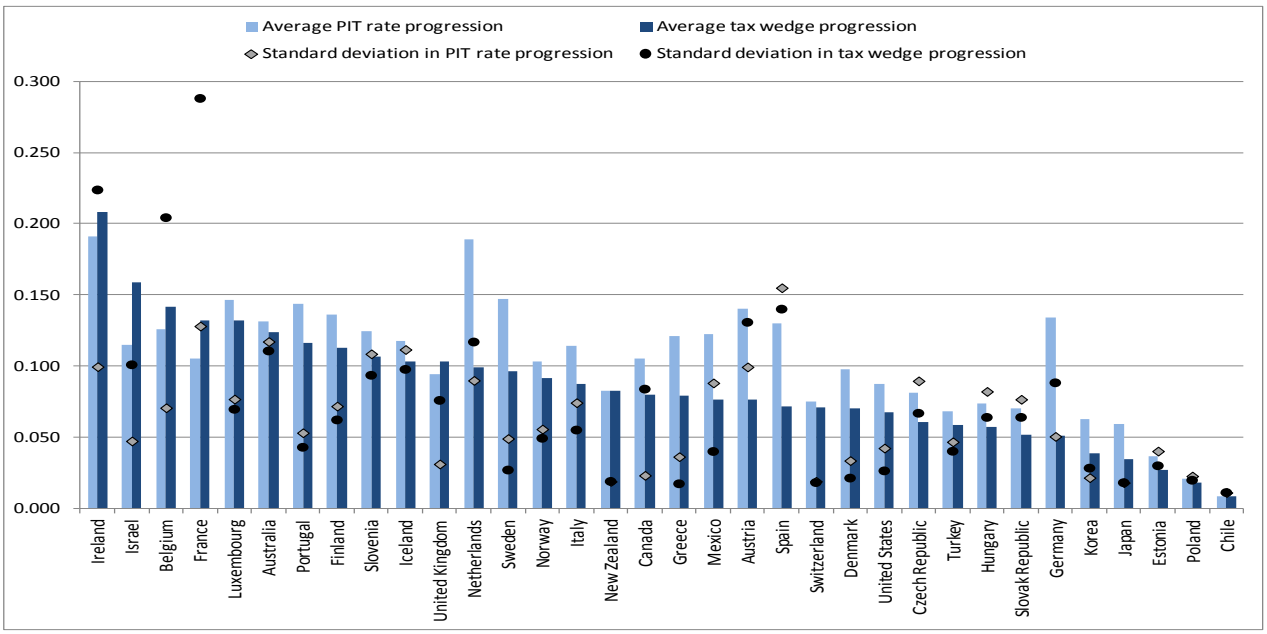
These results show that social security contributions tend to reduce tax progressivity, basically because they are levied at a flat rate. However, some countries have employee and employer SSC provisions explicitly targeted at low-income workers and/ or a basic exemption for SSCs from which low-income workers benefit relatively more; this explains the higher tax progressivity at the bottom income interval in some countries (and for the OECD on average).

Overall tax wedge and PIT rate progression for the 50%-200% of the AW income interval

This conclusion is confirmed when comparing the overall PIT rate and tax wedge progression for the 50% to 200% of the AW income interval. Figure S.5 shows that the overall progression decreases for most OECD member countries when social security contributions are taken into account. However, overall progression increases in Belgium (+0.016 percentage points), France (+0.027 percentage points), Ireland (+0.018 percentage points), Israel (+0.044 percentage points) and the United Kingdom (+0.009 percentage points) mainly because of social security reductions targeted at low incomes. This also explains why in those countries, the standard deviation in tax wedge progression across income levels is substantially higher than the standard deviation in PIT rate progression.

Figure S.5: Overall average PIT rate and tax wedge progression and standard deviation across 5 income intervals[1]

For single taxpayers without children, income ranging from 50% to 200% of the AW



1. The standard deviation indicates the level of variation in the average PIT and tax wedge progression across the five income intervals for each country.

In most of the other OECD countries, the overall PIT rate progression is higher than the overall tax wedge progression, while at the same time the standard deviation in PIT rate progression is higher than the standard deviation in tax wedge progression. This does not, however, apply to Austria, Canada, Germany, Korea and the Netherlands. Although social security contributions reduce the tax progressivity in those countries, the variation in tax wedge progression between the bottom and top income intervals is particularly large. The tax wedge progression measure is negative in Austria and Germany at the highest income interval (Figure S.A.1).

5.2.2. One-earner married couples without children

Highest and lowest tax wedge progression levels for one-earner couples without children

In line with the OECD average, the wedge progression decreases at higher income intervals in 16 OECD countries: Australia, Austria, Belgium, Estonia, France, Greece, Germany, Iceland, Israel, Italy, the Netherlands, Norway, Poland, Spain, Switzerland and Turkey. There are 6 other countries where the highest tax wedge progression is found at the bottom income interval and the lowest progression at the top income interval (Denmark, Ireland, Japan, Mexico, Portugal, and the United Kingdom). In Canada, Finland, Hungary, Slovenia and the United States, the highest tax wedge progression is also observed at the bottom income interval but the lowest progression is found in the fourth income interval. As it is for single workers, the tax wedge progression is negative at the top income interval in Austria (-0.041), Germany (-0.031) and Spain (-0.013).

Comparing tax wedge progression with PIT rate progression

As for single taxpayers, Figure S.1 shows that, on average across the OECD, tax progressivity is lowered with the inclusion of social security contributions except at the bottom income interval; this pattern can be found in Belgium, Canada, France, Ireland, the Netherlands and the United Kingdom. The

country charts in Annex A also reveal that in most other countries, the average tax wedge progression is lower than the average PIT rate progression at all income intervals. There are however some exceptions. In Israel, the tax wedge progression remains higher than the PIT rate progression across the five income intervals. In Chile and New Zealand, the tax wedge progression is equal to the PIT rate progression at all income intervals. Finally, in Hungary, the tax wedge progression is lower than the PIT rate progression in the first three income intervals after which the rates become the same.

The very high tax wedge progression in Australia at the bottom income interval is the result of the "Newstart Allowance", which is an income tested cash transfer towards the non-employed spouse.

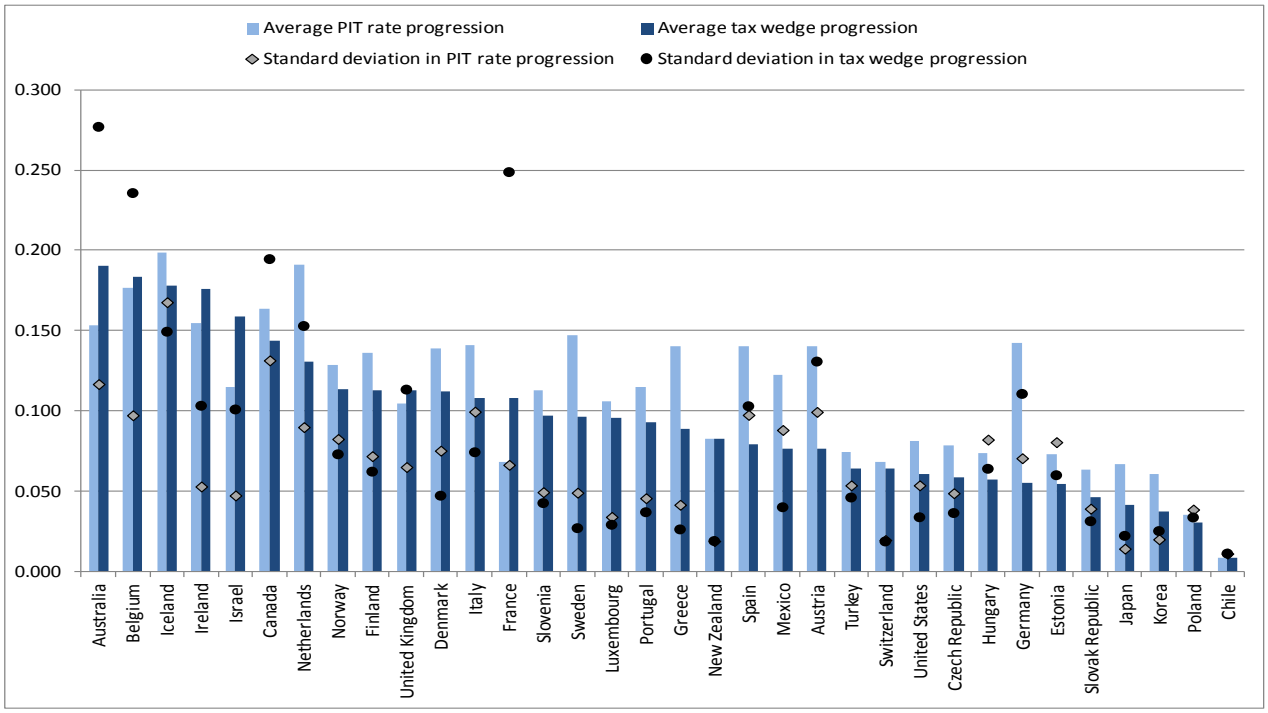
Overall tax wedge and PIT rate progression for the 50%-200% of the AW income interval

In most countries, the overall average tax wedge progression for income ranging from 50% to 200% of the AW is lower than the overall average PIT progression (see Figure S.6). Similar to the results for single taxpayers, however, tax wedge progression higher than PIT rate progression is found in Belgium, France, Ireland, Israel and the United Kingdom. In contrast with the results for single taxpayers, in Australia the overall average tax wedge progression exceeds the overall average PIT rate progression as a result of the 'Newstart Allowance'. The variation in the tax wedge progression across income levels in these countries is also higher than the variation in PIT rate progression.

In most of the other OECD countries, the overall PIT rate progression is higher than the overall tax wedge progression, while at the same time the standard deviation in the PIT rate progression is higher than the standard deviation in the tax wedge progression. In Austria, Canada, Germany, Japan, Korea, the Netherlands and Spain, however, the standard deviation in tax wedge progression is higher than in PIT rate progression.

Figure S.6: Overall average PIT rate and tax wedge progression and standard deviation across 5 income intervals[1]

For one-earner married couples without children, income ranging from 50% to 200% of AW



1. The standard deviation indicates the level of variation in the average PIT and wedge progression across the five income intervals for each country.

5.2.3. One-earner married couples with children and single parents

Figure S.1 shows that, in contrast to the results for households without children, the OECD average tax wedge progression exceeds the OECD average PIT rate progression except at the top income interval. The difference is very large at the second but especially at the bottom income interval. These results are confirmed in the country charts in Annex A.

Figures S.7a) and b) show that the overall average tax wedge progression over the 50% to 200% of the AW income range exceeds the overall average PIT rate progression in more than 25 countries for both single parents and one-earner couples with 2 children. In fact, the overall average tax wedge progression is at least twice as high as the overall average PIT rate progression in Australia, Canada, Chile, France, Ireland, New Zealand, Slovenia and Switzerland for both one-earner couples and single parents with children, in Luxembourg and Poland only for one-earner couples with children and in Denmark only for single parents.

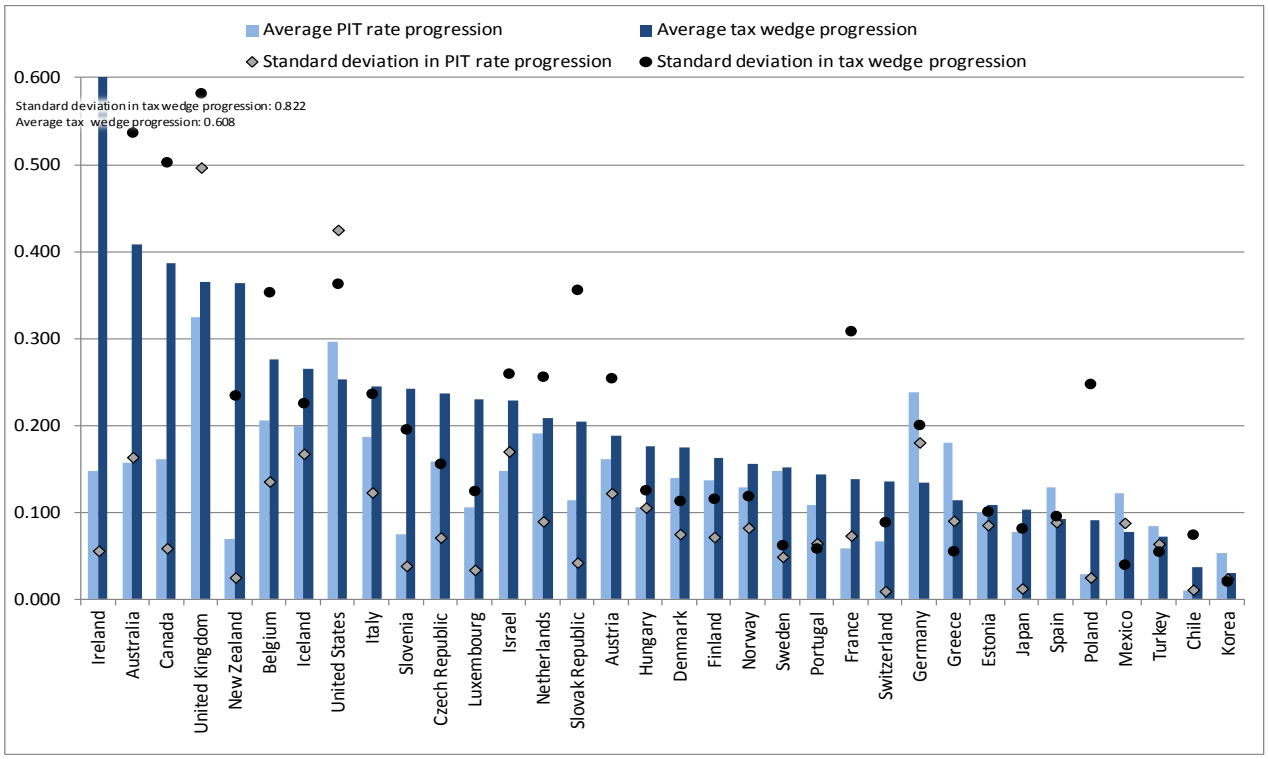
These results demonstrate that cash benefits, which are mainly provided to households with children, strongly increase tax progressivity. Moreover, the effect of cash benefits on progressivity considerably outweighs the flattening effect of SSCs for all except the top income level.

Figures S.7 also confirm the positive correlation between the overall average PIT rate/ tax wedge progression and the corresponding standard deviation in progression over the 5 income intervals.

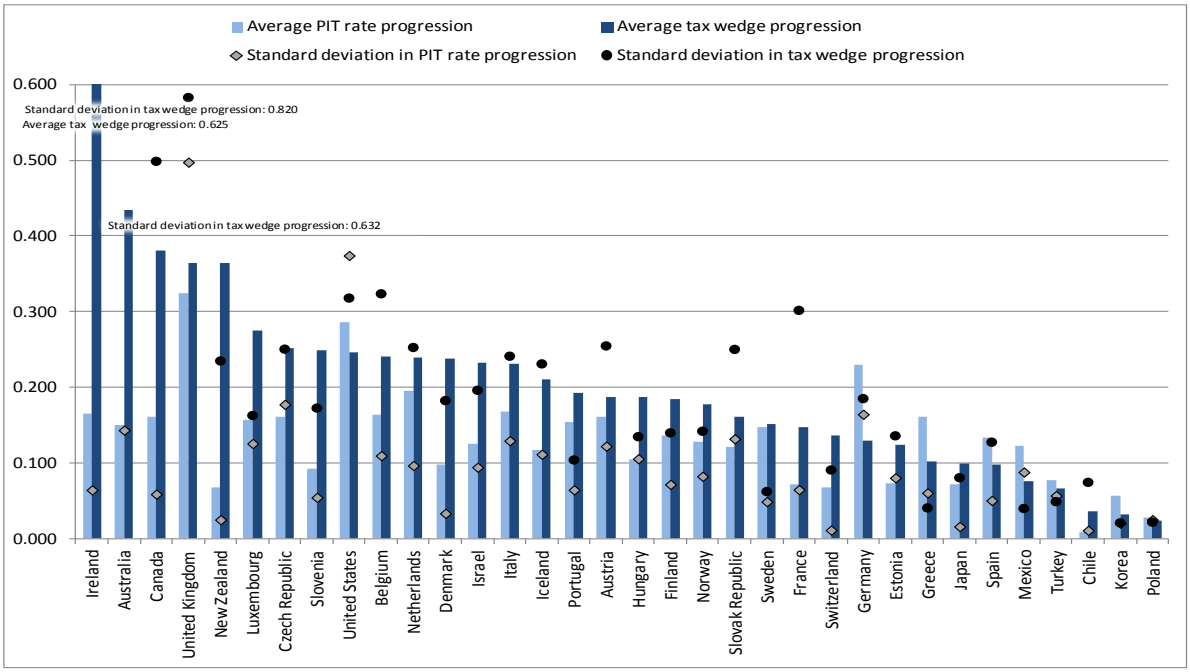
However, as was the case for households without children, the overall average tax wedge progression is lower than the overall average PIT rate progression for both household types with children in Germany, Greece, Korea, Mexico, Spain, Turkey and the United Sates, and only for single parents in Poland.

Figure S.7: Overall average PIT rate and tax wedge progression and standard deviation across 5 income intervals[1]

a) For one-earner married couples with 2 children, income ranging from 50% to 200% of the AW



b) For single parents with 2 children, income ranging from 50% to 200% of the AW



1. The standard deviation indicates the level of variation in the average PIT and tax wedge progression across the five income intervals for each country.

5.2.4. Differences between PIT and tax wedge progression for households with and without children

Figure S.8 a) and b) show values for the average tax wedge progression *net of* the average PIT rate progression at the bottom income interval for families without and with 2 children. A positive value implies that the average tax wedge progression exceeds the PIT rate progression. Figures showing the difference between the average tax wedge and PIT rate progression for the other income intervals are included in Annex B. There are separate figures for single taxpayers (panel a) and one-earner married couples (panel b).

The differences between the average tax wedge and PIT rate progression show the impact of social security contributions, payroll taxes and cash benefits on tax progressivity. As families without children typically do not receive cash benefits, the difference in the tax wedge and PIT rate progression for families without children isolates, to a large extent, the effect of SSCs and payroll taxes on progressivity. The change in progression rates for families with children shows the combined impact of SSCs/payroll taxes and cash benefits. A comparison of panels a) and b) indicates the impact of marital status, and especially i) whether SSC provisions and especially cash benefits have a stronger impact on progressivity for married couples than for single taxpayers and ii) how tax provisions targeted at low-income or dependant spouses, which are typically implemented through the PIT, interact with SSCs and cash benefit provisions.

Figures S.8 show that, for families without children at the bottom income interval, SSCs tend to reduce progressivity in a majority of OECD countries. However, in Canada, the United Kingdom, Israel, the Netherlands, and especially in Ireland, Belgium and France, SSCs strongly increase tax progression at the bottom income interval. As SSCs tend to be levied at flat rates, these results indicate that these countries have special SSC provisions (i.e. reductions) which are targeted at low-income workers. The average tax wedge progression is considerably higher than the PIT rate progression also in Australia but only for one-earner married couples. This is the result of the “Newstart Allowance”, as indicated before.

When focusing on the difference in progression for families with children, Figure S.8 shows that the impact of cash benefits strongly outweighs the flattening impact of SSCs in most OECD countries. Cash benefits reduce the average tax wedge especially for low-income earners because benefits are typically larger as a percentage of wage earnings for lower income levels, thereby leading to higher progression when income increases. This impact on progressivity is strengthened if benefits are tapered out with income. The average tax wedge progression is below the average PIT rate progression for single parents at the bottom income interval only in Greece, Germany, Turkey, Mexico and the United States.

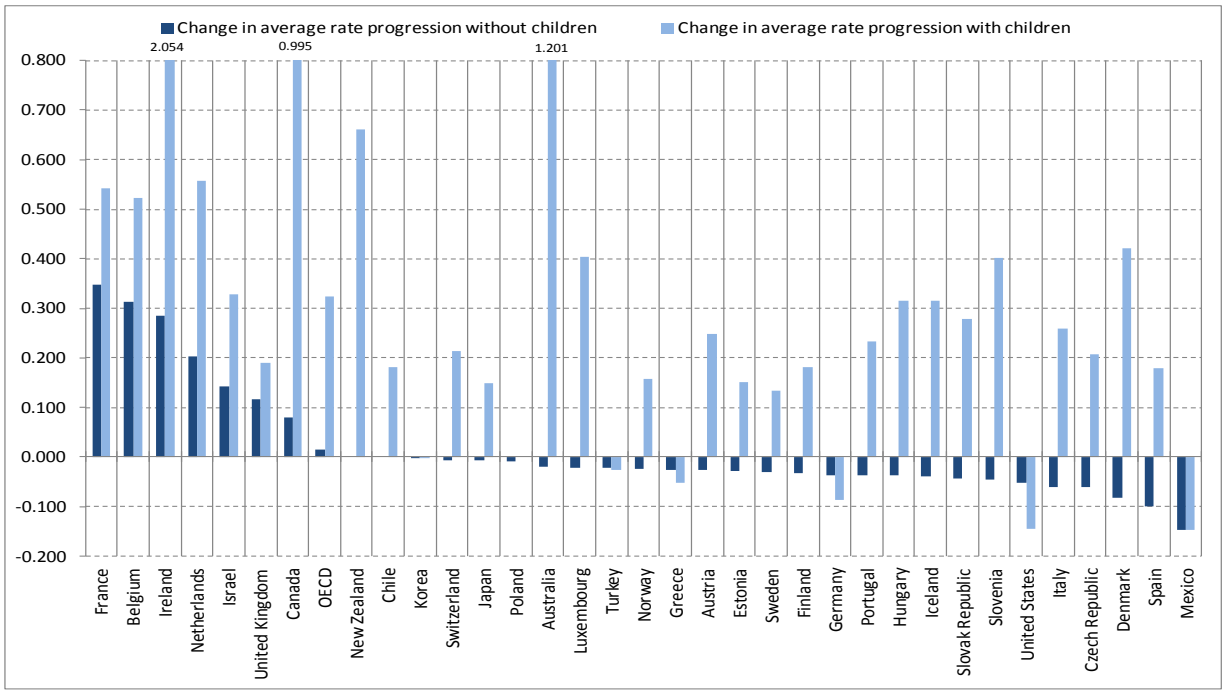
Although the differences are very small, a comparison of panel a) and b) also shows that the difference in the progression is slightly higher for one-earner married couples without children at the bottom income interval especially in France and the Netherlands. For families with children, the change in tax progression is considerably higher for one-earner married couples than for single taxpayers in the Slovak Republic, Poland and Slovenia, while it is significantly lower in Iceland and Denmark.

Annex B shows that the effect of SSC provisions targeted at low incomes on tax progression is completely exhausted in the second income interval in Belgium, Ireland and the Netherlands or is strongly reduced in Canada, France, Israel and the United Kingdom. The flattening effect of SSCs continues to be observed in the figures for higher income intervals.

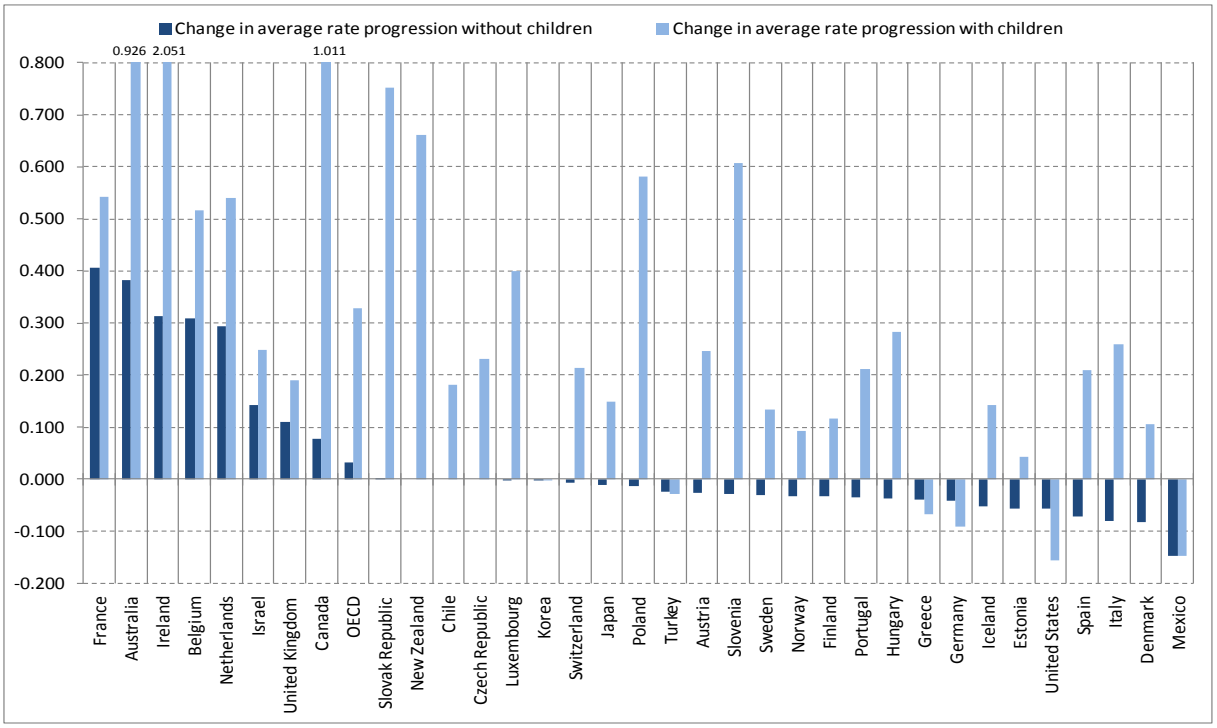
Also the impact of cash transfers on tax progression is considerably smaller in the second income interval in most countries. However, cash transfers continue to increase tax progression, although to a smaller extent than in the bottom income interval, in Australia, Canada, Ireland, New Zealand and Slovenia, which are countries with generous benefits. This indicates that these benefits continue to be tapered out over the second income interval.

Figure S.8: Average tax wedge net of PIT rate progression for households with and without children at the bottom income interval

a) For single taxpayers



b) For one-earner married couples



From the third income interval onwards, no large progression increases are observed as a result of SSCs and benefits. However, cash benefits continue to increase progression to some extent especially in Australia, Denmark, Ireland, New Zealand and Slovenia. The SSC flattening effect remains relatively significant in Austria, Germany, and Spain whereas it becomes marginal in other countries.

This analysis has demonstrated that SSC provisions and cash benefits increase tax progression especially at the bottom and to a smaller extent the middle income intervals. Tax progression at higher income intervals is more influenced by the progressivity of the PIT rate schedule.

6. Conclusion

This paper has presented results on average PIT rate and average tax wedge progression for 5 income intervals (50%-67%, 67%-100%, 100%-133%, 133%-167%, 167%-200% of the AW) in OECD countries in 2011. The average PIT rate progression captures the progressivity of the PIT system in isolation. The average tax wedge progression takes also the effect of employee and employer social security contributions, payroll taxes and cash benefits on progressivity into account. Average rate progression has been calculated for 4 different household types: singles without children, one-earner married couples without children, single parents with 2 children and one-earner married couples with 2 children. The overall progression rate for the 50%-200% of the AW income interval has also been presented, as well as the standard deviation in progression across the 5 income intervals.

The results show a clear pattern of progression rates across the 5 income intervals. On average across the OECD, the highest tax progression can be observed at the bottom income interval, while progression decreases for each higher income interval. This pattern emerges for the 4 household types considered and for the average PIT rate as well as average tax wedge progression. These results indicate that this pattern is observed in many OECD countries, although considerable differences among countries exist. In most countries, however, the top average rate progression can be found at the bottom income interval and the lowest average rate progression is reached at the top income interval.

The highest average PIT rate progression for single taxpayers over the 50% to 200% of the AW income range is observed in Ireland and the Netherlands, while the lowest progression can be found in Estonia, Poland and Chile. One-earner married couples without children face the highest PIT rate progression in Iceland, the Netherlands and Belgium while Korea, Poland and Chile have the lowest progression. The ranking differs considerably for families with children. In this case, the United Kingdom, the United States and Germany have the highest PIT rate progression while Korea, Poland and Chile have the flattest PIT. The OECD average progression over the 50% to 200% of the AW income range is slightly above 0.1 for both single taxpayers and for one-earner married couples without children, thereby indicating that the presence of a dependent spouse does not increase progressivity to a large extent over the 50% to 200% of the AW income range. The presence of children, however, does strongly increase the OECD average progression to about 0.135 for both single parents and one-earner couples with 2 children.

Although tax progression tends to be relatively similar for both one-earner married couples and single taxpayers without children, some countries do have a more progressive PIT system for married couples as a result of a dependent spouse allowance. However, progressivity might also decrease if some taxable income can be transferred from the principal earner to the spouse.

The analysis has found considerable differences between average PIT rate and average tax wedge progression on average across the OECD, thereby indicating the strong impact of SSCs and cash benefits on tax progressivity. The direction of the difference in these rates strongly depends on whether the taxpayer has children or not.

First, the average tax wedge progression is lower than the average PIT rate progression for households without children except at the bottom income interval. As families without children typically do not receive cash benefits, this result shows that SSCs tend to reduce tax progressivity because they are typically levied at flat rates. A SSC ceiling even leads to overall regressivity at the top income interval in Spain, Germany and Austria. The higher tax wedge progression at the bottom income interval is the result of SSC provisions targeted at lower income levels in some countries. This result is driven by the low-income SSC provisions in Canada, the United Kingdom, Israel, the Netherlands, and especially in Ireland, Belgium and France. The effect of these SSC provisions on tax progression is completely exhausted in the second income interval in Belgium, Ireland and the Netherlands and is strongly reduced in Canada, France, Israel and the United Kingdom. The effect is no longer present in any country as from the third income interval onwards. The flattening effect of SSCs, however, continues to be observed in the figures for higher income intervals.

Second, the average tax wedge progression is higher than the average PIT rate progression for households with children, except at the top income interval. Thus, for households with children, the effect of cash benefits, which reduce the tax wedge, and the fact that these benefits are typically phased out when income increases, results in an increase in (local) tax progressivity in a large majority of OECD countries. This effect tends to be stronger than the flattening effect from social security contributions, except at the top income interval. Also, the impact of cash transfers on tax progression is considerably smaller in the second income interval except in Australia, Canada, Ireland, New Zealand and Slovenia. The impact continues to decrease for higher income intervals.

The variation in progression over the 5 income intervals, on average across the OECD, is positively related to the level of the average progression. For instance, the higher OECD average PIT rate progression for families with children compared to families without children results also in a higher deviation across the 5 income levels, basically indicating that PIT provisions for children reduce the average effective tax rate more for lower-income than for higher-income earners. The same observation holds for the OECD average tax wedge progression. The flattening impact of SSCs reduces the average tax wedge progression

below the average PIT rate progression for families without children; this results in lower standard deviations, on average across the OECD as well.

The analysis in this paper may be extended in a number of ways. First, the analysis does not focus on income levels above 200% of the AW. In many countries, however, the top statutory PIT rate only hits at earnings exceeding 200% of the AW. Future work may therefore extend the analysis by focusing on earnings up to 400% of the AW, for instance. Second, rates of tax progression could be calculated for earlier years (e.g., 2000 and 2006). This would allow analysing the change in progression over time. These extensions could be the topic for a follow-up paper and Taxing Wages Special Feature.

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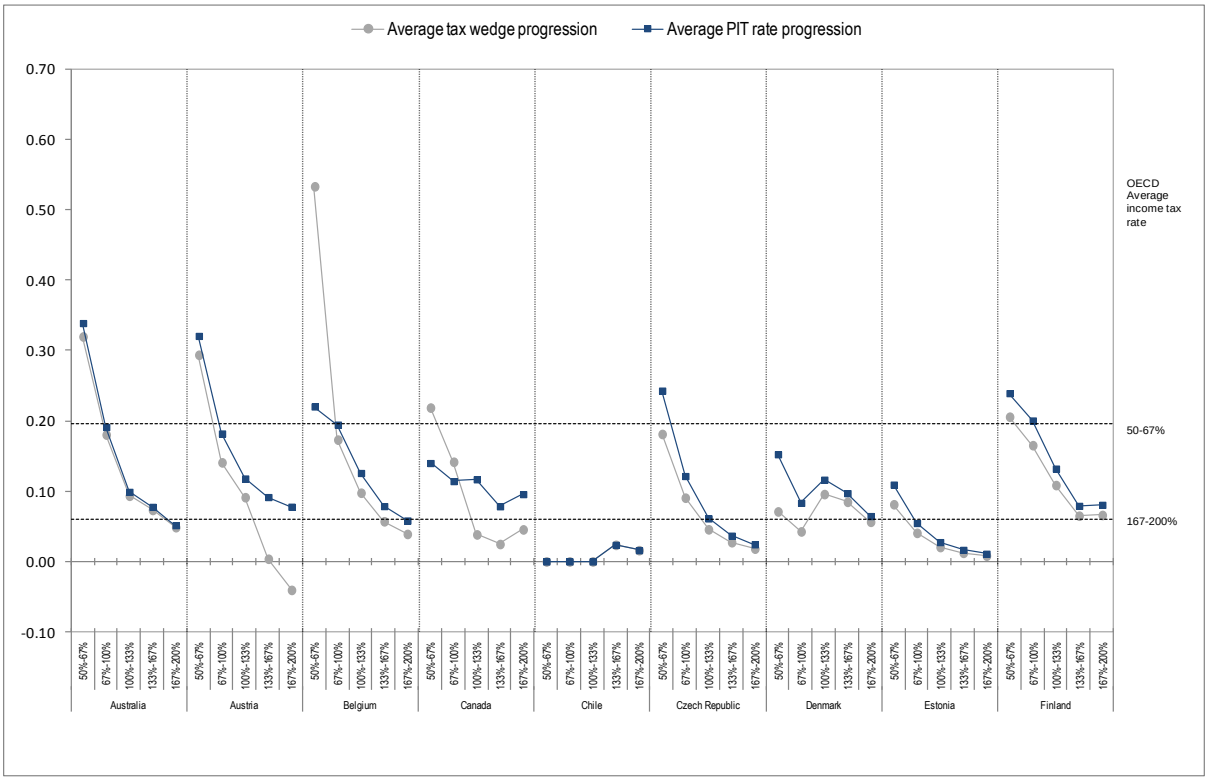
ANNEX A

AVERAGE TAX RATE PROGRESSION IN 2011

(COUNTRY CHARTS)

Figure S.A.1: Average rate progression in 2011 for single taxpayers without children



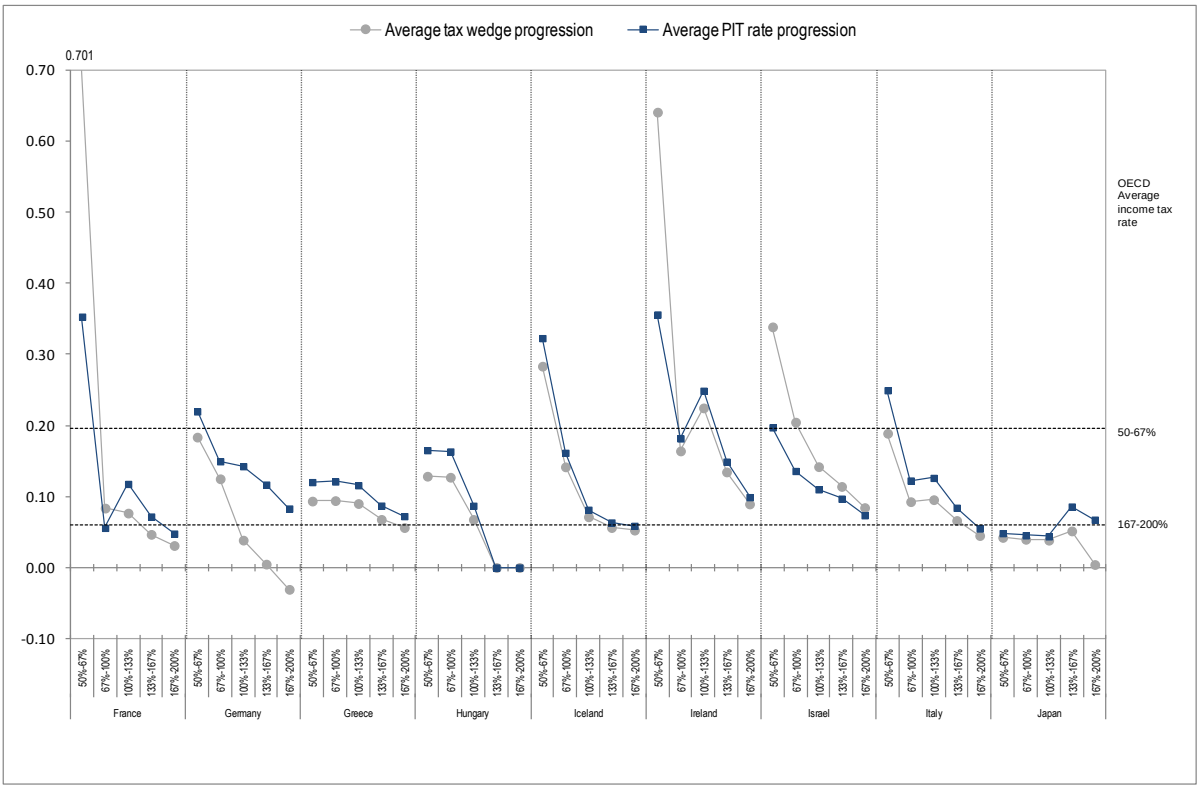
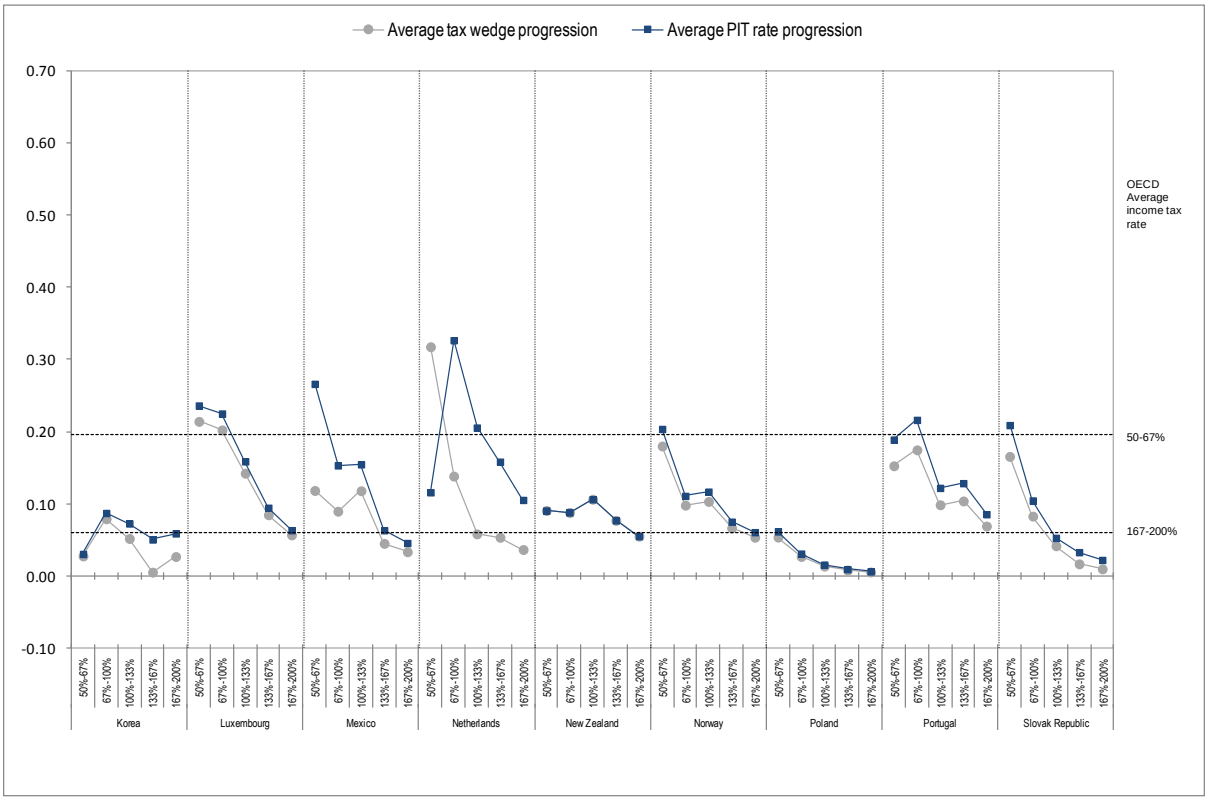


Figure S.A.1: Average rate progression in 2011 for single taxpayers without children (cont.)



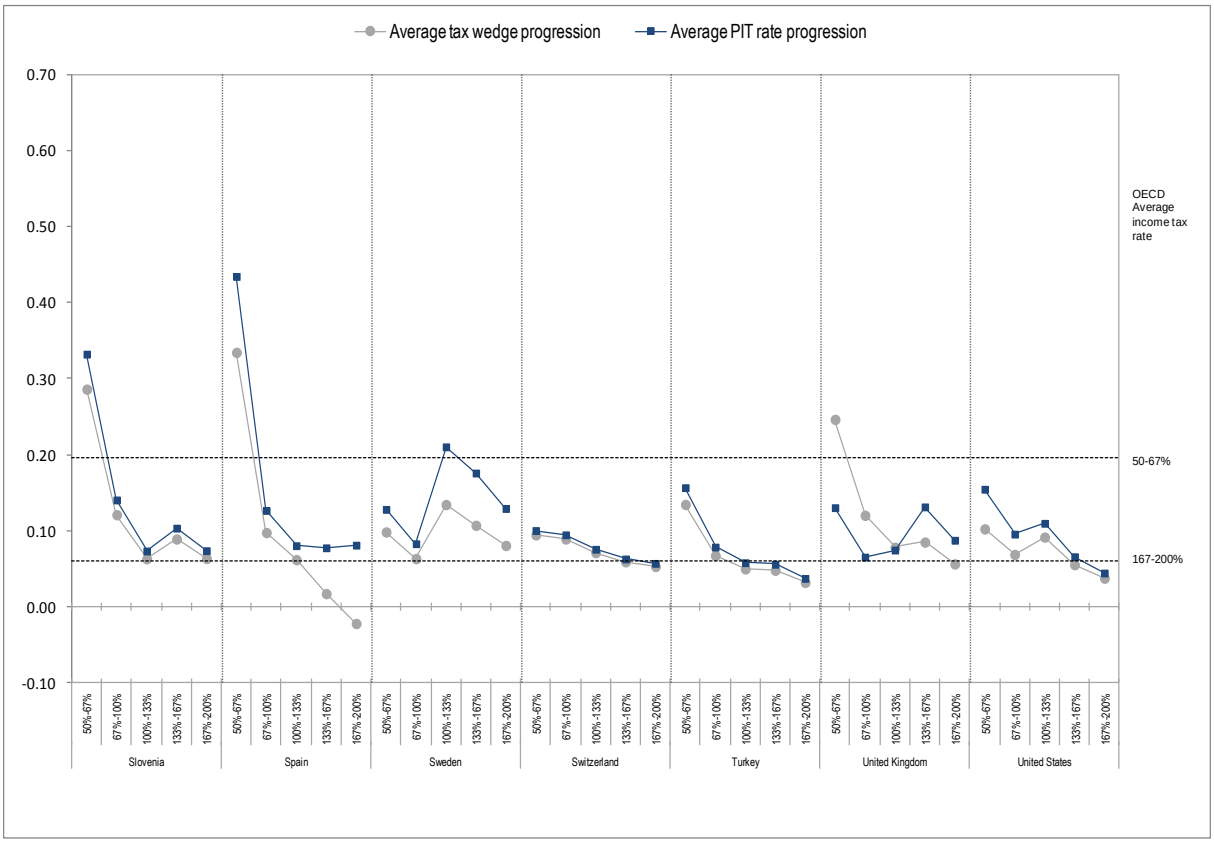
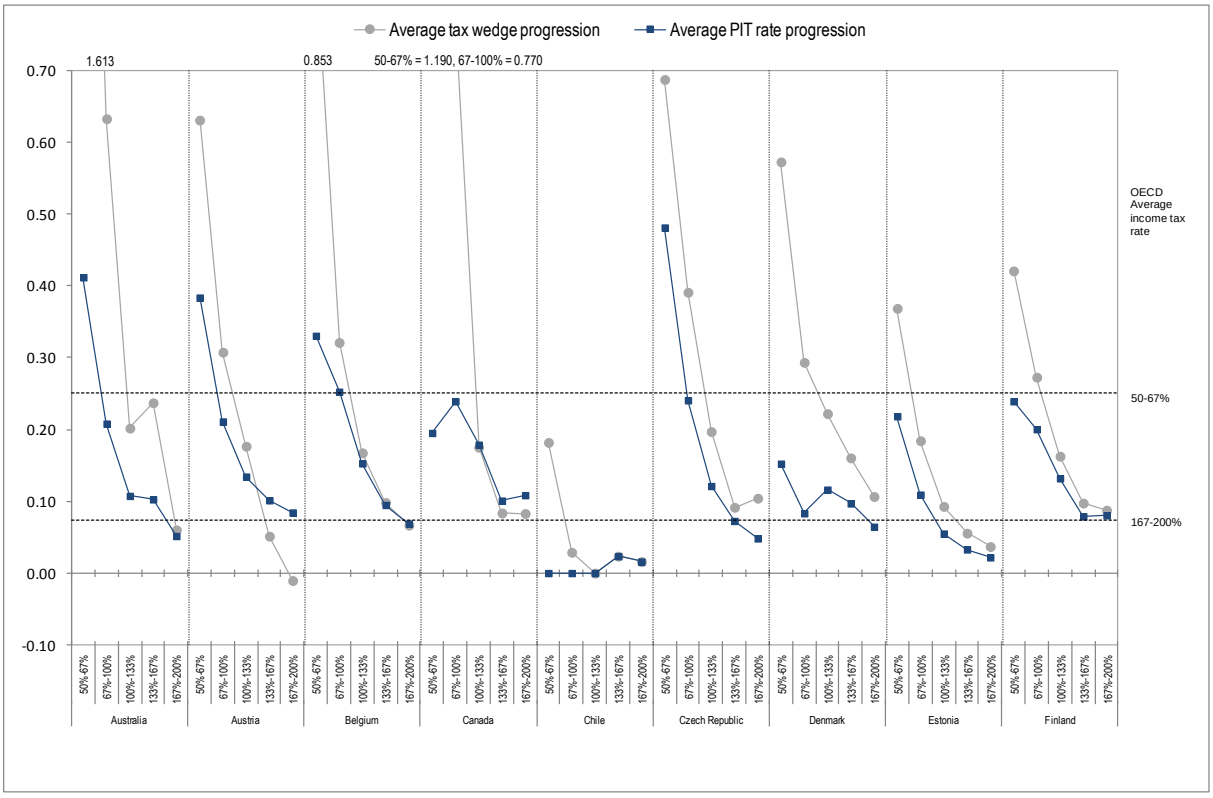


Figure S.A.2: Average rate progression in 2011 for single parents with 2 children



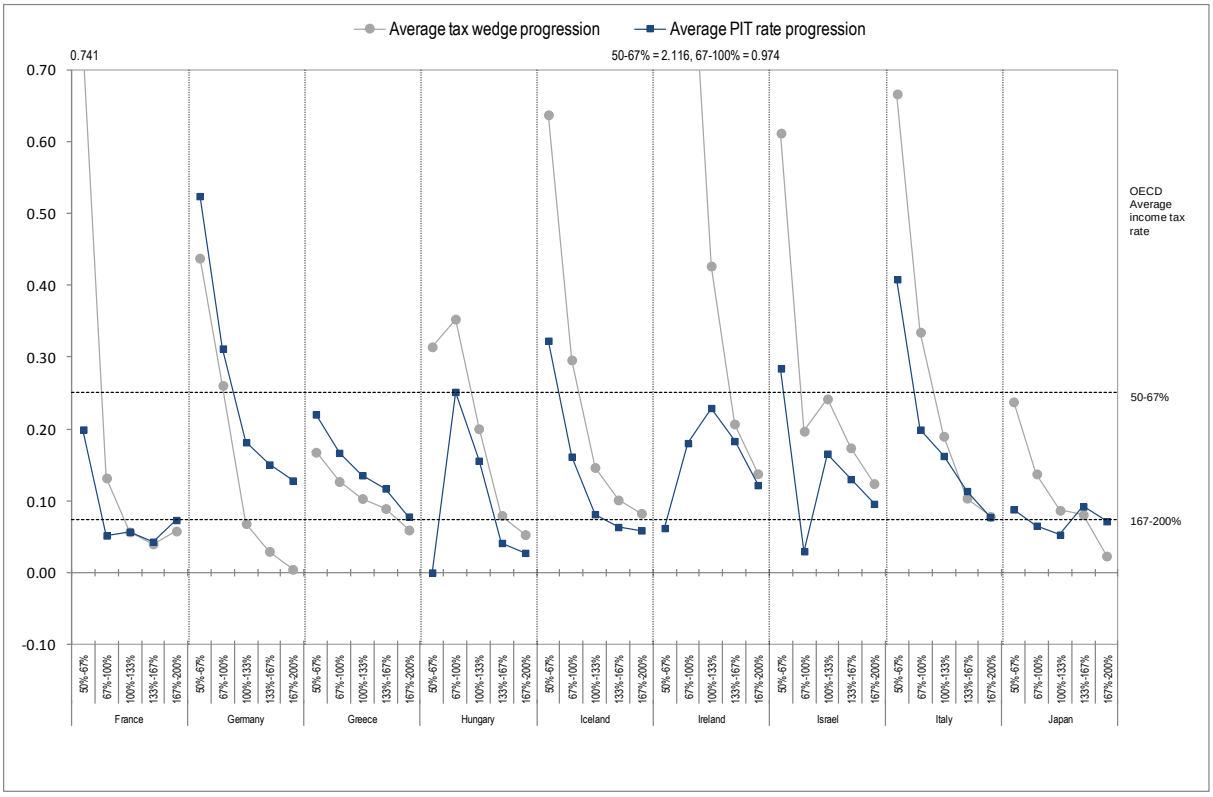
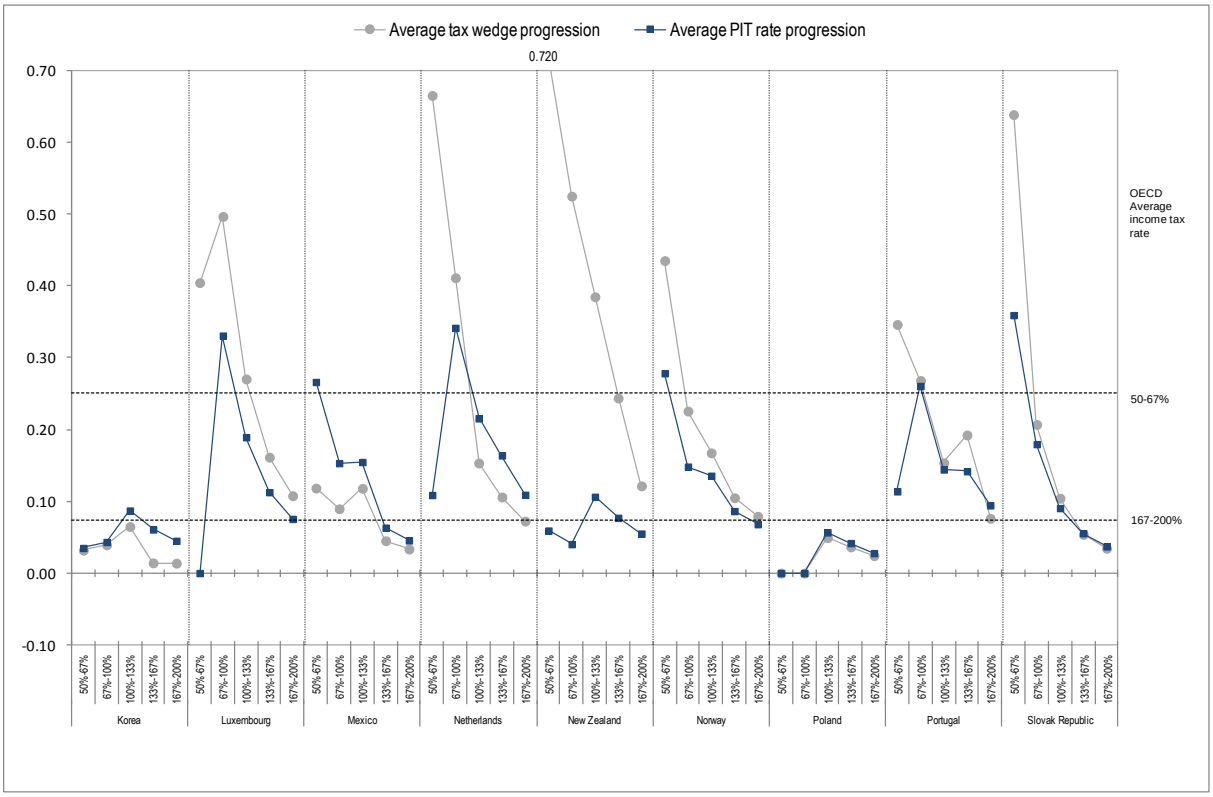


Figure S.A.2: Average rate progression in 2011 for single parents with 2 children (cont.)



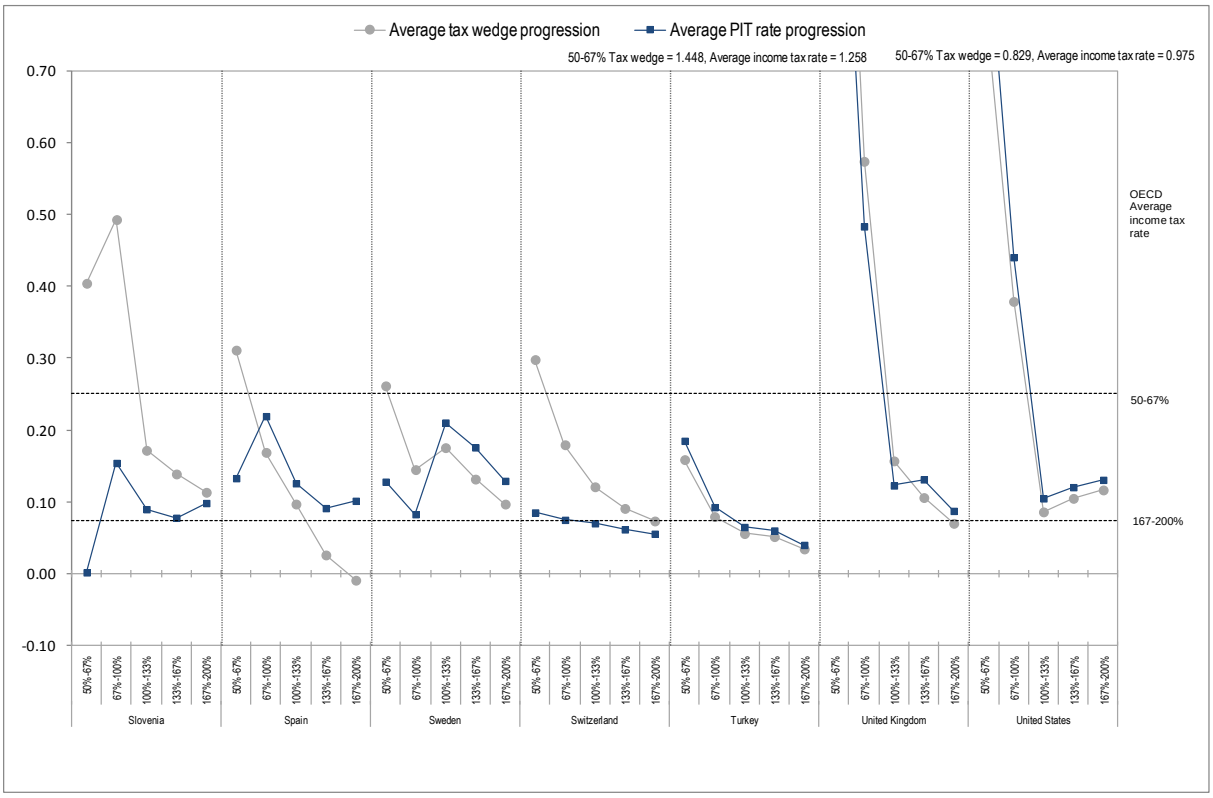
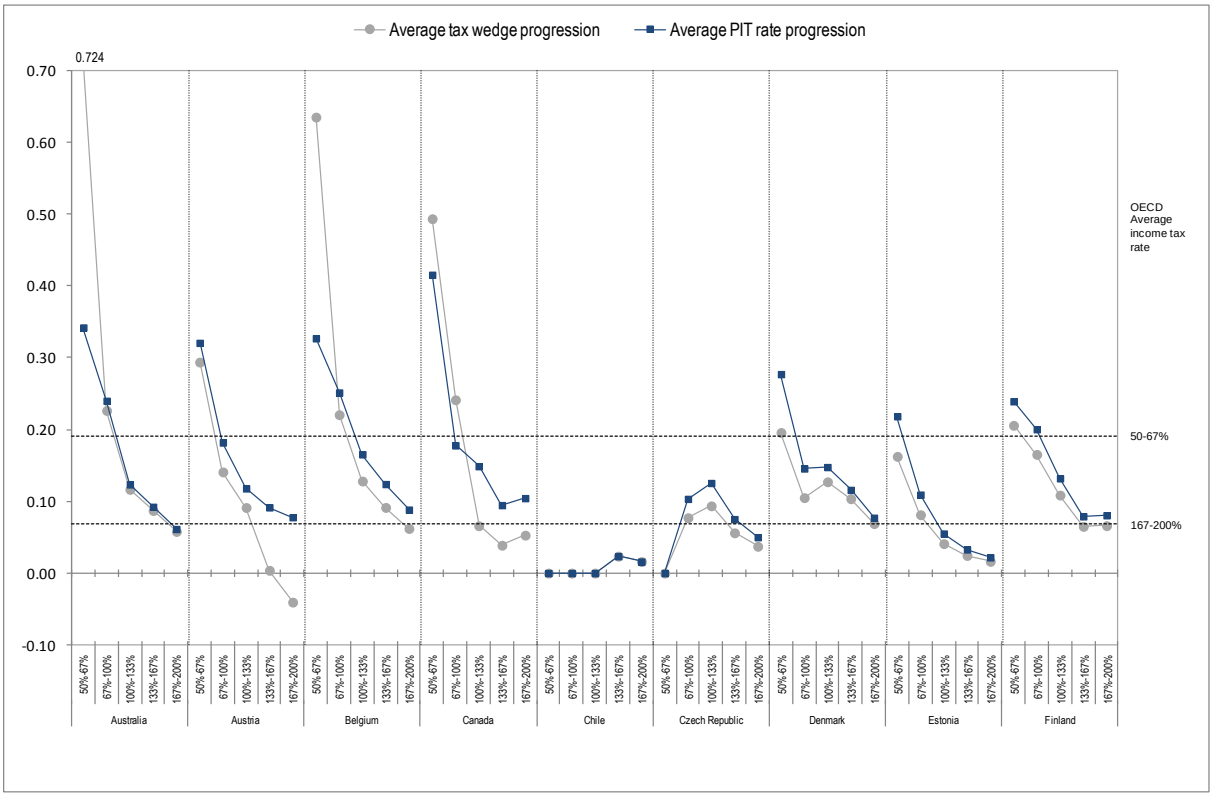


Figure S.A.3: Average rate progression in 2011 for one-earner married couples without children



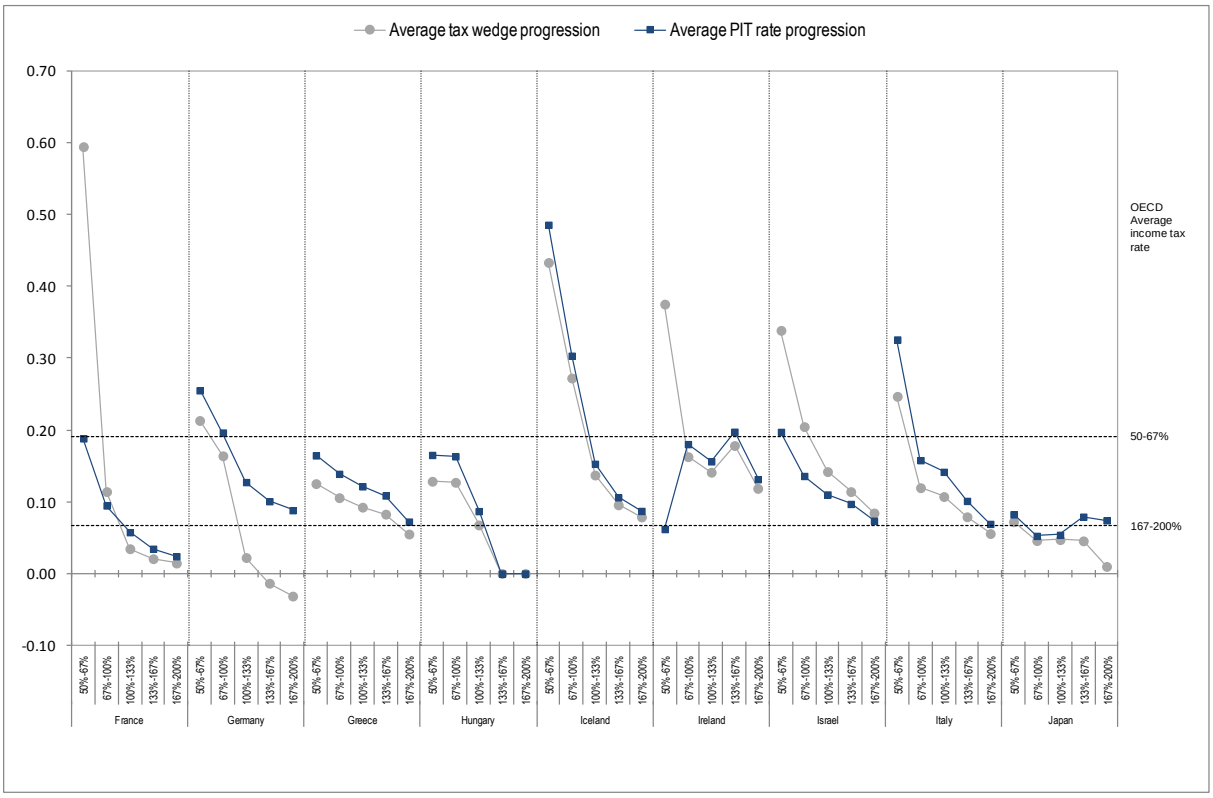
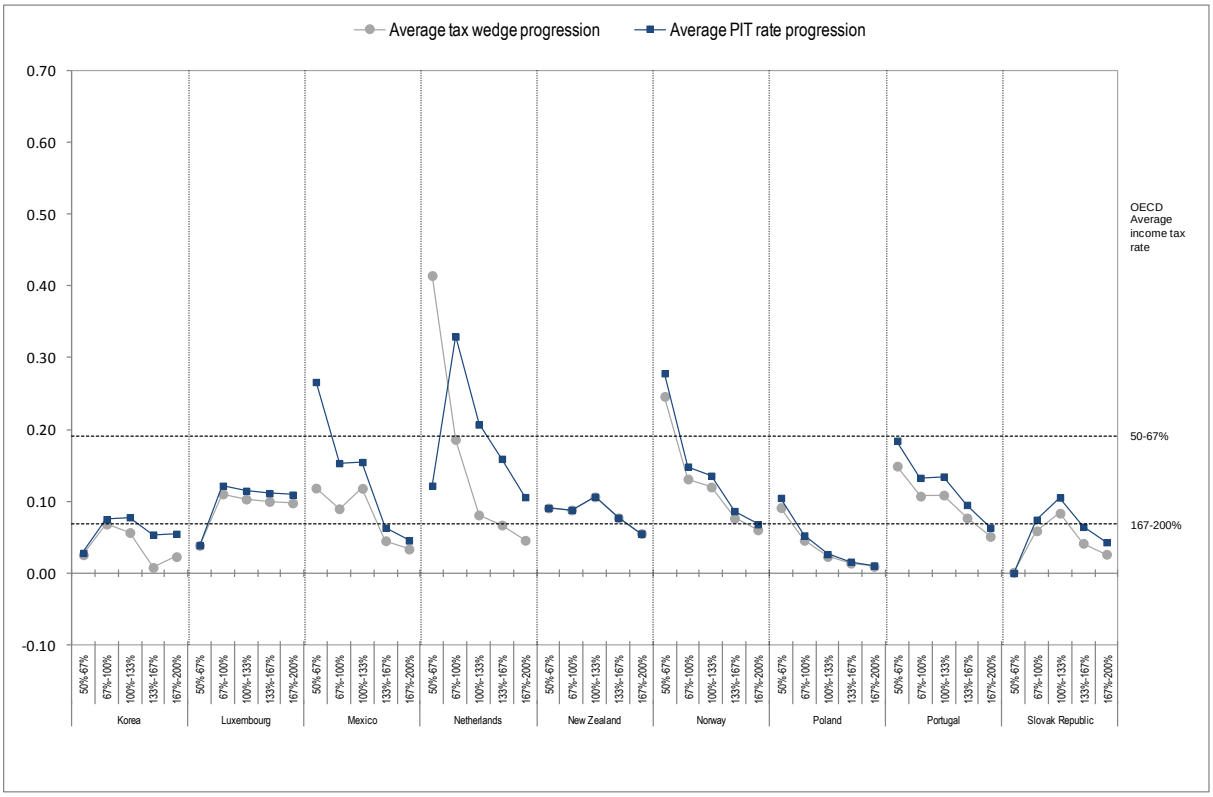


Figure S.A.3: Average rate progression in 2011 for one-earner married couples without children (cont.)



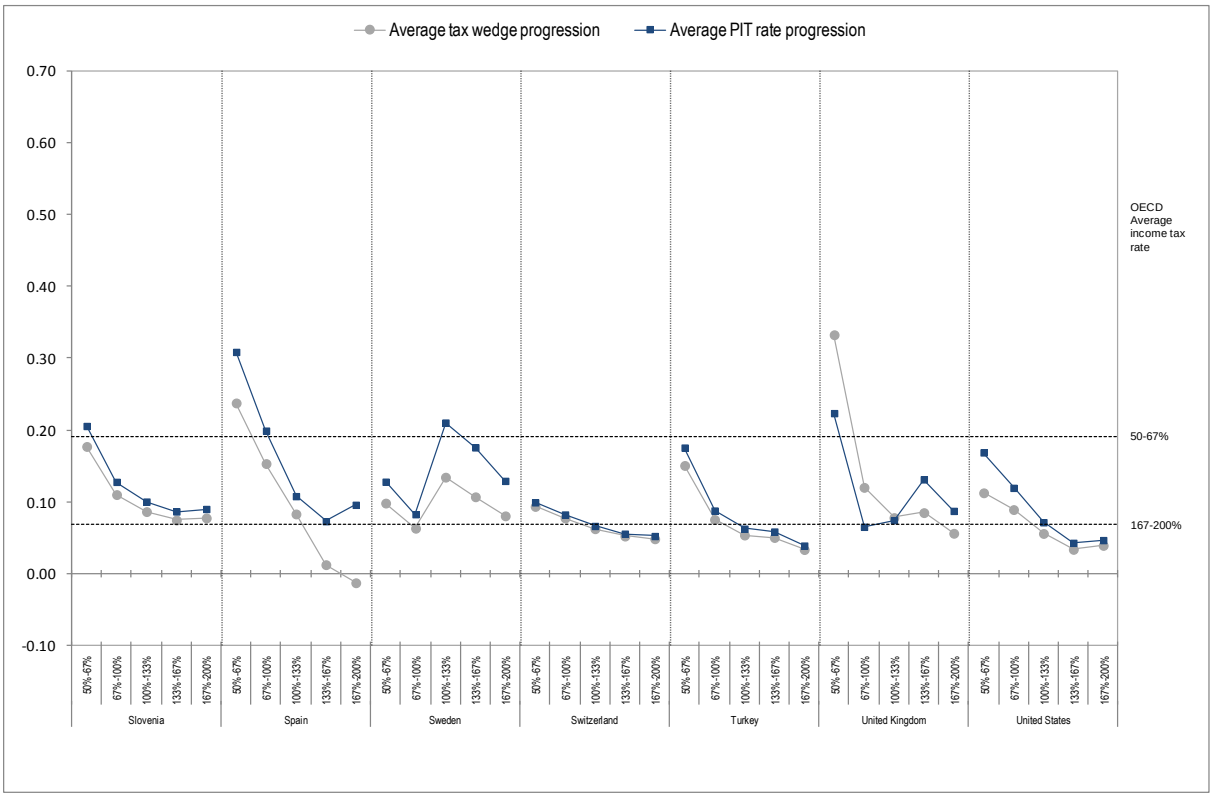
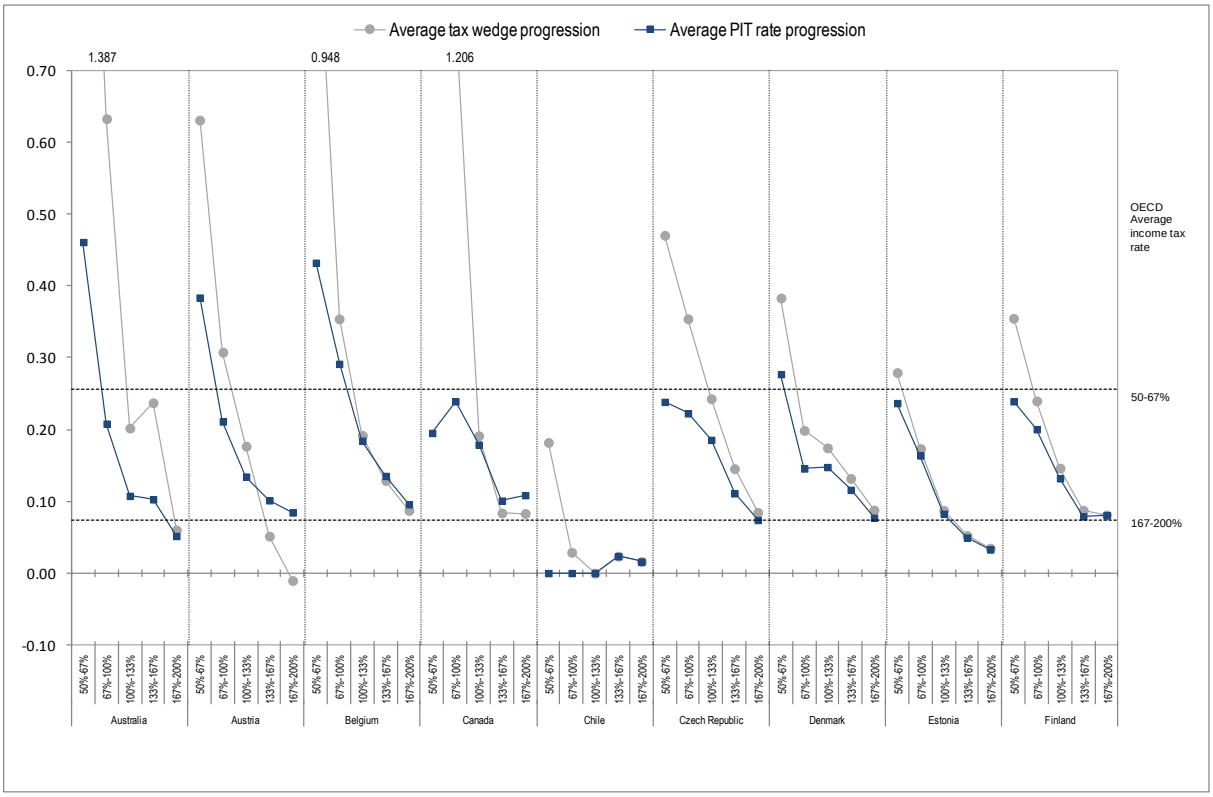


Figure S.A.4: Average rate progression in 2011 for one-earner married couples with 2 children



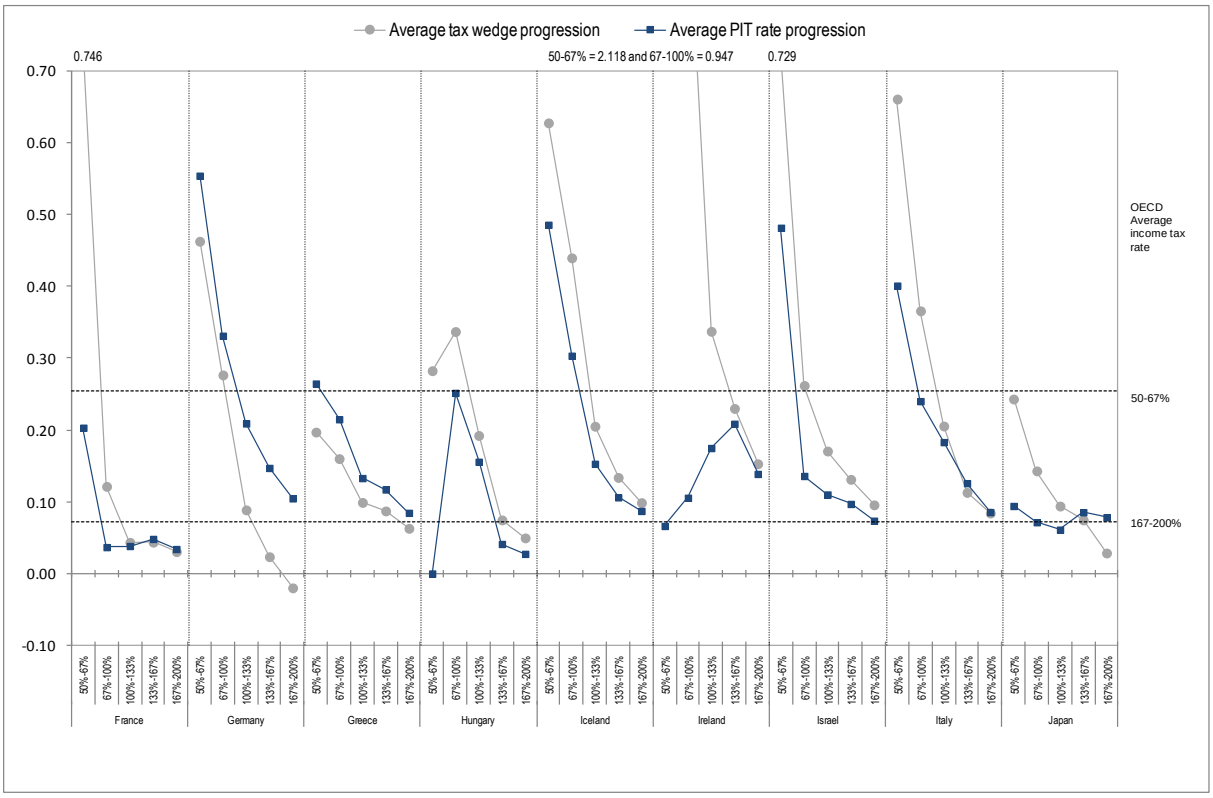
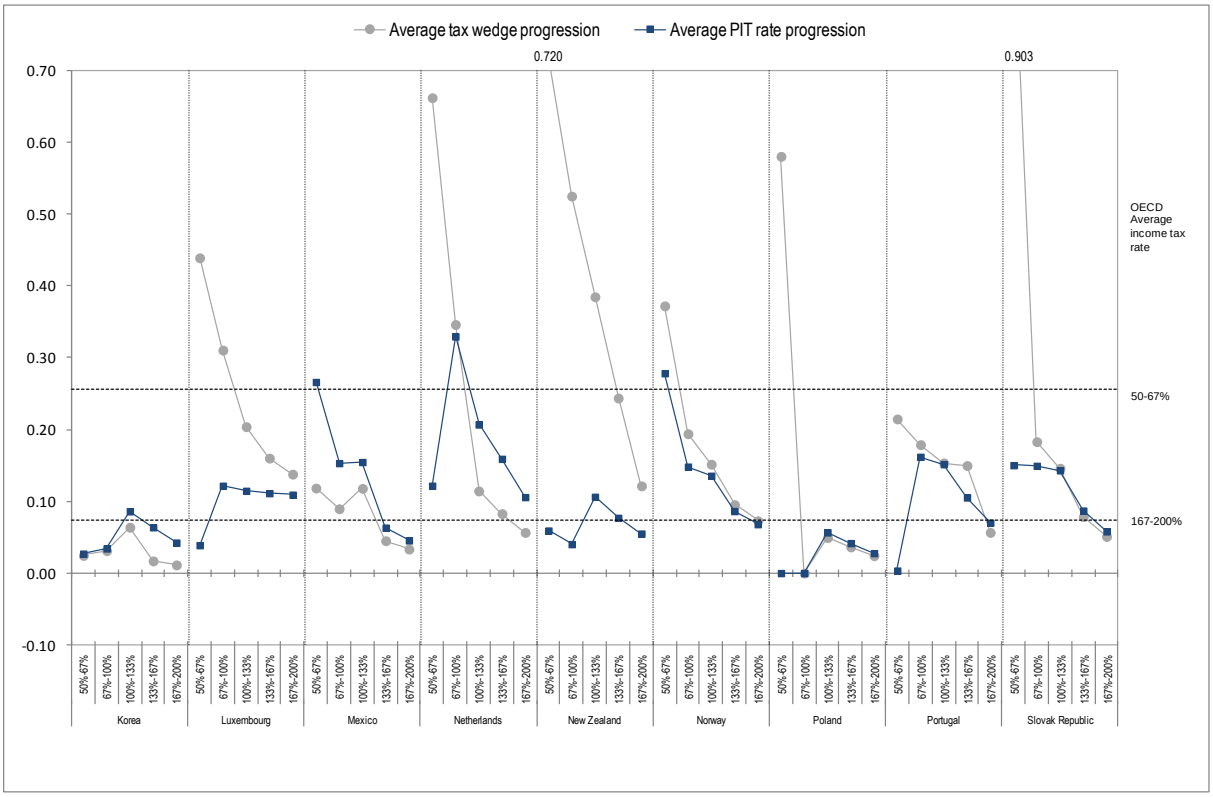
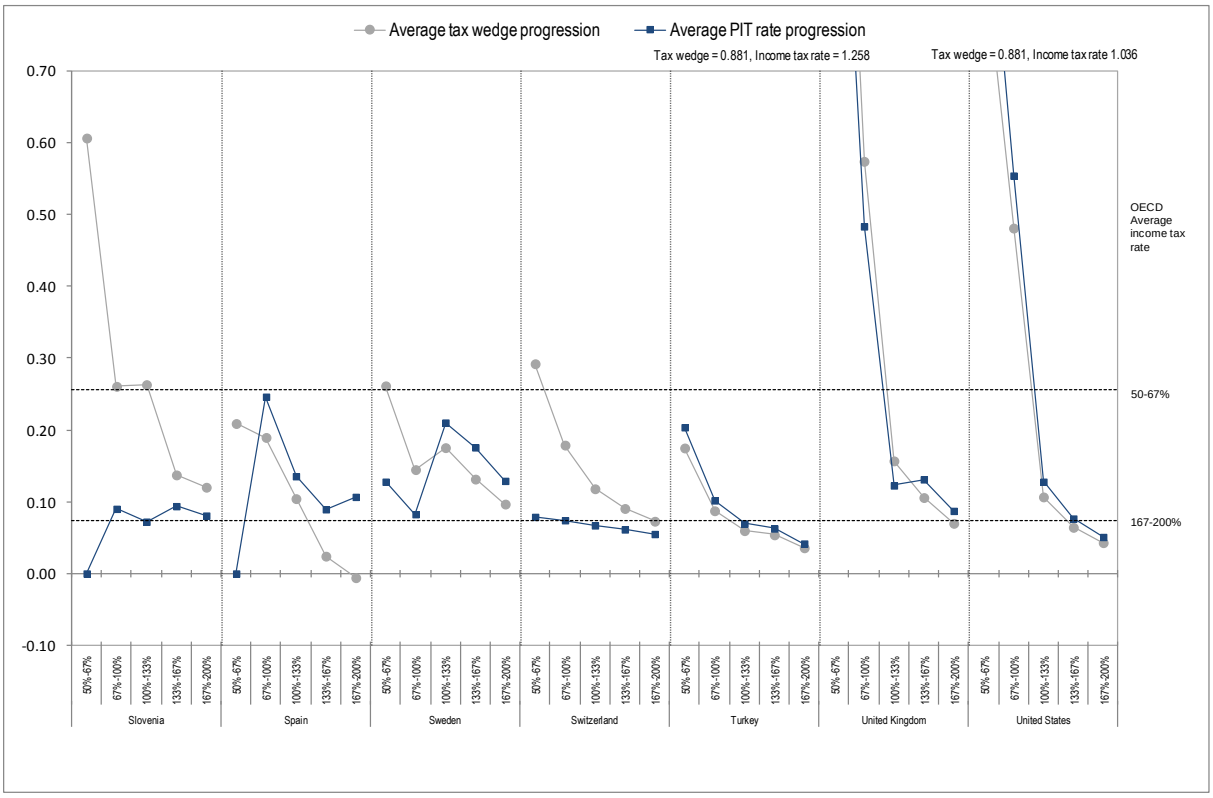


Figure S.A.4: Average rate progression in 2011 for one-earner couples with 2 children (cont.)



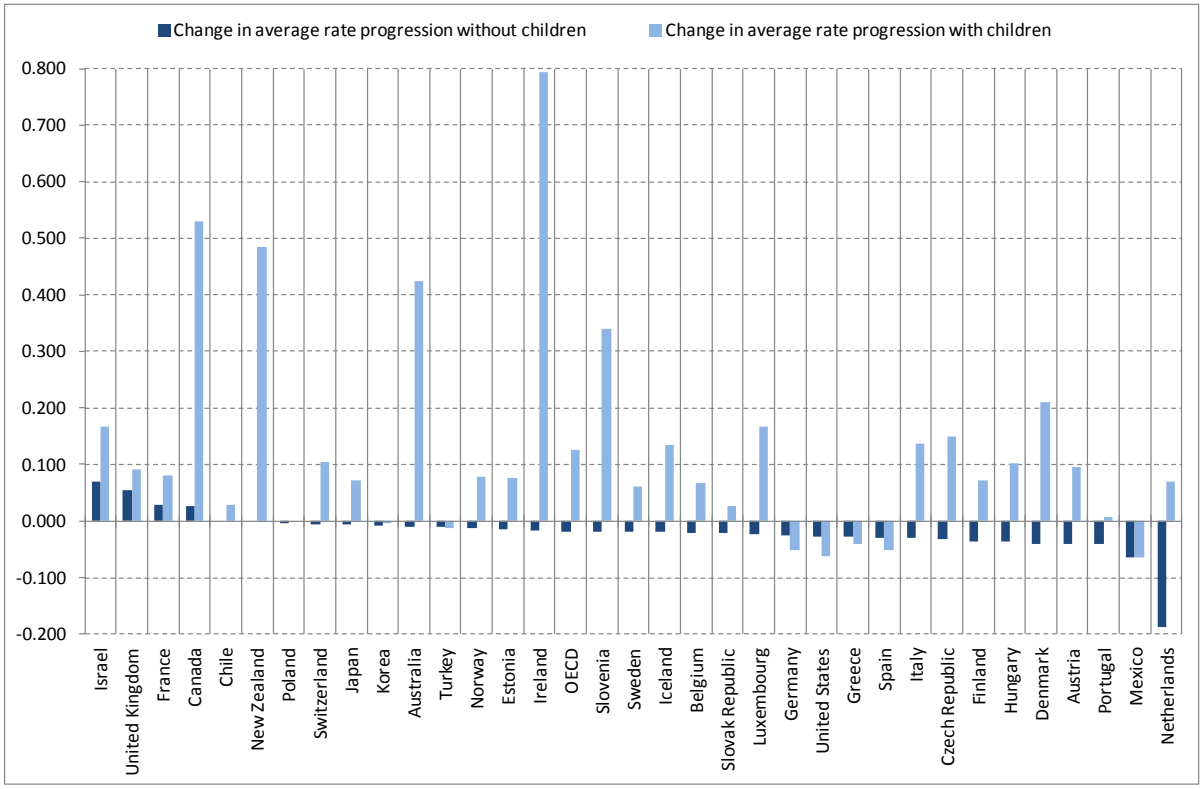


ANNEX B

AVERAGE TAX WEDGE NET OF PIT RATE PROGRESSION FOR HOUSEHOLDS WITH AND WITHOUT CHILDREN

Figure S.B.1: Average tax wedge net of PIT rate progression for households with and without children at the second income interval

a) Single taxpayers



b) One-earner married couples

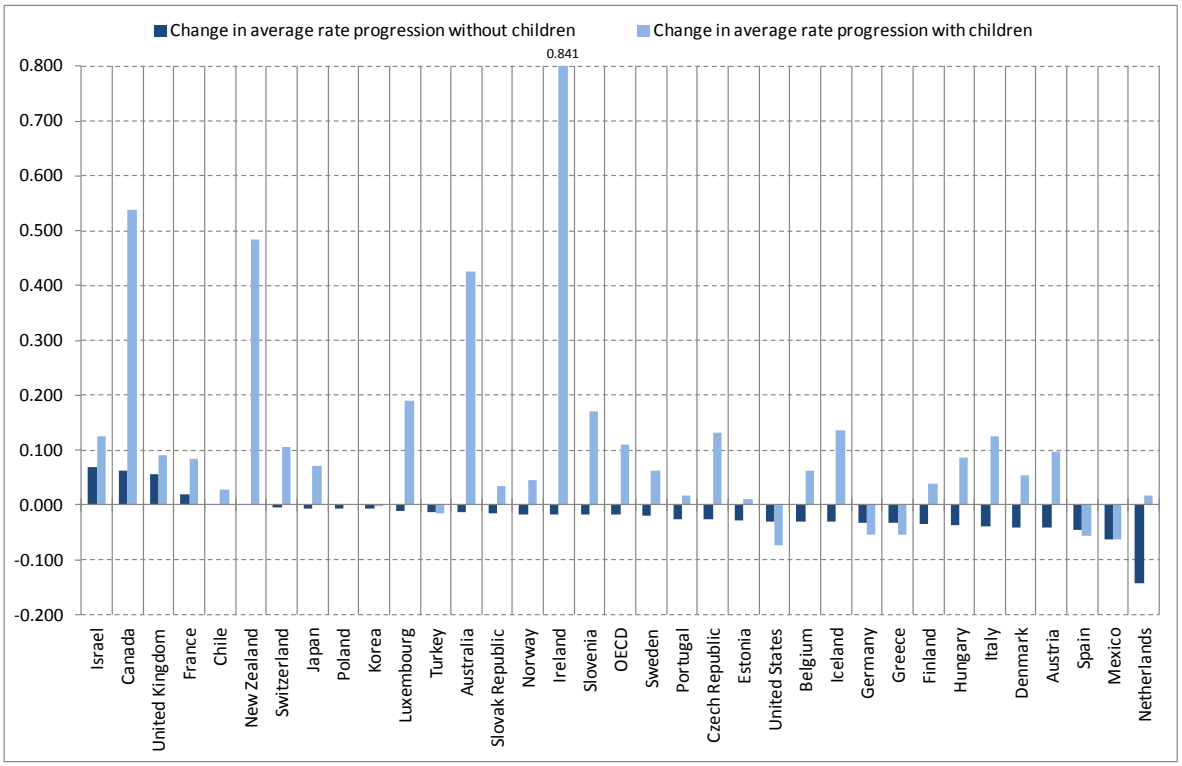
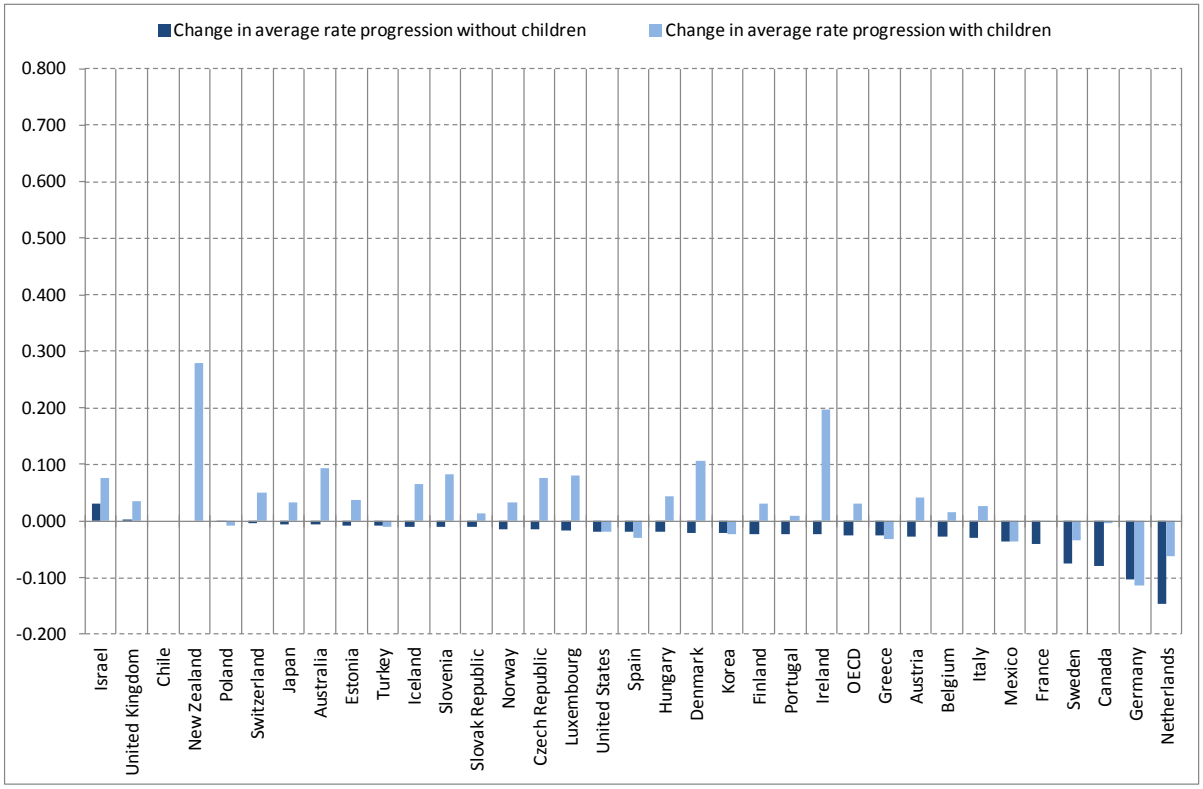


Figure S.B.2: Average tax wedge net of PIT rate progression for households with and without children at the third income interval

a) Single taxpayers



b) One-earner married couples

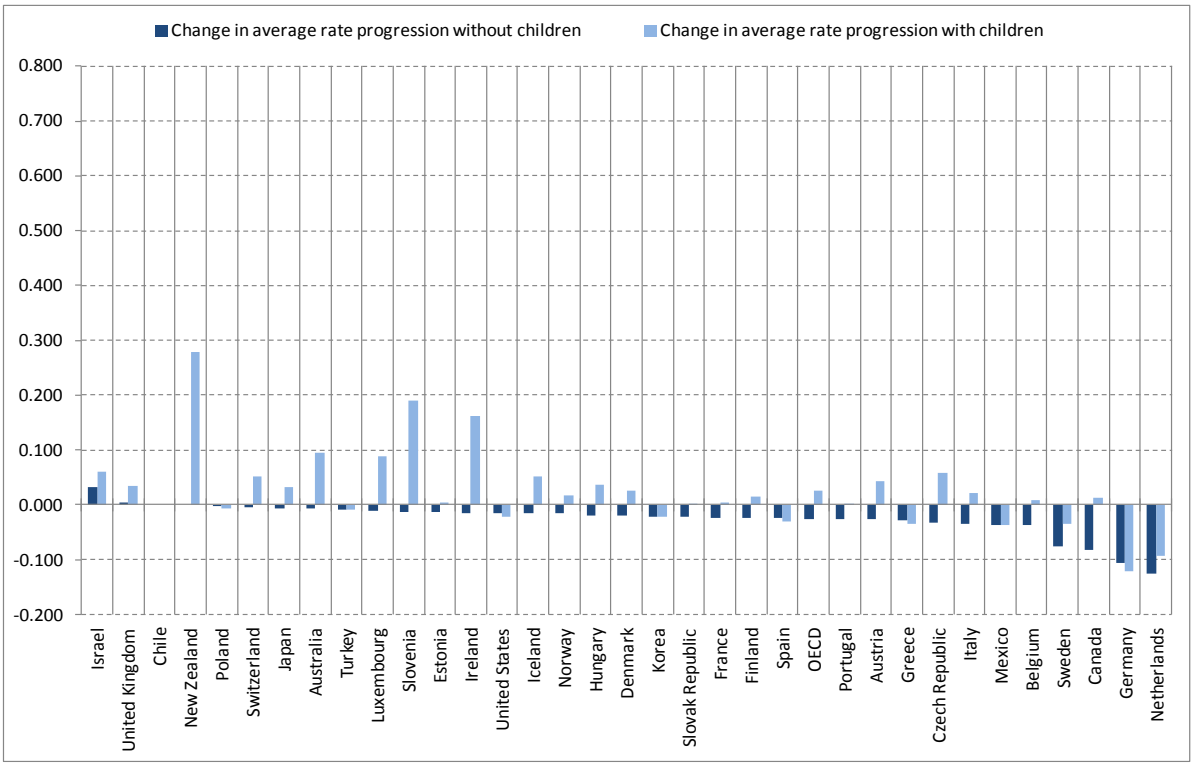
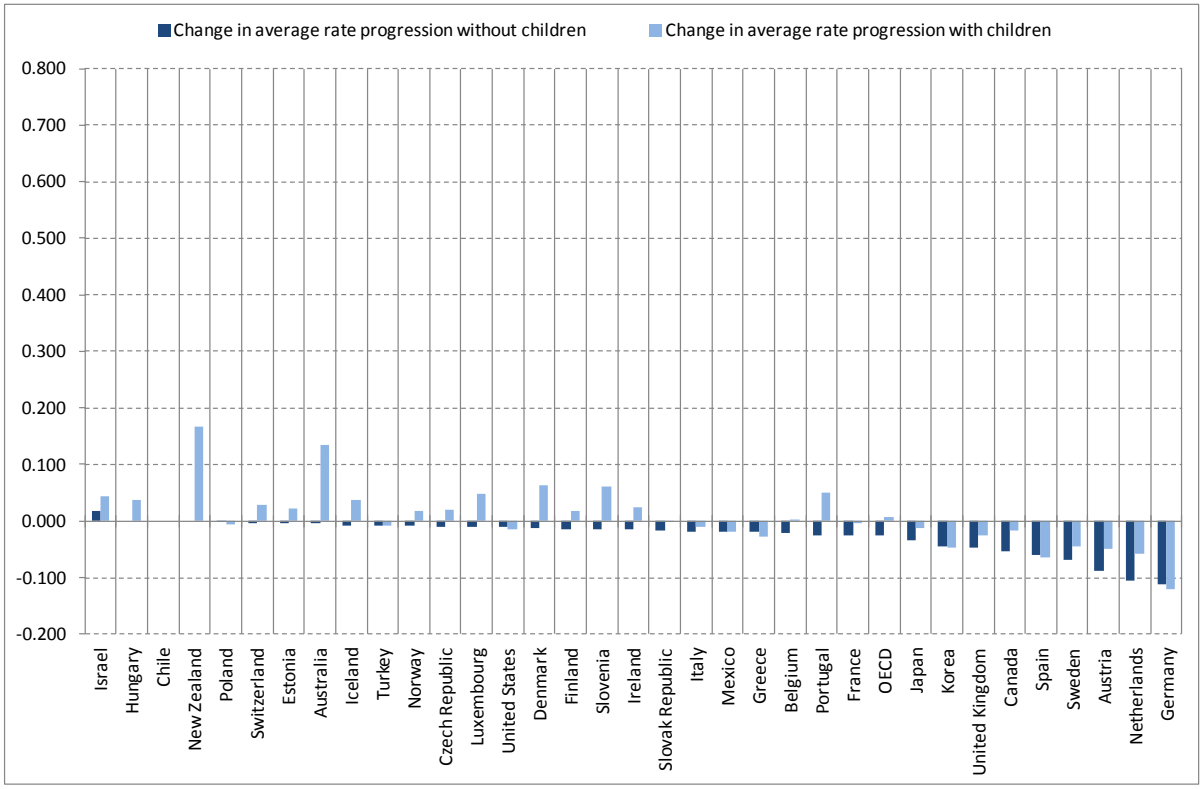


Figure S.B.3: Average tax wedge net of PIT rate progression for households with and without children at the fourth income interval

a) Single taxpayers



b) One-earner married couples

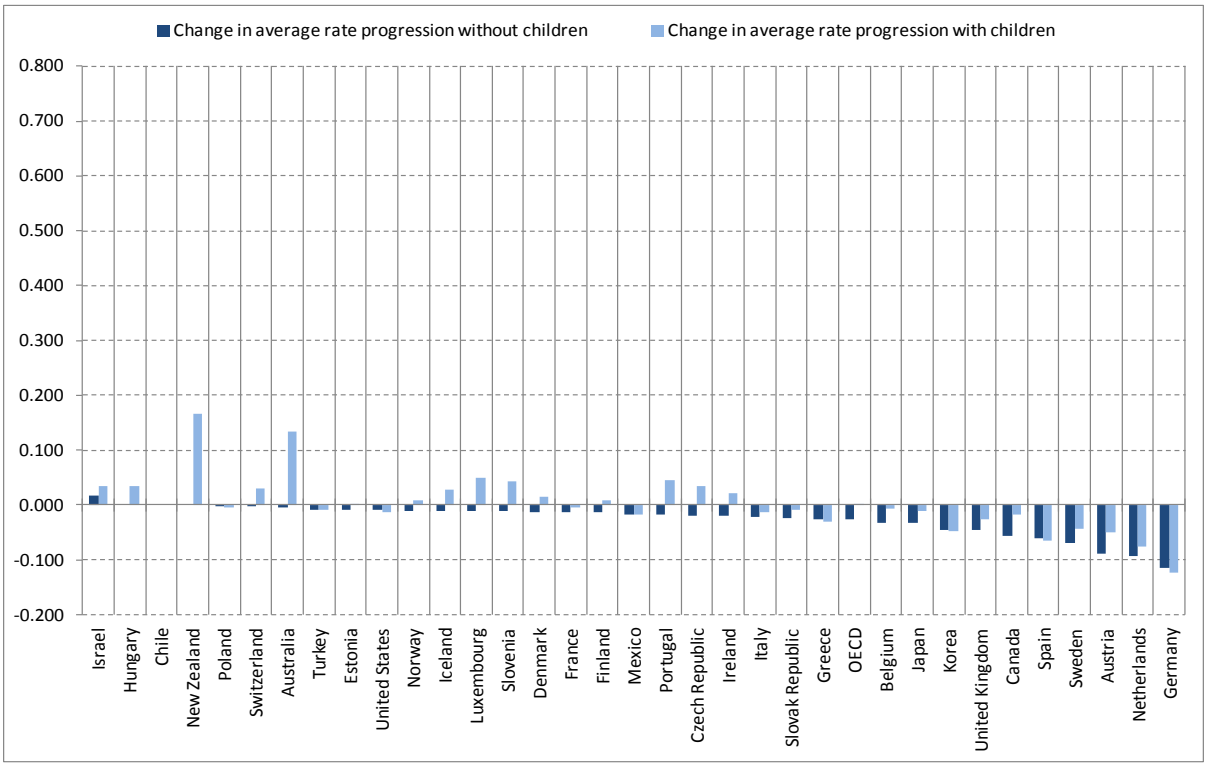
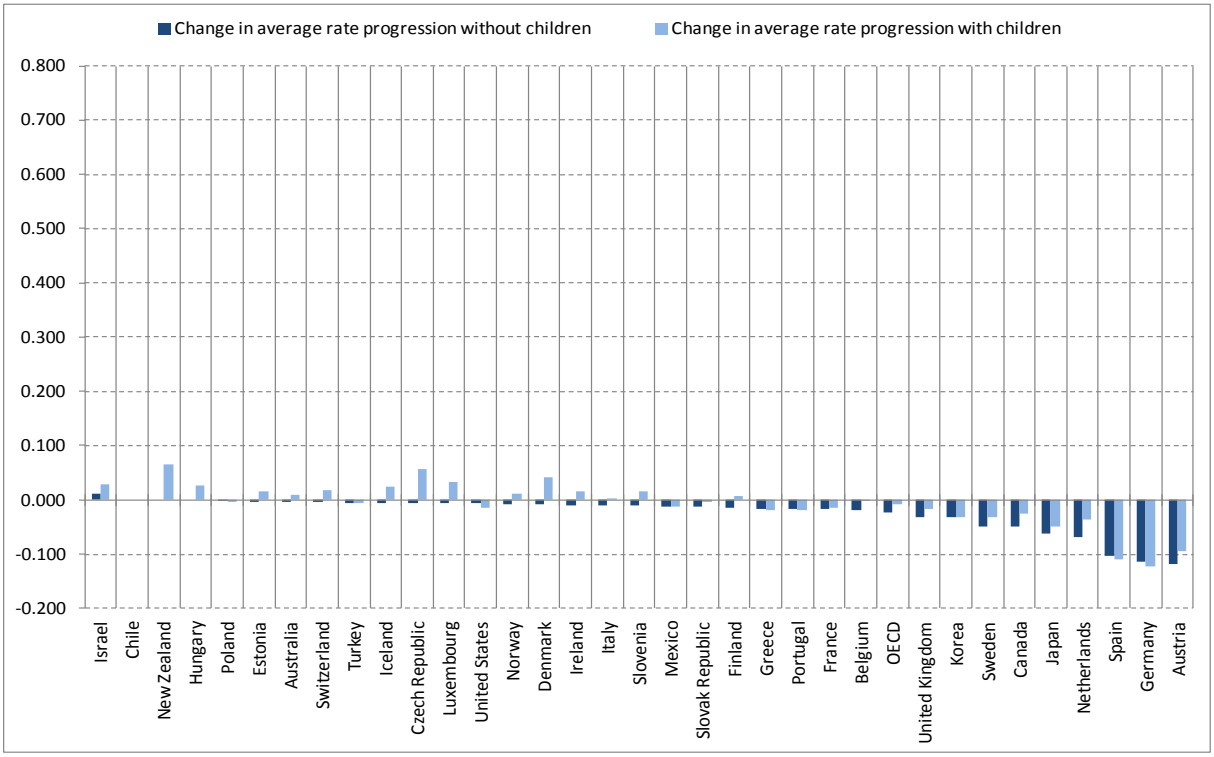
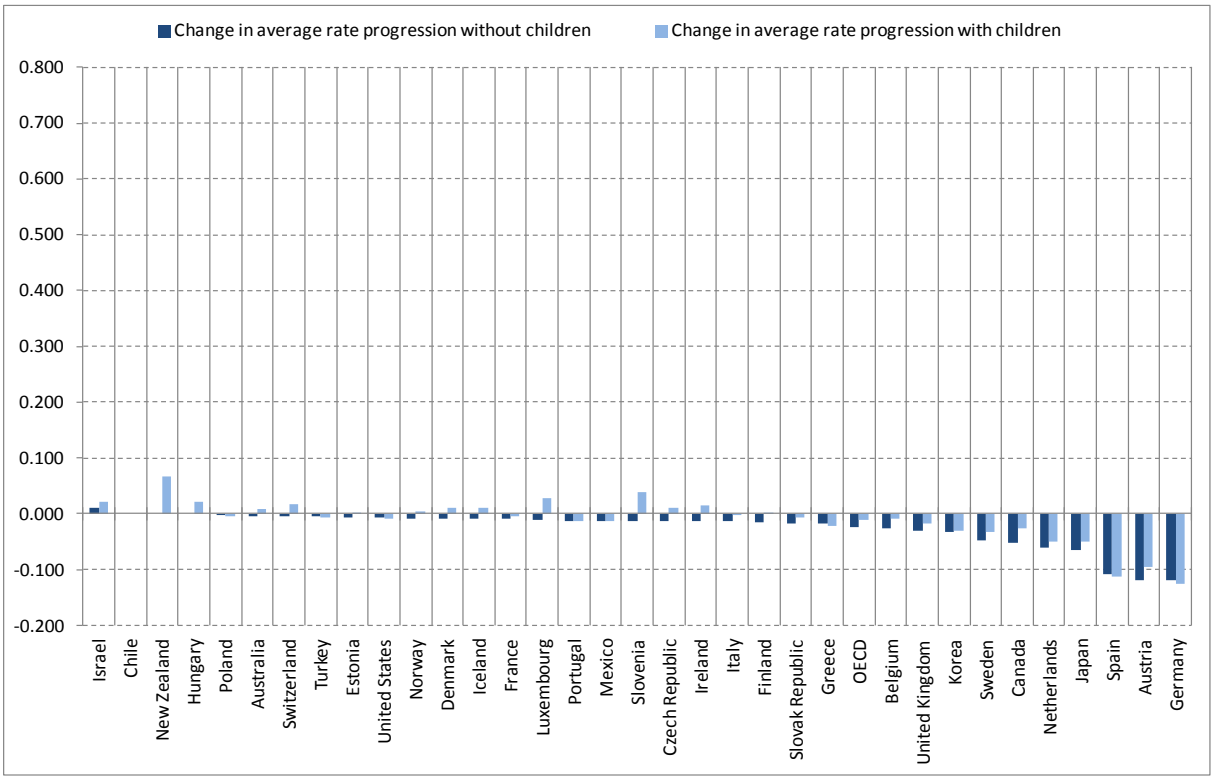


Figure S.B.4: Average tax wedge net of PIT rate progression for households with and without children at the top income interval

a) Single taxpayers



b) One-earner married couples



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