Analysis of Intergenerational Inequality: the Role of Public Expenditure and Taxation

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Abstract

In this paper I analyse the impact of public expenditure and income taxation on intergenerational inequality for seventeen countries. Age group Gini index is calculated by using data from the Luxemburg Income Study (LIS). Results are very robust in demonstrating that only income taxation is able to influence the level of intergenerational inequality, since it directly affects the wealth of households. Otherwise, public expenditure seems to have no impact on individuals' welfare, even if we consider public expenditure components which should be tailored for specific cohorts. Different hypotheses on standard errors are considered, in order to detect the presence of one-way or two-way fixed effects.

Keywords: Age group inequality, Public Expenditure, Income Taxation

JEL Classification Codes: E62, E64, H24

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1 Introduction

All modern democracies use fiscal policies in order to achieve redistribution goals. A common belief taken from the optimal theory of taxation affirms that a better income distribution may be achieved via a system where income tax paid as a fraction of before-tax income increases somewhat with income. Nevertheless, even though statutory schedules are revised from time to time, the stylised facts show that in Britain and America, "from the 1970s to the 1990s inequality rose in both countries" and "redistribution toward the poor tends to happen least in those times and polities where it would seem most justified by the usual goal of welfare policy" (Lindert (2000)). Other evidence which shows an increasing level of inequality within industrialized countries was found by Gottschalk and Smeeding (2000). Finally, a comprehensive study made by the United Nations (WIDER 2000) demonstrated that a recent increase in inequality has taken place in several countries such as Australia, United Kingdom, United States, Chile, Peru, Bangladesh, China, Philippines and Poland. As a result, it seems that redistribution and equity goals are far from being reached even in more industrialised countries.

There is a huge amount of literature which studies the impact of fiscal policy on macroeconomic variables. For example, Fatás and Mihov (2001) demonstrate the existence of a significant effect of fiscal policies on consumption and employment, while Giavazzi et al. (1999) detected the presence of casual effects on savings. Otherwise, no significant effects were discovered between fiscal policies and output (Tsoukalas, 2008).

Otherwise, the impact of fiscal policies on income distribution is less studied, although there are some authors who have started to fill this gap. For instance, an empirical study by Afonso et al. (2008) for a set of OECD countries adopts a non-parametric approach to assess the efficiency of public spending in promoting more equalization of income and finds that redistributive public spending has a significant effect on income distribution.

Of course one may always think that inequality is originated by factors which have nothing to do with the government intervention as, for example, the inheritance of tangible and financial wealth or individual talent (Huggett and al., 2007). Nevertheless, it is indubitable that Governments can undertake several actions to affect households' spending power, such as the control of prices and rents. One way or another, the literature on income inequality has been focusing on studying the issues related to income distribution at a macroeconomic level.

In this paper instead I analyse the impact of public expenditure and income taxation on intergenerational inequality for seventeen countries. Age group Gini index is calculated by using data from the Luxemburg Income Study (LIS). To the best of my knowledge this is the first study which calculates age group inequality indices and assesses the impact of fiscal policies on the welfare of different generations. The econometric framework is designed in order to allow for different hypotheses on standard errors, aiming to detect the presence of one-way or two-way idiosyncratic components among clusters. The use of two-way fixed effects, obtained by clustering data by country and age group, is certainly not standard in the econometrics literature. Results are very robust in demonstrating that income taxation is able to influence the level of intergenerational inequality, since it directly affects the wealth of households. Otherwise, public expenditure seems to have no impact on individuals' welfare, even if we consider public expenditure components which should be tailored for specific cohorts, such as pensions or childcare supports.

The paper is organised as follows: section two introduces some basic concepts and tools used in the income inequality measurement and focuses on age group inequality. Section three describes the database based on the Luxemburg Income

Study and the econometric technique used. Section four describes the main results and section five concludes.

2 Measuring income inequality at a microeconomic level

We now have all the elements to measure how groups' welfare is affected by the decisions taken by self-interested candidates who choose their taxation policy in order to maximise the probability of winning elections. The goal of this section is twofold: measuring the difference in the level of inequality amongst age groups and analysing the relation between this inequality and the structure of taxations systems. To the best of my knowledge this is the first attempt to measure the cohort-specific inequality and the first time that the Gini index is disaggregated at a microeconomic level in order to capture in a more precise way the differences in inequality amongst social groups. In other words, I suggest that the Gini index measured at a `macroeconomic level` to capture the general inequality levels of countries, is the result of many Gini indexes calculated at a `microeconomic level`. Calculating Gini indexes at a microeconomic levels allows us to evaluate more precisely the impact of the Government's policies on groups' welfare, something which cannot be made by using the Gini index calculated at a country level.

The question addressed is: which are the age groups which are afflicted by the highest degree of inequalitity? In order to answer this question we must remember that inequality measurement is always an attempt to give meaning to comparisons of income distributions in terms of criteria which may be derived from ethical principles, appealing mathematical constructs or simple intuition (Cowell, 2000). As a consequence, before measuring the level of inequality in practise it is necessary to define the concepts, the ranking criteria and the indices necessary to achieve our goal.

2.1 Distributional and Ranking concepts

I will denote by $\mathcal{F}$ the space of all univariate probability distributions with support $\Lambda \subseteq \Re; x \in \Lambda$ represents a particular value of income and $F \in \mathcal{F}$ one of the possible income distribution. So $F(x \leq \widetilde{x})$ represents the proportion of population with income less than $\widetilde{x}$. Furthermore define $\underline{x} := inf(\Lambda)$ and denote by $\mathcal{F}(\varrho) \subseteq \mathcal{F}$ a subset with given mean $\varrho : \mathcal{F} \mapsto \Re$ given by

$$\varrho(F) := \int x dF(x) \tag{1}$$

and $f : \Lambda' \mapsto \Re$ as a density function, supposed that F is continuous over some intervals $\Lambda' \subseteq \Lambda$. Furthermore, in order to compare distributions, I assume the existence of a complete and transitive binary relation $\succcurlyeq_I$on $\mathcal{F}$, called *inequality ordering* and represented by $I : F \mapsto \Re$, if the ordering is continuous.[1]

In order to compare distributions we also need some ranking criteria over $\mathcal{F}$. I use the notation $\succcurlyeq_T$to indicate the *ranking* induced by a comparison principle T. Three possible situations arise:

Definition 1 *For all* $F, G \in \mathcal{F}$:

(a) (strict dominance) $G \succ_T F \Leftrightarrow G \succcurlyeq_T F \quad \wedge \quad F / \succcurlyeq_T G$.

(b) (equivalence) $G \sim_T F \Leftrightarrow G \succcurlyeq_T F \quad \wedge \quad F \succcurlyeq_T G$.

(c) (non-comparability) $G \perp_T \quad F \Leftrightarrow G / \succcurlyeq_T F \quad \wedge \quad F / \succcurlyeq_T G$.

Suppose now to focus on the concept of social-welfare function, expressed in the following additively separable form:

[1] I assume that axioms of *Anonymity*, *Population Principle*, *Principle of Transfers*, *Monotonicity*, *Scale Invariance*, *Decomposability*, *Uniform income growth* and *Translation Invariance* (Cowell, 2000) are satisfied.

$$W(F) = \int u(x)\, dF(x) \tag{2}$$

where $u : \mathcal{F} \mapsto \Re$ is an evaluation function. Denote by $\hat{W}_1$ the subclass of SWFs where u is increasing and by $\hat{W}_2$ the subclass of $\hat{W}_1$ where u is also concave. Furthermore, define the set of age years A where a is a given age in A. Finally, introduce the following

Definition 2 *For all $F \in \mathcal{F}$, $a \in A$ and for all $0 \leq q \leq 1$, the quantile functional for a given age year is defined by*

$$Q(F; (q, a)) = \inf \{x | F(x) \geq q, a\} = x_{qa} \tag{3}$$

This definition enables us to state the theorem of *first-order distributional dominance*

Theorem 3 $G \succcurlyeq_Q F \Leftrightarrow W(G) \geq W(F)\ \forall \left(W \in \hat{W}_1\right)$

Otherwise, if we consider this other

Definition 4 *For all $F \in \mathcal{F}$, $a \in A$ and for all $0 \leq q \leq 1$, the cumulative income functional for a given age year is defined by*

$$C(F; (q, a)) := \int_{x}^{Q(F;(q,a))} x dF(x) \tag{4}$$

[2]

which leads us to the theorem of *second-order distributional dominance*

Theorem 5 $\forall F, G \in \mathcal{F}\ (\varrho) : G \succcurlyeq_C F \Leftrightarrow W(G) \geq W(F)\ \forall \left(W \in \hat{W}_2\right)$

[2]The graph $C(F; q)$ against q describes the *generalised Lorenz curve*

Suppose now that a distribution depends on the effects of a policy $p \in P$, where P is the space of all the possible policies. Without loss of generality, I suppose that $P = \left\{p^1, p^2\right\}$. Suppose also that distribution F is obtained under policy p^1 and distribution G is obtained under policy p^2. We may denote by $F = F\left(p^1, a\right)$ and $G = G\left(p^2, a\right)$ the distribution obtained under the two policies for a given age group a.

We want to define a comparison criterion for judging policies and their effects on the distribution of age groups.

Theorem 6 *(First-order distributional dominance) For all* $p^1, p^2 \in P,\ a \in A:$ $p^1 \succcurlyeq_Q p^2 \Leftrightarrow W\left(F\left(p^1, a\right)\right) \geq W\left(G\left(p^2, a\right)\right)\ \forall \left(W \in \hat{W}_1\right)$

Theorem 7 *(Second-order distributional dominance) For all* $p^1, p^2 \in P,\ a \in A,$ $F, G \in \mathcal{F}\ (\varrho) : p^1 \succcurlyeq_C p^2 \Leftrightarrow W\left(F\left(p^1, a\right)\right) \geq W\left(G\left(p^2, a\right)\right)\ \forall \left(W \in \hat{W}_2\right)$

These two theorems simply state that a policy q^1 is preferred to policy q^2 if and only if the welfare obtained under the distribution it generates is higher than the welfare obtained under the distribution generated by the other policy for every age group. Notice that this condition must hold *for every age group*; that means that we should see an improvement in welfare of all cohorts.

2.2 Decomposition indices

The Generalised Entropy measure is the more suitable index to analyse inequality within and between groups because of its decomposability. It may be written as

$$GE(\alpha) = \overbrace{\int_h f^h \left(\frac{x_h}{x}\right)^\alpha I_h(\alpha)}^{within-group\ inequality} + \overbrace{I_{bet}(\alpha)}^{between-group\ inequality} \tag{5}$$

where

$$I_{bet}(\alpha) = \frac{1}{\alpha(\alpha-1)}\left[\int_h f^h \left(\frac{x_h}{x}\right)^\alpha - 1\right] \tag{6}$$

The α in **??** is a parameter that characterises different members of the GE class: a high positive value of α yields an index that is very sensitive to income transfers at the top of the distribution. In particular, $GE(0)$ represents the mean logarithmic deviation, $GE(1)$ the Theil index, and $GE(2)$ the half of square of the coefficient of variation.

Another useful indicator to measure the inequality between groups is represented by Gini:

$$G = 1 + \frac{1}{N} - \left[\frac{2}{N^2 x}\right]\left[\int_h (N-h+1)\, x_h\right] \tag{7}$$

where $N = \int w_h$, $w_h = f^h N$. When data are unweighted, $w_h = 1$ and $N = H$. Individuals are ranked in ascending order of h.

3 Empirical evidence from the Luxemburg Income Study

3.1 Dataset

The Luxembourg Income Study (LIS) is a panel database including 30 countries and made by 5 *waves* of data from 1979 – 2002. The source of data is represented by country specific household income surveys. For example, individual data from the United States are taken from the *Current Population Survey.* Datasets are identified by a code made by two letters denoting a country and two numbers which identify the wave of data. For instance, US00 identifies the wave 2000 for the United States. In the analysis I used a reduced panel of 17 countries (letters in brackets represent the LIS codes): `Austria` (AT), `Belgium` (BE), `Canada` (CA), `Czech Republic` (CZ), `Switzerland` (CH), `Germany` (DE), `Denmark` (DK), `Estonia` (EE), `Spain` (ES), `Finland` (FI), `France` (FR), `Greece` (GR), `Hungary` (HU), `Ireland` (IE), `Israel` (IL), `Italy` (IT), `Luxemburg` (LU), `Mexico` (MX), `Netherlands` (NL), `Norway` (NO), `Poland` (PL), `Romania` (RO), `Russia` (RU), `Slovak Republic` (SK), `Slovenia` (SI), `Sweden` (SE), `Taiwan` (TW), `United Kingdom` (UK) and `United States` (US).

The dataset includes data at both an individual and household level on demographics, expenditure, income, labor market outcomes and tax variables.

Inequality indexes were calculated using the definition of disposable income, calculated as follows:

$\texttt{disposable income} = \texttt{compensation of employees}$

$+ \texttt{gross self}$

$- \texttt{employment income}$

$+ \texttt{realised property income}$

$+ \texttt{occupational pensions}$[3]

$+ \texttt{other cash income}$[4]

$+ \texttt{social insurance cash transfers}$[5]

$+ \texttt{universal cash transfers}$[6]

$+ \texttt{social assistance}$[7]

[3] Occupational pensions include all pensions paid from non-social retirement schemes including employer-based pensions for private sector workers and public employees.

[4] Other cash income includes regular private transfers, alimony and child support benefits, other sources of regular cash income, not classified above.

[5] Social insurance transfers include: accident or short-term disability pay, long-term disability pay, social retirement benefits (old age and survivors), unemployment pay, maternity allowances, military or veteran's benefis, other social insurance.

[6] Universal cash transfers include child and/or family allowances if paid directly by governments. Universal cash transfers paid as refundable income tax credits are counted as negative amounts in the income tax of some countries.

[7] Social assistance includes all income-tested and means-tested benefits, both cash and near-cash.

– `direct taxes`

– `social security contributions`.

This choice is natural because the disposable income allows us to assess the impact of taxation on individuals' welfare and thus to evaluate the degree of inequality as a result of the candidates' choice.

3.2 Empirical Framework

In order to evaluate if and how the cohort-specific inequality depends upon the structure of fiscal policies chosen by the Government I built an econometric model where Gini indexes, calculated for every age group by using the Jenkins' routine, represent the dependent variable. The regressors are the variables which capture the two sides of fiscal policies, taxation system and public expenditure's components, and some control variables, such as the GDP growth rate, the unemployment rate and the consumer price index (CPI). The specification of the model is the following:

$$g_{ij} = \alpha + \sum_q \beta_q t_{qj} + \sum_p \delta_p c_{pj} + \varepsilon_{ij} \tag{8}$$

where i denotes the i-th generation, j the j-th country, g_{ij} the age group Gini index calculated for year 2000, t_{qj} the q-th fiscal policy for country j and c_{pj} the p-th control variable for country j. Since it is not easy to quantify how long the effects of a fiscal policy take to affect individuals' wealth (the so called *transmission lag*), I took the values of public expenditure components measured for three years (1985, 1990 and 1995). Otherwise, we may reasonably assume that taxation affects directly and instantaneously the welfare of households, which means that the transmission lag is particularly low.

I use many proxies to capture the two sides of fiscal policy, namely:

1. Public Expenditure

- *Old-age* – pensions, early retirement pensions, home-help and residential services for the elderly;
- *Health* – spending on in- and out-patient care, medical goods, prevention;
- *Family* – child allowances and credits, childcare support, income support during leave, sole parent payments;
- Active labour market policies – Employment services, training youth measures subsidised employment, employment measures for the disabled;
- *Housing* – housing allowances and rent subsidies.

2. Taxation

- *ttw67* - total tax wedge as a 67% of Average Wage; marginal personal income tax and social security contribution rates on gross labour income;
- *ttw100* - total tax wedge as a 100% of Average Wage; marginal personal income tax and social security contribution rates on gross labour income;
- *ttw133* - total tax wedge as a 133% of Average Wage; marginal personal income tax and social security contribution rates on gross labour income;
- *ttw167* - total tax wedge as a 167% of Average Wage; marginal personal income tax and social security contribution rates on gross labour income;
- *attw67* - total tax wedge as a 67% of Average Wage; average personal income tax and social security contribution rates on gross labour income;
- *attw100* - total tax wedge as a 100% of Average Wage; average personal income tax and social security contribution rates on gross labour income;
- *attw133* - total tax wedge as a 133% of Average Wage; average personal income tax and social security contribution rates on gross labour income;

- *attw167* - total tax wedge as a 167% of Average Wage; average personal income tax and social security contribution rates on gross labour income;
- *tmpit* - top marginal personal income tax rates for employee (combined);
- *nptdi* - net personal Tax; overall statutory tax rates on dividend income.

I also consider two control variables:

- GDP Growth Rate, calculated for years;
- Consumer price index;

both calculated for years 1997, 1998 and1999.

The marginal and average tax rates "all-in" for employees include personal income tax and employee social security contributions, less cash benefits, for a single individual without children at different income levels. Marginal tax rates measure how much of the extra wage income an individual worker keeps after taxes, whilst average tax rates measure how much total net income after tax changes if an individual decides to join (or exit from) the labour market (OECD, 2004).

The taxation of personal capital income varies substantially amongst OECD countries because some of them tax all personal capital income at a flat rate and wage and pensions at progressive rates (*Dual-income* tax). In other countries the taxation is progressive and the capital is taxed at more or less the same rates as labour (comprehensive income tax systems); finally in some countries we observe a semi-dual income taxation of capital income, since some capital is taxed at lower rates than wage income. Due to these differences, the OECD has chosen to use the taxation of dividends as a proxy for the taxation of capital, in order to allow for comparability.

3.2.1 Fixed effects: one-way error component model

Regressions were performed by using different hypotheses on the error components.

Following Baltagi (2008) I assume that observations could have unobserved fixed effects. I initially assume that residuals consist of a generation specific component μ_i and an idiosyncratic component which is unique to each observation v_{ij}, independent and identically distributed $\text{IID}\left(0, \sigma_v^2\right)$. That is

$$\varepsilon_{ij} = \mu_i + v_{ij} \qquad i = 1, ..., N; \quad j = 1, ..., M \tag{9}$$

Secondly, I follow the same reasoning for the country specific component μ_j

$$\varepsilon_{ij} = \eta_j + v_{ij} \qquad i = 1, ..., N; \quad j = 1, ..., M \tag{10}$$

This produces White standard errors which are robust to within cluster correlation (Clustered or Rogers standard errors). These standard errors would allow observations in the same generation/country to be correlated (i.e. different generations), but would assume that observations in the same generation, but different countries (or *vice versa*), are assumed to be correlated. The residuals are correlated across observations of the same generation, but are independent across countries:

$$corr\left(\varepsilon_{ij}, \varepsilon_{ts}\right) = \begin{cases} 1 & for\ i = t\ \wedge\ j = s \\ \rho_\varepsilon = \frac{\sigma_\mu^2}{\sigma_\varepsilon^2} & for\ i = t\ \wedge\ \forall\ j \neq s \\ 0 & \forall\ i \neq t \end{cases}$$

or correlated across observations of the same country, but are independent across generations:

$$corr\left(\varepsilon_{ij},\varepsilon_{ts}\right)=\begin{cases}1 & for\ i=t\ \wedge\ j=s\\ \rho_{\varepsilon}=\frac{\sigma_{\eta}^{2}}{\sigma_{\varepsilon}^{2}} & for\ i\neq t\ \forall\ j=s\\ 0 & \forall\ j\neq s\end{cases}$$

If $\rho_{\varepsilon}>0$ when the data have a fixed generation effect, the OLS standard errors will underestimate the true standard error. It can be demonstrated (see Petersen, 2006) that clustered standard errors are designed to correct the correlation of the residuals within cluster.

3.2.2 Fixed effects: two-way error component model

Secondly, I consider the regression model given by (8), but clustering data with two-way error components disturbancies:

$$\varepsilon_{ij}=\mu_{i}+\eta_{j}+v_{ij}\qquad i=1,...,N;\qquad j=1,...,M \tag{11}$$

with μ_i *and* η_j assumed as fixed parameters to be estimated. This approach allows for correlations among different generations in the same country and different countries in the same generation. The $t_q$and c_p are assumed independent of the v_{ij}. Therefore we have

$$corr\left(\varepsilon_{ij},\varepsilon_{ts}\right)=\begin{cases}1 & for\ i=t\ \wedge\ j=s\\ \rho_{\varepsilon}=\begin{cases}\frac{\sigma_{\mu}^{2}}{\sigma_{\varepsilon}^{2}} & for\ i=t\ \wedge\ \forall\ j\neq s\\ \frac{\sigma_{\eta}^{2}}{\sigma_{\varepsilon}^{2}} & for\ i\neq t\ \wedge\ \forall\ j=s\end{cases} & \\ 0 & for\ \forall\ j\neq s\ \wedge\ \forall\ j\neq s\end{cases}$$

In matrix notation, (8) may be written as

$$G=\alpha I+D_{\mu}\mu+D_{\eta}\eta+\beta T+\delta C+\varepsilon \tag{12}$$

where I is the identity matrix, D_μ and D_η the dummy matrix for the generation and country effects. The full least squares solution to the estimation problem for equation (12) solves the following normal equations for all estimable effects:

$$\begin{bmatrix} C'C & C'T & C'\mu & C'\eta & C'T \\ T'C & T'T & T'\mu & T'\eta & T'I \\ \mu'C & \mu'T & \mu'\mu & \mu'\eta & \mu'I \\ \eta'C & \eta'T & \eta'\mu & \eta'\eta & \eta'I \\ IC & IT & I\mu & I\eta & II \end{bmatrix} \begin{bmatrix} \delta \\ \beta \\ \eta \\ \mu \\ \alpha \end{bmatrix} = \begin{bmatrix} C'G \\ T'G \\ \mu'G \\ \eta'G \\ IG \end{bmatrix} \tag{13}$$

3.2.3 Random effects

When the residuals are correlated within a cluster, not only are the OLS standard errors biased but the slope coefficients are not efficient. One method for taking advantage of the additional information in the residuals (and generating more efficient estimates) is to estimate a random effects model using a generalized least squares approach. In this case $\mu \sim IID\,(0, \sigma_\mu)$.

4 Analysis of Results

Tables 1-7 report the results of regressions. I summarised them in the following six points:

[TABLE 1-7 HERE]

1. Tables 4-7 clearly show that the structure of taxation, captured by marginal and average personal income taxes, is strongly significant in explaining intergenerational inequality. These variables are almost always strongly significant at the 1 per cent of the confidence interval. This is an intuitive result, since taxation directly affects the income of individuals;

2. On the other hand, the components of public expenditure are not significant, as Tables 1-3 show; variables are never significant at the 5 per cent of the confidence interval. This is a counterintuitive result which goes against the conventional wisdom that public expenditure contributes to reduce inequality;

3. Point 2 and 3, taken together, provide a very important policy suggestion which is generated by the following asymmetry: it is the amount of money subtracted to individuals which generates disparities, not the amount of money they receive;

4. Average income taxes are more significant than marginal income taxes; this consideration comes out from the comparison between the parts (a) and (b) of Tables 4-7;

5. Macroeconomic variables strongly influence the level of intergenerational inequality; from Tables 4-7 we may see that both CPI and GDP are almost always strongly statistically significant;

6. p-values are quite similar across approaches, especially between fixed and random effects estimations.

5 Conclusions

This paper analyse the role played by fiscal policies on what I defined as age group inequality. This work represents a first attempt to move from the study of the macroeconomic inequality to that of the microeconomic inequality, which aims to detect differences in income distribution between social groups. Results are robust in showing that taxation has immediate and direct effects on intergenerational inequality, whilst public expenditure components have not.

This study, of course, could be improved in many ways. For instance it is difficult to disentangle the effects generated by fiscal policies from those generated by monetary policy, since we have to assume that the two instruments produce effects on households. Secondly, it would be important to measure the age group inequality by clustering according other variables, such as location, social status and so on and so forth. I hope this could be done in future researches.

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Age group Gini index	**Coef.**	**Std.Err.**	**t**	**P>t**
family95	0.004605	0.021785	0.21	0.835
health95	-0.0065	0.00976	-0.67	0.515
housing95	0.004003	0.021047	0.19	0.852
labour_programme95	-0.0247	0.02357	-1.05	0.31
old_age95	-0.01192	0.006798	-1.75	0.099
const	0.46695	0.046772	9.98	**0*****

Age group Gini index	**Coef.**	**Std.Err.**	**t**	**P>t**
family90	0.001554	0.019585	0.08	0.938
health90	-0.00167	0.010998	-0.15	0.881
housing90	-0.00321	0.036059	-0.09	0.93
labour_programme90	-0.03393	0.034364	-0.99	0.338
old_age90	-0.01147	0.006789	-1.69	0.111
const	0.443228	0.056334	7.87	**0*****

Age group Gini index	**Coef.**	**Std.Err.**	**t**	**P>t**
family85	-0.0063	0.021778	-0.29	0.776
health85	-0.02126	0.012489	-1.7	0.109
housing85	0.018843	0.038721	0.49	0.634
labour_programme85	0.011648	0.033422	0.35	0.732
old_age85	-0.00349	0.008786	-0.4	0.697
const	0.458517	0.039882	11.5	**0*****

Table 1, (a) (b) (c): Fixed Effects regression with Robust Clustered Standard Errors (RCSE) - Expenditure. Cluster: *country* (One-way Error Component Model); (***) significant at 1% C.I.; (**) significant at 5% C.I.; (*) significant at 10% C.I.

Age group Gini index	Coef.	Std.Err.	t	P>t
family95	0.004605	0.021573	0.21	0.831
health95	-0.0065	0.009615	-0.68	0.499
housing95	0.004003	0.020601	0.19	0.846
labour_programme95	-0.0247	0.023271	-1.06	0.289
old_age95	-0.01192	0.006758	-1.76	0.078*
const	0.46695	0.046647	10.01	**0*****

Age group Gini index	Coef.	Std.Err.	t	P>t
family90	15539	0.019448	0.08	0.936
health90	-0.00167	0.010905	-0.15	0.878
housing90	-0.00321	0.035397	-0.09	0.928
labour_programme90	-0.03393	0.03393	-1	0.318
old_age90	-0.01147	0.006737	-1.7	0.089*
const	0.443228	0.056497	7.85	**0*****

Age group Gini index	Coef.	Std.Err.	t	P>t
family85	-0.0063	0.021473	-0.29	0.769
health85	-0.02126	0.012626	-1.68	0.092*
housing85	0.018843	0.037873	0.5	0.619
labour_programme85	0.011648	0.033042	0.35	0.725
old_age85	-0.00349	0.008738	-0.4	0.69
const	0.458517	0.040338	11.37	**0*****

Table 2 (a) (b) (c): Fixed Effects Regression with Robust Clustered Standard Errors (RCSE) - Expenditure. Cluster: *country* and *generation* (Two-way Error Component Model); (***) significant at 1% C.I.; (**) significant at 5% C.I.; (*) significant at 10% C.I.

Age group Gini index	**Coef.**	**Std. Err.**	**t**	**P>t**
family95	0.004583	0.021762	0.21	0.833
health95	-0.00663	0.009752	-0.68	0.497
housing95	0.003989	0.021009	0.19	0.849
labour_programme95	-0.02463	0.023543	-1.05	0.295
old_age95	-0.01186	0.006777	-1.75	**0.08***
const	0.467187	0.046822	9.98	**0*****

Age group Gini index	**Coef.**	**Std. Err.**	**t**	**P>t**
family90	0.001556	0.019548	0.08	0.937
health90	-0.00192	0.010935	-0.18	0.86
housing90	-0.00335	0.036016	-0.09	0.926
labour_programme90	-0.03361	0.034266	-0.98	0.327
old_age90	-0.01137	0.006743	-1.69	**0.092***
const	0.443686	0.056418	7.86	**0*****

Age group Gini index	**Coef.**	**Std. Err.**	**t**	**P>t**
family85	-0.00635	0.021722	-0.29	0.77
health85	-0.0213	0.012341	-1.73	**0.084***
housing85	0.018893	0.038691	0.49	0.625
labour_programme85	0.011725	0.033165	0.35	0.724
old_age85	-0.00345	0.008714	-0.4	0.692
const	0.458513	0.039871	11.5	**0*****

Table 3, (a) (b) (c): Random-effects GLS regression - Expenditure. Group variable: generation i in country j

Age group Gini index	Coef.	Std. Err.	t	P>t
ttw67	-0.20047	0.082481	-2.43	**0.027****
ttw100	-0.19127	0.081404	-2.35	0.032**
ttw133	0.059009	0.120458	0.49	0.631
ttw167	-0.05639	0.041465	-1.36	0.193
tmpit	0.096988	0.058601	1.66	0.117
nptdi	-0.00243	0.000492	-4.94	**0*****
cpi99	0.011996	0.004436	2.7	**0.016****
cpi98	-0.02625	0.006118	-4.29	**0.001*****
cpi97	0.037592	0.006469	5.81	**0*****
gdpgr97	-0.01004	0.00819	-1.23	0.238
gdpgr98	0.016937	0.005002	3.39	**0.004*****
gdpgr99	-0.01479	0.007696	-1.92	**0.073***
cons	0.478973	0.035225	13.6	**0*****

Age group Gini index	Coef.	Std. Err.	t	P>t
attw67	0.628184	0.340144	1.85	**0.083***
attw100	-2.64326	0.703977	-3.75	**0.002*****
attw133	2.056846	0.718587	2.86	**0.011****
attw167	-0.59488	0.294185	-2.02	**0.06***
tmpit	0.19563	0.064955	3.01	**0.008*****
nptdi	-0.00261	0.000408	-6.4	**0*****
cpi99	0.023905	0.003516	6.8	**0*****
cpi98	-0.04175	0.005192	-8.04	**0*****
cpi97	0.050312	0.007533	6.68	**0*****
gdpgr97	-0.02963	0.008291	-3.57	**0.003*****
gdpgr98	0.023136	0.002319	9.98	**0*****
gdpgr99	-0.00596	0.007915	-0.75	0.462
cons	0.467718	0.029121	16.06	**0*****

Table 4, (a) (b): Fixed Effects Regression with Robust Clustered Standard Errors (RCSE) - Taxation. Cluster: *country* (One-way Error Component

Model); (***) significant at 1% C.I.; (**) significant at 5% C.I.; (*) significant at 10% C.I.

Age group Gini index	Coef.	Std. Err.	t	P>t
ttw67	-0.20047	0.051357	-3.9	**0***
ttw100	-0.19127	0.033771	-5.66	**0***
ttw133	0.059009	0.047406	1.24	0.218
ttw167	-0.05639	0.031492	-1.79	**0.078***
tmpit	0.096988	0.032788	2.96	**0.004***
nptdi	-0.00243	0.000166	-14.63	**0***
cpi99	0.011996	0.003876	3.09	**0.003***
cpi98	-0.02625	0.004136	-6.35	**0***
cpi97	0.037592	0.002587	14.53	**0***
gdpgr97	-0.01004	0.00409	-2.46	**0.017***
gdpgr98	0.016937	0.002025	8.37	**0***
gdpgr99	-0.01479	0.004422	-3.34	**0.001***
cons	0.478973	0.016388	29.23	**0***

Age group Gini index	**Coef.**	**Std. Err.**	**t**	**P>t**
attw67	0.628184	0.232783	2.7	**0.009*****
attw100	-2.64326	0.469374	-5.63	**0*****
attw133	2.056846	0.48484	4.24	**0*****
attw167	-0.59488	0.246385	-2.41	**0.019****
tmpit	0.19563	0.042712	4.58	**0*****
nptdi	-0.00261	0.000143	-18.31	**0*****
cpi99	0.023905	0.004153	5.76	**0*****
cpi98	-0.04175	0.004844	-8.62	**0*****
cpi97	0.050312	0.004034	12.47	**0*****
gdpgr97	-0.02963	0.004118	-7.2	**0*****
gdpgr98	0.023136	0.002163	10.7	**0*****
gdpgr99	-0.00596	0.004085	-1.46	0.149
cons	0.467718	0.016106	29.04	**0*****

Table 5, (a) (b): Fixed Effects Regression with Robust Clustered Standard Errors (RCSE) - Taxation. Cluster: *generation* (One-way Error Component Model); (***) significant at 1% C.I.; (**) significant at 5% C.I.; (*) significant at 10% C.I.

Age group Gini index	**Coef.**	**Std. Err.**	**t**	**P>t**
ttw67	-0.2005	0.08248	-2.43	**0.015****
ttw100	-0.1913	0.0814	-2.35	**0.019****
ttw133	-0.0564	0.04147	-1.36	0.174
ttw167	0.05901	0.12046	0.49	0.624
tmpit	0.09699	0.0586	1.66	**0.098***
nptdi	-0.0024	0.00049	-4.94	**0*****
cpi99	-0.01	0.00819	-1.23	**0.22**
cpi98	0.01694	0.005	3.39	**0.001*****
cpi97	-0.0148	0.0077	-1.92	**0.055***
gdpgr97	0.03759	0.00647	5.81	**0*****
gdpgr98	-0.0263	0.00612	-4.29	**0*****
gdpgr99	0.012	0.00444	2.7	**0.007*****
cons	0.47897	0.03523	13.6	**0*****

Age group Gini index	Coef.	Std. Err.	t	P>t
attw67	0.62818	0.34014	1.85	**0.065***
attw100	-2.6433	0.70398	-3.75	**0*****
attw133	-0.5949	0.29418	-2.02	**0.043****
attw167	2.05685	0.71859	2.86	**0.004*****
tmpit	0.19563	0.06496	3.01	**0.003*****
nptdi	-0.0026	0.00041	-6.4	**0*****
cpi99	-0.0296	0.00829	-3.57	**0*****
cpi98	0.02314	0.00232	9.98	**0*****
cpi97	-0.006	0.00791	-0.75	0.451
gdpgr97	0.05031	0.00753	6.68	**0*****
gdpgr98	-0.0418	0.00519	-8.04	**0*****
gdpgr99	0.02391	0.00352	6.8	**0*****
cons	0.46772	0.02912	16.06	**0*****

Table 6, (a) (b): Random-effects GLS regression - Taxation. Group Variable: *country*; (***) significant at 1% C.I.; (**) significant at 5% C.I.; (*) significant at 10% C.I.

Age group Gini index	Coef.	Std. Err.	t	P>t
ttw67	-0.2005	0.05136	-3.9	**0*****
ttw100	-0.1913	0.03377	-5.66	**0*****
ttw133	-0.0564	0.03149	-1.79	**0.073***
ttw167	0.05901	0.04741	1.24	0.213
tmpit	0.09699	0.03279	2.96	**0.003*****
nptdi	-0.0024	0.00017	-14.63	**0*****
cpi99	-0.01	0.00409	-2.46	**0.014****
cpi98	0.01694	0.00202	8.37	**0*****
cpi97	-0.0148	0.00442	-3.34	**0.001*****
gdpgr97	0.03759	0.00259	14.53	**0*****
gdpgr98	-0.0263	0.00414	-6.35	**0*****
gdpgr99	0.012	0.00388	3.09	**0.002*****
cons	0.47897	0.01639	29.23	**0*****

Age group Gini index	Coef.	Std. Err.	t	P>t
attw67	0.62818	0.23278	2.7	**0.007*****
attw100	-2.6433	0.46937	-5.63	**0*****
attw133	-0.5949	0.24638	-2.41	**0.016****
attw167	2.05685	0.48484	4.24	**0*****
tmpit	0.19563	0.04271	4.58	**0*****
nptdi	-0.0026	0.00014	-18.31	**0*****
cpi99	-0.0296	0.00412	-7.2	**0*****
cpi98	0.02314	0.00216	10.7	**0*****
cpi97	-0.006	0.00409	-1.46	0.144
gdpgr97	0.05031	0.00403	12.47	**0*****
gdpgr98	-0.0418	0.00484	-8.62	**0*****
gdpgr99	0.02391	0.00415	5.76	**0*****
cons	0.46772	0.01611	29.04	**0*****

Table 7, (a) (b): Random-effects GLS regression - Taxation. Group Variable: *generation*; (***) significant at 1% C.I.; (**) significant at 5% C.I.; (*) significant at 10% C.I.