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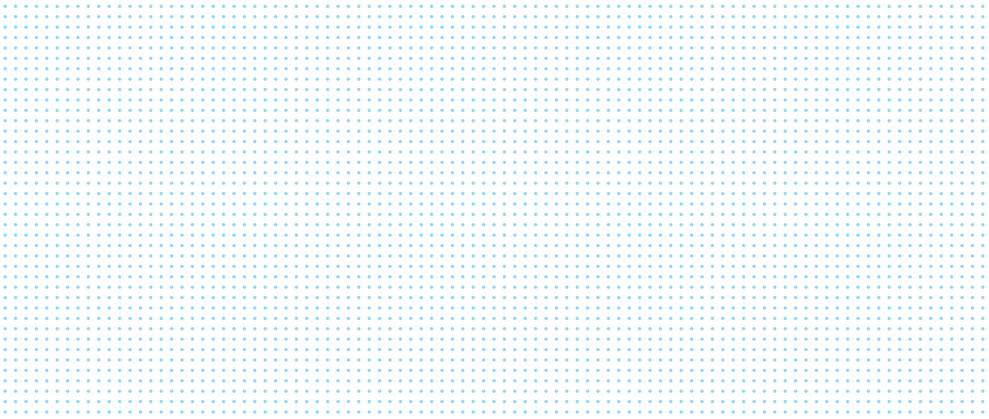
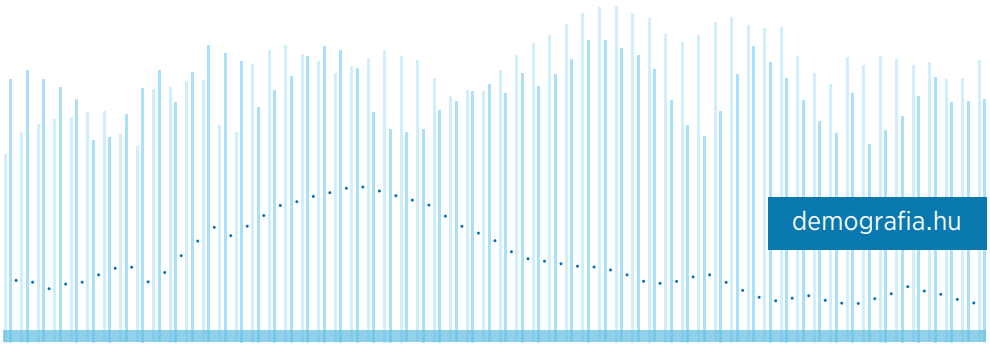


Nº 28

FINANCING THE LIFECYCLE OR MITIGATING POVERTY: REDISTRIBUTION IN THE HUNGARIAN WELFARE SYSTEM BY AGE AND INCOME

by
Róbert Iván Gál and Márton Medgyesi



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ABSTRACT

There seems to be a general consent in the expert community that Hungarian social policy provides poorly targeted benefits and services that are prone to Matthew-effects. Our results confirm this observation but we also find that the data offer an alternative interpretation of what the Hungarian welfare state is actually doing. Instead of supporting the poor it reallocates resources from the working age population to children and elderly people. It functions as an intermediary between overlapping generations that seek to finance their lifecycle by exploiting the opportunity offered by the very overlap, the fact that contemporaries are of different age.

In a cross-sectional framework we analyse reallocations by age and income simultaneously and assess the relative importance of these two variables in explaining the access and contribution to public benefits. Our data from 2010 (based on EU-SILC and the Household Budget Survey) covers public transfers (cash and in-kind) and both direct and indirect taxes. We compare the importance of age and income in explaining transfers and taxes in a regression-analysis framework by studying causal importance (comparing coefficients) and dispersion importance of the variables (using Shapley-value decomposition). We find that income is irrelevant in explaining access to benefits and services but age is important. On the contribution side, income proves as important as age. This qualifies our description of the Hungarian welfare system: it serves as a channel through which affluent people in their working age support people in inactive age of all income groups.

Keywords: welfare state, decomposition of income inequalities, National Transfer Accounts, provision and effects of welfare programs, income redistribution, taxation and government expenditures

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1. INTRODUCTION[1]

Hungarian social policy[2] is indifferent to income inequalities. This statement is made frequently in public debates – and always in a negative context. There is a corrupt redistribution in the welfare system because benefits and services do not aim the poor; the system is ill-targeted and at times even produces Matthew-effects: the well-to-do have better access to public resources than the needy (Ferge, 2000; Révész, 2002; Benedek, Firle and Scharle, 2006; Szikra, 2014). Our results support this observation but we also offer an alternative context to the analysis. Like previous research we find that the income position is practically irrelevant in explaining receipt of benefits. However, age is not. The main beneficiaries of the Hungarian welfare state are children and elderly people. This implies the re-interpretation of the welfare state: instead of being a failed redistributor of resources captured by the well-to-do we consider it a component of a multi-channel system of financing the lifecycle through inter-age reallocations. Its programmes fund human capital investments at the beginning of the lifecycle, in childhood, and cover consumption in old age through taxing the returns of such investments. Its institutional context are not charities but households as well as insurance, real estate and capital markets. Yes, it deals with situations of insufficient income but this inadequacy is not a consequence of distortions of the economy, asymmetry of power, or market failures but the typical age patterns of the human lifecycle. Namely, the fact, that, independently of the level of economic development and culture, the age-profile of consumption is more uniform than that of production. Children and the elderly as well as the working age population consume but production is concentrated in the active age.

This finding is certainly not new. Three decades ago Becker and Murphy (1988) already considered the welfare system as a mechanism financing the lifecycle. Cigno (1993) describes the emergence of the welfare system as a government intervention in a chain of intergenerational resource reallocations. Boldrin and Montes (2005), while examining the relationship of education and pensions, introduce the concept of the intergenerational state. Similarly, van Groezen, Leers and Meijdam (2003) present a model of interrelated reallocations, family benefits and pensions, flowing to opposite directions; they even call them Siamese twins. Exploiting the same relationship, Berlinger (2005) recommends detailed policies in the Hungarian context linking student loans and pensions. Miller (2011) applies comparative data of the National Transfer Accounts project in discussing the welfare system as an inter-age reallocation mechanism between overlapping generations. The social investment school (Esping-Andersen, 2002; Morel, Palier and Palme, 2012) recognizes, and advocates, a shift from passive income replacement programmes to active human capital investments as the main task of the welfare state. Folbre and Wolff (2012) argue that ignoring the intergenerational nature of the welfare system creates problems of sustainability and fairness. They also make recommendations for institutional reform to overcome such distortions. Making a step further Rangel (2003) proves that the two intergenerational chains, one conveying resources backward from the younger to the older and another one flowing forward from the older to the younger, are connected. To put it simply: what is transferred today

1 Comments by Gábor Kézdi, Amílcar Moreira, Saumik Paul, Pieter Vanhuysse and conference participants in Hirosaki, Budapest, Athens and Lisbon are gratefully acknowledged. The usual disclaimer holds.

2 In this paper we use the terms "welfare state," "welfare system," "social policy" as synonyms. The borders of the welfare state are not unambiguous; the literature usually refrains from providing an exact definition of its tasks. Following the general practice of international organisations, such as the OECD, the IMF, Eurostat; or influential university programmes such as the curricula of the Department of Social Policy of the London School of Economics, the Malcolm Wiener Center for Social Policy at Harvard University or the internationally used textbook by Barr (1987) we cover public education, public health and long-term care, as well as various cash programmes, including family benefits and pensions, of the general government.

from working age cohorts to the elderly depends on the transfers that flew among the same cohorts in the opposite direction a time period before.

In addition to the usual targeting analysis limited to transfers and services we extend our research to the taxation side. Here we find that income proves to be as important as age. This result qualifies our description of the Hungarian welfare state: it is an inter-age reallocation system by which working age people of richer income groups contribute to the funding of the inactive sections of the lifecycle of all income groups.

We make our point in Section 2 by splitting the revenues and expenditures of the Hungarian welfare system by age and income and depicting the results in three-dimensional figures. After this eyeball analysis, in Section 3 we quantify the relative importance of income and age in two ways. First, we measure importance by comparing the absolute values, range and standard deviation of the regression coefficients of age and income. Second, we examine the dispersion importance of age and income based on Shapley-value decomposition of the variance of public inflows and outflows. Finally, we discuss some of the consequences in Section 4.

2. AGE AND INCOME PROFILES OF WELFARE PROGRAMMES

First, we make an eyeball analysis of welfare expenditures and the taxes financing them by age and income. In Section 2.1 we describe our data and the assumptions made processing them. We present definitions of cash and in kind benefits as well as taxes and contributions covered. We discuss assumptions applied while drawing the three-dimensional age and income profiles; and the creation of age and income categories. We present the distributions in Section 2.2. We use the figures only for illustration and with some simplification. We distinguish 10 age groups and five income categories. In the subsequent calculations income categories will be created with a special attention in order to avoid distortions by data grouping. We will discuss this issue in Section 3.2.

Following standard terminology, we call taxes and contributions revenues and we call services and benefits expenditures. This language is telling. What is revenue for government is expenditure for its citizens and the other way around. The mainstream approach is government centred. Our approach would fit the opposite way more easily. If the welfare system is but one of the channels through which people in different points in their lifecycles organise the reallocation of resources among themselves taxes would be expenses and benefits or services would be revenues. Nevertheless, we stick to standard terminology in order to avoid confusion.

2.1 DATA AND ASSUMPTIONS

Our main data sources for the study of the distribution of welfare benefits and taxes covering them by income and age are the Hungarian legs of the 2010 waves of the Household Budget Survey (HBS) and the European Union Statistics on Income and Living Conditions (EU SILC).

Cash benefits are recorded in several aggregate variables in EU-SILC such as old-age pensions, survivor benefits, sickness benefits, disability benefits, education-related benefits, family/children related allowances, social exclusion benefits and housing allowances. Most of these categories comprise several allowances. For instance, unemployment benefits include unemployment benefit as well as other forms of income replacement for the unemployed (*munkanélküliek ellátásai*). Also, family/children related allowances include maternity benefits, such as the birth grant (*anyasági támogatás*) and the so called pregnancy-confinement benefit (*terhességi-gyermekágyi segély*, TGYÁS); as well as various forms of family benefits, such as the child home care allowance (*gyermekgondozási*

segély, GYES), the child raising support (*gyermeknevelési támogatás*, GYET), the child care allowance (*gyermekgondozási díj*, GYED), and the family allowance (*családi pótlék*, CSP).[3] Social exclusion benefits include both the regular social assistance (*rendszeres szociális segély*) and the temporary social assistance *(átmeneti szociális segély*).

Allocating cash benefits among household members is sometimes less than straightforward and requires additional assumptions. In some cases, EU-SILC includes only household level data, so assumptions have to be made when calculating individual-level benefits. In other cases, conceptual problems of incidence require intervention by the researcher. In particular, in a country such as Hungary with its extended and generous maternity and family benefit programmes the outcome of the analysis is affected by the assignment of such benefits to either the child or the parent. In order to decide we applied a two-question test. First, would a child without parents receive support from society to get a chance to grow up? Second, would a childless couple receive support from society to grow their non-existing child? The answer is yes to the first and no to the second question. This leads us to assign child-related benefits to children.[4]

All other benefits reported only at the household level in the survey are distributed uniformly among working age adults of the household.[5]

Survey data on government expenditures are scaled to match national accounts totals. National accounts totals were taken from the Eurostat database on general government expenditure by economic function according to the international Classification of the Functions of Government (COFOG). The implicit assumption here is that any deviations of the (weighted) sample from the population are income and age neutral.

In contrast to cash benefits, consumption of welfare related public services in kind is not recorded in these surveys. We have to estimate the value, and sometimes the very use, of such services from external information sources. We applied the assumption most frequently applied in the literature that the value of a service equals the average cost of its provision (Verbist, Förster and Vaalauvo, 2012). Admittedly, this assumption ignores variation by quality. Also, due to limits of survey information we cannot separate consumers of publicly and privately financed services. This is no problem in education, since students of private schools also receive the same per capita public funding as their counterparts in public education. However, it distorts the results in health care although, due to the funding structure of health care in Hungary, the effect is marginal.

Education is a relatively simple case because users can be identified in EU-SILC. The survey explicitly asks about each household member whether they attended school at the time of data collection and if yes, at which level. We imputed per capita (attendee) public spending of the corresponding education levels. EU-SILC also contains data on participation in early childhood care and education so we applied the same approach in this case, too. Unfortunately, EU-SILC does not provide data on use of health care services. Instead, we turned to data of the first wave of the European Health Interview Survey (EHIS) to estimate the value of these in-kind benefits. EHIS records the number of days spent in hospital during the year, and the number of visits to a general practitioner or doctor during

3 We do not cover the child-related deduction from the personal income tax although it can be considered a separate cash benefit. Ignoring it affects the benefit as well as the tax side (showing the amounts of both benefits and taxes smaller in the well-to-do working age groups). Since in 2010 child-related tax deductions were negligible in Hungary and gained importance only in later years (0.05% of GDP in 2010 compared to 0.75% expected in 2017) and since the consequences bias our conclusions on both the income and the age axis we believe that the effect of ignoring it is invisibly small.

4 The standard incidence question asks who pay the taxes, and gives the answer based on income elasticities of suppliers and buyers (Pechman, 1985; Fullerton and Metcalf, 2002). This is extended to the transfer side by modelling the effects on the consumption of those potentially affected. This approach implicitly assumes the very existence of the taxes and transfers in question, which is more realistic in the case of taxes than on the benefit side. Instead, our incidence question targets the existence of a transfer type: would there be family benefits without children? In short, we find an asymmetry between the incidence analysis on the tax side (where the existence of taxes is less of a question) and the benefit side (where it is not so obvious to find this or that type of benefits).

5 Access to various social assistance type of benefits is frequently easier if children are present in the applicant's household. We did not go into such details and assigned all such benefits to the applicant, which affects our conclusions in a conservative way by diminishing the effect of age on social policy.

the year. We identified averages of uses of primary and outpatient services by age group and income category in EHIS. These averages were imputed to the EU-SILC data and were multiplied by per patient public spending in 2010 in the relevant service categories.

Calculations on the revenues of the welfare system start with an assumption stating that the benefit and the tax sides balance out. What is not covered by special earmarked taxes, such as the pay-roll tax, is financed from what we call here general taxes, which includes government revenues other than the pay-roll taxes.

Data on the age and income profiles of revenues come from various sources. Taxes levied on labour income (personal income tax, which is over 90% labour related in Hungary, and pay-roll tax) are reported in EU-SILC at the household level. Such direct taxes are divided between household members by their labour income.

Payment of indirect taxes (VAT and excise taxes) was estimated using data from the HBS, which contains detailed information on household consumption of different goods and services. Individual VAT payments were calculated from individual consumption and VAT rates. Individual consumption was derived from household aggregates using the OECD II equivalence scale. Excise tax is levied on consumption of tobacco, alcohol and petrol. The latter was estimated from HBS data using weights developed by an expert of the Hungarian Central Statistical Office (see Medgyesi, 2004) to split consumption among household members. As HBS provides information only on expenditure on cigarettes and alcohol, but not on the quantities consumed, we used information on quantities consumed from EHIS data (see below about the methodology).

In order to keep our set of incidence assumptions consistent, we assigned taxes on the consumption of children to them, the actual consumers and not the parents, in line with the assumption made above on the incidence of child-related benefits. Implicitly this assumes intra-familial transfers from parents.

Direct and indirect taxes are estimated from different data sources. In order to be able to handle them simultaneously, we imputed VAT and excise tax payments in EU-SILC. Similarly to other studies analysing the redistributive effect of indirect taxes, such as De Agostini et al (2017), Pestel and Sommer (2017) or Savage (2017), we used a regression-based method for the imputation. We constructed a regression model of VAT payment in the Household Budget Survey based on overlapping socio-demographic variables[6] as explanatory variables and applied this model to predict VAT in EU-SILC. A similar method was used to impute units of alcohol and tobacco consumption from EHIS to EU-SILC to calculate the amount of excise tax paid by the individuals.

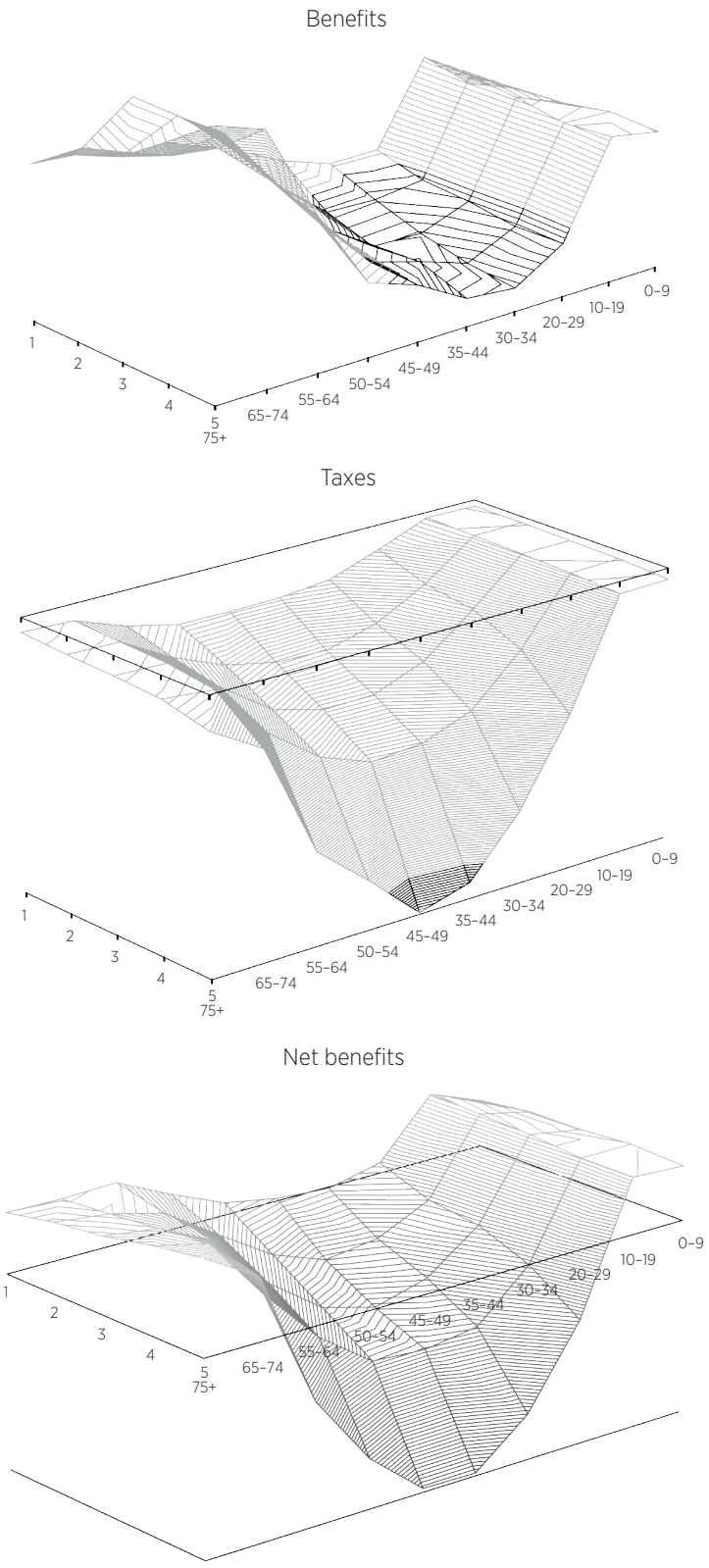
All tax items assigned to taxpayers are finally readjusted to the aggregates reported in the TAXUD and the National Tax List databases of Eurostat.

2.2 EXPENDITURE AND TAX PROFILES BY AGE AND INCOME

The three panels of *Figure 1* are three-dimensional. On each, the two horizontal axes are age groups and income categories. The latter are quintiles from 1, the poorest, to 5, the richest, based on the equivalent household income. The vertical axes are per capita Forint values of benefits, taxes or net benefits, respectively. Since at this stage the figures are presented only for illustration the scales of the vertical axes differ in the three panels and the graphs are rotated so as to offer better visibility. Accordingly, the richest

6 Serafino and Tonkin (2017) show that there is a range of common variables in HBS and EU-SILC. For the majority of these variables, the distributions are highly comparable between the two datasets. We use the following variables available both in HBS and EU-SILC to predict household VAT payment: gender of household head, age of household head, percentage of children below age 5 in the household, percentage between age 6 and 14 in the household, percentage of those aged 70 years or older, urbanisation (densely populated, intermediate, thinly populated), region (number of categories depends on country), household size, household type (6 categories), highest education level obtained by the household head (less than upper secondary, upper secondary, tertiary), economic activity of household head (employed, unemployed, retired, inactive), occupation of household head (10 categories) and log household income. *Table A4* of the Appendix shows coefficients of the regression.

income group is the closest to the viewer and age grows from right to left. Using income quintiles serves the same illustrative purpose. In the actual analysis we apply the same number of age and income groups.



Source: Authors' calculation.

Figure 1

Benefits, taxes and net benefits of social policy by age group (0–9 to 75+) and income quintile (1 to 5 from poorest to richest), Hungary, 2010 (per capita values in Forint)

As the upper panel shows, welfare spending reflects the dominance of age over income. The relief map reveals a slope among children, a valley among the working aged and a high ascent among the old. This general image is just slightly coloured by the crosswise climber towards the highest income category in old age (and practically none among children) and the decent in working ages. The iso-age lines run almost parallel with the income axis; the iso-income lines largely deviate from the age axis. In numbers: the 10–19-year-old receive 3,7 times as much in benefits as the 30–34-year-old, who get the least; the oldest get more than 5 times as much. Among the income groups the largest difference is 20 percent and it is not the poorest who receive the most per capita.

The tax side (see the central panel of *Figure 1*) is also affected by age but it shows stronger income effects than the benefit chart. To start with, children pay only indirect taxes, which limits their contributions as welfare expenses are covered to a large extent by pay-roll taxes and even the rest, general taxes draw from labour-related duties, such as the personal income tax in Hungary. More or less the same applies to the elderly. However, unlike on the benefit side here iso-age lines, too, bend sharply in working age especially in the highest income quintile.

We sum up our eyeball analysis in the *Net benefits* (benefits less taxes) panel of *Figure 1*. Details are presented in *Table A1* of the Appendix. Here we limit ourselves to the most important features:

1. All age groups below age 20 and above age 55 are net beneficiaries in any income category (except for the 55–64 age bracket in the highest income quintile).
2. Net benefits are the lowest among the 35–44-year-old except for the poorest quintile where 30–34-year-olds, the only net contributor age bracket in this income category, receive the lowest net amount.
3. Among the poorest, all age groups are net beneficiaries except the 30–34-year-old.
4. The poorest quintile is the highest net beneficiary in the 10–19-year-old through the 55–64-year-old; however, among small children and among the elderly they are not.
5. We emphasise that Figure 1 reflects a time period; caution is recommended when someone tries to derive conclusions about lifecycles of cohorts.

3. THE RELATIVE IMPORTANCE OF AGE AND INCOME

In this section we make a more rigorous and systematic inquiry of what we have analysed visually so far. In Section 3.1, we position our calculations among previous results and describe our research strategy. In order to support our view of the welfare state as a channel of inter-age resource reallocations rather than an institution mitigating poverty and equalising income we make an effort to show that age is more important in explaining differences in receipt of benefits and services. Following the statistical literature (see Achen, 1982 or Grömping, 2015) we approach 'importance' in several ways. First, we consider a variable more important than another if its coefficient is higher in a regression model (Section 3.3) and/or if it explains more of the total variation of the dependent variable (dispersion importance; Section 3.4), in our case welfare spending, taxes funding such expenditures and their netted out difference. Before, however, in Section 3.2, we discuss some special issues of methodology of our research problem.

3.1 RESEARCH DESIGN AND PREVIOUS RESULTS

We separate the effects of age and income on the access to benefits of as well as contributions to the welfare system. Related efforts in the context of cross-sectional versus lifecycle redistributions have been made in the literature before.

Pestieau (1989) and independently Fullerton and Rogers (1993) apply a thought experiment. They show that under conditions of zero economic growth, equality of entry wage for every cohort and identical wage profiles over the lifecycle there is no inequality across birth cohorts, yet due to the typical hump shape of the wage profile there is inequality in cross section. Consequently, inequality and relative poverty, measured usually in cross-section, are in part the result of age-specific productivity. Consequently, if social policy reduces cross-sectional relative poverty and inequality it most likely smooths age-related inequalities. Fullerton and Rogers (*ibid*) demonstrate that the US tax system is progressive in that the lifetime tax rates of high income groups are higher than those of low income groups but the difference is much smaller than any such comparison in cross section would suggest. Nelissen (1998) shows the same for the Netherlands and Bengtsson, Holmlund and Waldenstörm (2016) for Sweden. The two European calculations take the transfer side into account in addition to taxes.

Our way of raising the question is closer still to research comparing welfare systems by the relative importance of lifecycle financing versus redistribution by income. Falkingham and Harding (1996) compare social policies of Australia and the United Kingdom and find that the former focus more on alleviating poverty whereas the latter put more effort on financing the lifecycle through intergenerational reallocations. Instead of lifecycle financing they use the term insurance. Ståhlberg (2007) reviews longitudinal studies of social policy and concludes that smaller systems concentrate more on mitigating poverty whereas larger systems finance the life-cycle. She calls the former inter-personal and the latter intra-personal.

All these approaches compare cross-sectional and longitudinal redistributions. However, only Bengtsson, et al (2016) are able to analyse actual lifecycles. Swedish data are particularly rich. Similar micro panel data are not available elsewhere so all other results are based on microsimulation. This limits the number of potential country studies. The methods presented below are based on cross-sectional data, which has the advantage of making actual or simulated lifecycles unnecessary.

The statistical literature on importance of regressors in multivariate regressions differentiates between causal or theoretical importance and dispersion importance of a predictor variable (see e.g. Grömping, 2015). *Causal or theoretical importance* is the change in the outcome variable in response to a unit change in the predictor variable. This can be measured using the regression coefficient or the standardised regression coefficient. *Dispersion importance* refers to the amount of the variance in the outcome variable explained by the regression equation that is attributable to each predictor variable.[7] We discuss both aspects of variable importance in the following analysis.

3.2 SPECIAL METHODOLOGICAL ISSUES

We apply OLS regressions with two ordinal variables on the right-hand side of the equation:

$$Y = \alpha + \sum_i \beta_{A_i} Age_i + \sum_j \beta_{I_j} Income_j + \varepsilon, \qquad (1)$$

where Y represent benefits, taxes or net benefits, respectively in separate runs; Age_i and $Income_j$ are categories for age and income (i, j = 2, ..., 10) and the ßs are regression coefficients.

7 A third concept of variable importance is *level importance,* which refers to the increase in the mean outcome score that is contributed by the predictor. The measure of level importance proposed in the literature corresponds to the product of a variable's mean and its unstandardized regression coefficient (Achen, 1982). Since here the distribution of the explanatory variables is identical by construction the level importance does not add new information.

We use categorized versions of age and income in order to allow for non-linearities in the effects of the variables. Since both the regression coefficients of the models of causal importance and the between-group variation in the analysis of dispersion importance depend on the way age groups and income categories are created special care is needed here. For instance, fewer and larger categories keep more of the overall variation within groups so a potential asymmetry in the classification of the two explanatory variables would affect the results. In order to overcome this problem, we created 10 categories in both dimensions and set the borders of income classes in a way that its distribution (the share of the sample in the ensuing classes) would be the same as the distribution of people in the age groups (see *Table A2* in the Appendix). The age groups were created so as to minimise the variation of the number of observations (the share of the sample) so leaning to the Hungarian age pyramid they are not of the same length. Some are quinquennial and some are longer (see *Figure 1*).

In the models presented here we use only the two explanatory variables without controls. The aim of the analysis is to compare the relative importance of age and income in explaining the variance of the dependent variables. This does not require the search for a model explaining as much of the total variance (as high R^2) as possible. For robustness tests not reported here we added controls not directly correlated with income or age, such as gender, settlement type and region. We found that including them did not affect our results on the relative importance of age and income.

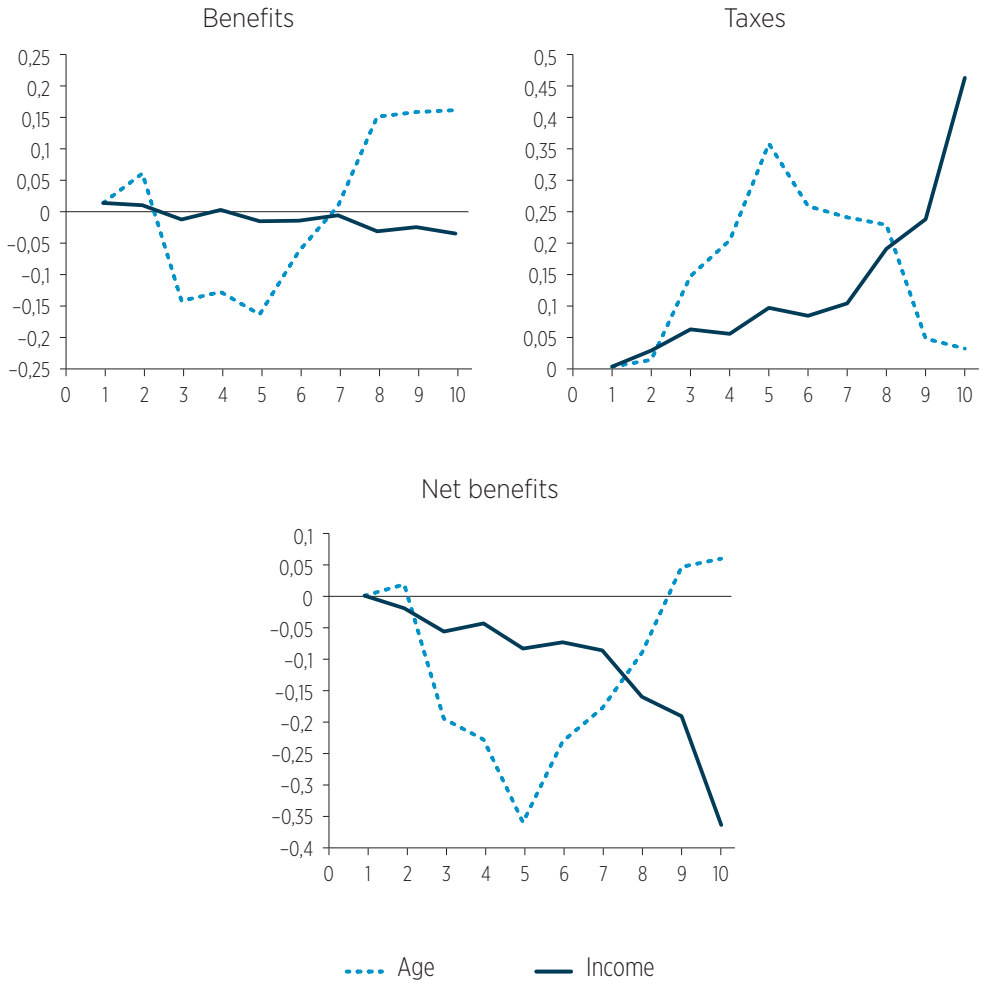
3.3 COEFFICIENTS OF AGE AND INCOME

The three panels of *Figure 2* stand for the regression table usually presented at this point. They show the standardised regression coefficients of the benefit, the tax and the net benefit models, respectively, for each income group (solid lines) from the poorest (1) to the richest (10) and for each age group (dotted lines) from the youngest (1) to the oldest (10). In order to help the orientation, the scales of the vertical axes are the same although the three panels depict different segments of the coordinate system. Full regression tables of the three models are presented as *Table A3* of the Appendix.

Figure 2 confirms our previous intuitive results. In *Table 1*, we propose three indicators to summarise the differences in coefficients of age and income: the sum of absolute values, the range and the standard deviation of coefficients. In the benefit model, the sum of the distances of the regression coefficients of the income categories from the reference category is a mere 0.27; the range of the coefficients is 0.05 and their standard deviation is only 0.02 (see *Table 1*). The corresponding figures of age are 1.10, 0.35 and 0.14, respectively. On the benefit side age matters, while income does not.

On the revenue side both variables prove to be relevant. Age coefficients are on average further away from the reference category than income coefficients while their range and standard deviation are similar. Overall, in the case of taxes, the comparison of causal importance of the two right-hand-side variables is inconclusive.

In the resulting net benefits model age again is more important than income. Net benefits differ more between age groups than between income groups.



Source: Authors' calculation.
Note: Based on regression models including only age and income dummies as explanatory variables.

Figure 2

Regression coefficients of income and age groups in the benefits, taxes and net benefits models (reference category: age=1, income=1)

Table 1

Sum of absolute values, range and standard deviations of regression coefficients of age and income in models of benefits, taxes and net benefits

	Benefits		Taxes		Net benefits	
	Income	Age	Income	Age	Income	Age
Sum of absolute values	0.27	1.10	1.31	1.52	1.08	1.41
Range	0.05	0.35	0.47	0.36	0.37	0.42
Standard deviation	0.02	0.14	0.14	0.13	0.11	0.14

Source: Authors' calculation.

3.4 COEFFICIENTS OF AGE AND INCOME

As mentioned above, a variable is more important than another in the sense of dispersion importance if it explains more of its variance. In order to measure dispersion importance, in Section 3.4.1 we present the method of decomposition. In Section 3.4.2, we show the results of the exercise.

3.4.1 Dispersion importance: methods

The Shapley-value decomposition and the Fields-decomposition are two common methods for studying dispersion importance of variables in regression models (Israeli, 2007). In the Shapley-value decomposition the contribution of an explanatory variable to the explained variance of the dependent variable is equal to its marginal effect on the fitness of the model (R^2). This marginal effect is equal to the change in the R^2 if the variable in question is eliminated from the regression. When there are several explanatory variables, the marginal effect of a variable depends on the order of elimination. The idea of the Shapley-value decomposition is that the contribution of a regressor is equal to the average of its marginal effects over all possible elimination orderings. Using results by Shorrocks (1982) Fields (2003)[8] proposed a decomposition, based on the regression model of some outcome Y (e.g. income)

$$Y = \alpha + \sum_j \beta_j X_j + \varepsilon. \tag{2}$$

The percentage contribution of the composite variable, $C_k = \beta_k X_k$, to the total variation of Y can be given as

$$s_k = cov(C_k, Y)/var(Y) = \beta_k cov(X_k, Y)/var(Y). \tag{3}$$

Israeli (2007) compares the two methods and finds that they give identical results in the unlikely case of uncorrelated explanatory variables but if the explanatory variables are highly correlated the Shapley contributions of the variables tend to be similar, whereas the Fields-method can counterintuitively result in contributions of inverted signs. She reckons this an advantage of the Shapley-method over the Fields-method. Further advantage of the former is that the Shapley-decomposition easily accommodates categorical explanatory variables and interaction effects. Based on these considerations our first choice for the decomposition method is the Shapley decomposition.

3.4.2 Dispersion importance: results

We present the results of the decomposition exercise in *Table 2*. It contains percentages of the total variance of benefits, taxes and net benefits, respectively, accounted for by age and income as well as the contributions of these variables to the explained variance (R^2) of the models. The analysis again confirms the conjectures of Section 2. Age is much more important in explaining the access to benefits; income is in fact irrelevant here. On the financing side, the two variables are both relatively important but income explains more of the variance. In this respect the analysis of dispersion importance somewhat qualifies the results of Section 3.3. Whereas the analysis of the regression coefficients proved to be inconclusive, in terms of dispersion importance income is clearly more dominant. As for net benefits, the analysis of dispersion importance gives a similar picture to the above analysis of coefficients: age is more important in explaining the dispersion of net benefits than income.

8 Fields (2003) introduced this decomposition in the study of inequality, but the formula has been proposed and discussed in the statistical literature on variable importance in multivariate regression models since the 1960s (see Johnson and Lebreton, 2004; Grömping, 2015). A similar decomposition was proposed by Morduch and Sicular (2002); see also Cowell and Fiorio (2011) for a restatement of the technique.

The lower panel of *Table 2* also shows that our results change only marginally if we take into account the interaction of the two explanatory variables. The three-dimensional figures in Section 2 suggested interactions between age and income since the income effect is clearly different in working age than in old age. The inclusion of the interaction terms modifies our benefit results the most: the contribution of income to the R^2 of the model increases from 2% to 7%, while that of age decreases from 98% to 93%. However, this does not affect our conclusion that age is much more important than income in explaining differences in benefits. Minor changes also occur in net benefits, but again the conclusion that age is more important than income remains valid.

Table 2

Dispersion importance of age and income on benefits, taxes and net benefits (results of Shapley-value decomposition of the R^2)

	Benefits		Taxes		Net benefits	
	% of					
	total variance	explained variance (R^2)	total variance	explained variance (R^2)	total variance	explained variance (R^2)
	Without interaction					
Age	18.4	98.1	16.6	44.2	21.5	62.5
Income	0.4	1.9	20.9	55.8	12.9	37.5
Total	18.8	100.0	37.4	100.0	34.3	100.0
	With interaction					
Age	19.5	93.0	19.9	45.1	24.5	60.6
Income	1.5	7.0	24.3	54.9	15.9	39.4
Total	21.0	100.0	44.2	100.0	40.4	100.0

Source: Authors' calculation.
Note: Without interaction: based on regression models including only age and income dummies as explanatory variables. With interaction: based on regression models including age and income dummies and interaction of age and income as explanatory variables.

The analysis of dispersion importance confirms that the Hungarian welfare state is an intermediary between overlapping generations that seek to finance their lifecycle by exploiting the opportunity offered by the very overlap, the fact that contemporaries are of different age. Watching more closely it serves, at least in Hungary, as a channel through which affluent people in their working age support people in inactive age of all income groups.

4. CONCLUSIONS

We confirmed the conjecture, long time present in the literature on social policy, that Hungarian welfare programmes are insensitive to income differences. Poor and well-to-do receive almost the same resources. We extended this result showing that, in contrast, age has a sizeable effect on the access to the welfare system. The benefit side of Hungarian social policy is better described as an institutional system of lifecycle financing through inter-age resource reallocations than a public programme to mitigate poverty, equalise income or create opportunity. Adding the taxation side of the system shows that income-related redistribution mostly takes place through the tax system. Overall however redistribution between age-groups turns out to be more important than redistribution between income-groups.

For a more definitive statement on welfare states in general we will extend our research to further countries in the future. Falkingham and Harding (1996) and Ståhlberg (2007) have found that although reallocation among age groups is always crucial, some welfare systems are more redistributive across income groups than others. Yet, even our single-country case leads to some important consequences for the analysis of Hungarian social policy. We will focus on two such conclusions, firstly on the public discourse on poverty and inequality and secondly on the institutional environment of the welfare system.

As for the first point, our findings do not imply critical conclusions regarding poverty alleviation, income equalisation or government intervention in general. To the contrary, strong arguments support government activity in this field as well as its use in mitigating poverty. However, lifecycle financing is just one, if important, area where government intervenes. Public investments, regulation, setting of exchange rates and interest rates, services, such as public safety are all areas where poverty and/or inequality are as relevant (or not) as in the field of lifecycle financing. Yet, in such areas the question of poverty or inequality is not as automatically raised. There is no particular reason to expect more active equalisation from pensions, which is the return on investments in the human capital of the next tax-paying generation from a lifecycle finance perspective, than from building roads. Still, the growing inequality of pensions is subject to an active public debate in Hungary, whereas road construction is discussed in terms of efficiency rather than equality. This is despite of the strong effect on equality of the strategy of such activities. Highways favour residents of cities, where the rich live. In contrast, investing in the lower level road-network and public transport in the country brings more benefit to the poor in relative terms. Public investments in air traffic produce even stronger Matthew-effects and the examples could be easily counting. Yet, we use the terminology of inequality in these fields less frequently than, say, in the case of family benefits, even though family benefits are more human capital investments than tools for mitigating poverty.

Our other point is the general neglect of the poverty-inequality framework of alternative resource providers. If the main task of the welfare state is to alleviate poverty and mitigate inequality the institutional environment of the welfare state is formed of charities that, besides government, help the poor and needy and give chances to their children. In this context the leading research question is crowding out: whether government intervention deprives resources and motivation of charitable activity and voluntary work. The research community tested this hypothesis several times (for a recent review see Boberg-Fazlić and Sharp, 2017). Also, the most important policy question is the optimal coordination of government, charities and civil organisations in general: where should government provide services; where should it support non-governmental organisations but should not be directly involved; and where should it leave the sector to organise its own way of operation.

However, if social policy reallocates resources principally from people in working age to people in inactive age its institutional environment is not charities but organisations managing inter-age reallocations, most importantly, families. In fact, tacitly and without acknowledging it, the poverty-inequality framework recognizes intra-familial transfers. The general business standard of the measurement of poverty and inequality is based on household equivalent incomes. Equivalence scales are derived from consumption shares rather than income shares and in this way, redistribute resources among household members. This process disguises inequalities of primary incomes in the household as well as the resulting resource reallocation that mitigates it. In the household, the same way as in the welfare state, income owners finance the consumption of incomeless people. Working age individuals cover the costs of relatives in inactive age; in societies characterised by nuclear families, such as Hungary, they are typically parents and dependent children.

Within-household resource reallocation is not recorded by official statistics. The household as a scene of poverty alleviation and inequality mitigation does not appear in these registries, even though its performance is hardly less in this field than that of the government. This deficiency of public statistics is corrected by a new development in national accounting, the National Transfer Accounts (Lee and Mason, 2011; United Nations, 2013). The new method, NTA by its acronym, adds a tertiary redistribution to the income account of National Accounts beyond the market-generated primary allocation and the government-supervised secondary redistribution. The special feature of the tertiary redistribution is that it is organised mostly by families within or between households among people of different age.

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APPENDIX

Table A1

Annual per capita welfare benefits and taxes by age group and income quintile in 2010 ('000 Forint)

Age group	Income quintile				
	1	2	3	4	5
			Benefits		
0– 9	639	715	732	783	773
10–19	869	859	839	795	821
20–29	408	339	323	288	301
30–34	406	305	221	162	133
35–44	501	314	228	254	159
45–49	641	542	418	333	318
50–54	898	860	750	623	415
55–64	1 094	1 089	1 100	947	865
65–74	886	966	1 053	1 197	1 401
75+	876	1 030	1 124	1 306	1 499
			Taxes		
0– 9	–62	–58	–70	–78	–107
10–19	–52	–65	–74	–91	–118
20–29	–244	–416	–491	–704	–1 156
30–34	–415	–674	–866	–1 164	–1 955
35–44	–464	–804	–1 056	–1 345	–2 504
45–49	–471	–787	–1 065	–1 381	–2 644
50–54	–463	–678	–923	–1 192	–2 181
55–64	–347	–471	–571	–823	–1 757
65–74	–164	–188	–209	–274	–638
75+	–143	–173	–192	–224	–337

Table A2

Income brackets and age groups in the regression models: scale intervals and sample shares

	Lower bracket	Upper bracket	Mean	Share of sample, %
		Age groups (age in years)		
1	0	9	5.10	9
2	10	19	14.75	11
3	20	29	24.12	13
4	30	34	32.06	6
5	35	44	39.33	14
6	45	49	46.98	6
7	50	54	52.17	7
8	55	64	59.11	16
9	65	74	69.23	10
10	75	81	78.90	7
		Income groups (income in Forints)		
1	0	650 690	1 889	9
2	650 784	839 109	2 724	11
3	839 181	1 025 333	3 394	13
4	1 025 895	1 107 000	3 871	6
5	1 107 047	1 292 875	4 351	14
6	1 293 199	1 389 166	4 862	6
7	1 389 317	1 521 394	5 278	7
8	1 521 600	1 951 503	6 215	16
9	1 951 578	2 486 060	7 895	10
10	2 486 136	10 200 000	12 149	7

Table A3

ßs, t-statistics and p-values in the sample of grouped values

	Benefits			Taxes			Net benefits		
	ß	*t*	*p*	*ß*	*t*	*p*	*ß*	*t*	*p*
				Age groups (age in years)					
1	0.000	.		0.000	.		0.000	.	
2	0.050	6.75	***	0.011	1.74		0.018	2.62	**
3	−0.166	−21.42	***	0.146	21.31	***	−0.196	−27.92	***
4	−0.151	−22.52	***	0.204	34.30	***	−0.229	−37.49	***
5	−0.189	−23.96	***	0.360	51.48	***	−0.361	−50.38	***
6	−0.082	−12.30	***	0.259	43.46	***	−0.232	−38.10	***
7	−0.005	−0.79		0.241	39.33	***	−0.179	−28.56	***
8	0.146	17.87	***	0.229	31.53	***	−0.091	−12.27	***
9	0.154	21.07	***	0.045	6.97	***	0.046	7.02	***
10	0.157	22.81	***	0.029	4.83	***	0.059	9.54	***
				Income groups (income in Forints)					
1	0.000	.		0.000	.		0.000	.	
2	−0.004	−0.60		0.026	3.96	***	−0.020	−2.94	**
3	−0.028	−3.61	***	0.060	8.48	***	−0.057	−8.00	***
4	−0.012	−1.76		0.053	8.81	***	−0.044	−7.11	***
5	−0.031	−3.84	***	0.095	13.25	***	−0.084	−11.38	***
6	−0.030	−4.41	***	0.082	13.50	***	−0.074	−11.89	***
7	−0.021	−3.00	**	0.102	16.47	***	−0.087	−13.60	***
8	−0.048	−5.81	***	0.190	25.69	***	−0.161	−21.23	***
9	−0.041	−5.59	***	0.238	36.32	***	−0.192	−28.65	***
10	−0.052	−7.57	***	0.466	75.54	***	−0.365	−57.73	***

Note: * $p<0.05$, ** $p<0.01$, *** $p<0.001$

Table A4

OLS regression model of log household VAT payment, Hungary 2010

	Benefits	Taxes
Female	−0.0167*	(2.50)
Household head age group		
20/34	ref	
35/49	0.024*	(1.853)
50/64	0.047***	(3.790)
65+	0.002	(0.128)
Percent 0–5 years old	−0.001***	(3.598)
Percent 6–14 years old	−0.001*	(1.934)
Percent 70+	−0.001***	(11.837)
Urbanisation		
densely populated	ref.	
intermediate	−0.031***	(3.596)
thinly populated	−0.092***	(10.914)
Region		
HU1	ref.	
HU2	−0.074***	(8.869)
HU3	−0.062***	(7.400)
Household size	0.015**	(3.035)
Household type		
Single adult	ref.	
2 adult, no child	0.008	(0.805)
Other, no child	0.004	(0.224)
Single parent	0.061***	(3.616)
2 adults, with children	0.085***	(5.171)
Other, with children	0.041*	(1.763)
Hhd head education		
Tertiary educated	0.034***	(3.353)
Hhd head economic activity		
employed	ref.	
unemployed	−0.008	(0.469)
retired	−0.011	(0.840)
inactive	−0.036**	(2.885)
Hhd head occupation		
Elementary occupations	ref.	
Armed forces	0.061*	(2.074)
Legislator, manager	0.156***	(10.256)
Professional	0.130***	(9.576)
Technicians	0.099***	(8.167)
Clerks	0.095***	(7.555)
Service, sales workers	0.115***	(9.419)
Skilled agricultural workers	0.055***	(3.403)
Craft and trades workers	0.055***	(5.350)
Plant and machine operators	0.038***	(3.524)
Log hhd income	0.601***	(69.912)
Constant	1.722***	(22.863)
N	9704	
R-squared	0.693	

*Note: t-values in parenthesis, *p<0.05, **p<0.01, *** p<0.001*

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