Distributional Effects of Tax and Benefit Reforms in the Czech Republic

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Abstract—The Czech Republic has over the past decade carried out two waves of tax and benefit reforms. The first one took place in 2005–2006 during the left-wing government and the second one has been carried out in 2008 by the right-wing government. Using EU-SILC data for selected types of households, the paper assesses changes in the distribution of gross incomes and effects of the changes in taxes and benefits on the distribution of incomes after taxes and a provision of social benefits. The analysis is carried out on four types of households with and without children. The analysis is performed using Lorenz curves and Gini coefficients. The results show that the tax system changes the distribution of incomes less significantly than benefits. The 2006 reform reduced the differential between the Gini coefficient for the gross income and the Gini coefficient after taxes and benefits for households with active parents and one child. Reform in 2008 supported families with children and an reduced the differential between the gross income and income after taxes and benefits for different types of families.

Keywords—Czech Republic, redistribution, tax reforms.

I. INTRODUCTION

THE Czech research for tax and benefits impact on redistribution was published mainly at the beginning of the last decade. As summarised in Vítek and Pavel [1], Večerník [2], [3] analysed redistribution of incomes through taxes and benefits in the Czech Republic from 1988 to 1996 and 2006, respectively, pointed out methodological problems and the political "lack of transparency" of redistributive instruments. Sojka [4] discusses also earnings distribution and its development during the 1990s. Schneider and Jelínek [5], [6] analysed distributive impacts of the Czech security and tax system in the 2000s and quantified impacts of taxes and benefits on individual deciles of households and the overall effectiveness of benefit systems. Sirovátka and Valentová [7] examined attitudes of voters in the Czech Republic and abroad in terms of the legitimacy of a redistribution. Vítek and Pavel [8] analyzed data from EU SILC 2006-2010 for families with more children and showed that the benefit system affects redistribution more than taxes and social security contributions.

From the recent research in developed countries, e.g. Bhattarai and Whalley [9] deal with redistributive effects of transfer programmes in the United Kingdom, Moriguchi and Saez [10] show the development of income concentration in Japan during 1886–2005 and Ziliak [11] analyses the process of liberalisation of statutory rules regarding the tax treatment of earned and unearned income for welfare program eligibility and benefit levels in the USA. Piketty and Saez [12] discussed the progressivity of the U.S. federal tax system and its evolution since 1960 and compared the USA with other countries. Garfinkel, Rainwater and Smeeding [13] verify the hypothesis whether large cross-national differences in inequality amongst rich Western nations are affected by differences in the generosity of welfare state transfers. Hungerbühler, Lehmann, Parmentier and Linden [14] suggest an optimal redistributive non-linear income taxation model.

The main objective of this paper is through the use of available data (for 2005–2009) to analyse the impact of taxes and benefits on redistribution in the Czech Republic for selected types of hoseholds. Processed will be Europe-wide standardised EU-SILC data [15] for the Czech Republic and using standard Lorenz curves and Gini coefficients will be quantified impacts of these fiscal instruments.

II. METHODOLOGY

Europe-wide standardised survey European Union – Statistics on Income and Living Conditions (EU-SILC) is since 2005 performed also in the Czech Republic ("Living Conditions"). Data from this survey allow comparing households across the EU however in this paper we will focus only on the Czech Republic. This survey also applies to an inquiry of representative data on income distribution of individual types of households, their gross income, taxes, social security contributions and transfers provided to the households. Data in the corresponding EU-SILC statistics reflect the status of the previous year. The taxonomy of household types cover in the EU-SILC is for our purposes following:

TABLE I
HOUSEHOLDS TYPES

Household type	Household description
100	First adult economically active, second adult not present, no children
101	First adult economically active, second adult not present, 1 child
200	Two economically active adults, no children
202	Two economically active adults, 2 children

Source: methodology of EU-SILC (2006-2010) [15].

In general, the first number in the three-digit code indicates the number of economically active adults in the household, the second number represents the number of economically inactive adult family members and the third figure is the number of children. In case there are more than 2 children in the household, the third number takes the value of 9. In order

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to analyse the impact of taxes, security contributions and benefits on the income distribution, we will cover the following types of income:

TABLE II
INCOMES, TAXES AND BENEFITS

Abbreviation	Identifier	Income description and its adjustments
GI	Income_0	Gross income = earned income
ATI	Income_1	Income after taxes and social contributions = earned income – social security contributions – taxes + tax credit
ATBI	Income_9	Income after taxes, social contributions and social benefits = earned income – social security contributions – taxes + tax credit + pensions + healthcare benefits + unemployment support + family allowances + child allowances + social premia + housing allowances + foster care benefits + other benefits + all social need benefits

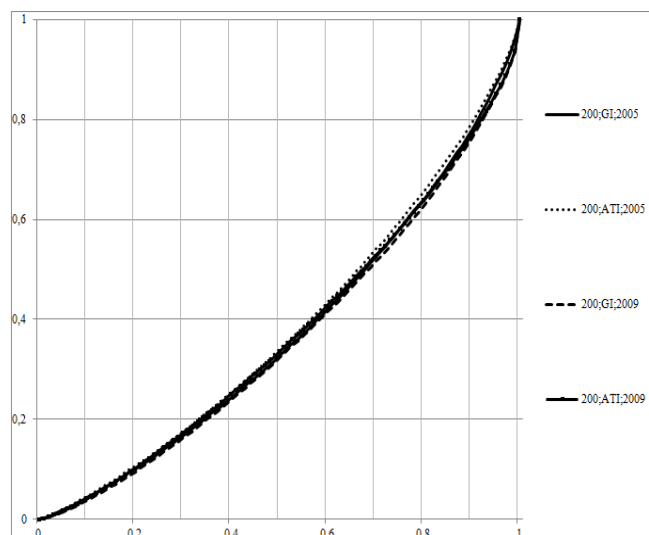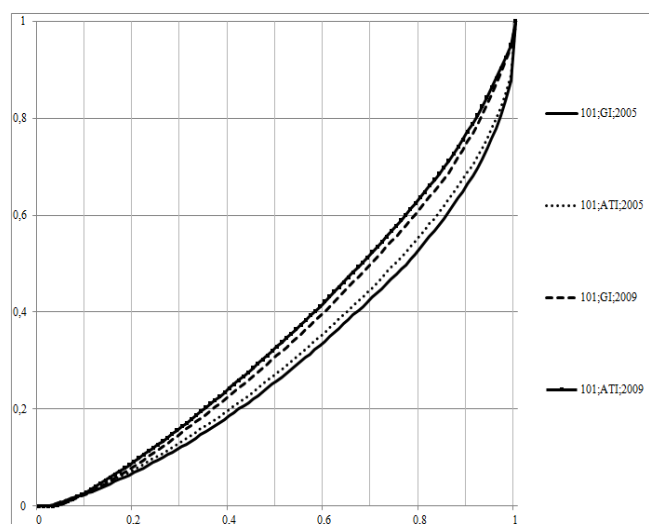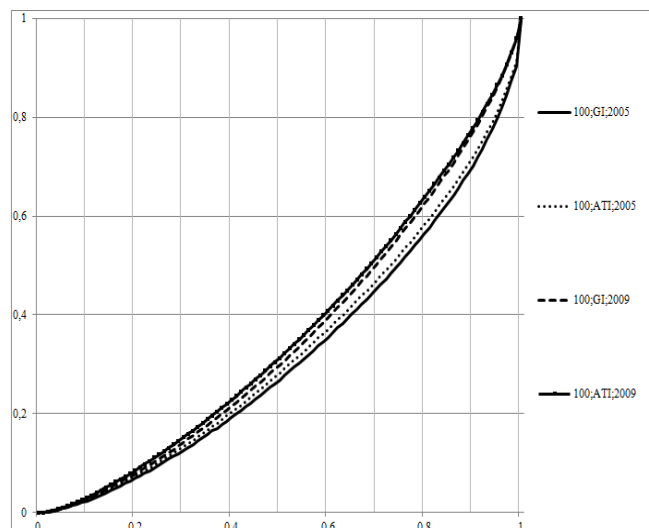Source: based on structure of EU-SILC (2006-2010) [15].

For purposes of this analysis, it was necessary to decide what households, incomes and periods should be addressed. For a more detailed analysis were selected the most common household with and without children: household, where first adult is economically active and second adult and children is not present (household type 100), household, where first adult is economically active, second adult is not present and household has one child (household type 101), household, where exist two economically active adults without children (household type 200) and finally household with two economically active adults and two children ((household type 202).

III. RESULTS

A. Impact of Taxes and Social Security Contributions on Lorenz Curves

A general view on the impact of taxes and compulsory insurance premia (social security contributions) on the redistribution of income allow Lorenz curves (see Hindls, Hronová, Seger and Fischer [16]). The x-axis of Lorenz curves indicates households arranged from the poorest to the richest and the y-axis shows their cumulative share on the total income (wealth) of the file. Axes x and y are labelled in percentages or in hundredths up to one and Lorenz curves always start at zero and end at one. The line of equality (LC) shows that under completely equitable income distribution, each person / household would receive an equal share of income (wealth) and the value of the x-axis coordinate is in this case is always equal to the value of the y-axis coordinate (x is always equal to y). For the opposite extreme position to the flat distribution (Lorenz curve of total inequality) would apply that except for the last richest individual nobody acquires any income at all (for all x < 100% it holds that y = 0, for x = 100% is y = 100%). From Lorenz curves are derived Gini coefficients.

What impacts have changes in the gross income and taxes on analysed families? Changes in Lorenz curves and the effect of taxes and social security contributions on their development show for the years 2005 and 2009 and households 100, 101, 200 and 202 the following charts.

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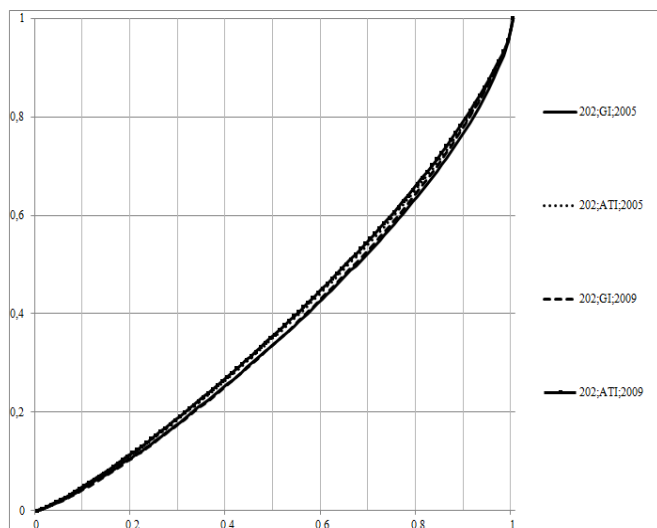International Journal of Economics and Management Engineering
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Fig. 1 Lorenz curves for selected households (gross income GI and
after taxes and contributions income ATI)
Source: own calculation based on EU-SILC data [15]

Analysis of data from the EU-SILC sources shows that significant changes in the Czech Republic occurred only for the households with one economically active adult and 1 child (type 101). For these families, however, the primary cause of the change is gross incomes development; taxes did not played important role. Also in this case, taxes and social security contributions have not substantially intervened in the distribution, not even in the following years 2006–2008.

From the other results it can be highlighted that:
- for household without second adult taxes and security contributions in 2005 decrease Lorence curves similarly as in 2009,
- for the household with second adult had taxes little effect on the redistribution,
- more important role have taxes for hoseholds where second adult is not present,
- taxes and security contributions did not shift Lorenz curves towards the line of equality (line of straight distribution) in all cases (households and years) – especially in the case with two parents.

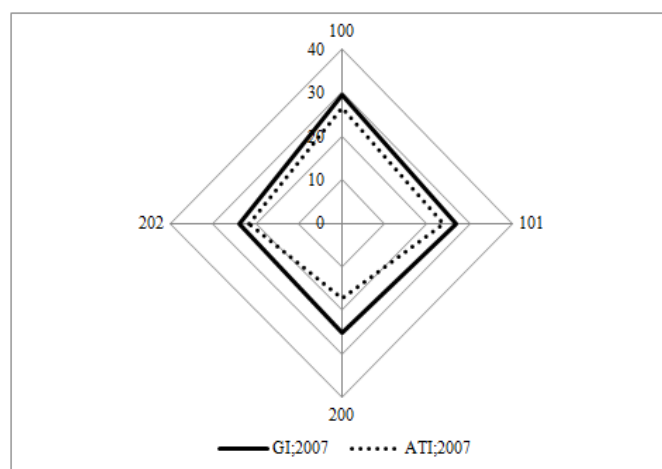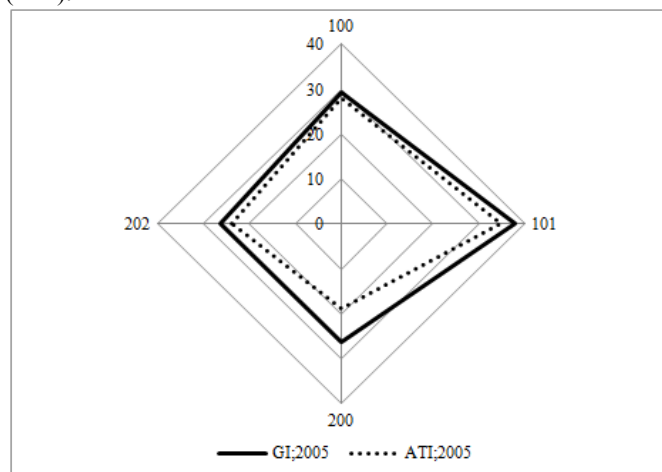### B. Impact of Taxes and Social Security Contributions on Gini Coefficients

The impact of taxes and social security contributions on Gini coefficients (GC) for the selected households is shown in following results. We can see the impact of left government reforms (2005) and also impact right government reforms (2008). As in the previous section, into account we only take the gross income before taxes and benefits (GI) and an effect of the income tax (including tax bonuses) and social security contributions paid by an employee or a self-employed person (ATI). Gini coefficient is the ratio between the actual surface of the Lorenz curve and the straight line of distribution, and the area under the actual Lorenz curve. To calculate the Gini coefficient (G), adopted is usually the following procedure:

$$G = 1 - 2 \int_0^1 L(X) dX, \qquad (1)$$

where $Y = L(X)$ is the function describing the Lorenz curve.

Decreasing Gini coefficient means that taxes and social security contributions reduced the inequality in distribution of the gross income and brought the Lorenz curve closer to the true straight line distribution. As Vítek and Pavel [1] summarised, theoretically taxes and social security contributions should rather reduce the Gini coefficient since they possess a built-in open (progressive rates of personal income taxes) or implicit (e.g. ceilings for deductions, tax bonuses) elements that support the redistribution. However, cancellation of progressive rates of personal income taxes since 2008 and the introduction of ceilings on social security contributions in the same year should reduce the progressivity of the overall tax system.

The impact of the taxes and social security contributions on redistribution of incomes show the following charts of Gini coefficients. Each chart contains for the given year all analysed households and for each of them are in each year plotted two points: for the gross income before taxes (GI) and for the income after taxation and social security contributions (ATI).

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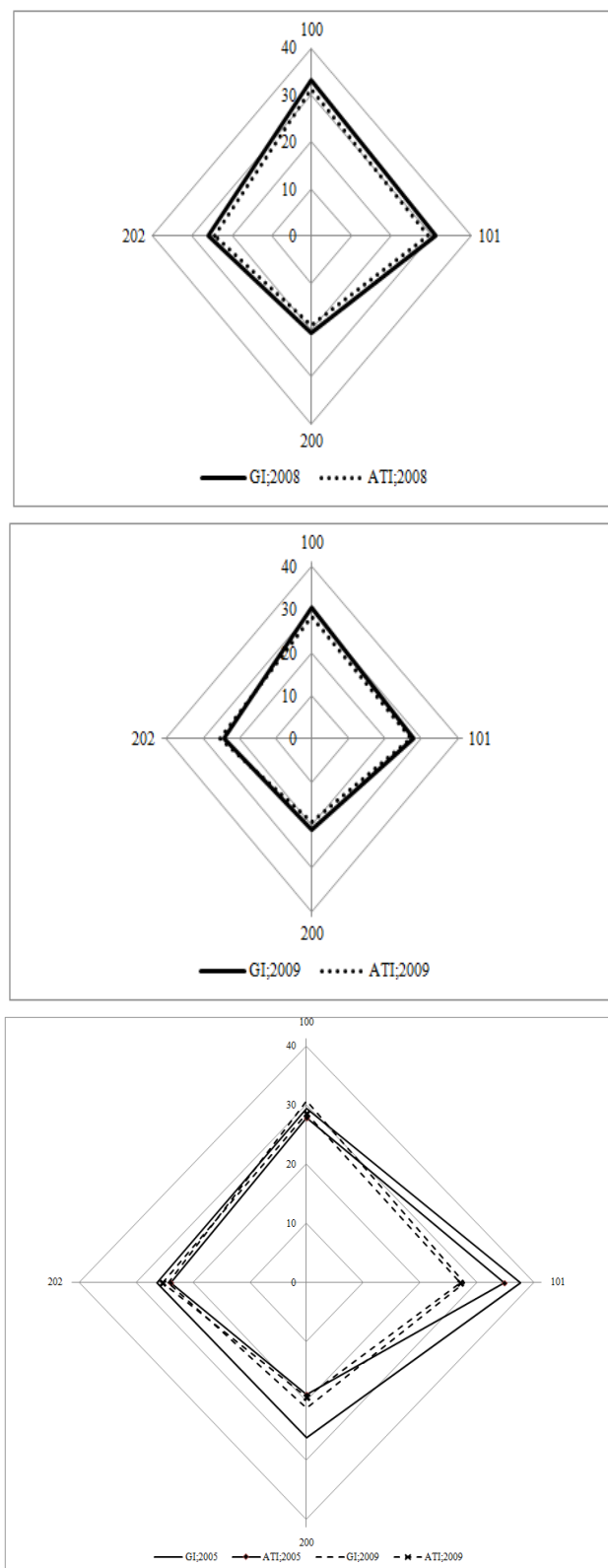International Journal of Economics and Management Engineering
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Fig. 2 Gini coefficients for selected households (gross income GI and after taxes and contributions income ATI) Source: own calculation based on EU-SILC data [15].

Results for the years 2005–2009 show:

- Gini coefficient has been significantly decreased via taxes and contributions in year 2005 for households with two adults and without children,
- Gini coefficient has been slightly increased decreased via taxes and contributions in year 2006 for households with two adults and two children,
- in year 2008 the difference between the Gini coefficient for gross income and Gini coefficient for income after taxes were significantly reduced for families with two adults and without children,
- tax reform 2008 almost eliminated the influence of taxes on Gini coefficient,
- the biggest changes in Gini coefficient between years 2005-2009 are evident for households with one adult and one children, but the main driver of changes is gross income development, not taxes.

The following table summarizes development of Gini coefficients for gross income and income after taxation for years 2005-2009. Gini coefficient is calculated as the arithmetic average of the Gini coefficients in the analyzed households for the relevant year.

Tax reforms 2005-2006 decreased average Gini coefficient after taxation. On the contrary, tax reform 2008 increased average Gini coefficient and decreased difference between gross and after tax income.

TABLE III
CHANGES IN GINI COEFFICIENTS

	2005	2006	2007	2008	2009
ATI	26,4	25,7	22,4	26,0	25,1
GI - ATI	3,6	1,4	4,0	1,7	0,9
ATIt - ATIt-1		-0,6	-3,4	3,6	-0,9
(ATI - GI)t - (ATI - GI)t-1		-2,2	2,6	-2,3	-0,8

Source: methodology of EU-SILC (2006-2010) [15].

C. Impacts of Benefits

Benefits encompass a very broad spectrum of public social expenditures. Therefore, chosen was a total aggregate of benefits that shows the aggregate impact of all cash benefit systems.

Let us now look at the situation of selected families (100, 101, 200, 202) and years (2005-2009) not only in terms of the taxes and social security contributions, but also social benefits. Theoretically we could (if the benefit system is set "reasonably") assume that the benefit system will push the distribution of incomes towards the first quintile, or at least decile. If this does not happen, the benefit system does not meet the expected redistribution function. Combined tax and benefits effects for the selected family types are shown in the following charts.

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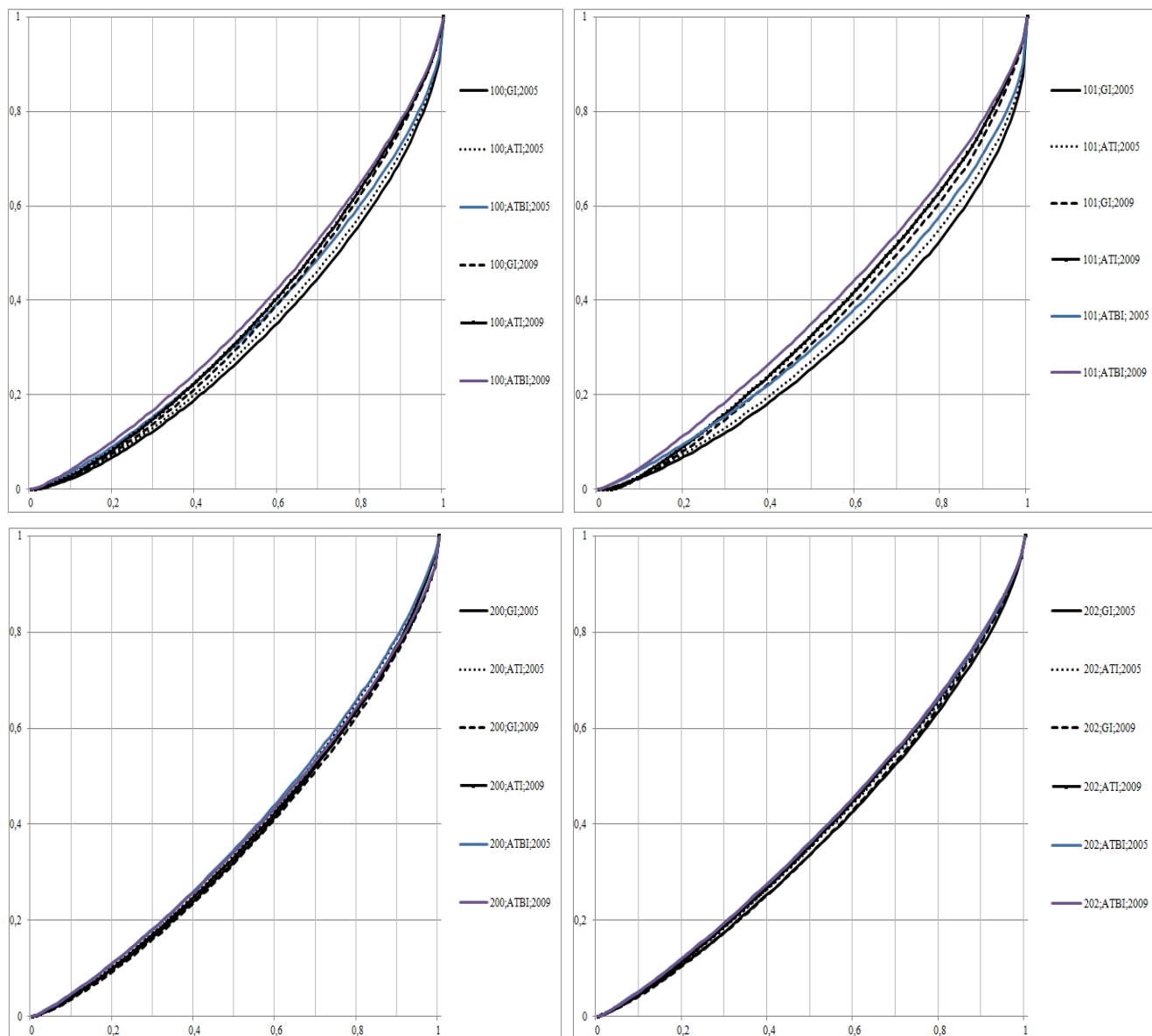International Journal of Economics and Management Engineering
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Fig. 3 Lorenz curves for stylized households 2005 and 25009 (gross income, income after taxes and income after taxes and all social benefits)
Source: own calculation based on EU-SILC data [15].

Data for the years 2005 – 2009 show that:
- benefit systems have generally greater impacts on the total net income than systems of taxation and security contributions,
- tax and benefit systems had very little significance in all years for households with two adults (without affecting by the number of children),
- for households with only one adult ("single mothers families") benefits influence redistribution intensively in year 2005 then in 2009 and for these households

benefits influence also higher income groups,
- for high-income households (the last quintile or decile) benefits do not have a direct redistribution impact (but they have an indirect one),
- benefits are important in the first two to three quintiles,
- tax benefit systems do not overly significantly dampen the increasing steepness of Lorenz curves,
- importance of benefits for redistributions in the years 2007 and 2008 decreases.

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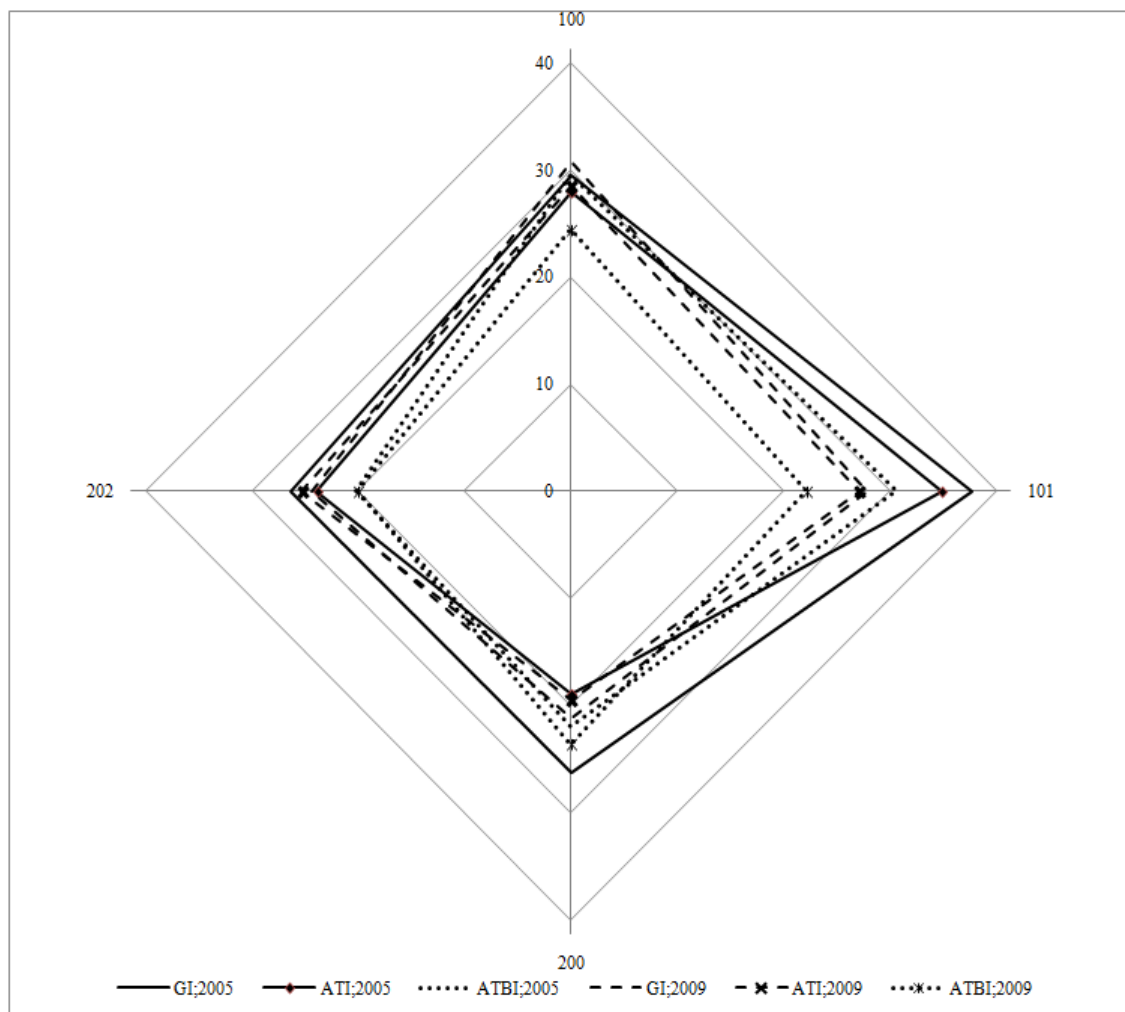International Journal of Economics and Management Engineering
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Fig. 4 Gini coefficients for stylized households 2005 and 2009 (gross income, income after taxes and income after taxes and all social benefits)
Source: own calculation based on EU-SILC data [15].

Social benefits reduce the Gini coefficients, especially if benefits are provided mainly to low-income groups (so called mean tested benefits). In this case, although the benefits do not reduce the nominal income of the high income groups (the progressive personal taxes do), they still reduce their share on the total income of the whole population. The aggregate impact of the tax and benefit policy on redistribution of incomes demonstrate the last charts of Gini coefficients.

- For the households with only one adult tax and benefit system influenced net incomes significantly only in 2009 through benefits. Gini coefficients did not increased by benefits.
- Taxes and benefits were important for single mothers' families with one child in 2005. Data in 2009 showed that tax influence was negligible and net income influenced almost entirely benefits." Gini coefficients did not increased by benefits.
- Households with only two adults were significantly influenced by taxes in 2005 and much less in 2009.

Benefits increased Gini coefficients in all years but more in 2009.
- Households with two adults and two children were influenced more by taxes then benefits in 2005 and different directions in 2009 (taxes increased coefficient, benefits decreased).

Medgyesi [17] analyzed Gini coefficients of EU countries with EU SILC data 2005 and stated that Czech Republic had low Gini coefficients. The key factor of distribution of incomes is distribution of gross incomes among households. The same results presented Malá and Červená [18]. The tax and benefit system corrects this distribution only slightly. The problem of the Gini coefficients is that in case there are simultaneously such changes in the distribution that cancel each other, the Gini coefficient does not capture these changes.

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IV. CONCLUSION

The analyzed data presented in the paper showed rather slow impact of taxes and benefits on net incomes of selected stylized households in the Czech Republic during 2005 – 2009. We expected that the share of an income after taxes on total incomes would increase (this usually happens among the poorest in a very limited extent). Conversely, the share of the wealthy should due to the progressivity of the personal income taxation (at least until 2008) after the taxation decrease (it has never happened). The 2008 tax reform did not fundamentally change the inter-annual income after taxes and very weakly negatively affected only the rich.

After adjusting for the benefits, the Gini coefficients for gross incomes in all years range around 20 to 35% and gradually decrease. The 2006 reform from the benefits' perspective increased the Gini coefficients for households with economically active parents (202 and 210) and strongly reduced the differential between the Gini coefficient for the gross income and the Gini coefficient after taxes and benefits for households with active parents and one child (211). Reforms in 2008 brought from the perspective of benefits a reduction in the Gini coefficient for the family types 112 or 201 and an increase (or a reduction in the differential between the gross income and income after taxes and benefits, respectively) for the family types 111, 210 and 219.

Overall, the social security contributions and new personal income tax (2008 reform) did not affected income inequality. Benefits had a greater influence and income inequality and according Malá and Červená [18] affected Gini coefficients by approximately 25 % (0,096 p. p. of Gini coefficients) in the 2005 - 2009. Večerník ([2], p. 16) formulated similar conclusion - personal income tax reforms affect overall redistribution only to a very limited degree.

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