Distributional impacts of taxes and benefits among Czech households: Results from a TAXBEN model

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Abstract

This paper provides a unique up-to-date analysis of the redistributive effects of the Czech tax and benefit system. We quantify its redistributive impacts on the whole population of heterogeneous Czech households. Among our key findings is rather weak combined power of the tax and benefit systems in alleviating income inequalities. The tax system is only slightly progressive and the tax and in particular benefit system is heavily targeting households with children rather than households who are poor per se. Due to the generous non-means tested child-related benefits, even in the top three deciles of income distribution, 13 percent of households collect some benefits, and they collect higher amounts of benefits (per unit) than recipients in all other deciles except the first one.

1. Introduction

Taxes of individual earnings constitute a majority of tax revenues in the Czech Republic (CZK 744 billion), while a big proportion of these revenues is then spent in form of social benefits (CZK 464 billion, of which 80 percent is spent on pensions).[2] While government policies tend to be assessed using aggregated indicators (such as total revenues and expenditures), the redistributive effects of the tax and benefit systems and their impact on inequality in the society are devoted smaller attention. Recently, the issues of micro level impact of tax and benefit systems and optimal tax design gained renewed interest in the public finance literature (see e.g. Mirrlees 2010a, 2010b; Paulus et al., 2009; Immervoll, 2004).

This paper contributes to the evidence-based approach to the analysis of tax and benefit systems. In particular, we explore the redistributive impacts of the tax and benefit systems across households by household earnings and characteristics in the Czech Republic. These are computed with newly developed TAXBEN model that uses

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the Statistics on Income and Living Conditions (SILC 2011) collected and provided by the Czech Statistical Office (CSO), a representative sample of 8,866 Czech households.

The Czech tax-and-benefit system has several notable features. It is dominated by a nearly linear payroll tax with very high tax rates earmarked for funding the health and social security insurance (which finances old-age and disability pensions, sickness and maternity leave benefits).[3] The personal income tax has a single marginal tax rate of 15 percent. Earnings from private business (self-employment) are taxed far more lightly than earnings from employment. Various welfare benefits and tax credits provide relief predominantly to households with children rather than to households that are poor per se.[4] The system underwent frequent modifications during the past decade.[5] Some modifications, scheduled for 2015, have been already legislated. Despite such reform zeal, the evidence-based evaluation of policies, both ex-ante and ex-post, has been largely missing.

Several academic papers have explored the distributional or incentive measures of the Czech tax-and-benefit system. Večerník (2006) uses the Czech Microcensus survey (CSO) in 1988, 1996, and 2002. He describes the redistribution via the tax-and-benefit system at household level, focusing on the change in redistribution during years of transition from central planning to market economy. Schneider and Jelínek (2005) investigate the distributive impacts of particular welfare benefits and tax allowances and the trends in their relative generosity, using the regular Household Budget Surveys (CSO) in 1999-2002.

Recently, there has been an expansion in the literature providing international comparisons of the redistributive properties of the tax-benefit systems.[6] Immervoll et al. (2005) explore impact of taxes and benefits on income inequalities in the EU-15 countries for 1998 and compare the effectiveness of individual policies at reducing

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[3] The current health and social security insurance rates are 4.5 and 6.5 percent for the employee and 9 and 25 percent for the employer; when added together, these payroll taxes take 45 percent of the gross wage.

[4] Main parameters of the Czech tax and benefit system in 2013 are summarized in Table A1.

[5] In 2005, joint taxation of married couples with children was introduced. In 2006, the many deductions from taxable income were replaced by tax credits. In 2007, the concept of a minimum living standard was changed, and an existence minimum was introduced. In 2008, a flat 15% income tax rate replaced a progressive rate structure, and the joint taxation of couples was abolished. A new flexible system of the parental leave benefit was introduced and the child allowance benefit was reformed. In 2011, birth grant became a means-tested benefit and available for the first child only. In 2012, the parental leave benefit was made even more flexible and the social supplement benefit was abolished. In 2013, a special surcharge on high earners was added.

[6] These studies mostly use the EU-wide tax-benefit microsimulation model EUROMOD. See Sutherland (2007) or https://www.iser.essex.ac.uk/euromod for more information about the EUROMOD model.

income disparities. Paulus et al. (2009), a study that is methodologically closest to ours and provides the most recent estimates for the EU countries, examine how taxes and benefits shape income distributions in 19 EU countries[7] using the EUROMOD model and policy years 2001, 2003, or 2005 (different years are available for different countries).

This paper brings several contributions. First, we provide an up-to-date analysis of the redistributive effects of the Czech tax and benefit systems. The most recent Czech studies (Schneider and Jelínek, 2005; Večerník, 2006) are based on the tax-benefit system from 2002. However, a lot has changed in the design of taxes and benefits in the Czech Republic since then (see footnote 5). We provide an update reflecting the legislation in force in 2013, and some comparisons with other EU countries.

Second, we quantify the redistributive impacts on the whole population of heterogeneous Czech households. Unlike studies using only "stylized" individuals/households, this approach shows how taxes and benefits differ across the whole population. In the "stylized" approach, the impact of increase in earnings on the tax and benefit rates is calculated keeping the characteristics of all individuals within a household fixed. Our approach thus provides better insight, because it reflects that households with different earnings also have different characteristics (structure) implying different utilization of tax credits, deductions, and social benefits. We also show the distribution of tax and benefit rates across real population of households and within households with similar earnings.

Third, the paper brings some methodological improvements. Our TAXBEN model simulates direct taxes and social benefits based on current legislation and captures some features that are not commonly captured in micro-simulations, such as mortgage deductions, disability tax credits, etc. Our approach also follows the standards of the Mirrlees Review.[8] Most importantly, we measure the full tax wedge between the net disposable income and the employer cost or the pre-tax profit.

It should be noted that the focus of this paper is on households.[9] It is therefore informative for questions such as: How is the tax burden distributed across households with different earnings levels? How progressive are the taxes and benefits at the household level? To what extent do households with similar earnings pay similar taxes and receive similar benefits? What is the impact of the tax and benefit system on income inequality?

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[7] EU-15, Estonia, Hungary, Poland, and Slovenia.
[8] Mirrlees (2010a), chapter 4.
[9] In a companion paper (Dušek, Kalíšková, and Münich 2013) we present the average, marginal, and participation tax rates at the individual level.

Among the key findings, we find that the redistributive effects of the tax and benefit systems at the household level are rather modest. The tax system itself is only slightly progressive. While the benefit system creates some progressivity in the bottom half of the income distribution, the combined power of the tax and benefit systems in alleviating income inequalities is rather small in international comparison.[10] The benefit system is heavily targeting households with children - apart from means-tested benefits (child allowance and birth grant), it provides generous benefits that are not means-tested (maternity and parental leave benefits). Mainly thanks to these generous non-means tested benefits, even in the top three deciles of income distribution, 13 percent of households collect some benefits, and they collect higher amounts of benefits (per unit) than recipients in all other deciles except the first one. Another notable feature is a huge dispersion in taxes paid and benefits collected by households of similar earnings levels. This dispersion is pronounced mainly at the bottom of income distribution - there are households subject to tax rates as high as 40 percent of their earnings as well as households receiving equally large or greater subsidies.

The rest of the paper is organized as follows. Section 2 describes the main features of the TAXBEN model and the data (detailed description is relegated to the Appendix). Section 3 presents the results – tax and benefit rates by household income deciles and by characteristics and some evidence on the progressivity of the tax and benefit systems. The description of the results is purposefully factual and free of normative recommendations. We reserve the normative assessments for the conclusions in Section 4.

2. The TAXBEN model and data
2.1. Data
We developed a new TAXBEN model that simulates the taxes and benefits for individuals and households in the representative Survey of Income and Living Conditions (SILC). The SILC is being collected annually by the Czech Statistical Office and follows a standardized methodology across all EU countries. We used the latest available SILC issue (collected in 2011, it provides information on incomes during year 2010) which contains information on 8,866 households consisting of 20,629 individuals. It reports information about the household structure, its dwelling, and the economic activity and health of the household members. Importantly for tax simulations, it reports each member's annual earnings from employment, separated into main and secondary employment and annual profits from small business (self-employment), also separated into main and secondary business. It further reports the levels of various welfare benefits received by the household, the income taxes, social and health contributions (for employees only) and property taxes.

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[10] The resulting net income inequality is kept low thanks primarily to relatively low gross income inequality before redistribution.

SILC is well suited for TAXBEN-type simulations. It is relatively large, representative (including weights allowing to extrapolate to the population), and contains sufficient amount of income and demographic information to capture the key aspects of the tax and benefit system. One disadvantage of the SILC is likely under-reporting of capital income - interest, dividends, rents etc. Even though such items exist in the database, their values are frequently zero or unrealistically low. We cannot therefore include taxation of capital income into the analysis but focus on solely on earnings from wages or self-employment.

2.2. Definitions of the main concepts and model simulations
To describe the distributional effects of the tax and benefit system, we use the concepts of average tax, benefit and net tax rates at the household level. These describe the shares of total taxes, benefits and net taxes imposed on the full household earnings. Therefore, these indices can be calculated for households with positive earnings only, and we thus complement them with information on average amounts of taxes, benefits, and net taxes paid and received by all households including households without earnings in the analysis below.

The *average tax rate* is the ratio of total taxes paid by all household members $T^h(Y^h)$ to the full household earnings (Y^h):

$$ATR^h = \frac{T^h(Y^h)}{Y^h}.$$

The *average benefit rate* is the share of total benefits received by household members $B^h(Y^h)$ of the full household earnings (Y^h):

$$ABR^h = \frac{B^h(Y^h)}{Y^h}.$$

The *average net tax rate* describes the combined effect of tax-and-benefit system and is defined as total net taxes paid by the household (taxes paid decreased by benefits received) over the full household earnings (Y^h):

$$ANTR^h = \frac{T^h(Y^h) - B^h(Y^h)}{Y^h}.$$

The full household earnings (Y^h) are defined as a sum of earnings from business (gross profit before taxes and contributions) and work (total employer cost, i.e., the sum of the wage and social and health contributions paid by the employer) for all household members. Taxes $T^h(Y^h)$ include direct taxes only – personal income tax and mandatory health and social security contributions.

Benefits $B^h(Y^h)$ include maternity benefit (*peněžitá pomoc v mateřství*), birth grant (*porodné*), child allowance (*příspěvky na děti*), housing benefit (*příspěvek na bydlení*),

and aid in material need benefits: living allowance (*příspěvek na živobytí*) and housing supplement (*doplatek na bydlení*). These benefits are simulated in the model, while we also include reported values of benefits that cannot be simulated in the model - unemployment benefits (*podpora v nezaměstnanosti*) and parental leave benefit (*rodičovský příspěvek*). For details on income definitions and tax and benefit simulations, see the Appendix.

2.3. Summary statistics of the sample

Table 1 shows basic summary statistics for households. We exclude households with at least one inactive pensioner and no potential earner in productive age from the whole analysis.[11] We thus restrict our sample to 5,794 non-pensioner households, which corresponds to over 3 million households in the Czech population (out of 4.38 million households living in the Czech Republic).[12] All incomes, taxes and benefits reported here and below correspond to yearly amounts. Most of the non-pensioner households have some positive earnings (either from work or business), but there is a non-negligible amount of households with no earnings (over 200,000 households). Households with positive earnings (from work or business) have average earnings of CZK 469,000 per a year[13] and pay income and payroll taxes of CZK 35,000 and 187,000, respectively. Over one third of households with positive earnings are eligible for some benefits with the average amount of benefits slightly over CZK 20,000 per a year.

Households without any positive earnings are obviously most likely to be net recipients of government support - 83 percent are eligible for some benefits, and the only taxes they pay are health insurance contributions (minimum amounts required). While an average household with positive earnings pays net taxes of over CZK 200,000 per a year, an average household without earnings receives a net support of CZK 65,000.

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[11] We exclude these "pensioner" households from the analysis, because we do not account for old-age pensions in our tax-benefit system (old-age pensions are not a standard social benefit, and lack of previous income data in the SILC does not allow us to simulate old-age pensions). Inactive pensioner is defined as an individual in the retirement age reporting inactivity, while potential earner is a person aged between 18 and retirement age, who is not a full-time student and does not have serious health problem. Our sample thus excludes all households consisting of inactive pensioners only, but includes multi-generational households, where there are some productive-age individuals living together with their retired parents.

[12] All the summary statistics reported here and below are based on a sample from the SILC 2011 data, which is reweighted by sampling weights to correspond to actual population size in the Czech Republic.

[13] Most of these earnings come from work (majority of households have work income only), but those with positive business income have higher average income than those with positive work income.

Table 1 also reports for all household types the average number of OECD consumption units.[14] We use OECD consumption units to normalize earnings, taxes, and benefits that the households receive and pay in the analysis below taking into account economies of scale within a household.[15] The average number of OECD consumption units is 2.2 in households with positive earnings and 1.8 in households that have no earnings (these also have lower average number of children and older head of household than households with positive earnings).

In the further analysis, households are divided into income deciles that are calculated based on equivalised full household earnings (full household earnings from work and business normalized to the OECD consumption unit) to reflect household size and composition. The basic distribution of household characteristics across these deciles is illustrated in Table 2. Households in the first decile differ a lot from the rest of households - they are much more likely to have a female head[16] living without a spouse. The head of household is also much less likely to be working (only 11 percent work), and most of these households are childless. Households in the first decile are very specific and include heterogeneous households - single parent as well as households of students or other single individuals. With higher equivalised (per unit) earnings, households are more likely to have male head, who is working, and also a spouse, who is more likely to be working. The highest earnings households (in per unit terms) are most likely to be childless. The average annual gross earnings per unit differ greatly from slightly over CZK 7,600 in the first decile (most of the households in the first decile have no or very small earnings) to over CZK 564,000 in the highest decile.

3. Results: tax system characteristics at the household level
In this section, we review the Czech tax and benefit system from the standpoint of household characteristics. We are interested in how taxes, benefits, and net taxes (the difference between taxes and benefits) vary with household earnings and characteristics, and how the tax-benefit system mitigates differences in living standards.

3.1. Average rates of taxes, benefits and net taxes
Table 3 tabulates the basic information about annual average taxes, benefits, and net taxes by household income deciles. On average, taxes take out 36 percent of the households' full earnings (which corresponds to annually almost CZK 100,000 per

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[14] Number of consumption units in a household is a sum of the weights for all household members. Weights are defined as follows: 1 for the head of household; 0.7 for all other household members aged above 13; and 0.5 for children aged 0 to 13.

[15] The use of so called "equivalised" income is common in the literature; see e.g. Večerník (2006) or Paulus et al. (2009).

[16] The SILC defines head of household as a man in all complete households, so that the female head implies an incomplete household (e.g. single mother with children) or a non-standard household composition (e.g. household of students, siblings etc.).

unit), but 10 percent of full earnings is then returned in benefits. The average net tax rate (proportion of full earnings taken in taxes, which is not returned in benefits) is thus 26 percent (see the last row of Table 3).

Per unit taxes increase substantially with income deciles from average of CZK 3,900 to CZK 275,000. Average tax rates (share of taxes paid on the full earnings) are slightly progressive except for the first income decile, which faces a little higher average tax rate than the second income decile.[17] However, the benefit system compensates for this relatively high tax rate - households in the lowest income decile receive highest average benefits (CZK 36,000 per unit), and even those who work have most of their disposable income coming from benefits not from work (average benefit rate is above 1). Amount of benefits received then decreases sharply with earnings, but households in the highest income deciles still receive some positive benefits (this is mainly driven by maternity benefit and parental allowance, which is the main non-means-tested benefit in the Czech Republic).

Figure 1 plots the household average tax rates against equivalised full household earnings. This figure conveys similar information as Table 3, but also demonstrates the dispersion in the tax rates across households. The "bandwidth" between the highest and lowest average tax rate for the same level of earnings is around 20 percentage points at most levels of equivalised earnings. This is driven mainly by differences in taxation of employees and self-employed, and by the presence of generous tax credits for households with children and one earner only (for details, see the companion paper Dušek, Kalíšková and Münich, 2013).

The average benefit rate at the lowest levels of earnings varies greatly and reaches above 1, but then falls rapidly to level off at 3 percent once equivalised earnings exceeds CZK 150,000 and then converges to zero (see Figure 2). The disparities in benefits are substantial. In the first two deciles (earnings below CZK 100,000 per unit), there are households whose benefits exceed their earnings from work or business as well as households who receive no benefits. The standard deviation of the benefit rate is almost three times greater than the mean in first decile (Table 3). Moreover, even in the upper part of income distribution (7th to 9th income decile), the average benefit rate is about 1 percent, but there are many households who receive between 10 to 20 percent of their income in benefits.[18]

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[17] This is probably caused by the minimum levels of health and social security contributions, which are required even if earnings from work or business are very low. We can also see that the variance of average tax rates is much higher in the first income decile than in the other deciles. This is because average tax rates can be calculated for households with positive earnings only, and only 27% of households in the first decile have some positive earnings.

[18] This is again is due to the entitlement to parental allowance and maternity leave benefits, which are the both very important in magnitude and are not means tested.

Figure 3 and the rightmost panel of Table 3 depict the joint distributional effect of the combined tax-and-benefit system. It is strongly progressive up to the 6th decile: the net average tax rate rises from -118 percent in the first decile[19] through 5 percent in the second to 35 percent in the 6th decile. After that, the net ATR converges slowly to 39 percent. The disparities at low earnings levels are as pronounced as they were with benefits: There are households paying tax rates as high as 40 percent as well as households receiving equally large or greater subsidies (Figure 3). At higher earnings levels, the standard deviation of 0.06 implies a fairly wide "bandwidth" of approximately 20 percentage points. The very high negative net average tax rates in the first decile are crucially driven by very low denominator (average annual gross earnings in the first decile is CZK 7,600 per unit), rather than very high benefits. The average net tax (or rather a subsidy) of CZK -32,000 per unit per a year (see Table 3) thus does not put the households in the first decile on a very high living standard.

3.2 Identifying taxpayers and benefit recipients

A different perspective on the disparities in taxes and benefits is given by Table 4. It shows the fraction of households who pay positive taxes or receive positive benefits, and the average amounts for those with positive values. A comparison with the unconditional averages in the previous table reveals the extent to which the unconditional averages are affected by people without taxes or benefits. As for taxes, only 42 percent of households in the first decile pay some taxes, but from the 2nd decile up, essentially all households do.

As for benefits, full 40 percent of households collect benefits of some kind. The share of recipients is 84 percent in the first decile, and then declines by approximately 10 percentage points with each decile. Still, there are 12-13 percent of households in each of the top three deciles that collect benefits. The parental allowance and maternity benefits are the culprits – they are not conditional on income, and the amounts of these benefits are quite high compared to other benefits.[20] For that reason, the benefit recipients in the top three deciles actually collect higher absolute amounts of benefits (per unit) than recipients in all other deciles except the first.

The last panel of Table 4 shows that 86 percent of households are net taxpayers; hence 14 percent are net recipients. Only 11 percent of households in the 1st decile are net taxpayers. This share jumps sharply in the 2nd decile (65 percent of net taxpayers). From the 5th decile up, essentially all households pay more in taxes than they get in benefits.

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[19] The very large negative net average tax rate in the first decile is crucially driven by very low proportion of households with positive earnings in the first decile (see footnote 17).

[20] Maternity benefit is collected for 28 weeks, and the amount corresponds to approximately 70% of previous wage. Parental allowance is in total CZK 220,000 per a child that can be collected within two to four years.

3.3 Progressivity of the tax and benefit system

Table 5 provides the final gauge of the distributional effects of the tax-and-benefit system at household level. It reports the share of each income decile in total earnings, and the corresponding shares in taxes, benefits, and net taxes. The taxes themselves are only slightly progressive. The below-median households earn 27 percent of total earnings and pay 21 percent of total taxes. The share of the top decile in taxes (28 percent) exceeds the share of the top decile in earnings (23 percent) by several percentage points. This provides and interesting comparison with the individual-level progressivity of tax system, which is much lower (see results for individual-level progressivity in a companion paper Dušek, Kalíšková and Münich, 2013). The reason is that the household top decile, based on earnings per OECD unit, is not made of the top 10 percent of high-income individuals, but rather of households that combine high earnings and fewer OECD units. Such households are not able to claim as generous child credits and hence face higher tax rates than top-decile individuals.[21]

Table 5 also shows that one third of all benefits are paid to the poorest decile, while the second decile gets much lower share (18 percent). Interestingly, each decile above the median collects 3 to 5 percent of total benefits; overall, the above-median households collect 20 percent of total benefits (see cumulative decile shares in the right part of Table 5). When the taxes and benefits are combined, the system becomes very progressive up to the 5th decile (net tax shares are below earning shares and are rising faster than earning shares), almost proportional between 6[h] and 8th deciles (net tax shares almost generally equal to the earning shares), and then progressive in the top two deciles (net tax shares substantially above the earning shares). The benefits play far greater role than taxes in the progressivity of the combined tax-and-benefit system.

To illustrate the extent to which the tax and benefit systems reduce income inequality among households, we report here the Gini coefficients of household incomes before and after taxes and benefits. The Gini coefficient for the equivalised full household earnings is 0.40. In international comparison, this is a very low level of inequality. In comparison with 19 EU countries[22] from the Paulus et al. (2009) study, the Czech Republic would have the second lowest income inequality before taxes and benefits (after Netherlands). If we exclude taxes from household earnings, the Gini coefficient decreases to 0.37. If we further include benefits, the coefficient decreases to 0.32.

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[21] Moreover, household-level tax rates combine relatively low taxation of high-earning primary earners (who claim the child tax credits and thus face relatively low tax rates) with the relatively high taxation of lower-income secondary earners (child tax credits can be claimed by one of the parents only). The household-level tax rate for high-income households is thus higher (also due to higher taxation for secondary earner) than individual-level tax rate faced by high-income individuals. Some implications of this like selection of high-skill women into employment and resulting gender wage gap, are analyzed by Jurajda and Harmgart (2007).

[22] The sample includes EU-15, Estonia, Hungary, Poland and Slovenia.

Therefore, the interplay of the Czech tax and benefit systems decreases inequality by mere 8 percentage points, when measured by Gini coefficient. However, this is rather low decline in international comparison - most tax-benefit systems decrease inequality measured by the Gini coefficient by around 10-15 percentage points, similarly low redistribution can be found only in the Southern European countries (Paulus et al., 2009: Figure 4, p. 11).[23]

3.4 Benefits a net taxes by household characteristics

In this section, and we analyze how characteristics of a household (number of children, type of earnings, and working status of spouses) affect taxes paid and benefits received by the household. The first part of Table 6 illustrates the huge impact of children on taxes paid and benefits received.

Both the amount of taxes paid and the average tax rate decreases substantially with number of children in a family. This is primarily a consequence of relatively large child tax credit (CZK 13,404 per a child). Moreover, most of the benefits in the current Czech system are linked to the presence of children in a family (child allowance, parental allowance, birth grant, and maternity benefit), so that childless households receive benefits only if they have very low income (aid in material need) or face low income and high housing costs (housing benefit). More than half of households with children are eligible for some benefits compared to only 28 percent of childless households. Benefits constitute on average only 7 percent of household earnings for childless households as opposed to 37 percent for households with three and more children. Childless households also have highest gross equivalised earnings and pay highest net taxes. On the other hand, households with three and more children have lowest per unit earnings, are most likely to be eligible for some benefits (73 percent are entitled for at least one benefit), and pay very low net taxes.

Second part of Table 6 reports differences in earnings, taxes, and benefits by type of household earnings for households that have some positive earnings. Households with positive earnings from work have lower average earnings, but pay higher taxes than households with earnings from business. Average tax rate on work income is thus substantially higher (37 percent) than on business income (27 percent). Maybe surprisingly, households with business income are more likely to be eligible for some benefits and receive higher amounts of benefits than households with work income. This is caused by larger variation in earnings from business than from work causing more households with business income to fall below income threshold for some benefit eligibility. Overall, households with business income pay on average only two thirds of the amount of net taxes paid by households with work income. Households with both sources of income have the highest average earnings, pay the highest taxes, and are the least likely to receive any benefits.

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[23] However, Paulus et al. (2009) include also public pensions into the benefit system, while we exclude retiree households from the analysis entirely.

Third part of Table 6 focuses on two-parent households, where both the head of household (man) and his spouse are working-age potential earners,[24] and shows how taxes and benefits differ by working status of the head and his spouse. Households with neither head nor spouse working pay no or very little taxes, but the average tax rate is as high as for households where the head is working.[25] 83 percent of households where neither head nor spouse is working are entitled to some benefits, and the average amount of benefits received is almost CZK 38,000 per unit. However, even among households where the head of household is working and his spouse is not, there are 80 percent of households eligible for some benefits. This is mainly driven by maternity and parental leave benefits, which are collected by women who do not work, because they take care of their children. Among households where the head is inactive and his spouse is working the proportion of households eligible for some benefits is much lower (57 percent), because there is much lower proportion of households with small children who provide entitlement to maternity and parental leave benefits. Maybe surprisingly, one in five households where both spouses work is entitled to some benefits.

3.5 Coverage and benefit amounts by benefit types
A detailed analysis of different types of benefits is provided in Table 7. The parental leave benefit is the most important benefit in the Czech Republic with respect to coverage (percentage of recipients). This benefit cannot be simulated, because of high variation in the amount and length that parents can choose from, and because of the lack of information on incomes during periods preceding maternity. However, based on reported values from the SILC data, 27 percent of households with children receive parental leave benefit with an average amount of CZK 27,000 (this is because not all households receive this benefit for the whole calendar year). The second most important benefit for households with children is the child allowance, which is available to 21 percent of households with children.

The largest benefit with respect to the amount per recipient is maternity benefit (slightly under CZK 40,000 per a year on average), but it is available only to 4 percent of households with children. Childless households are mainly eligible for housing allowance, which is the largest social benefit that is not tied to children.[26] Unemployment benefit and other benefits (which include mainly support for disabled people) are not simulated in the model, but based on reported values they also belong to the largest benefits received by childless households. Benefits of aid in material need (living allowance and housing supplement) cover approximately 5-6 percent of

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[24] Potential earner is a person aged between 18 and retirement age, who is not a full-time student and does not have serious health problem.

[25] This is most likely driven by the taxation of earnings of other household members.

[26] While the number of people eligible for housing benefit is quite high, it is one of the benefits with the lowest take-up rate in the Czech Republic. Mareš (2001) estimates the take-up to be only around 50%.

households with lowest earnings, and provide a support of approximately CZK 13,000 and CZK 17,000 per year on average.

Comparison with aggregate statistics on benefit expenditures in Table A2 in the Appendix confirms that the parental allowance is by far the largest benefit with respect to expenditures (almost CZK 28 billion in 2010). Unemployment benefit is the second largest benefit (almost CZK 13 billion in 2010), while all other benefits are much smaller in the amount of expenditures – they accounted for between CZK 1.6 and 7.4 billion in 2010. But in this comparison, we subtract from old-age pensions, which consume much greater proportion of the budget – almost CZK 338 billion in 2010. [27] The expenditures on social benefits (except old-age pensions and sickness/health care) are very small also in an international comparison (see Figure 4).

4. Assessment and conclusions

This paper provides a unique insight into the redistributive impacts of the current Czech tax-and-benefit system. We documented several interesting features of the system, which are summarized below.

On average, taxes (including personal income taxes and social security contributions paid by both employees and employers) take out 36 percent of the households' full earnings (which is annually almost CZK 100,000 per unit), but 10 percent of full earnings is then returned in benefits. Very high fraction of the households (40 percent) is eligible for some benefits, and a non-negligible fraction of households are net recipients (14 percent) – they pay in taxes less than they collect in benefits.

We also document the redistributive effects of the tax and benefit systems at the household level. The taxes themselves are only slightly progressive. The share of the top decile households in taxes (28 percent) exceeds the share of the top decile in earnings (23 percent) by several percentage points only. But the progressivity is still much higher than the individual-level progressivity of the tax system (see a companion paper Dušek, Kalíšková and Münich, 2013). Moreover, the redistributive effects increase if we include the benefit system, which creates progressivity mainly in the bottom half of the household income distribution. However, the combination of tax and benefit systems decreases income inequality measured by Gini coefficient by 8 percentage points, which is rather small decline in international comparison. The redistributive power of the Czech tax-benefit system in alleviating income inequalities is thus rather small.

Although the benefit system increases incomes of households in the bottom half of the income distribution, it is certainly not exclusively aimed at the low-income households. Households with above-median earnings collect 20 percent of all benefits.

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[27] We also subtract from sickness benefit, which accounted for almost CZK 23 billion in 2010. Source: MPSV Statistical Yearbook, http://www.mpsv.cz/files/clanky/11544/rocenka_2010.pdf

Interestingly, there are more poor households (1st decile) who are not entitled to any benefits (16 percent) than rich households (10th decile) who are eligible for some benefits (12 percent). Moreover, the benefit recipients in the top three deciles of income distribution actually collect higher absolute amounts of benefits (per unit) than recipients in all other deciles except the first. The parental allowance and maternity benefits are the culprits – they are not conditional on income, and the amounts of these benefits are quite high compared to other benefits. The parental leave benefit is the most important benefit in the Czech Republic with respect to coverage (percentage of recipients), while the maternity benefit is the largest benefit with respect to the annual amount per recipient.

The Czech tax-and-benefit system is highly focused on supporting families with children. The tax system provides notable tax credits for taxpayers with children and most of the benefits are connected to the presence of children in a family (child allowance, parental allowance, birth grant, and maternity benefit). Therefore, childless households only receive benefits if they have very low or no income (aid in material need) or low income and high housing costs (housing benefit). More than half of households with children are eligible for some benefits, while only 28 percent of childless households are. Moreover, childless households are mainly eligible for housing allowance, which is the largest social benefit that is not tied to children, but which also has a very low take-up rate.[28] The actual percentage of benefit recipients among childless households is thus even lower than what our model suggests and the gap between households with and without children is even wider. Although the tax and benefit systems are largely targeted at families with children, the fertility rate remains low in the Czech Republic (1.42 children per woman in 2011)[29] and the negative impact of motherhood on the female employment is the highest in the EU (the employment rate of women with children aged 0-6 is 41 percentage points lower than the employment rate of women without children).[30]

Another interesting feature of both the tax and benefit systems in the Czech Republic is a huge dispersion in taxes paid and benefits collected by households with similar earnings. The "bandwidth" between the highest and lowest average tax rate for the same level of equivalised earnings is around 20 percentage points at most levels of earnings. This is driven mainly by the significant differences in taxation of employees and self-employed, and by the presence of generous tax credits for households with children and one-earner households. The disparities in benefits are also substantial among households with similar earnings. The combined effect of the tax and benefit

[28] Mareš (2001) estimates the take-up rate of the housing allowance in the Czech Republic to be only around 50%.
[29] Source: CSO: http://www.czso.cz/csu/csu.nsf/informace/coby031312.doc (accessed July 2013).
[30] Source: European Commission (2010) Indicators for monitoring the Employment Guidelines: ec.europa.eu/social/BlobServlet?docId=4093&langId=en (accessed July 2013).

system causes great disparities mainly at low earnings levels - there are households paying tax rates as high as 40 percent of their earnings as well as households receiving equally large or greater subsidies.

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FIGURE 1
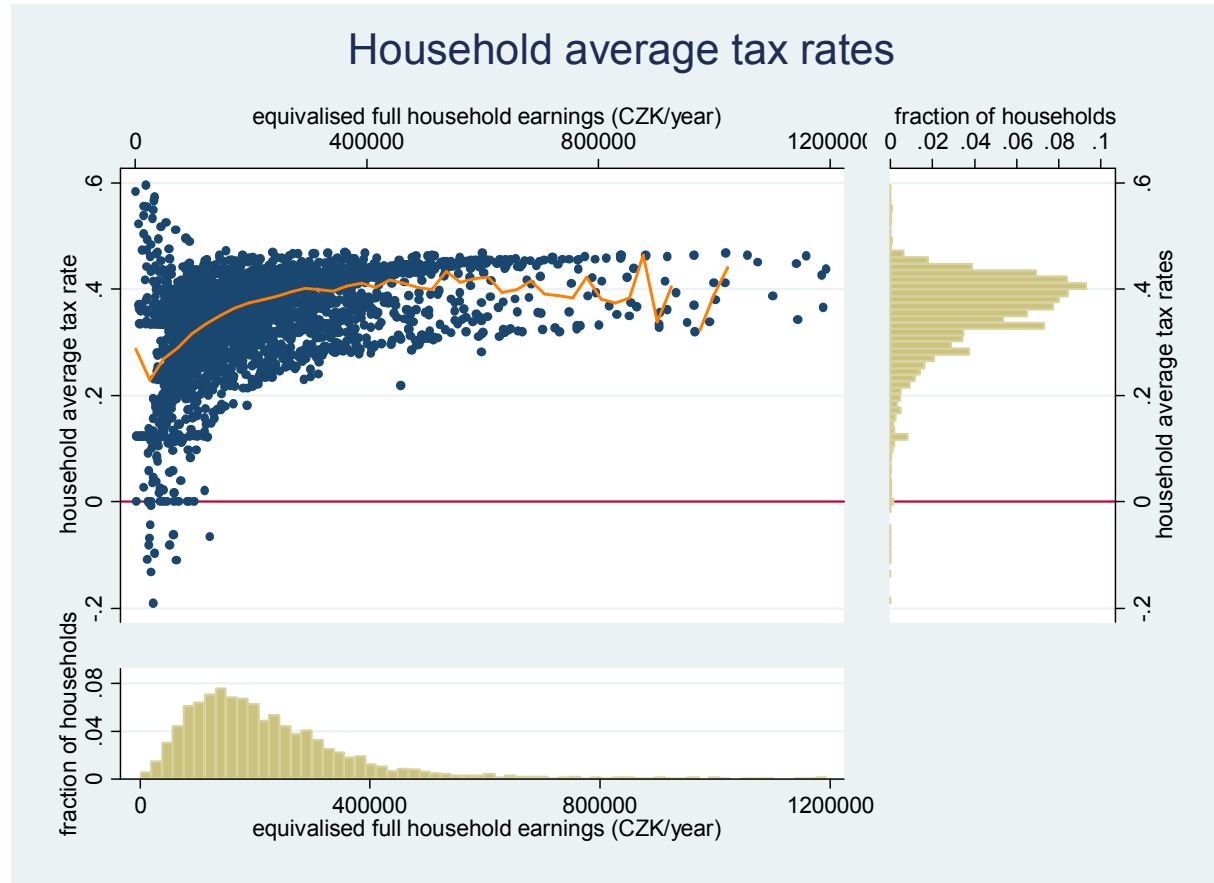
Note: Only non-pensioner households with positive earnings.
Source: SILC 2011, TAXBEN model based on 2013 legislation.

FIGURE 2
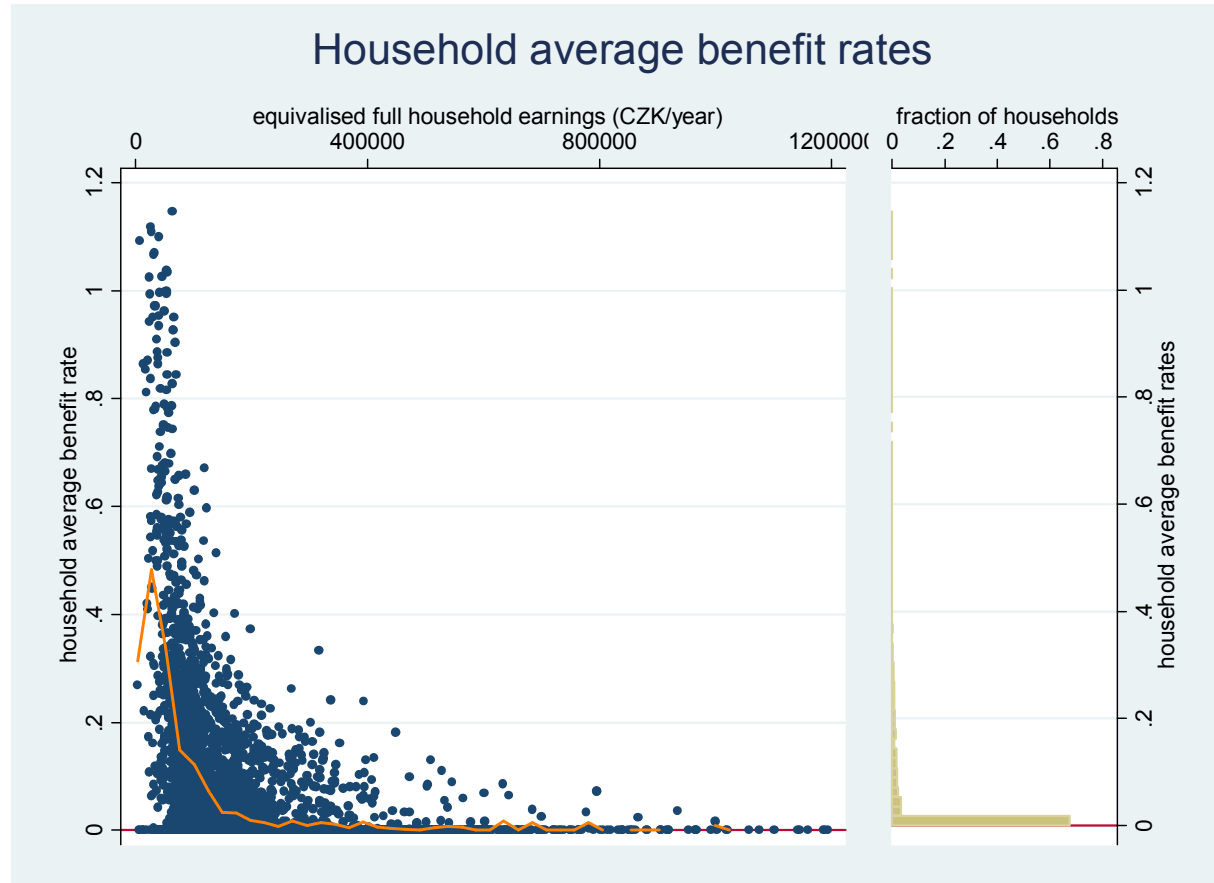
Household average benefit rates

Note: Only non-pensioner households with positive earnings.
Source: SILC 2011, TAXBEN model based on 2013 legislation.

FIGURE 3

Household net average tax rates

equivalised full household earnings (CZK/year)

fraction of households

Note: Only non-pensioner households with positive earnings.
Source: SILC 2011, TAXBEN model based on 2013 legislation.

FIGURE 4

Expenditure on social protection benefits by function relative to GDP (2010)

Legend:
- Social exclusion n.e.c.
- Housing
- Family/Children
- Unemployment
- Disability
- Sickness/Health care
- Survivors
- Old age

Y-axis: Percentage of GDP

X-axis categories: RO, BG, LV, EE, SK, LT, PL, CZ, MT, CY, LU, HU, SI, ES, PT, UK, EL, EU27, IE, BE, IT, DE, AT, FI, SE, NL, FR, DK
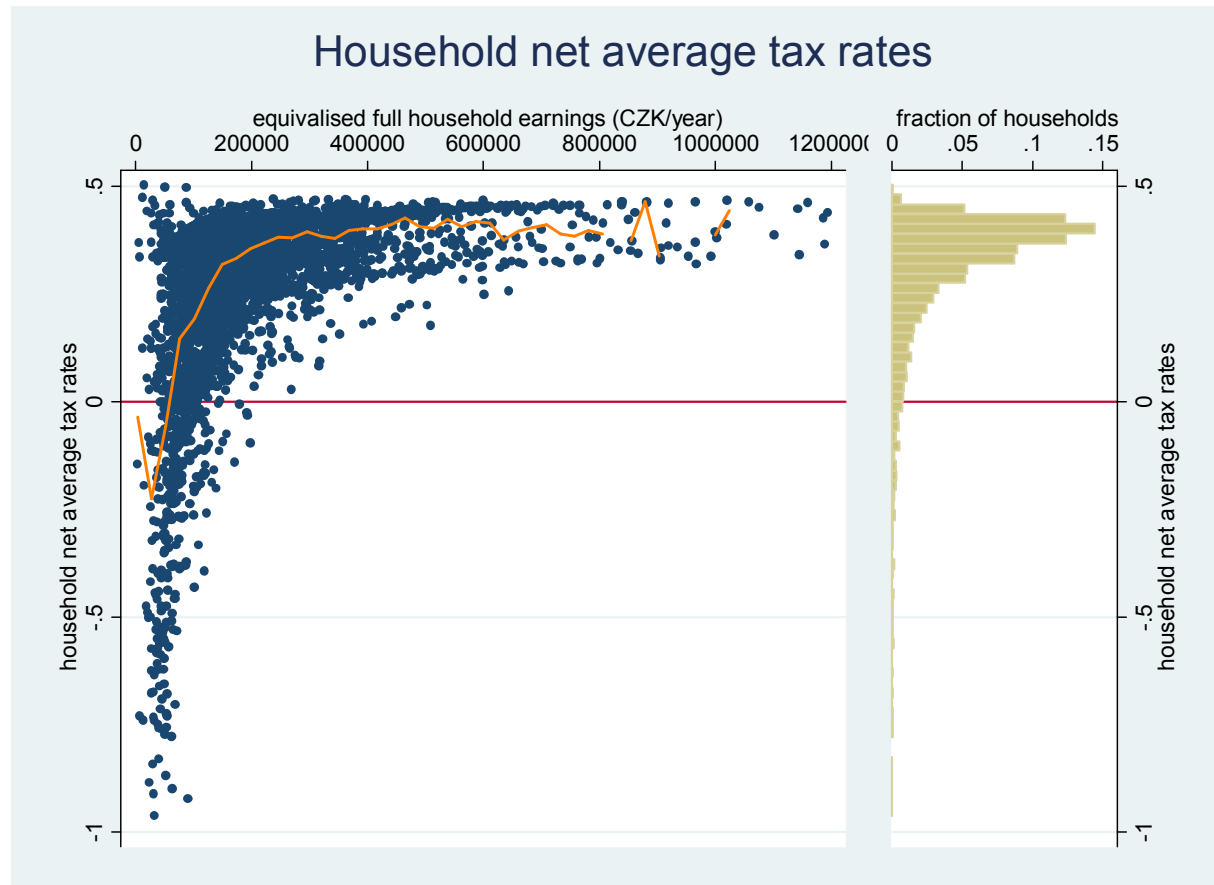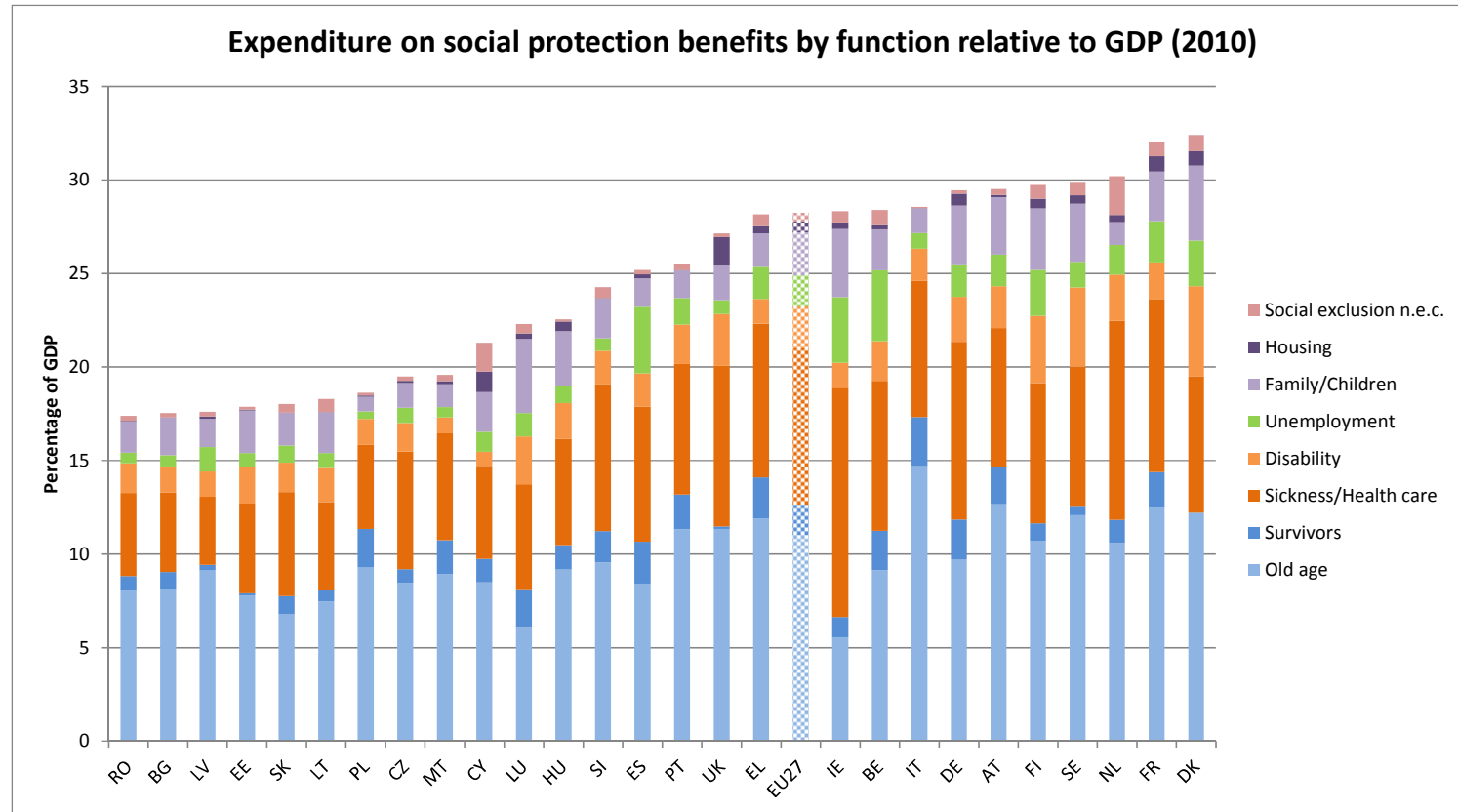
Source: European Commission (2012). Employment and Social Developments in Europe 2012 (Chapter 3, Chart 6). Available online at: http://ec.europa.eu/social/BlobServlet?docId=9687&langId=en (accessed July 2013).

TABLE 1
Summary statistics of households (means and standard deviations)

	Households with positive earnings		Households without earnings		Total	
	Mean	Std. dev.	Mean	Std. dev.	Mean	Std. dev.
Number of HHs (population)	2,829,561		223,435		3,052,996	
Number of HHs (sample)	5,362		432		5,794	
Income from work and business	468,606	340,321	0	0	434,311	349,624
Income from work	361,527	281,484	0	0	335,068	286,880
Income from business	107,080	282,005	0	0	99,243	272,918
Income tax paid	34,642	56,577	0	0	32,106	55,209
Payroll tax paid	186,952	119,665	2,876	5,781	173,480	124,790
Benefits received	20,171	37,614	68,150	67,744	23,682	42,465
Percentage of households eligible for some benefits	36%	0.48	83%	0.38	40%	0.49
Net tax paid	201,422	181,017	-65,274	66,720	181,904	188,466
Number of OECD consumption units in a household	2.24	0.78	1.77	0.79	2.2	0.79
Number of children	0.78	0.94	0.56	1.05	0.77	0.95
Age of head of household	44.7	11.56	50.89	15.8	45.16	12.03

Note: Only non-pensioner households. All incomes, taxes and benefits are in CZK and correspond to yearly values. Taxes include income tax, social security and health contributions. All values are weighted by population weights.
Source: SILC 2011, TAXBEN model based on 2013 legislation.

TABLE 2
Summary statistics of households by household income deciles

Household income decile	Gross earnings per unit	Percentage of HHs with female head	Percentage of coupled HHs	Age of head of HH	Age of spouse of head of HH	Percentage of HHs with working head	Percentage of HHs with working spouse (if present)	Percentage of childless HHs	Percentage of HHs with 1 child	Percentage of HHs with 2 children	Percentage of HHs with 3 and more children
1	7,617	44%	39%	50.4	48.8	11%	7%	65%	17%	9%	9%
2	69,295	21%	69%	45.1	43.2	72%	30%	39%	20%	32%	9%
3	104,015	16%	73%	43.9	42.7	85%	38%	42%	22%	27%	9%
4	132,808	16%	75%	43.9	41.6	89%	54%	36%	28%	31%	6%
5	161,038	15%	75%	44.4	42.7	91%	69%	42%	28%	28%	3%
6	191,390	10%	77%	44.9	42.5	94%	76%	51%	24%	22%	3%
7	227,540	14%	73%	45.0	42.3	97%	83%	51%	30%	18%	1%
8	272,199	13%	73%	44.8	42.8	98%	89%	61%	25%	13%	1%
9	334,370	14%	70%	44.9	43.0	98%	89%	70%	19%	10%	2%
10	564,406	10%	70%	44.3	42.5	99%	89%	73%	17%	9%	1%
Average	206,377	17%	69%	45.2	42.9	83%	65%	53%	23%	20%	4%

Note: Only non-pensioner households. All incomes, taxes and benefits correspond to yearly values. All values are weighted by population weights. Household income decile is defined based on equivalised gross household earnings.
Source: SILC 2011, TAXBEN model based on 2013 legislation.

TABLE 3
Household taxes, benefits and net taxes, and their average rates

Households income decile	Taxes paid per unit	Average tax rate		Benefits received per unit	Average benefit rate		Net taxes paid per unit	Average net tax rate	
	Mean	Mean	Std. dev.	Mean	Mean	Std. dev.	Mean	Mean	Std. dev.
1	3,940	0.32	0.38	35,842	1.50	3.71	-31,903	-1.18	3.61
2	25,914	0.29	0.09	19,467	0.24	0.29	6,447	0.05	0.32
3	43,237	0.32	0.07	13,271	0.10	0.13	29,966	0.22	0.16
4	58,129	0.34	0.06	11,037	0.07	0.10	47,092	0.27	0.13
5	74,337	0.36	0.05	7,193	0.04	0.07	67,144	0.32	0.09
6	91,964	0.37	0.04	5,591	0.02	0.05	86,374	0.35	0.08
7	110,047	0.38	0.05	4,071	0.01	0.04	105,976	0.36	0.07
8	138,222	0.39	0.04	3,474	0.01	0.03	134,748	0.38	0.06
9	168,507	0.39	0.05	4,014	0.01	0.03	164,493	0.38	0.06
10	275,230	0.40	0.05	4,263	0.01	0.03	270,967	0.39	0.06
Average	98,911	0.36	0.09	10,831	0.10	0.70	88,080	0.26	0.69

Note: Only non-pensioner households. All incomes, taxes and benefits correspond to yearly values. Taxes include income tax, social security and health contributions. Average tax, benefit and net tax rates are for households with positive earnings only. All values are weighted by population weights. Household income decile is defined based on equivalised gross household earnings.
Source: SILC 2011, TAXBEN model based on 2013 legislation.

TABLE 4

Household taxes, benefits, and net taxes - positive values only

Household income decile	Share with positive taxes	Taxes paid per unit if positive	Share with positive benefits	Benefits received per unit if positive	Share with positive net taxes	Net taxes paid per unit if positive
1	42%	8,982	84%	42,829	11%	8,887
2	99%	26,060	76%	25,755	65%	20,601
3	100%	43,372	64%	20,664	91%	34,151
4	100%	58,129	51%	21,487	96%	49,594
5	100%	74,337	36%	19,914	99%	67,635
6	100%	91,964	27%	20,853	99%	87,197
7	100%	110,047	19%	21,268	100%	105,976
8	100%	138,222	13%	25,991	100%	134,748
9	100%	168,507	13%	30,113	100%	164,493
10	100%	275,230	12%	34,397	100%	270,967
Average	94%	104,916	40%	27,343	86%	107,112

Note: Only non-pensioner households. All incomes, taxes and benefits correspond to yearly values. Taxes include income tax, social security and health contributions. All values are weighted by population weights. Household income decile is defined based on equivalised gross household earnings.

Source: SILC 2011, TAXBEN model based on 2013 legislation.

TABLE 5
Income shares and tax/benefit shares by household income deciles

Household income decile	Decile shares				Cumulative decile shares			
	in full earnings	in taxes	in benefits	in net taxes	in full earnings	in taxes	in benefits	in net taxes
1	0.00	0.00	0.33	-0.04	0.00	0.00	0.33	-0.04
2	0.04	0.03	0.18	0.01	0.05	0.03	0.51	-0.03
3	0.06	0.04	0.12	0.03	0.11	0.07	0.63	0.01
4	0.08	0.06	0.10	0.05	0.18	0.13	0.74	0.06
5	0.09	0.08	0.07	0.08	0.27	0.21	0.80	0.13
6	0.10	0.09	0.05	0.10	0.38	0.30	0.85	0.23
7	0.12	0.11	0.04	0.12	0.49	0.41	0.89	0.35
8	0.13	0.14	0.03	0.15	0.62	0.55	0.92	0.51
9	0.15	0.17	0.04	0.19	0.77	0.72	0.96	0.69
10	0.23	0.28	0.04	0.31	1.00	1.00	1.00	1.00

Note: Only non-pensioner households. All values are weighted by population weights. Household income decile is defined based on equivalised gross household earnings.
Source: SILC 2011, TAXBEN model based on 2013 legislation.

TABLE 6

Benefits and net taxes by household characteristics

	Number of households	Average equivalised earnings	Taxes paid per unit	Average tax rate	Percentage of HHs eligible for some benefits	Benefits received per unit	Average benefit rate	Net taxes paid per unit	Average net tax rate
By number of children:									
0	1,619,995	229,119	113,570	0.38	28%	7,492	0.07	106,078	0.32
1	695,923	201,976	95,556	0.36	49%	15,355	0.12	80,201	0.24
2	607,692	169,725	75,266	0.32	53%	12,532	0.11	62,733	0.21
3 and more	132,966	119,848	45,941	0.26	73%	20,065	0.37	25,876	-0.11
By type of household earnings:									
HHs with positive earnings from work only	2,054,390	202,865	107,874	0.37	37%	8,732	0.09	99,141	0.28
HHs with positive earnings from business only	289,972	263,945	78,574	0.27	46%	12,619	0.16	65,955	0.12
HHs with positive earnings from business and work	473,752	283,313	117,773	0.34	29%	5,869	0.03	111,904	0.31
By working status of the head of household and his spouse:									
neither spouse working	57,814	19,729	9,892	0.31	83%	37,739	1.35	-27,847	-1.04
head working, spouse not	485,706	162,467	67,954	0.31	80%	22,338	0.18	45,617	0.13
spouse working, head not	67,723	138,208	62,006	0.33	57%	14,094	0.12	47,912	0.22
both spouses working	1,188,581	267,807	129,692	0.37	22%	4,353	0.02	125,339	0.35

Note: Only non-pensioner households (classification by working status is for two-parent households only, where both the head and his spouse are working-age potential earners). Average tax, benefit and net tax rates are for households with positive earnings only. All incomes, taxes and benefits correspond to yearly values. All values are weighted by population weights.
Source: SILC 2011, TAXBEN model based on 2013 legislation.

TABLE 7
Recipients of benefits by type of benefit and type of household

		Childless households	Households with children	All households
Percentage of recipients	Birth grant (porodné)	0%	0.8%	0.4%
	Maternity benefit (peněžitá pomoc v mateřství)	0%	4.1%	1.9%
	Child allowance (přídavky na děti)	0%	21.4%	10.1%
	Housing benefit (příspěvek na bydlení)	13.7%	15.3%	14.4%
	Living allowance (příspěvek na živobytí)	3.4%	7.4%	5.3%
	Housing supplement (doplatek na bydlení)	4.0%	8.4%	6.1%
	Unemployed benefit - reported (podpora v nezaměstnanosti)	11.2%	9.1%	10.2%
	Parental allowance - reported (rodičovský příspěvek)	0%	27.1%	12.8%
	Other benefits - reported	5.2%	2.9%	4.1%
Average annual amount received per unit for recipients (in CZK)	Birth grant (porodné)	0	5,467	5,467
	Maternity benefit (peněžitá pomoc v mateřství)	0	39,559	39,559
	Child allowance (přídavky na děti)	0	5,179	5,179
	Housing benefit (příspěvek na bydlení)	13,892	12,384	13,137
	Living allowance (příspěvek na živobytí)	16,054	16,908	16,616
	Housing supplement (doplatek na bydlení)	10,359	7,512	8,502
	Unemployed benefit - reported (podpora v nezaměstnanosti)	18,965	9,214	14,887
	Parental allowance - reported (rodičovský příspěvek)	22,800	26,507	26,505
	Other benefits - reported	34,522	28,259	32,436

Note: Only non-pensioner households. All values are weighted by population weights.
Source: SILC 2011, TAXBEN model based on 2013 legislation.

APPENDIX

TAXBEN model – algorithms and assumptions

Computing the taxes and benefits would be straightforward if the information in the SILC dataset was the same as on the tax returns and benefit application forms. This is true for the key information (e.g., wages, family structures) but not for the myriads of detailed provisions of the tax and benefit laws. We inevitably had to resort to assumptions on how to reflect those provisions which cannot be perfectly computed with the data available. Below we describe the TAXBEN computations and justify the assumptions.

i. Defining incomes

SILC reports the gross wage income from primary and secondary employment, and also reports the type of labor contract that the person has. For tax purposes, the first distinction is not relevant, but the second is because wages from informal temporary contracts [31] up to 10,000 per month are exempt from the health and social contributions. We therefore distinguish the wages from formal work (fully-taxed) and informal work (partially taxed) based on whether the individual has the informal temporary contract. Finally, we add the employer health and social contributions, calculated from the gross wages by applying the tax laws, to obtain the full employer cost, our concept of wage income Y_i.

Employees also receive some compensation in employee benefits (perks). Perks are generally not taxable, with the exception of a company car provided for private use. Ideally, the wage income should include the monetary value of the perks. SILC provides a yes/no information on some of the perks (car, food vouchers, cell phone) but not their monetary value. Therefore, perks are not included in the TAXBEN model.

The income of the self-employed reported in SILC is the difference between revenues and costs, as recorded on the tax return or self-reported by the respondent, minus the social and health contributions. The social and health contributions are then not reported for the self-employed. We therefore have to reconstruct the gross business income before paying the contributions. Fortunately, there is a one-to-one correspondence between the profit before and after subtracting the contributions, even if one takes into account the non-linearities induced by the minimum and maximum contributions. The exact function linking the two is:

$$NY = Y - \tau_{SS}B_{SSmin} - \tau_H B_{Hmin} \qquad if\ Y \leq \frac{B_{SSmin}}{f_D}$$

$$= Y - \tau_{SS}Y - \tau_H B_{Hmin} \qquad if\ Y > \frac{B_{SSmin}}{f_D}\ \ and\ Y \geq \frac{B_{Hmin}}{f_D}$$

$$= Y - (\tau_{SS} + \tau_H)Y \qquad if\ Y > \frac{B_{Hmin}}{f_D}\ \ and\ Y \leq \frac{B_{SSmax}}{f_D}$$

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[31] The so-called "dohoda o provedení práce" in Czech, which is currently limited to 300 hours per year with a single employer.

$$= Y - \tau_{SS}B_{SSmax} - \tau_H Y \qquad\qquad if \ Y > \frac{B_{SSmax}}{f_D} \ and \ Y \le \frac{B_{Hmax}}{f_D}$$

$$= Y - \tau_{SS}B_{SSmax} - \tau_H B_{Hmax} \qquad if \ Y > \frac{B_{Hmax}}{f_D}$$

where *NY* denotes the net income (after subtracting the contributions but not the income tax), τ_{SS} and τ_H are the statutory social security and health contribution rates for the self-employed, and B_{SSmin}, B_{Hmin}, B_{SSmax} and B_{Hmax} denote the minimum and maximum tax bases for social and health contributions. The tax base for social security and health contributions equal to the profit reduced by a scale-down factor f_D (currently equal to 0.5). We invert the function to express *Y* as a function of *NY*, and apply the inverse function to the net income reported in SILC to recover the gross business income.[32]

ii. Computing taxes
We first divide the household members into tax units. A tax unit is the collection of household members where one taxpayer can potentially claim tax credits on behalf of some other members.[33] The tax unit is simply the household in single-adult, married couple, or basic parent(s)-children households. In more complicated households (typically young parents and children living with grandparents, or other relatives present), we use the information on the relationship of each member to the household head to isolate the parent(s) and children into one tax unit, the grandparents into another unit, and the remaining individuals into other single-person units.[34] We assume that the highest-earning person in the tax unit claims all the tax credits for children and spouse.

For each individual with positive income, we apply the appropriate tax law to compute the health and social security contributions by the employee and employer.[35] To compute the income tax, we first set the partial tax base, which equals the wages plus employer contributions for wage income and profit before contributions for business

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[32] The minimum tax bases also depend on the number of months during the year when the business is operating. For main business income, this number is reported in SILC and we use it to set the individual-specific minimum tax bases. For secondary business income, the number of months is not reported. We therefore invoke the assumption that the number of months of secondary business activity is distributed uniformly and assign the number of months according to the rank in the distribution of secondary business income. (I.e., that people in the top 12th of the distribution of secondary business income are assigned 12 months, people in the second 12th are assigned 11 months etc.).

[33] Typically, a child tax credit claimed by one of the parents and the spouse tax credit claimed by the primary earner for a low-earning spouse.

[34] Even in basic parents-children household, a child can form a separate unit if he/she is old enough to earn income and the parents cannot claim a tax credit for him/her.

[35] Taxes for the self-employed do not include the sick leave insurance. Participation in this scheme is voluntary for them. We would therefore expect that the self-employed pay the sick leave contributions only if participation makes them better off.

income. Next, taxpayers can deduct several items from the partial tax base.[36] The SILC data is rather limited for incorporating this feature of the tax system. There is no information to impute the deductions for charitable gifts, life insurance contributions, and the study costs, and we do not build them into the model. This is not too a serious omission since these deductions represent only 28 percent of all deductions.[37] The deductions for voluntary pension insurance can be computed directly, since the pension insurance amounts are reported in SILC.

The mortgage deduction is the most important, representing 62 percent of all deductions. We impute the mortgage deduction from the information on whether the household has a mortgage or not, the self-reported value of its home, how long it has lived in the current home, an assumed interest rate and repayment length. We construct a "typical" mortgage that the household is likely to have given this information and compute the interest payments.[38] Doing so inevitably implies that our imputed deductions sometimes underestimate and sometimes overestimate the true deductions, and they have lower variance than the true deductions. However, we think that our imputations are precise enough to capture the main consequences of the mortgage interest deduction: the preferential tax treatment that homeowners with a mortgage receive over other taxpayers and its regressive impact because higher-income households are more likely to have a mortgage and to deduct higher interest payments.[39]

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[36] According to the income tax breakdown statistics produced by the Ministry of Finance, the total value of these deductions was 22.3 billion, or 3.6% of the personal income tax base. However, these income tax statistics are compiled from the individual income tax returns only. As we discuss above, the majority of taxpayers has their taxes administered by their employers. The employers also process common deductions, such as the mortgage interest deduction. Even the tax collecting authority does not have the information to calculate the total amounts of deductions. The statistics on the deductions that we mention here are based only on the subpopulation that files a return. Unfortunately, this lack of information does not enable us to check the external validity of the assumptions that we use to impute the deductions.

[37] Source: Income tax breakdown statistics (2010), Ministry of Finance.

[38] The mortgage market in the Czech Republic expanded substantially since 2000. The SILC data demonstrates this with a large difference between the number of households that have mortgage and moved into in the current home during 2000-2010 and those who moved in during the previous decade (564,000 and 117,000, respectively, population-weighted). For that reason, we assume that households that moved in since 2000 used the mortgage to buy the home. The mortgage amount is assumed to be 50% of the value of the home, and naturally the households took the mortgage when they moved in. The households that had moved in earlier are assumed to have used the mortgage for the renovation of the home. The mortgage amount is assumed to be 20% of the value of the home and the year when they took the mortgage is assigned to them randomly from 2000-2011 interval. The interest rate and the mortgage payment period are assumed to be 4% and 15 years, respectively.

[39] Descriptive probit and OLS regressions on a subsample of households with positive earnings show that a 1-percent increase in household income increases the probability that a household has mortgage by 0.075 percentage points. On the subsample of households with a mortgage, a

After subtracting the deductions, a 15 percent tax rate sets the income tax before credits. Subtracting the basic credit, credit for a non-working spouse and the child is straightforward because SILC provides enough information to determine eligibility. There are also additional credits for taxpayers and spouses with disabilities. The basic tax credit for each taxpayer is higher for people with a serious disability (the so-called ZTP/P card holders), and also the tax credit for non-working spouse is higher if the spouse is a ZTP/P card holder. The eligibility for these tax credits is assigned to people who report "very bad" health status in the SILC data (or their spouse does).[40] There is also an additional tax credit for people who receive disability pension. Disability pension is reported in the SILC data, so determining the eligibility for this tax credit is more straightforward.[41]

The differential taxation of wage and business income is one of the focuses of our analysis. We therefore have to portion the total taxes into taxes on wage and business income for taxpayers that have both sources of income. While the health and social contributions are assessed separately on wages and profits, the income tax is determined jointly. We portion the income tax by the share of the wage and business income in the tax base.

iii. Computing benefits

As with taxes, we start by defining the benefit units. It basically means creating units that are treated separately for benefit entitlement purposes. Some benefits (like housing benefit and aid in material need benefits) treat the whole household as one unit (so that characteristics and incomes of all household members are tested). In case of benefits that are connected to presence of children in a family, the benefit units sometimes do not include all household members. For entitlement to child benefit and birth grant, the benefit unit includes children and their parents (if parents are themselves dependent children, then grandparents are also included in the benefit unit). For maternity benefit, the amount of benefit depends on the previous income of mother, so the unit includes her only.

Based on benefit units' definitions and detailed information in the SILC data, we can simulate eligibility and amounts of most of the welfare benefits that are available in the Czech Republic. We simulate maternity benefit (*peněžitá pomoc v mateřství*), birth

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1-percent increase in income increases the amount of the mortgage interest deduction by 0.35 percent.

[40]The information about ZPT/P card holder is not available in the data, but the "very bad" self-reported health status in SILC data corresponds well in total numbers to the total number of people with ZTP/P card.

[41] However, the amount of tax credit differs based on the type of disability pension that an individual collects, and the information on the type of disability pension is not reported the in data. We thus again apply the assumption that only people with "very bad" self-reported health status in SILC collect the most generous disability pension, and therefore are eligible for the most generous tax credit.

grant (*porodné*), child allowance (*příspěvky na děti*), housing benefit (*příspěvek na bydlení*), and aid in material need benefits: living allowance (*příspěvek na živobytí*) and housing supplement (*doplatek na bydlení*). However, some benefits cannot be simulated due to lack of information on previous incomes and employment history in the SILC data (unemployment benefit – *podpora v nezaměstnanosti*), because of the length and amount of benefit being subject of a choice of recipients (parental leave benefit – *rodičovský příspěvek*) or because of very individual assessment process for benefit eligibility (benefits for people with serious disability). These benefits are thus not simulated; the amounts of these benefits are taken from the self-reported values in SILC.

Simulation of some of the means-tested benefits is further complicated by the fact that period for which incomes are tested does not always correspond to the period for which incomes are reported in SILC. SILC data reports incomes in the previous calendar year, while for example housing benefit and birth grant are assigned based on income from the previous quarter. Therefore, we have to apply an assumption that incomes are spread smoothly across the whole year and there are no big jumps in it. Moreover, the reported benefits in SILC are reported for the same period as reported incomes, while in reality benefits are often assigned based on incomes from previous period. So, to some extent, we also assume no big jumps in incomes across years, because some of the reported results are based on combination of reported benefits from SILC (unemployment benefit and parental leave benefit) and simulated benefits (all other benefits).

The simulation of maternity leave benefit requires further assumptions. Eligibility for this benefit is conditioned upon paying health insurance contributions for at least 270 days in the previous two years. We assume this condition is satisfied for all women who have positive incomes from work or business in the previous calendar year. In the simulation of housing benefit, we compare information about actual housing costs reported in the SILC data with the maximum normative costs (taken from legislation).

Finally, the main assumption of benefit simulation is the full take-up of all benefits for which a household is eligible. Although this is a standard assumption in the microsimulation literature (see e.g. Immervoll and O'Donoghue, 2002), the take-up of some welfare benefits in the Czech Republic is quite low. The low take-up concerns mainly housing benefit, but the extent of non-take-up is not known.

iv. Consistency with external data
The accuracy of the TAXBEN model in predicting revenues is evaluated in Table A2. It shows the actual budget revenues[42] in 2010 (the year for which the income

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[42] Ideally, we would like to use the tax liability on income earned in 2010 instead of the cash revenues of the government. However, Ministry of Finance was not able to provide this information separately for employment and business income.

information is available in SILC), the revenues predicted by TAXBEN (based on tax parameters in 2010), and also the revenues reported directly in SILC (however, SILC does not report the health and social security contributions of the self-employed).

The model does an excellent job in predicting the two most significant revenue sources: social security and health contributions paid on wage income. The TAXBEN predictions differ from the actual revenues by 0.2 percent and 1.8 percent, respectively. The TAXBEN underpredicts the income tax on wage income and overpredicts the income tax on business income, such that the total income tax revenues are still underpredicted by 15 percent. The relative disparity between business and wage income is in part due to differences in the way the income tax is allocated between wage and business income in the official statistics and in TAXBEN.[43] The overprediction of the income tax on business income is most likely due to the discrepancy between the incomes of the self-employed reported in SILC and incomes that are actually taxed. SILC contains direct information on the income tax paid by the self-employed, which, however, is not taken from the tax returns but is imputed by the Czech Statistical Office based on reported incomes and family structures. The income tax revenue reported in SILC exceeds the actual revenue by the order of 3.5. Also, the TAXBEN predicted health and social security contributions on business income are higher than the actual revenues, despite the fact that these are very simple, almost linear taxes. SILC thus appears to be over-reporting business income. One reason might be the availability of several (legitimate) deductions that reduce the tax base below the actual profits. The most important are the estimated costs that the self-employed may deduct instead of their true costs. The estimated costs are set as a fixed percentage of revenues (40, 50, 60 or 80, depending on the industry) are deducted by about 300,000 self-employed.[44] Total tax revenues are over-predicted by the TAXBEN model by mere 1.1 percent.

Benefit expenditures are overpredicted mainly for the housing benefit, which has very low take-up in the Czech Republic, and for the aid in material need benefits, where the take-up probably plays its role as well. The child allowance, birth grant and maternity benefit expenditures are predicted very well by the TAXBEN model.

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[43] Persons that have both wage and business income have the income tax on their wages withheld by the employer. They also file a tax return on which both income sources are consolidated and all tax credits and deductions are claimed. Taxes paid based on this return appear in the official statistics as taxes paid by the self-employed, and hence the tax credits and deductions disproportionately reduce the reported income taxes paid by the self-employed. In TAXBEN, we divide the income tax in proportion to the share of business and wage income in the tax base.

[44] Source: Explanatory memorandum to Act no. 500/2012, available at:
http://www.psp.cz/sqw/historie.sqw?o=6&t=801 (last accessed June 28, 2013).

TABLE A1

Main parameters of the Czech tax and benefit system, 2013

Taxes	
Personal income tax	
tax rate - basic	15.00%
tax rate - surcharge	7.00%
surcharge applies if gross income exceeds	1,242,432
basic tax credit	24,840
child tax credit	13,404
Health contributions	
Tax rate - employees	4.50%
Tax rate - employers	9.00%
Tax rate - self-employed	13.50%
Tax base for the self-employed	50% of profit
Min tax base for the self-employed	155,304/year
Max tax base	none
Minimum contribution (employees and non-workers)	1,080/month
Social security contributions	
Tax rate - employees	6.50%
Tax rate - employers	25.00%
Tax rate - self-employed	29.20%
Tax base for the self-employed	50% of profit
Min tax base for the self-employed	77,652/year
Max tax base (employees, employers, self-employed)	1,242,432/year

Benefits	
Child allowance (přídavky na děti)	
Eligibility	Income below 2.4 times minimum living standard
Amount per child up to 5 years	CZK 500 / month
Amount per child 6 - 14 years	CZK 610 / month
Amount per child 15 years and older	CZK 700 / month
Birth grant (porodné)	
Eligibility	Income below 2.4 times minimum living standard
Amount per first new-born child	CZK 13000
Amount if twins, triplets etc.	CZK 19500
Maternity benefit (peněžitá pomoc v mateřství)	
Eligibility	Previous health insurance contributions
Duration	28 weeks
Amount	70% of average wage in the last 12 months (reduced)
Parental allowance (rodičovský příspěvek)	
Eligibility	Raising child up to 4 years of age
Total amount	CZK 220,000
Duration	Flexible (up to 2 to 4 years of age of a child)
Housing benefits (příspěvek na bydlení)	
Eligibility (Prague)	Housing costs (socially respectable) above 35% of income
Eligibility (out of Prague)	Housing costs (socially respectable) above 30% of income
Amount	Difference between housing costs and 30 (35)% of income
Living allowance (příspěvek na živobytí)	
Eligibility	Income below subsistence level
Amount	Difference between subsistence level and income
Housing supplement (doplatek na bydlení)	
Eligibility	Income below 1.3 * subsistence level
mount	Difference between subsistence level and income

TABLE A2

External validity of the TAXBEN model: Tax revenues and benefit expenditures (mil. CZK)

	2010			
	External statistics	**TAXBEN predictions**	**SILC values**	**TAXBEN vs. external statistics**
Taxes:				
Income tax - wage income	111,842	82,407	83,426	-26.3%
Income tax - business income	7,987	19,193	27,304	140.3%
Social security - wage income	323,095	323,658	322,989	0.2%
Social security - business income	22,450	45,670	N/A	103.4%
Health insurance - wage income	148,582	145,855	140,040	-1.8%
Health insurance - business income	14,280	23,791	N/A	66.6%
Total taxes on earnings	628,237	640,573	N/A	2.0%
Benefits:				
Child allowance (přídavky na děti)	3,875	3,690	3,916	-4.8%
Birth grant (porodné)	1,565	1,572	1,266	0.4%
Maternity benefit (peněžitá pomoc v mateřství)	7,409	5,547	N/A	-25.1%
Housing benefits (příspěvek na bydlení)	5,321	11,175	2,833	110.0%
Aid in material need (pomoc v hmotné nouzi: příspěvek na živobytí a doplatek na bydlení)	3,882	6,945	1,896	78.9%
Parental allowance (rodičovský příspěvek)	27,765	from SILC	26,345	N/A
Unemployment benefit (podpora v nezaměstnanosti)	13,355	from SILC	9,355	N/A
Other benefits (příspěvek na péči, příspěvky pro zdravotně postižené, výsluhový příspěvek atd.)	N/A	from SILC	12,854	N/A