

Gábor Kiss – Tomasz Jędrzejowicz – Jana Jirsákova:
How to measure tax burden in an internationally comparable way?¹

Abstract

In this paper we address the issue of tax burden and its measurement, beginning with a discussion of use of tax-to-GDP ratio for this purpose. We show that this commonly used indicator has a number of flaws, related to the methodology of calculation of taxes and GDP in national accounts. Firstly, tax revenue calculated in accordance with ESA95 methodology is not perfectly in line with the economic concept of taxes, i.e. levies imposed by the government, which are compulsory and unrequited. Secondly, both tax revenue and GDP include a government component, which distorts the true picture of tax burden. Taxes paid on government expenditure do not affect incentives and do not constitute a ‘burden’ on economic activity. We propose a number of adjustments to deal with these problems and apply them to data for Hungary, Poland and Slovakia. The results indicate that in these countries, the underlying (methodologically and cyclically adjusted) tax burden imposed on economic activity has followed different trends from those implied by the headline tax-to-GDP ratios. The results show that it is also important to look at the headline and adjusted measures of the tax burden in disaggregated terms, namely dividing the tax burden into labour, corporate and indirect tax components.

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1. INTRODUCTION

The size and structure of the tax burden is one of the most important ways in which government actions affect economic activity. The linkages involved are complex and multi-faceted, as taxes impact private agents' incentives, cyclical developments, long-term growth and the distribution of income and wealth. Taxes also affect different groups of agents in different ways and consequently, are perceived by them differently. Companies are interested in their post tax profits; their effective tax burden has distorting effects on their economic behaviour, e.g. investment decisions are based on post-tax profit projections. These distortions cause excess burden over the tax revenue raised. Apart from those efficiency considerations which are taken into account in labour supply decisions, households may also be concerned with redistributive properties of taxation (tax incidence). This is related to the distribution of the tax burden and can be measured by what is called vertical and horizontal equity. Social preferences seem to be often in favour of higher (progressive) taxation of higher incomes, because proportional taxation (i.e. vertical equity) conflicts with fairness. Fairness considerations usually also require that taxpayers with the same income would bear the same tax burden (i.e. horizontal equity). Governments aim at finding an optimal design of taxation, which takes into account both efficiency considerations and social preferences, which are often in conflict. They are interested not only in the structure of taxation, but also in the significance of the aggregated tax revenue compared to GDP. In the rest of this chapter we provide an overview of the problems related to the measurement and interpretation of the aggregated tax burden indicators.

The most commonly used and simple aggregated tax burden indicator is the tax-to-GDP ratio, which is a measure of what percentage of production is transferred to general government in the form of compulsory, unrequited payments. For those countries which have deficits, the actual tax-to-GDP ratio is a distorted measure of the size of the government, although the tax-to-GDP ratio is ultimately determined by the desired level of spending, this level has to be financed through taxation only in the future. Diamond and Mirrlees (1971a, 1971b) defined an "optimal" fiscal burden as the value placed by society on public goods financed by taxes divided by the loss of efficiency caused by taxation. Although the expenditure-to-GDP ratio and the tax-to-GDP ratio cannot capture the value (quality) of the public goods and the excess burden of taxation², respectively, these ratios are often used as reference points in economic and political debates.³

² Microeconomic analysis of the individual tax burden calls for a very detailed study of behaviour of the economic agents in an economy. Excess burden is difficult to be estimated, since the distorting effects on the economic behaviour can be captured only in a complex model-based approach that includes several assumptions regarding household behaviour etc. In an optimal case the effective tax rates should be inversely proportional to the elasticity of different tax bases (incomes, commodities) in order to minimise excess burden. (Alm, 1996, Slemrod, 1990) Apart from minimising allocative distortions, different rates can be justified by the need for the internalisation of external effects (Atkinson and Stern, 1974), or incentives for innovation (OECD, 2008). These optimal tax rates, however, may conflict with social preferences regarding horizontal equity and vertical inequity.

³ For example some studies have attempted to measure the effect of taxation on per capita output by regressing directly the growth rate and the tax-to-GDP ratios, but the results were contradictory. Engen and Skinner (1992) find that changes in aggregate average tax rate do not have significant effects on growth. Marsden (1986) finds that the tax-to-GDP ratio has a significant, negative impact on output growth, especially for lower-income countries.

Despite of the continuous efforts of several international organizations in determining tax revenue, the comparability of tax-to-GDP ratio across countries and time has raised some concerns. (Messere and Owens, 1987, OECD, 2000, Burn, 2004, P. Kiss, 2005) These refer not only to the numerator of the ratio, i.e. the overall amount of taxes collected, but also to the denominator, where the GDP is not necessarily the most appropriate base for comparisons (Brown and Jackson, 1978). Furthermore, the cyclical developments affect tax revenue and GDP differently due to composition effects; therefore cyclical effects should be filtered out.

There are several measurement problems of the tax revenue, which will be discussed in the next chapter more in detail. The OECD identified borderline cases between different categories such as tax expenditure and expenditure. As a result of the different methodology, OECD tax data are slightly different from the national accounts classification of tax data. (See: OECD 2007) This classification, however, is not exhaustive and for example does not address the problems of tax treatment of corporate losses carried forward. (OECD, 2000) Another issue is that the European national accounts (ESA) record part of VAT and customs duties as indirect taxes paid to the EU removing them from indirect taxes collected by the member state. For comparability reasons the ESCB decided to impute them. (ECB, 2007) Headline tax burden measures also exclude certain types of burden imposed on employers in the form of social benefits they are required to pay their employees. (Adema, 1998) These compulsory social benefits can be imputed as transfers and taxes (P. Kiss, 2005). Additionally, according to some authors, part of the excises on fuel can be classified as a fee for using the public road network (Newbery-Révész 1996, 2000).

The comparison and interpretation of the tax burden is further complicated as a result of the difference between the tax burden faced by the private and government sectors. For example, different tax treatment of social benefits distorts comparability. (OECD, 2000, 2006, the Danish Ministry of Taxation, 2008⁴) As an alternative of their simple exclusion from the tax burden, the OECD decided to report the identifiable tax components as memorandum items (OECD interpretative guide). Another option is the exclusion of all taxes and contributions paid by the government to itself (P. Kiss, 2005). In addition to taxes paid directly on government expenditure, such as labour taxes on government salaries and VAT on government investment, social benefits and public wages affect the disposable income of the households. This leads to an indirect impact of government expenditure on tax collection through consumption taxes. (OECD, 2006, Marčanová and Ódor, 2008) This means that one can define two alternative measures of private taxes; the “broad” measure excludes only the direct tax component of the government spending, while the “narrow” measure excludes also the indirect tax component paid by the recipients of government transfers and wages.

Both measure of the private tax burden can be interpreted as the percentage of the private GDP which is transferred to government. The problem here is the measurement of the private GDP, which has three different approaches, the expenditure⁵, the production⁶ and the

⁴ “International comparisons show that traditionally calculated tax burdens and other tax burden measurements are heavily influenced by the organisation of the individual country’s tax and transfer income systems.”...”An example of this is that in Denmark the tax burden technically rose between 1993 and 1994 as a consequence of the restructuring of a number of social pensions from fully or partially tax free, to fully taxable. Contributions before tax rose accordingly.”

⁵ This is equal to the use of private income, which is the sum of private domestic demand and net exports.

⁶ This is the total market value of goods and services produced in the private sector by deducting the cost of goods utilized in the process of production.

income⁷ measures. The aggregated private tax revenue is not consistent with any single measure of the private GDP. The only solution is disaggregating the tax revenue into two major groups of taxes, and then aggregating them again. (P. Kiss, 2005) Direct taxes and contributions paid by the private sector are consistent with the income measure of the private GDP at factor costs; therefore a “direct” burden ratio can be calculated. The major part of indirect taxes paid by the private taxes is consistent with the expenditure measure of the private GDP, a minor part is consistent with the production measure of the private sector. For the sake of simplicity all private indirect taxes can be compared to the private demand by calculating an “indirect” burden ratio.⁸

Disaggregating the private tax burden has two other advantages. First, the potential distortions caused by the cyclical developments can be properly removed only by disaggregating tax bases. While trend GDP can be estimated relatively easily, cyclical effects are more difficult to be removed from the tax revenue, because the composition of the aggregate output gap matters if there are “tax-rich” and “tax-poor” elements like wages and profits. Bouthevillain et al (2001) argue that the aggregate output gap hides the underlying developments. While the same output gap can be made up from various components, this gap has different effects on taxes. In order to establish reliable links between the major tax bases and the cyclical fluctuations, the so-called disaggregated measures of the cyclical adjustment calculates several gaps instead of focusing on the aggregate output gap. (Bouthevillain et al., 2001; P. Kiss and Vadas, 2006) These approaches define cyclical fluctuations by restricting them to the developments in the private sector, i.e. government wages, consumption and investment are excluded. The latter variables are determined by the fiscal policy; therefore their changes can be described rather as “fiscal shocks”. This approach is consistent with the “broad” measure of the private taxes and private GDP.

Another advantage of the disaggregated tax burden is that it can be used to measure a benchmark case to assess deviations from horizontal or vertical equity. (P. Kiss, 2005) The “direct” and “indirect” burden ratios can be seen as two benchmark tax rates, which indicate what would be the tax rates that produces approximately the same tax revenue under horizontal equity. Comparing effective tax rates to these benchmark tax rates one can determine the size of redistribution between sectors or different groups of tax-payers. The estimation of the size of these implicit transfers between tax-payers can complement the similar measures in the expenditure side of the government. It could also augment the calculation of the gross social spending (OECD 2006) with the difference between the effective tax rates and the benchmark tax rates, which can either reveal preferential tax treatment of benefit recipients or “overtaxing”.

In this paper we calculate an adjusted private tax burden and then a cyclically adjusted “underlying” private burden. We measure a “broad” private burden, which means that the taxes paid directly by the government are subtracted from the total tax burden. We also

⁷ The income measure of the private GDP at factor costs can be seen as the income of the producers in the private sector, which is then distributed through payments to workers (wages), capital (profits). The GDP at market prices includes also indirect taxes paid to the government, but their inclusion in the denominator would be not consistent with their exclusion from the numerator. According to some other arguments if the significance of indirect taxes differs across countries and time, variations in the tax-to-GDP ratio would be sensitive to variations in the share of indirect taxes. (Brown and Jackson, 1978, P. Kiss, 2005)

⁸ In the case of the „narrow” measure of the private tax burden, indirect taxes paid by the recipients of government transfers and wages would be excluded from the numerator, and the sum of government transfers and wages would be excluded from the denominator (i.e. private demand).

determine the benchmark tax rates for both indirect and direct taxes, which would produce the same tax revenue under horizontal equity. The comparisons between the actual effective tax rates and these hypothetical benchmark tax rates as a measure of redistribution are beyond the scope of our study. The rest of the paper is organised as follows. First the methodology we used is described. After that our data sources are presented. Then our results are discussed. Finally we conclude.

2. METHOD

2. 1. Adjusted taxes

In this section we define a comparable measure of the adjusted taxes (AT). Our calculation is based on the tax data consistent with the European System of National Accounts (ESA). The total tax revenue is equal to the sum of direct taxes (D.5R), indirect taxes (D.2R), social contributions (D.61R) and capital taxes (D.91R).

According to their usual definition taxes are *compulsory, unrequited payments to the government*. We examine more closely the four elements of this definition. We find borderline cases between tax and non-tax revenue (sections 2.1.1 and 2.1.2), which have no impact on the total revenue. In some cases we adjust taxes and expenditures simultaneously, without effects on the deficit (sections 2.1.3/a, 2.1.4/a, and 2.1.4/c). Finally we identify cases, when the adjustment of the taxes has effects on deficit (sections 2.1.3/b and 2.1.4/b).

2. 1. 1. Compulsory

The category of social security contributions may include voluntary social security contributions as well (included in D.6113). There can be borderline cases, since part of voluntary payments may be classified as quasi-compulsory ones (e.g. in Germany), otherwise these payments should be reclassified as non-tax revenue from the category of taxes (see §8 in the OECD interpretative guide). Voluntary contributions were closer to non-tax revenues in Hungary; therefore they were excluded from social security contributions.

2. 1. 2. Unrequited

Taxes constitute unrequited payments because the government provides no direct benefits in return. One can identify at least two major issues as borderline cases.

a. Although ESA and OECD methodologies classify social security contributions as part of the tax burden, one could make an argument that these contributions are not taxes since the government provides a benefit in return. However, even if this was true, tax-payers consider contributions as burden in the short term. Tax-payers could treat contribution as (forced) savings if they were perfectly rational AND there were no liquidity constraints at all. This is why we propose to consider all such mandatory payments as part of the tax burden, extending this treatment also to contributions to a fully funded pension pillar (see 2.1.4).

b. Another potentially problematic issue is the distinction between taxes and fees or user charges. The first condition for classifying a levy as non-tax revenue is a direct link, which should exist between the payment and the service received in return. The second question is whether the service is proportional to the payments or considerably excesses its costs. In the

first case the levy is non-tax revenue, in the second case it is a tax. Fees and user charges may be related to regulatory or allocative functions of the government.

One of the regulatory functions of the government is to issue licenses, permissions and certifications for which a fee is demanded. According to ESA and OECD methodologies if the issue of such licenses involves little or no work on the part of the government, it is likely that they are simply a device to raise taxes. The actual boundary between taxes and purchase of services is based on the practices followed in the majority of countries, namely only licenses to own or use vehicles, boats or aircraft and for licenses to hunt, shoot or fish are treated as current taxes.

There are also allocative functions of the government for which fees and user charges can be demanded. Most of these payments are recorded as non-tax revenue (purchase of services) according to ESA and OECD methodologies.⁹ The shortcoming of these approaches is that they neglect those taxes, which have a clear and direct link to services provided by the government. As Newbery and Révész (1996, 2000) recognize, part of the excises on fuel can be classified as a fee for using the public road network. In the quoted Hungarian case therein, it was clear that a specific part of excises was transferred to the Road Fund which was in charge of operating roads. Even if such earmarked funds do not exist, one could introduce a notional fund for analytical purposes. From the users perspective tolls and excises on fuel are costs of using roads, particularly since excise paid on fuel is proportional to the use of roads. However, this does not necessarily mean, that these combined costs are proportional to the service the users receive, as the quality of roads may vary. The part of these payments, which is proportional to costs of amortization and maintenance of the road, can be seen as non-tax revenue, while the remaining part of excises is taxes.¹⁰ In order to calculate this proportional part, one can determine the costs. If a government cuts in the maintenance costs the service (quality of roads) decreases, and the value of the service obtained by the user of the road declines. This implies that a smaller part of excises can be reclassified as non-tax revenue (user-charge). This means that some measures in the expenditure side may have effects on the tax burden and non-tax revenue.

2. 1. 3. Payments

Taxes are defined as payments, but tax allowances, exemptions and deductions negatively affect the amount of taxes. The recording of these tax provisions poses two problems.

a. Some tax allowances and credits bear close resemblance to social transfers. Indeed, frequently they serve as a substitute for explicit transfers. According to the OECD methodology (OECD interpretative guide, §21) negative taxes can be taken into account in two different ways depending on their design. If the negative tax (tax credit) does not depend on current tax liabilities of tax-payers it is the same as a transfer. This so-called non-wastable tax credits means that any excesses of the tax credit over the current tax liability are paid to the tax-payers. This tax expenditure should be recorded in a gross way, increasing both

⁹ In the case of radio and television licence fees paid to public providers of the service the OECD method records non-tax revenues, while the ESA records taxes. We accept the OECD approach here, but this requires small adjustments of ESA figures only in the case of Slovakia.

¹⁰ Since excise duties are included in the price which is the base of VAT, revenue from excise taxes should be considered on a gross basis, i.e. together with VAT paid on them.

revenue and expenditure. If the size of negative tax is limited by current tax liabilities of tax-payers, it is not the same as a transfer. Indeed, these wastable tax credits differ from some mean-tested transfers. In this case tax expenditure can be treated as a vehicle of redistribution but the average ratio of taxes should not be corrected. In the case of non-wastable tax credits, the OECD methodology separates the ‘transfer component’, which is paid to tax-payers as the excess of the tax credit over the current tax liability from the ‘tax expenditure component’, which is that portion of the credit that is used as a deduction up to the tax-payer’s current liability. The Eurostat National Accounts Working Party (NAWP) made similar recommendations. (Eurostat, 2000) According to this approach in case of those tax credits which are considered as integrated parts of the tax system, the amounts paid to taxpayers in excess of their tax liabilities should be treated as expenditure and the rest should be treated as reductions in tax revenue. In our view the distinction between these components is not necessary, since the whole amount of these (non-wastable) negative taxes should be classified as expenditure. If there are no links between the tax liability and the negative taxes, they should be completely separated by increasing taxes and expenditures simultaneously. This was a minority view in the Task Force on Harmonization of Public Accounting (SNA update), but majority view in the International Public Sector Accounting Standards (IPSAS) Board. (TFHPSA, 2005)

b. The second problem is related to the wastable tax allowances of profit taxes.¹¹ The problem of the tax treatment of carry over losses is potentially important, but this is not addressed by the ESA and OECD methodologies. If accrual time of recording of profit tax was corrected for this lagged effect of corporate losses, distortions could not have arisen. On the one hand, these tax allowances are always wastable in the sense that they are lost once the tax base is reduced to zero as they never result in payments to the taxpayer. On the other hand, these losses can be deducted from the next years’ tax bases, by carrying forward this negative tax base. As a consequence of the unrecorded negative tax base, tax revenue can change over time even if actual current profits of companies do not change. If this negative tax base was recorded, developments in both profit tax and profits would have been linked more closely.¹² The practical problem is that loss carry-overs can expire, and some tax-payers can also go bankrupt without deducting the accumulated losses from previous years. Even though firm-level information about the portion of negative taxes deducted is not available, an average discount factor of reported losses may be calculated as an approximation. It requires aggregate data on the accumulated carry-overs and the yearly deductions. First, we calculated the sum of deductions in the examined period and accumulated loss carry-overs at the end of the period and then a ratio between this sum and the sum of losses reported in the examined period is determined. The reported yearly losses are discounted with this ratio and compared to the actual yearly deductions related to loss carry-overs. The difference between these two yearly figures is classified as correction of the tax base.

¹¹ Tax allowances are different from tax credits, since they are amounts used to determine the tax base, i.e. the income or profit that is to be taxed.

¹² The following example shows the importance of composition effects. If we have two tax-payers, both have profits of 50 bn, the recorded tax base would be the same as if the first tax-payer has a profit of 100 bn and the second one has a loss of 100 bn. Tax revenue would be the same in the first year but different in the following years.

2. 1. 4. The government as recipient

The category of taxes is restricted only to revenues paid to the government sector according to both ESA and OECD methodologies. In our view this distorts the measure of tax burden, since there often are similar compulsory, unrequited payments to the private sector, which should be considered as burden by those who are obliged to pay them.

- a. One example is the case of certain benefits, such as sick-pay, which employers are obliged to provide determined by laws or government regulations.¹³ In the case of sick-pay the contribution of the employers is dependent on the benefits paid to the employees in case of sick-leave; in other word the amount of payments is contingent upon the period of sick-leave. In our view these benefits and contributions should be imputed as transfers and taxes, i.e. included in the tax burden on enterprises.
- b. Another example is the case of fully funded privately managed pension pillars, which is relevant for the countries being examined. Of course, there are a number of differences between these private pillars and the social security funds, but from the taxpayers' perspective all contributions are considered as burden. It could also be noted, that contributions to a funded pillar may be very similar in nature to contributions to a notional defined contribution (NDC) scheme, which is classified inside general government.
- c. The national accounts of EU members classify part of VAT and customs duties as indirect taxes (EU own resources) paid by national residents to the institutions of the EU. Similarly to the methodology of the ECB, we adjust the tax revenue with the full amount of these taxes collected. The collection costs are imputed as a sale of services by the government to the rest of the world.

2. 2. Private adjusted taxes – Government adjusted taxes

In this section we divide the total adjusted tax revenue (AT) into private adjusted taxes (PAT) and government adjusted taxes (GAT), which is the amount of the tax component of government expenditure. This component is a potential source of distortions.

- The tax treatment of social benefits varies between countries; in some, pensions and transfers are subject to taxes and contributions, and this leads to an increase in revenue and expenditure at the same time. Direct taxes and contributions can be usually compared to primary income as a tax base.¹⁴ But if taxes levied on social benefits are

¹³ Another Australian example is the case of the Superannuation Guarantee Charge (SGC, levied at 9% on a payroll tax base and paid by employers), which is not included as a tax and therefore not reflected in the OECD revenue statistics. Since it is compulsory, Neil Warren calculates the SGC at 11.4% of all taxation revenue in 2001. The inclusion of this would have increased Australia's level of taxation in 2001 by 3.8% of GDP from 33.9% of GDP to 30.1%. (Burn, 2004)

¹⁴ This is equal to the earnings of production factors; wages and profits.

included in the numerator, their consistent denominator should be augmented with the secondary income, which mainly consists of government transfers redistributing income.

- Some kind of social benefits apparently have no tax content, but at the same time there are contributions paid by the state to social security funds on behalf of groups of persons defined by law (e.g. handicapped persons, children, women on maternity leaves, unemployed, young entrant, officers with early retirement, etc). These amounts should be also subtracted from overall tax burden as they do not represent burden of the private sector.
- More generally, the size of the taxable government expenditure varies over countries and time. For example the 50 percent increase in public wages in Hungary increased the overall amount of taxes paid in 2002-2003, as it expanded the economy-wide wage bill, which is a significant tax base. At the same time sizeable tax cuts were implemented in the private sector. Since the effects of these two measures were offset by each other, the overall tax burden has hardly changed, and the sizeable deterioration in the budget balance appeared purely as an expenditure increase. Such composition effects can be controlled for only if one calculates tax burdens in the private and government sectors separately.
- Apart from differences in the size of taxable government spending, their effective tax rates can be also very different from those in the private sector. Salaries paid to government employees, which are subject to labour taxation, but not VAT, account for a significant portion of government consumption, resulting in a relatively low VAT burden on government spending. Contrary to that, VAT can not be refunded on the government intermediate consumption and investment, and effective tax burden can be higher due to the more effective tax enforcement in the government sector (i.e. tax evasion is less relevant.)
- Finally, apart from the direct tax content of government spending, there are other expenditures (e.g. social benefits, public wages) which affect the disposable income of the households. Depending on the propensity to consume, these expenditures affect the households' consumption and thus indirect taxes. This effect can be regarded as the second round effect of the fiscal policy. As an option, one can define alternative measures of taxes, when the “broad” government tax burden includes the tax component from these second round effects, and the “narrow” private tax burden excludes them. (Marčanová and Ódor, 2008)

In order to eliminate taxes paid by the government from the total taxes, two obstacles should be overcome. The first problem is the lack of data. Usually only the employers' contributions can be identified, and the proportion of the unidentified tax component may vary from country to country. As a solution we were looking for alternative data sources on indirect taxes (from treasury or Ministry of Finance) and made estimations for the others. (See: in the data chapter)

Another problem is related to the GDP as denominator. If taxes from the government are eliminated from the numerator, GDP should be consistently corrected by the GDP components of the government. GDP can be measured in three different ways, and their values differ only slightly due to measurement errors. The problem is that the share of the government is different in these three measures. According to the production measure, GDP is the total market value of goods and services produced by deducting the cost of goods utilized in the process of production. The income measure can be seen as the gross income of the producers, which is then distributed through payments to workers (wages), capital

(profits), and government (indirect taxes). The expenditure measure is equal to the use of income, which is the sum of domestic demand and net exports.

As a solution we introduced a more disaggregated approach, which make distinction between direct and indirect tax and similarly between their respective potential tax bases, and finally we aggregate the two tax rates calculated which is discussed in the following section.

2. 3. Direct and indirect tax rates as neutral tax rates

Although the calculation becomes more complicated with the exclusion of the government, a closer look at the GDP components as approximations of potential tax bases proves to be insightful. Major part of taxes, namely income taxes, contributions and capital taxes (the sum of them is defined as T_d) link to the GDP measured as gross income.¹⁵ Indirect taxes (T_i) can be divided between taxes on consumption and taxes on production. The former is closer to the expenditure measure, while the latter closer to the production measure.

Gross income is measured as domestic income, which is consistent with the source principle of taxation. The gross national income (GNI) is not an appropriate measure of potential tax base, since the residence principle of taxation determines only minor part of taxes. The problem is that gross income includes not only factor income (wages and profits) but indirect taxes as well. In order to avoid the comparison of income taxes and contributions to a potential tax base which includes taxes, indirect taxes should be subtracted. In other words, value added at market prices should be replaced by value added at factor cost (which finally yields the appropriate tax base B_d). This category is not explicitly used in SNA, but it can be easily derived from GDP at basic prices (excluding indirect taxes) by subtracting the category of ‘other taxes, less subsidies on production’. It represents the amount remaining for distribution as wages and profits out of gross value added after the payment of all taxes on production and the receipt of all subsidies on production. We define direct tax rate

$$\text{as } \frac{T_d}{B_d}.$$

The expenditure measure of GDP covers consumption, investment and exports by subtracting imports. This is equal to domestic demand and net export. Consumption-based taxation (e.g. VAT) has a destination principle (exports are exempt and imports taxed); therefore its potential tax base would be domestic demand, in principle. Production-based taxation has an origin principle; these taxes are levied on the value of goods and services produced irrespective of their destination (consumption, investment, exports). The difference of these two potential tax bases is net export. We chose domestic demand (B_i) as an approximation of its potential tax base, since production-based taxes have an insignificant share within indirect taxes, with the exemption of the Hungarian Local Business Tax (LBT).

¹⁵ For example capital tax on housing is in fact an income tax on imputed rent (imputed income of owners).

The LBT is levied on the value added domestically produced, but it is source-based, similarly to most direct taxes. For this reason we decided to reclassify LBT as direct tax.

Thus we define indirect tax rate as $\frac{T_i}{B_i}$

These tax rates can be regarded as neutral benchmark tax rates (NTR_i and NTR_d)¹⁶.

Comparing any other measure of effective tax rates to these benchmark tax rates one can determine the size of redistribution between sectors or different groups of tax-payers.

The weighted average of these two neutral tax rates can be regarded as a hypothetical neutral tax rate (NTR), which could levy the same burden on income and expenditure.

$$NTR = \frac{T_i}{B_i} * \frac{B_i}{B_d + B_i} + \frac{T_d}{B_d} * \frac{B_d}{B_d + B_i}$$

By reducing them to a common denominator:

$$NTR = \frac{T_d + T_i}{B_d + B_i}$$

Note that the aggregate adjusted taxes (AT) can be measured as two times of this weighted average, if someone determines the denominator as the simple average of the domestic demand and value added at factor costs.

$$AT = \frac{NTR}{2} = \frac{T_d + T_i}{\frac{B_d}{2} + \frac{B_i}{2}}$$

The denominator is calculated as the simple average of the potential tax bases, which means that these potential tax bases are treated as equally important. One could replace these equal weights with alternative ones, which would allow variation across countries, but at the same time it would be difficult to avoid variation in time.

2. 4. Benchmark tax rates – private vs. government

Now we are turning back to our original challenge; the exclusion of the government components from the potential private tax base. First, indirect taxes can be compared to government demand, which is the sum of government actual consumption, social transfers in kind and government investment. Second, the direct taxes and contributions can be compared to the government value added at factor costs. We focus on the phase of the

¹⁶ If these rates would be applied for all income and use of income, horizontal and vertical equity could hold, since all sources and levels of individual tax bases could bear the same burden. This hypothetical restructuring of the tax burden is not completely revenue neutral, if the effects of the implied tax increases and tax cuts are not identical. It is the case if elasticities of different tax bases differ, but in practice these elasticities are difficult to be measured. (P.Kiss-Vadas, 2006)

generation of income: in other words public wages are not distributed to the households in this level. The generation of income can be seen as the ultimate economic source of taxation. Therefore, it is also applied as a potential tax base for the taxes paid on transfers in cash, which is a tax on the secondary incomes distributed by the government. Since this creates inconsistency, we calculate two measures for the government direct tax rates. The first one includes direct taxes and contributions paid on social benefits, and the second one excludes them.

Another option for separating private sector from the government is taking into account the ‘second round effects’ of fiscal policy on household demand. Changes in public wages and transfers affect the household’s disposable income (first round effect), and then domestic demand depending on their marginal propensity to consume. If we attribute this second round effect on demand entirely to the fiscal policy, we can have an alternative, broader definition of the government sector. This definition reclassifies that part of household demand as a demand of the government, which can be attributed to the effect of public wages and transfers in cash. Consistently we have a narrower definition of potential tax bases of the private sector. These alternative definitions provide us alternative explanations of the developments in the tax burden, but these ratios are less intuitive. It can be interpret as a broad definition in which public employees, pensioners, unemployed and other recipients of social benefits would be part of the government sector.

2. 5. Cyclical adjustment

The trends of private domestic demand and private value added at factor costs can be measured relatively easily. The cyclical effects can be removed with Hodrick-Prescott filters from the volume of these indicators, and then the results should be multiplied with the actual deflators.

Cyclical effects are more difficult to be removed from the tax revenue, because the composition of the aggregate output gap matters if there are “tax-rich” elements like wages and consumption and “tax-poor” elements such as profits and investment. Disaggregated measures of the cyclical adjustment calculate not only the output gap, but also gaps of private wages, profits, consumption and unemployment. (Bouthevillain et al., 2001; P. Kiss and Vadas, 2006) These approaches define cyclical fluctuations by restricted them to the developments in the private sector, i.e. government wages, consumption and investment are excluded; therefore they are fully consistent with our calculations.

The multivariate HP filter method suggested by P. Kiss and Vadas provides a solution to the problem that both aggregation constraint (gaps of wages and profits should be equal to the output gap) and the constraint is set by the capital and labour income share should be satisfied. In order to derive the cyclical component of the consumption, another behavioural equation is applied, namely a consumption function. Although this method is more accurate, as an approximation we use here the univariate HP filter method suggested by Bouthevillain et al. We use this method to calculate cyclical adjusted values for direct and indirect taxes paid by the private sector and for their two potential tax bases.

- Cyclical components of private value added at factor costs and private domestic demand and the relevant tax bases (wage, profit, and consumption) are determined by measuring their deviation from their medium-term trends in volumes. The HP filter is applied to

annual data using a smoothing parameter with a value of 30. The projections for all macroeconomic variables are extended by 7 years to solve the end point problem. Since the trends of the denominators (private value added at factor costs and private domestic demand) are defined in volumes, their values had to be determined in current prices.

- Cyclical components of private taxes are calculated by multiplying current value of taxes by the estimated gaps in their respective tax bases and constant elasticities between taxes and tax bases, as an approximation of the lag structures.

3. DATA

In this section we describe the data we used in our calculations. Three groups of data can be identified. First of all, the calculation of the tax bases is based on macroeconomic data from the National Accounts. As a starting point, the headline tax categories are also consistent with the National Accounts. Finally, these headline taxes are adjusted on the basis of different data sources, estimations and expert judgments. We provide a detailed overview on this third group.

3.1. Tax bases

In our method different tax bases are defined on the basis of specific macroeconomic aggregates of the National Accounts such as gross value added at basic prices or domestic demand. By determining these aggregates with their corresponding ESA codes, the required data were obtained from the Eurostat database.

3.2. Headline tax categories

The category of headline taxes covers direct taxes both from households and the corporate sector, indirect taxes and contributions paid by employers and employees. Similarly to the tax bases, these data were determined on the basis of their ESA codes. One exemption is that we use indirect tax data consistent with the methodology of the ECB. It means that the Eurostat data on indirect taxes are adjusted with those parts of VAT and customs duties, which are paid by national residents to the institutions of the EU as “own resources”. The other exemption is that we reclassify the Hungarian Local Business Tax (LBT) from indirect tax to direct tax, as we noted in section 2.3. Although LBT is levied on the value added domestically produced, but it is source-based, similarly to most direct taxes. Originally this tax was levied on sales, but one third of material costs could be deducted in 1998, two thirds could be deducted in 1999 and from 2000, the base of LBT is close to the value added. For analytical reasons we split LBT into tax on labour and profits in proportion to their shares in the value added of the private sector.

3.3. Adjustments

As in the method chapter was presented, we proposed a wide range of different adjustments to the headline tax categories. These adjustments require also a wide range of information. Some data is available from the National accounts; some other data can be obtained from other official sources, such as cash data recorded by the Treasury. The coverage of the available data differs country by country; therefore the missing data are replaced by estimates. In the rest of this chapter we present the sources of the information, which are taken into account in our calculations.

3.3.1. Data from the National accounts

National accounts contain data on the employer’s contributions in the government sector, the social security contributions paid to the fully funded private pension pillar, the imputed contributions, and the voluntary contributions.

The consumption of the fixed capital of the roads was available for Hungary, between 2000 and 2005, both for the roads of the central and local governments, in constant and current prices.

3.3.2. Data from other official sources

Some other information is not available from the National Accounts, but a part of them can be collected from alternative sources. The potential sources of this information are the data obtained from the Treasury, national statistical authorities, the tax authorities, the Ministries, the State Audit Office or budget documents. They are not entirely consistent with the data from the National Accounts, but these differences can be controlled by the experts. For example the Treasury provides usually cash data, while the National Accounts prefer the principle of accrual recording. In several cases, however, cash and accrual data are quite similar, since accrual recording can be approximated by a simple time adjustment of the cash data.

Data from the Treasury is available in Hungary in the case of VAT paid by local governments, contributions paid on some social transfers, excise duties on fuel and maintenance of roads paid by the central government. Data on the tax expenditure can be obtained from the tax authorities. The Hungarian tax authority provided also data on the current losses reported under the CIT and the current tax base reduction from carry forward losses in 1995-2006 and carry forward losses from previous years in 1998-2006. The Hungarian State Audit Office provided data on the user charges of roads between 2003 and 2006.

In Poland, budget data is available in the case of the tax expenditures, social security contributions paid to the mandatory funded pension pillar, expenditure on road maintenance at the central and local government level and effective personal income tax rates paid by employees and pensioners. The source of this budget data is the Finance Ministry and its annual reports on budget execution and on tax settlements.

In Slovakia data is available by request from Ministry of Finance regarding tax expenditures, loss carry-overs, social security contributions paid to mandatory funded pension pillar, and contributions paid to social security funds by the state on behalf of defined groups of persons. National Statistical Office provides data on concessionary fees by request. Data on operational costs of roads are mostly available from the Ministry of Transportation and from annual reports of local governments.

3.3.3 Estimation of the missing data

A limitation of the comparison is that not all data are available for every country or at least some years are not covered by official data. In order to overcome this obstacle, the missing data were replaced with estimations prepared by country experts. In the rest of this chapter we provide an overview on these estimations.

a. We have no data on the VAT, PIT, employee's contributions and imputed contributions paid within the government sector. In order to estimate this tax content of the government spending, tax rates calculated *on nationwide* data are extended to the government sector. The nationwide tax rates are determined on the basis of tax returns instead of National Accounts. The reason is that the nationwide statistical tax bases include the effect of tax evasion, and this effect is unlikely to be present in the government sector. VAT paid by the government is obtained on the basis of statutory VAT rates weighted by the shares of tax bases. PIT paid by

government employees is calculated from the actual tax revenue divided by the tax bases reported in annual reports on tax settlements.

In the case of Poland a similar approach is applied in the estimation of PIT paid by pensioners. In Poland the contributions paid by government employees is determined by splitting the total amount of contributions between the government and private sectors on the basis of their shares in the total wage bill. These shares are corrected with that part of government wages, which are not subject to contributions. The health care contributions are treated separately (they are collected together with PIT) and their estimation is based on statutory rates and share of the public sector in the wage bill.

In the case of Hungary, contributions are calculated from the wage bill of the government sector, on the basis of the estimated rate of contributions. This rate is estimated on the basis of the statutory rates, augmented with the estimated effects of specific nominal elements, such as the lump-sum health care contribution and the ceiling on pension contribution. In the case of Hungary imputed contributions is split between government and private sector on the basis of a fixed share, which is close to the average share within the total employment.

In the case of Slovakia, contributions are determined on the basis of the official rate, PIT payments of government employees are estimated with an implicit effective PIT rate calculated as a ratio between total PIT and total wage. VAT on government consumption is estimated by an implicit effective VAT rate, which is determined as ratio of total VAT over the total domestic consumption at current prices. VAT on government investment is calculated with the official VAT rate on investments, since full tax compliance is assumed within the general government sector. Excise duties on government consumption were estimated in a way, when only fuel consumption was taken into account.

b. In the countries under examination firm-level data is missing about the deductions from the CIT base because of loss carry-overs and even the aggregated data on the yearly deductions contain no information on the year from which the losses originate. In the case of Hungary we obtain aggregated data from the tax authority about the accumulated carry-overs and the yearly deductions. Since the sum of reported yearly losses exceeds the sum of accumulated carry-overs the yearly deductions, this gap shows that only part of the reported losses can be deducted later. From this gap we could calculate an average discount ratio as discussed in section 2.1.3/b. The reported yearly losses are discounted with this ratio and compared to the actual yearly deductions related to loss carry-overs. The yearly tax bases are corrected with the difference between these two yearly figures. A negative tax base was determined if discounted losses are higher than the deduction from the tax base in the same year. Then a negative tax liability calculated on this negative tax base is subtracted from the profit tax revenue. In the case of Poland data on the yearly deductions is available for 2003-2007 from the annual tax settlement reports. We obtain statistical data on profits and losses of corporations, but data about the accumulated carry-overs is missing. We calculate the average gap between the actual CIT and the hypothetical CIT revenue - which would have been paid if no losses were deducted – over the period 1995-2006. The average gap is 24%, which means that 24% of losses were deducted from profits on average. This ratio is applied for each year to losses incurred in that particular year, yielding an amount deducted from the tax on profits earned in this year. This twelve-year average is somewhat higher than the average of the actual deductions (18%) in 2003-2007. If we data were available about the accumulated carry-overs, a more precise discount rate would have been calculated, since the average gap of 24% implicitly assumes that the stock of the accumulated carry-overs is equal to zero at the end of 2006. In the case of Slovakia, we follow the same approach, since data

on losses of corporations and deductions from the tax base is available from tax returns. On the horizon of 14 years we have calculated the average ratio between these data, and then we applied this average gap to reported loss in each year and calculated hypothetical CIT that we compared to actual CIT.

c. Road statistics are also not comprehensive for the three countries. Road maintenance is defined by the World Bank as the total expenditure „that would be required to keep roads in working order. This includes maintenance, patching and running repairs (work related to roughness of carriageways wearing course, roadsides, etc)“ The definition of maintenance costs is vary from country to country, since they can include not only regular costs (“maintaining the functionality of existing infrastructure within its original lifetime”), but non-regular costs (“prolonging the lifetime of the infrastructure without adding new functionalities”) as well. (European Union Road Federation, 2008) Available data from these sources are fragmented and have a narrower coverage than the official data we used. In the case of Hungary this official data exclude the maintenance of local roads. We assumed that the available data about the central spending and the missing data about the local spending are proportional to their shares within the consumption of fixed capital of roads. In the case of Poland and Slovakia the consumption of the fixed capital of the roads is not available; therefore it is estimated by applying the (legal) rate of depreciation of roads to the stock of public capital in the transport sector multiplied by the share of investment on roads in overall public transport investment.

4. RESULTS

4.1. Description of calculations performed

As noted in Chapter 2, the commonly used tax ratios may distort the true picture of the burden imposed by the government sector on economic activity. Therefore, in order to obtain an appropriate and meaningful measure of the tax burden, adjustments need to be made. The approach we propose entails three main types of adjustments:

1. Adjustments of tax bases, to which the tax burden is compared. As noted, we adjust GDP to remove the government component – on the income side, by deducting government value added as well as taxes and subsidies; and on the demand side, by deducting government consumption and investment, as well as net exports, which are not subject to taxation.
2. Adjustments of the headline tax burden for borderline cases and time of accrual distortions. These are adjustments made to tax revenue in order to bring it in line with the economic definition of taxes – namely compulsory, unrequited payments to the government, which are accounted for at the time when they accrue.
3. Adjustments of the headline tax burden, meant to eliminate taxes paid by the government sector or financed with government expenditure, as these amounts do not constitute a burden imposed by the government on economic activity and do not affect private agents' incentives.

4.2. Tax base adjustment

The aim of this set of adjustments is to obtain a measure of economic activity, which is the closest to the potential base on which taxes are paid by private agents. This entails above all removal of the government component of GDP. Since taxes are paid both on demand (indirect taxes) and income (labour and corporate taxes), we need to consider GDP calculated from these two sides.

On the demand side, we firstly remove net exports. All three countries have been net importers for most of the analyzed period and in all three, the negative share of net exports in GDP has been declining towards the end of the period, so there are no major differences between them. The second stage is removal of the government component of demand – government consumption and government investment. Here, the share of government demand in GDP is the highest in Hungary throughout the period. It exhibits some variation at around 23%-27%, but without any clear tendency. The ratio is also relatively stable in Poland, at a level of 21%-22%. Meanwhile, in the case of Slovakia, it shows a clear declining tendency over the period, falling from over 27% in 1996 to below 20% in 2007. This is reflected in the development of the ratio of private domestic demand to GDP, which implies that in Slovakia actual bases on which economic activity is being taxed, have been rising faster than nominal GDP. As noted in Chapter 2, the concept of removing the government component from the tax burden may be further extended to taxes paid on consumption of government employees and social benefit recipients (see 4.4). In such a case, the tax base also needs to be additionally adjusted by deducting government wages and social benefits to obtain a narrow measure of private domestic demand. The average of this measure and private income shall be noted as 'average private demand narrow' and serve as the relevant tax base for the narrow measure of the adjusted private tax burden.

On the income side of GDP, the removal of the government component from the tax base involves deduction of taxes less subsidies and government value added. The share of the

private sector, calculated in this manner, in GDP is clearly the highest in Slovakia, at around 75%. A modest rise in the ratio may also be observed in Poland, from 72% to 74%, whereas in Hungary, the share of the private sector is the lowest and declines from 73% to 71%.

In order to obtain a single tax base measure, to which the overall tax burden may be related, we calculate an average of the two measures described above – private domestic demand and private income. Relative to GDP, the average private tax base is the highest and rising in Slovakia, it is also slightly rising in Poland. Meanwhile, in Hungary the share of the private sector in the economy is clearly lowest of the three countries and declining further.

% of GDP	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Share of net exports													
Hungary	0.0	0.5	1.0	-1.4	-2.7	-3.6	-1.2	-2.0	-3.9	-2.8	-1.1	0.6	2.3
Poland	2.2	-1.4	-3.9	-4.8	-5.9	-6.4	-3.7	-3.4	-2.6	-2.0	-0.4	-0.6	-2.7
Slovakia	2.1	-10.9	-9.8	-10.9	-4.5	-2.6	-8.2	-7.3	-1.9	-2.7	-4.6	-3.8	-1.1
Share of government demand													
Hungary	25.3	23.7	24.6	25.1	24.5	24.1	24.9	27.0	26.6	25.9	26.4	27.3	25.0
Poland	22.0	21.9	21.6	21.2	20.9	19.8	21.3	21.3	21.5	20.9	21.5	22.1	22.1
Slovakia	24.0	27.7	27.3	26.3	23.1	23.0	23.8	23.8	23.2	21.7	20.6	21.4	19.2
Private domestic demand = GDP – net exports – government demand													
Hungary	74.7	75.8	74.4	76.4	78.2	79.5	76.3	74.9	77.3	76.9	74.6	72.2	72.8
Poland	75.9	79.6	82.3	83.7	85.0	86.6	82.4	82.1	81.1	81.0	78.9	78.4	80.6
Slovakia	73.8	83.2	82.5	84.6	81.4	79.6	84.4	83.5	78.7	81.0	84.0	82.4	81.9
Narrow private domestic demand = GDP – net exports – govt demand – public wages and transfers													
Hungary	51.6	56.2	55.9	57.5	59.4	61.9	58.1	55.3	56.2	55.8	52.8	50.3	51.4
Poland	55.1	58.6	61.4	63.7	64.1	66.4	61.1	60.8	59.9	60.9	59.3	59.5	62.5
Slovakia	54.5	63.8	63.6	65.9	62.0	61.0	65.9	64.7	61.7	64.0	67.3	66.2	66.3
Taxes less subsidies on products													
Hungary	11.9	11.9	11.3	12.0	12.3	14.5	13.6	13.2	14.1	14.7	14.4	13.6	13.9
Poland	13.3	13.5	13.1	12.4	13.1	12.2	12.1	12.8	12.8	11.9	12.7	13.3	13.6
Slovakia	9.8	10.0	8.8	10.1	9.7	10.0	9.3	10.1	10.5	10.6	11.4	10.2	10.6
Government value added													
Hungary	16.7	15.5	15.3	15.2	15.2	14.5	14.8	15.6	16.5	15.7	15.6	15.3	15.3
Poland	14.5	14.4	14.2	13.6	13.6	13.5	14.2	14.2	14.0	13.3	13.3	12.9	12.4
Slovakia	13.6	13.6	13.3	13.4	13.5	12.7	12.8	12.9	12.8	11.6	10.3	10.2	9.6
Private income = GDP – taxes less subsidies – government value added													
Hungary	71.5	72.6	73.4	72.7	72.5	71.1	71.6	71.2	69.4	69.6	69.9	71.1	70.8
Poland	72.2	72.1	72.7	74.0	73.4	74.4	73.7	72.9	73.1	74.9	74.0	73.8	74.0
Slovakia	76.7	76.4	77.9	76.5	76.8	77.2	78.0	77.0	76.7	77.8	78.3	79.5	79.8
Average private tax base = average of private domestic demand and private income													
Hungary	73.1	74.2	73.9	74.5	75.4	75.3	74.0	73.1	73.3	73.3	72.3	71.6	71.8
Poland	74.1	75.8	77.5	78.8	79.2	80.5	78.0	77.5	77.1	78.0	76.5	76.1	77.3
Slovakia	75.3	79.8	80.2	80.6	79.1	78.4	81.2	80.3	77.7	79.4	81.1	81.0	80.8
Average narrow private tax base = average of narrow priv. dom. demand and priv. income													
Hungary	61.6	64.4	64.7	65.1	65.9	66.5	64.9	63.3	62.8	62.7	61.4	60.7	61.1
Poland	63.7	65.4	67.1	68.8	68.7	70.4	67.4	66.8	66.5	67.9	66.6	66.6	68.2
Slovakia	65.6	70.1	70.8	71.2	69.4	69.1	71.9	70.9	69.2	70.9	72.8	72.9	73.0

4.3. Tax burden adjustment – borderline cases

In the countries concerned, the most significant of these adjustments is the one for mandatory contributions to the funded pension pillar. In ESA95 national accounts these do not constitute government revenue, so they are not treated as taxes. However, since they are mandatory levies on salaries, most households are likely to perceive them in the same way as social contributions; therefore as part of the adjustment we add relevant amounts to taxes. In all three countries, these amounts have been increasing since the introduction of pension reforms (1998 in Hungary, 1999 in Poland and 2005 in Slovakia) and currently exceed 1% of the average private tax base in all three cases. The second item of the adjustment is non-wastable tax credits, which are re-classified as government expenditure on transfers. These are non-existent in Hungary and negligible in Poland, but in Slovakia they were introduced on a moderate scale in 2005 and have reached a level of around ½% of the average private tax base. The third correction concerns imputed social contributions on employers, most notably sickness benefits paid by employers. These sums amount to an equivalent of between 0.2% and 0.4% of the average private tax base. The fourth correction concerns voluntary social contributions, which are not present in Poland or Slovakia and negligible in Hungary. However, this adjustment was included in the methodology, as it is likely to be more significant for other countries. Social contributions are also adjusted for amounts paid by the government on behalf of certain groups of people who are currently not working, notably women on maternity leaves. Similarly to the GFS method applied by the ESCB we adjust indirect taxes with those parts of VAT and customs duties, which are paid by national residents to the institutions of the EU as “own resources”. Corporate tax revenues are adjusted in such a way, that losses are recorded as negative taxes in the year they accrue, rather than in the following years (as carryover deductions). In the case of excise taxes, they are adjusted by reclassifying part of the excises on fuel. Finally, in the case of Slovakia, private taxes are further adjusted with concessionary fees paid to national television and national radio, as they according ESA 95 principles represent the taxes, however by economic interpretation they are more fees paid for services.

Tax burden adjustment – borderline cases

% of avg priv tax base	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Hungary	-2.3	-1.9	-1.5	-1.5	-1.2	-1.2	-1.0	-1.0	-0.8	-0.4	-0.4	-0.4	-0.4
Poland	0.3	0.1	0.1	-0.6	-0.7	-0.5	-0.7	-0.9	0.3	0.1	-0.2	0.0	0.1
Slovakia	-3.5	-3.6	-2.9	-2.9	-3.1	-2.7	-2.8	-3.2	-3.2	-1.8	-1.1	-0.5	-0.6

4.4. Tax burden adjustment – government component

The first major component of tax revenue, which is financed by the government are taxes paid on social benefits and compensation of government employees. An important issue here are potential differences in tax regulations between countries. Indeed, among these countries, Poland is the only one, in which pensions are subject to personal income taxes, as well as a part of social contributions (the part which goes towards financing health care). As a result, the total amount of taxes paid on government wages and benefits is relatively high in relation to the average private tax base. However, in Hungary this level is similar, albeit for different reasons. There, the main reason for the relatively large figure is the amount of compensation in the government sector, which is by far the highest of the three countries, relative to GDP, while the tax rate is also quite high. Slovakia exhibits the lowest level of

taxes paid on social benefits and compensation of government employees, as the wage bill of the government sector is the lowest of the three countries.

The second component of taxes financed from government spending is indirect taxes paid by the government on its intermediate consumption and government investment. Also in this case, Slovakia exhibits the lowest amount of taxes relative to the average private tax base. This is due to both lower spending, especially towards the end of the analysed period, as well as lower tax rates. Meanwhile, in Poland the figure rises towards the end of the period, partly due to an increase in the VAT rate on construction in connection with EU accession, as well as a substantial increase in government investment. Nonetheless, Hungary has both the highest spending level, as well as the highest indirect tax rate on government spending.

Overall, the amount of taxes financed with government expenditure, relative to the average private tax base, is clearly the lowest – and declining – in Slovakia, while in Hungary and Poland it is broadly similar and fairly stable over time.

Tax burden adjustment – government component													
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Hungary	-11.2	-10.4	-10.5	-10.4	-9.7	-9.7	-10.2	-11.2	-11.1	-10.8	-11.0	-10.9	-10.5
Poland	-10.8	-11.0	-10.6	-10.1	-10.2	-9.6	-10.5	-10.7	-10.8	-10.2	-10.8	-11.0	-10.5
Slovakia	-8.1	-8.0	-7.9	-7.7	-7.2	-6.7	-6.8	-6.9	-6.3	-5.5	-4.9	-5.0	-4.5

Tax burden adjustment – overall corrections													
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Hungary	-13.5	-12.2	-12.0	-11.8	-10.9	-10.9	-11.2	-12.1	-11.9	-11.2	-11.5	-11.3	-10.8
Poland	-10.5	-10.8	-10.6	-10.7	-10.9	-10.0	-11.2	-11.6	-10.4	-10.1	-10.9	-11.0	-10.4
Slovakia	-11.6	-11.5	-10.9	-10.6	-10.3	-9.4	-9.6	-10.0	-9.5	-7.3	-6.0	-5.5	-5.1

It is important to note that the structure of government spending matters. A disaggregated analysis can reveal that the tax burden on labour is higher than the tax burden on government consumption and investment. The share of intermediate consumption within operational costs (labour costs included) is larger in Slovakia than in Hungary and Poland, this partly explains differences in the government component in taxation.¹⁷

As noted in Chapter 2, the removal of the government component may also be extended beyond taxes paid directly on government expenditure, such as wages or intermediate consumption. A further adjustment may be applied with a view to the consumption of government employees and recipients of social benefits, which is financed with government expenditure. Therefore, taxation of this consumption also constitutes, albeit in an indirect way, taxation of government spending. If one is seeking to determine the burden of taxation of economic activity, then all taxes paid by the government or on components of government expenditure, should be removed. In order to do this, we estimate effective rates of indirect taxes imposed on the consumption of government employees and apply them to wages and benefits they receive from the government.

¹⁷ Another difference between the governments' tax components in these countries can be explained with the different share of those social benefits in kind, which are provided via market producers, who are included in the private sector and their payments are accounted for private taxes. In 2006 it was 4.4% of GDP in Slovakia, 3.6% of GDP in Hungary and only 2.2% of GDP in Poland.

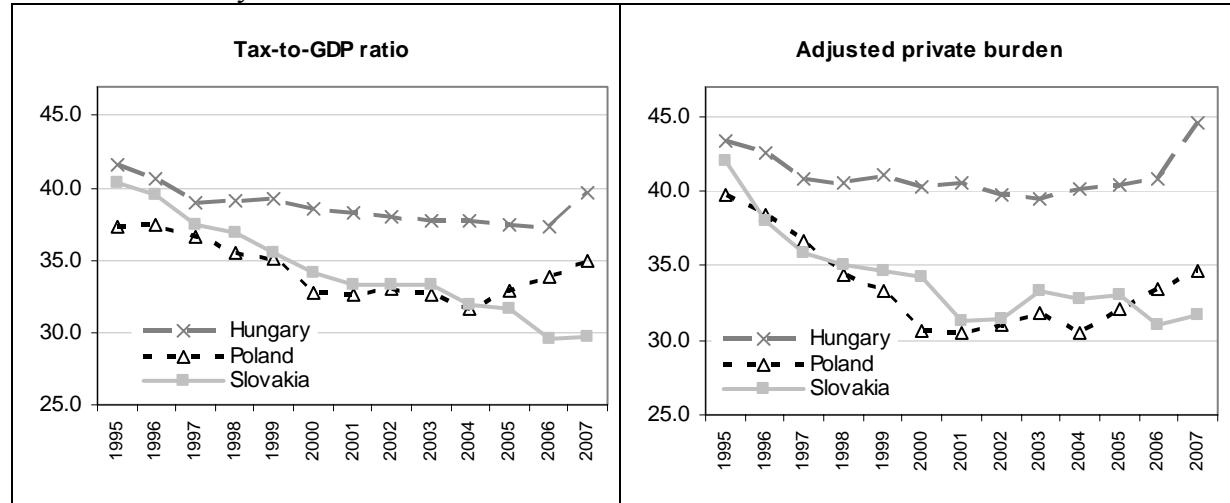
The results of this exercise do not change the previous picture considerably – the tax content of government expenditure remains clearly the lowest in Slovakia, whereas in Hungary and Poland it is quite similar. The size of the correction for taxes on consumption of government employees and benefit recipients is similar in Hungary and Poland – the former has a relatively higher government wage bill of the government sector, to which higher labour taxes are applied. However, this factor is offset by the fact that contrary to Poland, social benefits in Hungary are largely non-taxable.

Tax burden adjustment – taxes on consumption of gov't employees and benefit recipients													
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Hungary	-4.2	-4.2	-4.2	-4.3	-4.2	-4.1	-4.2	-4.5	-4.6	-4.7	-5.1	-4.6	-4.9
Poland	-4.9	-5.0	-5.0	-4.5	-5.0	-4.5	-4.8	-5.0	-5.1	-4.9	-5.3	-5.3	-5.0
Slovakia	-4.8	-4.0	-3.6	-3.6	-3.6	-3.5	-3.3	-3.4	-3.4	-3.5	-3.5	-3.0	-3.0

Tax burden adjustment – overall corrections (extended approach)													
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Hungary	-16.1	-14.1	-13.7	-13.5	-12.4	-12.4	-12.8	-14.0	-13.9	-13.1	-13.5	-13.3	-12.7
Poland	-12.2	-12.6	-12.2	-12.3	-12.6	-11.5	-13.0	-13.4	-12.1	-11.6	-12.6	-12.6	-11.8
Slovakia	-13.4	-13.1	-12.3	-12.0	-11.7	-10.7	-10.9	-11.4	-10.7	-8.2	-6.7	-6.1	-5.6

4.5. Tax burden adjustment – overall conclusions

Based on the three components presented above – adjustments of the tax base to exclude its government component, adjustments to the tax burden to exclude its government component and adjustments of the headline tax burden aimed at bringing it line with the economic sense of taxation – we may now calculate the overall adjusted tax burden measure, which in our view is a more accurate reflection of the burden imposed by the government on private economic activity.



A comparison of the headline tax-to-GDP ratio with the ratio of the adjusted private tax burden to the average private tax base leads to a number of interesting conclusions. Looking at each of the countries individually, in case of Hungary, the decline in the tax burden visible in the headline figures is not replicated in the adjusted measure, where the ratio stays broadly stable, with the exception of the beginning and end years. This can be partly explained by the launching of the mandatory funded pension pillar. According to ESA'95 data, contributions diverted to this pillar do not constitute revenue of general government and as

such are not considered taxes, whereas in our approach we treat them as taxes, as this is the perception of individuals who pay them. As a result, the development of the adjusted tax burden ratio is broadly similar to the headline one. In Slovakia, the tax burden was more volatile; there were tax increases as well, partly because of the launching of the mandatory funded pension pillar. However, there was a tendency of a gradually decreasing tax component in the government sector. Similar effect may be observed in Poland in the 1995-2001 period, when the adjusted tax burden declined by as much as 8.8 percentage points, while the headline one only by 4.7 points, as a result of a pronounced reduction in the share of the government sector in GDP. In Hungary a temporary increase in the government sector can be also recognized in 2001-2003, while other elements of this expansion distorted the private GDP itself. (Hornok et al, 2008).

Calculations of the adjusted tax burden also point to some conclusions considering the relative size of the tax burden among the three countries. Notably, the tax burden of Poland vis-à-vis the other two countries appears to be somewhat lower when the adjusted measure is used, compared to the headline one. This is mainly due to the taxation of social benefits, which distorts the headline measure of the tax burden.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Headline tax burden relative to GDP													
Hungary	41.6	40.6	39.0	39.1	39.2	38.6	38.3	38.0	37.7	37.7	37.5	37.3	39.7
Poland	37.3	37.4	36.6	35.6	35.1	32.8	32.6	33.1	32.6	31.6	32.9	33.9	34.9
Slovakia	40.4	39.6	37.4	36.8	35.5	34.2	33.3	33.3	33.3	31.9	31.6	29.6	29.7
Adjusted private tax burden relative to average private tax base													
Hungary	43.4	42.6	40.8	40.6	41.1	40.3	40.6	39.8	39.5	40.2	40.4	40.8	44.5
Poland	39.8	38.5	36.7	34.4	33.4	30.7	30.5	31.1	31.8	30.5	32.1	33.5	34.7
Slovakia	42.1	38.0	35.8	35.1	34.6	34.2	31.3	31.5	33.3	32.8	33.0	31.0	31.7
Narrow adjusted tax private tax burden relative to narrow average private tax base													
Hungary	47.4	44.8	42.5	42.2	42.8	41.5	42.2	41.5	41.6	42.3	42.5	43.5	47.4
Poland	41.4	39.6	37.4	34.9	33.4	30.6	30.6	31.1	31.7	30.1	31.6	33.0	34.4
Slovakia	43.5	39.3	37.0	36.1	35.8	35.3	32.1	32.3	34.0	33.3	33.3	31.4	32.1

4.6. Tax burden adjustment – disaggregated conclusions

As we noted that the adjustments with the tax components of the government reflect the structure of the government spending. As a consequence of these adjustments, it will also be revealing to look at the headline and adjusted measures of the tax burden in disaggregated terms, namely dividing the tax burden into labour, corporate and indirect tax components. The headline measures in this case are respective categories of taxes in ESA95 terms, divided by GDP. Meanwhile, in case of adjusted measures, for each of the tax categories we use a different macroeconomic tax base, one which is most relevant for this particular tax category. The adjusted tax ratios are therefore calculated in the following way:

- Labour taxes. To obtain adjusted tax revenue from labour taxation, we take ESA95 revenues from direct taxes on households and social contributions and adjust them for tax expenditure reclassified as government spending, contributions to the mandatory funded pension pillar, imputed social contributions on employers, as well as taxes and contributions on social benefits and wage bill of government employees. As the relevant macroeconomic base, we use the balance of primary incomes of households net of wages of government employees.
- Corporate taxes. To obtain the adjusted tax revenue from taxes on corporations, we take ESA95 revenues from direct taxes on corporations and adjust them for the

impact of loss carryovers. As the relevant macroeconomic base, we use the gross operating surplus in financial and non-financial corporations.

- The weighted average of these two ratios can be regarded as a neutral direct tax rate, which could replace the various effective rates. The deviation from this neutral direct tax rate represents the redistribution via taxation between labour and capital.
- Indirect taxes. To obtain the adjusted revenue from indirect taxes, we take GFS revenues from indirect taxes and adjust them for taxes paid on government intermediate consumption and investment.¹⁸ As the relevant macroeconomic tax base we use private domestic demand. This ratio can be regarded as a neutral indirect tax rate, which would produce approximately the same revenue as the various effective rates.
- As noted in Chapter 2, the weighted average of the neutral indirect tax rate and the neutral direct tax rate represents a hypothetical neutral tax rate, which could levy the same burden on income and expenditure. Comparing this horizontally and vertically neutral tax rate to the various effective rates one can determine the size of redistribution between sectors or different groups of tax-payers.

The labour tax burden as measured with our adjusted indicator in the three analysed countries shows a development significantly diverging from the headline ratio. The latter indicates that all three countries have experienced a reduction in labour taxation, with Hungary's taxes staying at the highest level of the three and Poland and Slovakia broadly similar, with the exception of 2006-2007, when Poland's ratio increases and Slovakia's declines. Meanwhile, according to the adjusted indicator, both Hungary and Poland's labour taxation ratios tend to rise over the whole analysed period, although with some fluctuation in case of Hungary. In addition, Slovakia's adjusted tax burden is also declining at a slower pace than the headline ratio. In all three countries this is partly explained by the impact of introduction of a mandatory funded pension pillar and the effect of social contributions previously considered government revenue now being classified outside the government sector according to headline figures. In addition, in Hungary and Poland, this effect is exacerbated by the declining share of household incomes in GDP over the analysed period. It is also worth noting, that the adjusted tax burden on labour in Poland turns out to be noticeably lower, than that of Slovakia, rather than similar as indicated by the headline rate. This is explained by the factor mentioned earlier, namely a larger adjustment for taxes paid on social benefits and wages of government employees, due to different rules for taxation of pensions.

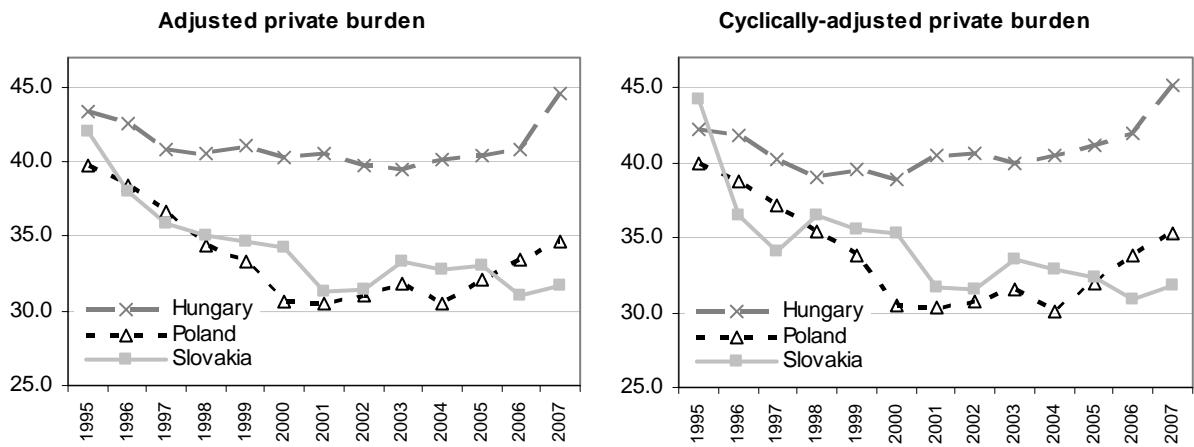
In case of corporate and indirect taxes, the adjustment has less dramatic results for the comparison of the three countries. For indirect taxes, the differences between the headline and adjusted ratios are quite minor. It is worth noting, that in Poland and Slovakia, the decline in the indirect tax ratio in the years 1995-1998 is somewhat greater when measured by the adjusted ratio. This because during that period the share of government demand in GDP has been declining, meaning that private domestic demand has been rising faster than GDP. Since, as noted earlier, the government demand component is taxed less than the private one, such a development will cause the adjusted indirect tax burden ratio to decline faster. In case of corporate taxes, one may note, that in case of Poland the decline in the adjusted corporate tax ratio is much stronger than of the headline one – this is due to rising share of corporate profits in GDP over the analysed period in Poland.

¹⁸ The GFS method adjusts the ESA95 indirect taxes with those parts of VAT and customs duties, which are paid by national residents to the institutions of the EU as "own resources"

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Labour taxation													
Headline tax burden relative to GDP													
Hungary	21.9	21.7	21.5	21.1	20.6	20.3	20.6	20.6	19.8	19.2	19.5	19.6	21.0
Poland	19.7	19.6	19.3	19.3	18.7	17.4	17.9	17.2	17.0	16.0	16.3	16.8	17.3
Slovakia	19.4	20.5	19.7	19.2	18.8	18.0	18.3	18.5	17.9	16.4	15.9	15.0	15.0
Adjusted tax burden relative to primary income of households													
Hungary	23.3	23.3	23.9	24.4	25.3	25.8	26.1	26.0	25.0	23.1	23.8	24.8	27.4
Poland	19.4	19.8	19.7	20.1	19.4	18.1	18.0	17.5	18.0	17.4	18.4	19.9	21.8
Slovakia	25.2	24.5	23.6	22.5	22.0	21.6	21.4	21.3	21.6	22.1	22.0	21.5	21.5
Corporate taxation													
Headline tax burden relative to GDP													
Hungary	1.9	1.8	1.9	2.2	2.3	2.2	2.3	2.3	2.2	2.1	2.1	2.3	2.8
Poland	3.4	3.3	3.4	3.2	2.8	2.8	2.2	2.6	2.4	2.7	3.0	2.9	3.4
Slovakia	6.3	5.0	4.4	4.6	4.2	3.5	3.4	3.1	3.1	2.8	2.8	2.8	2.9
Adjusted tax burden relative to gross operating surplus													
Hungary	7.8	7.9	8.3	8.6	10.4	11.0	12.2	11.5	11.1	11.6	11.3	11.7	13.7
Poland	28.9	29.6	25.5	20.1	16.2	14.2	11.8	12.4	14.7	13.6	13.6	12.8	15.6
Slovakia	18.3	16.1	14.0	15.1	12.7	11.6	11.6	10.9	10.7	8.8	9.4	9.0	9.3
Indirect taxes													
Headline tax burden relative to GDP													
Hungary	17.8	17.1	15.6	15.8	16.3	16.1	15.3	14.9	15.6	16.3	15.8	15.3	15.8
Poland	14.2	14.4	13.9	13.1	13.6	12.6	12.5	13.2	13.2	12.9	13.6	14.2	14.2
Slovakia	14.5	13.8	13.1	12.9	12.4	12.5	11.4	11.6	12.2	12.5	12.8	11.6	11.8
Adjusted tax burden relative to private domestic consumption													
Hungary	19.2	18.5	16.5	15.9	15.5	14.6	14.2	13.8	14.7	15.5	15.2	14.9	15.6
Poland	16.6	15.5	14.4	13.0	13.5	12.3	12.4	13.3	13.4	13.0	13.9	14.6	14.2
Slovakia	16.2	13.5	12.5	12.5	13.0	13.4	11.2	11.6	13.3	13.4	13.5	12.2	12.7

4.7 Underlying tax rates

By applying a disaggregated method of cyclical adjustment, based on the standard ESCB procedure (Bouthevillan et al, 2001), we also calculate an underlying, cyclically-adjusted measure of the private adjusted tax burden.



The overall results do not change very much, but the cyclical adjustment does shed light on some developments, which took place in the analysed countries over the 1995-2007 period.

For example, while the headline measure shows the tax burden in Hungary to have been clearly declining over the period 1997-2006, the adjusted measure shows that it has been broadly stable, while the underlying measure indicates, that actually a small increase took place. In the case of Poland, the headline measure shows the tax burden to have risen by 3.3 pct points of the base between 2004 and 2007; the adjusted private tax burden measure – by 4.3 pct points; and the underlying measure – by 5.2 pct points.

4.8 Benchmark tax rates

The calculation of the benchmark indirect tax rate and the benchmark direct tax rate allow a comparison with the various effective rates. The difference between these effective and benchmark rates can be regarded as a measure of the redistribution between sectors or different groups of tax-payers.

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007
Hungary													
BTRd	24.3	24.1	24.3	24.8	25.9	26.3	26.7	26.2	25.3	25.1	25.4	25.8	28.9
BTRi	19.3	18.6	16.6	16.0	15.6	14.7	14.3	13.9	14.8	15.6	15.3	15.1	15.8
BTR	21.7	21.3	20.4	20.3	20.6	20.2	20.3	19.9	19.8	20.1	20.2	20.4	22.3
Poland													
BTRd	23.4	23.3	22.8	21.9	20.3	18.8	18.4	18.0	18.6	17.6	18.3	19.1	20.8
BTRi	16.6	15.5	14.4	13.1	13.5	12.3	12.5	13.3	13.4	13.0	13.9	14.6	14.2
BTR	19.9	19.2	18.4	17.2	16.7	15.3	15.3	15.5	15.9	15.2	16.0	16.8	17.4
Slovakia													
BTRd	25.7	25.0	23.6	23.1	21.8	20.9	20.5	20.2	20.1	19.5	19.7	18.9	19.0
BTRi	16.2	13.6	12.5	12.5	13.1	13.4	11.2	11.6	13.3	13.5	13.5	12.2	12.7
BTR	21.0	19.0	17.9	17.5	17.3	17.1	15.7	15.7	16.7	16.4	16.5	15.5	15.9

BTRd – adjusted direct tax rate; BTRi – adjusted indirect tax rate; BTR – neutral tax rate

5. CONCLUSIONS

We have shown, that the tax-to-GDP ratio has a number of drawbacks as a measure of the tax burden. Firstly, tax revenue calculated in accordance with ESA95 methodology is not perfectly in line with the economic concept of taxes, i.e. levies imposed by the government, which are compulsory and unrequited. Secondly, both tax revenue and GDP include a government component, which distorts the true picture of tax burden.

In order to verify the significance of above-mentioned shortcomings of the tax-to-GDP ratio as a measure of economic impact of tax burden, we applied a methodology for adjusting both the numerator and denominator of this ratio to data for Hungary, Poland and Slovakia. We have found that, adjustments we performed are in some cases quite significant and suggest that the tax-to-GDP ratio indeed distorts the picture of tax burden.

Firstly, we have looked at the impact of the government sector on GDP as the denominator of the tax-to-GDP ratio. The size of the government component in GDP varies over time and among countries. Of the countries analysed, Hungary has the largest income and demand of the governments sector, while these components in Poland and Slovakia were declining. Secondly, we have looked at government revenue from the viewpoint of the economic concept of taxes as compulsory and unrequited payments mandated by the government. We have identified a number of borderline cases, in which the ESA95 classification appears not to be fully in line with this concept. We have performed adjustments for these borderline cases and shown that they are relevant for the overall tax burden ratio. For example, in all three analysed countries the actual tax burden faced by employees is currently higher than the headline tax-to-GDP ratio would imply, because of additional contributions to a mandatory funded pension pillar, which in national accounts is classified outside of general government. Meanwhile, other aspects of the tax system differ between these countries. Slovakia is the only one of them, in which non-wastable tax credits in personal income taxes are non-negligible. They have a lowering effect on the headline tax burden measure, but because of their non-wastable nature they are actually equivalent to government transfers. Therefore, in order to obtain a true measure of the tax burden, they should not be deducted from tax revenue, but instead they should be added to government expenditure.

Thirdly, we have considered the distorting impact of the government sector on the amount of taxes paid. This concerns indirect taxes paid on government expenditure, namely intermediate consumption and government investment, as well as labour taxes paid on the government sector wage bill. These amounts may differ over time and among countries, but contrary to what the headline tax burden ratio suggests, such differences are not a reflection of actual differences in the tax burden imposed by the government on economic activity. We therefore performed relevant adjustments, again finding that the potential distortions are quite significant. This is particularly relevant in cases of different tax treatment of government spending components. For example, in Poland, unlike Hungary and Slovakia, pensions are subject to personal income taxes, resulting in a higher amount of taxes paid on government spending. The structure of the government spending does also matter; labour costs are “tax rich”, while intermediate consumption is relatively “tax poor”.

Overall, we have found that the adjusted measure of the tax burden reveals different trends from those implied by the headline tax-to-GDP ratio. Hungary’s adjusted tax burden stays stable over the analysed period, rather than decline, as the headline ratio shows. This is because the pension reform and government sector accounts for virtually all of the reduction in the headline ratio, while the private sector did not see a drop in tax burden. The adjusted

tax ratio in Poland is relatively lower vis-à-vis the other countries, in part due to the abovementioned taxation of pensions. Furthermore, the sizeable decline in labour taxation in Poland and Slovakia, which the headline measure implies took place in these countries between 1995 and 2007, was actually less pronounced, when one takes into account the changes in composition of GDP over the period concerned. In case of Poland, the opposite is true for corporate taxes – revenue from this source declined more strongly against the relevant tax base, than against GDP.

While the adjusted tax measure we propose is by no means a perfect representation of the tax burden which matters for economic activity, in our view it is a closer approximation than the commonly used tax-to-GDP ratio and provides useful insights on how governments' tax policies may impact private agents.

References:

Adema, W. (1998): "Uncovering Real Social Spending" *OECD Observer, Vol. a, 1998*

Alm, J. (1996): "What is an 'Optimal Tax System'?" *National Tax Journal 49, pp 117-133.*

Bakos P. – D. Benedek – P. Benczúr (2008): "The Elasticity of Taxable Income: Estimates and Flat Tax Predictions using the Hungarian Tax Changes in 2005" *mimeo*

Brown C.V. and P.M. Jackson (1978): "Public sector economics" *published by Martin Robertson, Oxford*

Burn, P. (2004): "How Highly Taxed Are We?"

Bouthevillain C., P. Cour-Thilmann, G. van den Dool, P. Hernández de Cos, G. Langenus, M. Mohr, S. Momigliano and M. Tujula, 2001, "Cyclically Adjusted Budget Balances: An Alternative Approach" *ECB working paper September 2001*

The Danish Ministry of Taxation (2008): "The tax burden"
<http://www.skm.dk/foreign/statistics/thetaxburden.html>

Diamond, P. A. and J. A. Mirrlees (1971a): "Optimal Taxation and Public Production: Production Efficiency" *American Economic Review 61, pp 8-23.*

Diamond, P. A. and J. A. Mirrlees (1971b): "Optimal Taxation and Public Production: Tax Rules" *American Economic Review 61, pp 261-278.*

ECB (2007): „Government Finance Statistics Guide” January 2007

Engen, E. M. and J. Skinner, (1992): "Fiscal Policy and Economic Growth" *NBER working paper*

European Union Road Federation (2007): "European Road statistics 2007"

European Union Road Federation (2008): "European Road statistics 2008"

Eurostat (2000): B1/CN458e for the Eurostat NAWP meeting of 12 October 2000

Hornok C. Z. M. Jakab and G. P.Kiss (2008): "‘Through a glass darkly’: Fiscal expansion and macroeconomic developments, 2001–2006" *MNB Bulletin 2008/1*

Marčanová, M. and L. Ódor (2008): "Effective Aggregate Taxation in the SR" *in Slovak, Národná Banka Slovenska, Vyskumná štúdia 4/2008*

Marsden, K., (1986): "Links Between Taxes and Economic Growth: Some Empirical Evidence" *Journal of Economic Growth*

Messere K.C. and J.P. Owens (1987): International Comparisons of Tax Levels: Pitfalls and Insights", *OECD Economic Studies No. 8, Spring 1987*

Newbery, D. M. G. and T. Révész, (1996): "The burden and disincentive effects of Hungarian Personal Taxes, 1988-96" *CEPR discussion paper series*

Newbery, D. M. G. and T. Révész (2000): "The Evolution of the Tax Structure of a Reforming Transitional Economy: Hungary 1988-1998", *International Tax and Public Finance 7, pp 209-296.*

OECD (2006): " Society at a Glance, 2006"

OECD (2008): "Tax and Economic Growth" *OECD Working Paper No. ECO/CPE/WP1(2008)4.*

OECD (2007): Revenue Statistics 1965-2006, *OECD Publications, Paris*

OECD: The OECD classification of taxes and interpretative guide

P.Kiss, G. (2005): "How to measure tax burden in an internationally comparable way? Suggestion for a standardized effective tax rate" *mimeo, presented at the ADETEF, in Paris*

P.Kiss, G. and G. Vadas (2006): "Filling the Gap – Measurement of the Cyclical Effect on the Budget" *Fiscal Indicators, Workshop Volume, Banca d’Italia*

Slemrod, J. (1990): “Optimal Taxation and Optimal Tax Systems” *Journal of Economic Perspectives* 4, pp 157-178.

Tanzi V. (1968): “Comparing International Tax “Burdens”: A Suggested Method” *The Journal of Political Economy*, Vol. 76, No. 5 (Sep. - Oct., 1968), pp. 1078-1084

Task Force on Harmonization of Public Accounting (2005) “Tax revenue and Tax credits” Update of the 1993 SNA –issue No. 35, *Issue paper, July 2005*

World Bank: “Statistical Annex: Infrastructure Indicators”