There and Back Again – Six Fiscal Tales from the Past Decades: Methodological Annex

The analysis of Hungarian fiscal policy in the period under review is hampered by a shortage of data, in particular the absence of data from the base year of 1994, and by methodological problems. That is why it is especially important to document the technical and theoretical considerations behind the analysis, and to list the sources of the data and the details of the necessary adjustments in a separate annex. All the more so because presenting all of the necessary information would be beyond the scope limits, and it would only be relevant to a smaller group of experts. However, the results of the robustness analysis are interesting, and they can be compared to the findings of similar methodologies.

1. Methodology

1.1. Netting the nominal fiscal data of the National Accounts (ESA) and adjusting statistics for the impact of creative accounting

Table 1 summarises the revenue and expenditure categories that should be distinguished for the adjustments. In the following, the corresponding line numbers will be used to refer to the items in *Table 1*.

Table 1	
Main revenue and expenditure items of the general government	
Revenue	**Expenditure**
1) Accrual-based tax revenues	**7) Accrual-based wage expenditure**
1a) private 1b) general government	7a) tax content 7b) EU subsidies 7c) net wages
2) Current transfer revenues	**8) Accrual-based purchase of goods and services**
2a) EU funds 2b) other	8a) tax content 8b) EU subsidies 8c) net purchase of goods and services 8d) creative accounting
3) Current transfer revenues	**9) Accrual-based investment expenditure**
3a) EU funds 3b) creative accounting 3c) other	9a) tax content 9b) EU subsidies 9c) net investment 9d) creative accounting
4) Sales revenue and fee income	**10) Capital transfer expenditures**
	10a) creative accounting 10b) other
5) Property income	**11) Current transfer expenditure**
5a) from the central bank 5b) creative accounting 5c) other	11a) to the central bank 11b) creative accounting 11c) tax content 11d) depending on the cycle 11e) other
6) Accrual-based interest revenue	**12) Accrual-based interest expenditure**

The nominal statistical balance (expressed in forints) for the given years can be written as follows:

$$TB = (1) + (2) + (3) + (4) + [(5) - (5b)] + (6)$$
$$-(7) - (8) - [(9) - (9d)] - (10) - [(11) - (11b)] - (12) \tag{1}$$

But this indicator does not show the actual situation; therefore it is unsuitable for analysing the measures which have actual effects on the economy. By adjusting the items of creative accounting that distort the actual effect, the actual balance with economic impact can be written as follows:

$$TB = (1) + (2) + [(3) - (3b)] + (4) + (5) + (6)$$
$$-(7) - [(8) - (8d)] - (9) - [(10) - (10a)] - (11) - (12) \tag{2}$$

The difference between the two indicators is that the two related sides of creative accounting are considered at different times. These two sides with different signs are part of the essence of these operations, because their aim is to improve the balance at the current time (*t*) by deteriorating the future balance (*P. Kiss 2011*). Creative accounting changes the statistical balance, while net assets are essentially unchanged, and the economic effect also affects a different time. The main types of creative accounting are as follows:

1) Selling future current revenues, such as concessions, carried forward as a one-off item, in the form of capital transfers (this was allowed by the statistical rules of ESA95, but ESA2010 restricts it):

$$(3b)_t = \sum_{i=t+1}^{n} (5b)_i \tag{3}$$

2) Outsourcing investments into PPP projects,[1] where the repayment is part of the availability fee.

$$(9d)_t = \sum_{i=t+1}^{n} (8d)_i \tag{4}$$

3) Failure of the government to pay the costs for the quasi-fiscal activities of public enterprises (e.g. public transport) among current transfers, and instead settling the accumulated debt subsequently (in the form of capital transfers).

$$\sum_{i=t-n}^{t} (11b)_i = (10a)_t \tag{5}$$

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[1] PPP: Public-Private-Partnership

The three adjustments filter out the temporary items, which is one of the steps in determining the structural balance. These adjustments are constrained to the self-reversing measures, so their average is zero over the entire period, and therefore the average of the structural deficits equals the average of the ESA balances. The adjustment of self-reversing measures clearly affects the capital transfers granted and received. Unfortunately, these items remain volatile even after the adjustments, because the individual items appear in investments and in the case of capital transfers. The literature lists several alternatives to adjustment:

• *Kremer et al.* (*2006*) did not filter out all forms of creative accounting (this is asymmetrical treatment, as only the deficit-improving side of self-reversing measures is included in the adjustment), and the temporary items were mixed with the individual (extraordinary, apparently one-off expenditure-revenue) items.

• *Joumard et al.* (*2008*) smoothed net capital transfers with the HP filter (lambda=400). This method also mixes creative accounting and individual items, and although it treats the impact of creative accounting in a symmetrical way, it obviously does not differentiate between extraordinary capital revenues carrying forward future, continuously generated revenues, and the extraordinary capital transfers on the expenditure side that settle a past quasi-fiscal debt accumulated over years.

• *Hoffmann – P. Kiss* (*2010*) used three kinds of adjustments. They adjusted for the (symmetrical) impact of creative accounting on the deficit (*P. Kiss 2011*). They also used a backward-looking four-year moving average to smooth the fiscal effect of natural disasters, court decisions and the implementation costs of elections. Finally, they used a forward-looking four-year moving average to smooth the fluctuation in the aggregate (adjusted) primary balance, thus considering the future fiscal impact of lasting decisions already known at the given time.

• *Szemere – P. Kiss* (*2011*) used a four-year backward-looking moving average in the case of current corporate subsidies and net capital expenditure (investments and capital transfers less concession income).[2] When comparing this to the Hungarian adjustment of creative accounting (see *P. Kiss 2011*), it was found that the four-year backward-looking average is good at distributing over time the subsequent settlement of quasi-fiscal corporate losses, but the repayment of the debt incurred from PPP projects is drawn out for much more than the four-year period.

1.2. The trend/cycle decomposition and determination of revenue and expenditure ratios

The second step is to adjust the nominal fiscal data with cyclical adjustment on the one hand, and with division by the nominal trend GDP as denominator on the other hand. The aggregate methods used in international practice (IMF, OECD, European

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[2] No EU fund transfers were included in netting and thus also the smoothing of the fluctuations. This did not pose a problem back then, because that item was less important.

Commission) would distort results, because they calculate the cyclical gaps of the main macroeconomic variables from the output gap, using simple elasticity. This assumes that the cycles of all variables are at the same stage at all times (there is no lag), and the only difference is in the amplitude of the fluctuation, which is always the same (constant elasticity).[3] Therefore they are unable to capture the impact of the composition of GDP, because the same aggregate output gap may be derived from different combinations of the components (*Boije 2004*; *P. Kiss – Vadas 2005a*), and they do not produce smooth macroeconomic trends, in other words the "structural" tax bases continue to fluctuate even after the filtering. The so-called disaggregated methods offer a solution to these issues to varying degrees:

- The ECB's (*Bouthevillain et al. 2001*) solution based on a simple HP filter mainly focuses on the smoothness of the trends, and it extends the tax bases' time series to reduce the end-point bias.[4] It captures the composition effect, but only inconsistently, because the HP filtering of the variables is independent from each other, and the sum of wages and profits does not equal GDP.[5] Moreover, there is no correlation between the development of wages and consumption. They used a lambda of 30 during the HP filtering, arguing that this filtered the fluctuation of an 8-year business cycle. During the application to the Hungarian case, similarly to the method used by *P. Kiss – Reppa* (*2010*), a smaller number of taxes was considered that are fairly closely linked to the main macroeconomic variables.

- A link can be established between the variables using a multivariate HP filter (MVHP), but this yields less smooth trends. One MVHP method (*P. Kiss – Reppa 2010*) attempts to reduce the end-point bias by considering the output gap from an external input (e.g. from the estimate of an international institution) to be a given. This cyclical information is also applied to the rest of the variables: it enforces an accurate GDP identity, considering the factors of the identity other than wages and profits as well, and it assumes a correlation between the wage bill and consumption. The lambda used during the filtering is identical to the lambda of 30 applied by the ECB.

- The method of *P. Kiss – Vadas* (*2007*) is much more complex, as it uses the MVHP to ensure a link between the variables, and it creates its own estimate for potential GDP to mitigate the end-point bias, using the parameters of the production function

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[3] Based on *Cronin – McCoy* (*1999*), it is unlikely that the effective elasticity is constant.
[4] During the extension, other trend-cycle decompositions from external sources can be taken into account, so the end-point bias can theoretically be mitigated, or at any rate it will not be worse than other methods from external sources.
[5] *Bouthevillain et al.* (*2001*) argue that theoretical consistency is achieved due to the linear nature of the HP filter, because the weighted sum of the gaps calculated with separate HP filters equals the aggregate gap. However, *P. Kiss – Vadas* (*2005b*) demonstrated that even if the HP filter is linear, this does not ensure consistency in economic time series, because it has to be applied to the log transformed time series, and therefore the identity pertaining to aggregation is not true (e.g. GDP equals wages and profits). They also pointed out the extent of the distortion this may cause.

as well as capacity utilisation, and it also estimates factors of production changing over time. It enforces a simplified identity of "GDP equals wages and profits" and creates a link to the development of the wage bill by estimating a consumption function. However, this also comes at the expense of the smoothness of the trends.

The ECB recommended a lambda of 30 to filter an 8-year cycle and a lambda of 100 to filter a 16-year cycle (*Bouthevillain et al. 2001*). While the former detects a relatively lower cyclical component, in other words the trend is not that far from the volatility of the unadjusted data, the other one filters out a much greater cyclical impact, and the trend derived from that is slightly closer to a linear trend.

The trend derived from the filtering of the business cycle includes significant changes in the period under review. If neutral expenditures follow this changing trend, this is closer to what fiscal policymakers may have considered to be neutral in real time, and based on which they decided to implement additional expenditure or savings. The smoother trend derived by filtering the financial cycle can also be used to determine a neutral expenditure path, but this can only be produced based on subsequent, current knowledge. Any additional expenditure or savings in excess of this do not reflect the real-time fiscal policy intentions, they only show how it turned out to be. From the perspective of the episodes, the most important aspect is how they are perceived subsequently, and therefore the smoother trend was chosen as a benchmark. It is especially important to emphasise that the change in expenditure should not be identified as the intentions of fiscal policymakers.

Using the lambda of 100 and starting in 1992, the trend-cycle decomposition of macroeconomic variables was performed with all three methods above, and these estimates are shown in *Figures 8–15 of the Appendix.* The ECB method was chosen due to the smoothness of the trends. The method required that the time series be extended until 2030. This was solved by using actual figures until 2019 and then the forecasts available at the end of 2019, prior to the pandemic, as well as the extension of GDP until 2030. In the case of the other variables, the consistency with this projection of GDP was ensured by minimising the deviation from the results derived from the method of *P. Kiss – Reppa* (*2010*), which are consistent by definition. Accordingly, the estimate produced from the two methods were very close to each other at the end of the period under review, as evidenced by *Figures 9–10* and *12–15 of the Appendix.*

The common features of the methods presented above are as follows: 1) they are used for private tax and contribution income (1a) to adjust for those, 2) they are concerned with the gross wage bill (or the gross average wage and employment). Within total labour costs, the dynamics of gross wages are much greater, as employer's social contribution were reduced from time to time. While the trend of the wage bill increasingly deviated from the GDP trend, this did not hold true for the trend of total labour costs. In fact, the latter is the (total) tax base that must be

taken into account. To adjust for the positive decoupling, the estimated trend of the wage bill was adjusted for the decreasing rate of the employer's social contribution.

In contrast to the earlier estimate, (*P. Kiss – Reppa 2010*), in line with the theory this method assumes unit elasticity for the elasticity between cyclical gaps and taxes, because the absence of the valorisation of the nominal elements of the tax regime (brackets) is considered a measure.[6] The only exception is the corporate tax, where there is a distortion because aggregate profits are derived as the sum of profits and losses, while aggregate tax payments are the sum of the profits for the given year and the accrued losses from previous years. This means that the ratio of the aggregate tax and the aggregate profits changes continuously over time, depending on the share of losses. *P. Kiss – Reppa* (*2010*) used lagged elasticity to address this, which yielded a good approximation between 1992 and 2010. This paper used new data to repeat the estimate by *P. Kiss – Reppa* (*2010*), and a cut-off point was identified to divide the period until 2016 into two parts with respect to the elasticity of the corporate tax. Based on the elasticity from *P. Kiss – Reppa* (*2010*), the unemployment benefit was taken to depend on the cycle (11d) on the expenditure side, while pension payments were not included, unlike in the earlier method. *P. Kiss – Reppa* assumed that, in line with the actual regulation of that time, pension increases were affected by real wages in certain years. This has changed since then, and it was not always effective when the regulation was in effect (for example, it responded asymmetrically to changes in wages during the middle of the year, and in the case of higher-than-expected wage dynamics resulted in an additional rise, while in the case of lower-than-expected dynamics there was no reaction).

Another change compared to the methodology of *P. Kiss – Reppa* (*2010*) is that the group of smaller taxes (partly paid on mixed income) completely left out of cyclical adjustment was supplemented with the sum of the PIT and contributions paid on the mixed income, and mixed income as a tax base was consistently removed from cyclical adjustment. The case of the mining royalty was also reviewed. This is because this revenue was not part of cyclical adjustment (*P. Kiss – Reppa 2010*), as it mostly depends on energy prices and fluctuations in the volume of production, which are not traditional cyclical macroeconomic factors. In contrast to the old method, an average was calculated for the whole period in the case of this item to filter fluctuations (tax revenues/trend GDP), and any deviation from this was filtered out.[7]

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[6] In a neutral case, valorisation equalling the nominal change of the tax base is necessary to keep the effective tax burden unchanged. In practice, the change in the tax base may differ from what is forecast, for example in the case of unexpected inflation, when elasticity may differ from one. Since one of their methods considers the change in the effective tax burden a measure, the impact of unexpected inflation is classified as a measure, whether caused by government's actions, which is more frequent in this case, or a less frequent external shock.

[7] The effect of tax measures was disregarded as they are difficult to estimate and were smaller in scope. For example, a tax cut amounted to 0.04 per cent of GDP in 2009.

Thus, in a given t year the cyclical component is as follows (where the development of the items in line with the trend is shown with an asterisk):

$$CC_t = (1a)_t^* - (1a)_t - [(11d)_t^* - (11d)_t]$$ (6)

The structural balance in a given t year in nominal terms is as follows:

$$SB_t = (1a)_t^* + (1b)_t + (2)_t + [(3)_t - (3b)_t] + (4)_t + (5)_t + (6)_t - (7)_t - [(8)_t - (8d)_t]$$
$$-(9)_t - [(10)_t - (10a)_t] - (11a)_t - (11b)_t - (11\,c)_t - (11d)_t^* - (11e)_t - (12)_t$$ (7)

Of this, the structural primary balance can be established by ensuring that the *SB* balance is adjusted for the interest balance [(6) – (12)], the payment by the central bank (5a) as well as its reimbursement for losses (11a), similar to interest rates (see *P. Kiss 2011*):

$$SPB_t = (1a)_t^* + (1b)_t + (2)_t + [(3)_t - (3b)_t] + (4)_t + [(5)_t - (5a)_t] - (7)_t$$
$$-[(8)_t - (8d)_t] - (9)_t - [(10)_t - (10a)_t] - (11b)_t - (11c)_t - (11d)_t^* - (11e)_t$$ (8)

The structural primary balance can be divided into revenues and expenditure (*Szemere – P. Kiss 2011*).

First, it has to be netted with the tax content of the expenditure[8]:

$$(1b)_t = (7a)_t + (8a)_t + (9a)_t + (11c)_t$$ (9)

After this, EU funds can also be netted:

$$(2a)_t = (7b)_t + (8b)_t$$ (10)

$$(3a)_t = (9b)_t$$ (11)

Finally, wages (7) and the purchase of goods and services (8) can be netted with sales revenues and fee income (4), because in the case of budgetary institutions these revenues cover for the operating expenditure, which means that they affect the latter's increase. However, the relationship between operating expenditure and sales revenues cannot be broken down into the purchase of goods and services and wage expenditure, so sales revenue cannot be used for netting at the level of these expenditure items.

The structural primary revenue looks like this:

$$SPR_t = (1a)_t^* + (2b)_t + (3c)_t + (5b)_t + (5c)_t$$ (12)

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[8] Here *Szemere – P. Kiss* (*2011*) adjusted for the total, direct and second-round tax content, as available in the results of *P. Kiss et al.* (*2009*). The second-round tax content means that public wages and household transfers increase households' disposable income and consumption, and thus also VAT revenues. This adjustment is not included in the calculations (as there is no automatic relationship), and this in itself increases the adjusted revenue and expenditure levels by around 3 per cent of GDP each relative to the results of *Szemere – P. Kiss* (*2011*).

While the expenditure side is as follows:

$$SPE_t = [(7c)_t + (8c)_t - (4)_t] + (9c)_t + (9d)_t + (10b)_t + (11b)_t + (11e)_t + (11d)_t^* \tag{13}$$

To ensure that the revenue side only contains the cyclically adjusted private taxes $(1a_t^*)$, the expenditure side can be netted with the rest of the revenues, unlike in *Szemere – P. Kiss* (*2011*) *(Ádám et al. 2016).*[9] In the following, this is referred to as net primary expenditure:

$$NPE_t = \begin{array}{l} [(7c)_t + (8c)_t - (4)_t] + (9c)_t + (9d)_t + (10b)_t + (11b)_t + (11e)_t + (11d)_t^* \\ -(2b)_t - (3c)_t - (5b)_t - (5c)_t \end{array} \tag{14}$$

The nominal values derived from this need to be divided with the nominal trend GDP *(Kremer et al. 2006*; *Hoffmann – P. Kiss, 2010*; *Szemere – P. Kiss 2011)*. This is necessary because the size of the expenditure and revenue sides is so significant that the ratio can be shifted by 0.4 per cent if GDP fluctuates by 1 per cent. The division by current GDP and trend GDP yields different expenditure and revenue levels, and so the picture gained from examining the changes in these levels may also differ considerably.

Besides its smoothness, another advantage of trend GDP is that it is the basis for the neutral expenditure path. The concept of "measure" can be interpreted as a shift from the unchanged expenditure/trend GDP ratio. On the nominal side, this means that in a neutral, no-policy-change case aggregate primary expenditure can expand at the growth rate of nominal trend GDP *(Chand 1993).* This is what real expenditure fiscal rules determining the growth of expenditure are based on. They align the increase in expenditure appropriations with the growth rate of the GDP deflator/inflation and trend/potential GDP for the given year. Two things should be noted here. First, when determining the growth rate of expenditure items, the GDP deflator/inflation for the given year is merely a forecast, and the actual figure may differ from that (unexpected inflation), and the trend/potential GDP growth rate is an estimate that may be significantly revised later on. Second, the no-policy-change expenditure remains unchanged as a percentage of the nominal trend GDP if the neutral expenditure path is linked to the GDP deflator rather than inflation.

1.3. Decomposition of the change in the structural deficit, tax revenues and net expenditure levels into explanatory variables

As a first step in cyclical adjustment, the taxes independent from the cyclical volatility of major private macroeconomic variables were distinguished, including 1) the taxes paid by the government, 2) and other smaller taxes (e.g. paid on mixed income), and then 3) the mining royalty, which has its own cycle, was smoothed.

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[9] In itself, netting with non-tax revenues reduces the adjusted expenditure/revenue levels by 1–2 per cent of GDP relative to the results of *Szemere – P. Kiss* (*2011*).

After this, the cyclical adjustment of the nominal private tax revenue, the trend-cycle decomposition for the given tax bases ($\frac{T_t - T_t^*}{Y_t^*}$) was performed using the ECB's methodology in the case of the taxes that move together with the private tax bases.

The establishment of the "structural" tax and expenditure rates is followed by the breakdown of their change into explanatory variables. This is because on the tax side, as a result of the disaggregated cyclical adjustment, the change is also explained by the decoupling of the trends and the difference of the deflators, in other words the shift in structural tax rates cannot simply be classified as a measure.

One method in the analysis (*Kremer et al. 2006*) first divides revenues and expenditure with the nominal trend GDP, as per the definition of the neutral, no-policy-change expenditure, primary expenditure increases along with the nominal trend GDP.[10] The change in revenues can be first decomposed as follows:

$$\Delta R_t^n = g_t^y R_{t-1} + g_t^\pi R_{t-1} + \left(g_t^{m^p} - g_{t-1}^y\right)R_{t-1}^p + (\varepsilon^p - 1)g_t^{m^p} R_{t-1}^p + \left(g_t^{m^g} - g_t^y\right)R_{t-1}^g$$
$$+(\varepsilon^g - 1)g_t^{m^g} R_{t-1}^g + \left(g_t^{\pi^m} - g_t^\pi\right)R_{t-1} + (\varepsilon^\pi - 1)g_t^{\pi^m} R_{t-1} \quad (15)$$

This is sufficient if there is no cyclical effect and no measure. The first two terms on the right side of the equation show that in a neutral case the individual taxes (R) grow together with the GDP (or with the trend GDP in the absence of a cycle) (g_t^y and the GDP deflator is: g_t^π). The third term means that the trend of the individual private sector macroeconomic variables $g_t^{m^p}$ differs from the GDP trend (g_{t-1}^y), and the quantified effect of this on tax revenues (R_{t-1}^p) is the so-called decoupling. The fourth term captures the factor affecting tax revenues, if the elasticity between private taxes and the tax base ε^p differs from one. The next two terms show the effect of the decoupling of the government sector's tax bases $g_t^{m^g}$ and of their elasticity other than one ε^g. In other words, the private and the government sector are distinguished in this case, too. The last two terms show the difference between the deflator of the macroeconomic tax base ($g_t^{\pi^m}$) and the GDP deflator, and they capture the impact of elasticity other than one exerted through deflators. This is because in practice automatic distortions occur when the tax bases are expressed relative to GDP, while the deflators in the numerator and the denominator are different (the numerator contains the deflator of wages and consumption, i.e. the consumer price index, while the denominator contains the GDP deflator). That is why *P. Kiss – Vadas* (*2005a*) proposed the price gap, which supplements the cyclical adjustment focusing on real variables with the difference between the consumer price index and the GDP deflator as a nominal adjustment. Unlike there, the adjustment is distinguished here from the cyclical adjustment, as nothing ensures that this would have zero effect on average during the whole

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[10] In the present method, the division by the trend GDP will be used in determining structural revenues and expenditure, in other words it will not be classified as a variable explaining the change.

cycle. In the second step, *Kremer et al.* (*2006*) take into account and distinguish the impact of the cycle and the measures. However, this method does not consider the fact that the difference between the macroeconomic and legal tax bases may cause a distortion in the case of the corporate tax, since the effective tax rate may differ even without a measure, because profits and losses are recognised in an asymmetrical way. The macroeconomic tax base contains the current balance of profits and losses, whereas the legal tax base only contains the profits, while any accrued losses from the previous years can be written down from the taxpayer's profits. Only some of this effect can be filtered with an estimated, lagged elasticity between the tax and the tax base, which is not constant (just like the ratio of profits and losses), as it continuously changes *(P. Kiss – Reppa 2010).* Another factor important in the shift of tax revenues is that the extent of tax evasion may fluctuate along with the business cycle, and this is included among the unexplained residual items in the method of *Kremer et al.*[11]

In the following, deviations will be made from the method presented above. Instead of decomposing the evolution of taxes with the factors of the tax base and elasticity, the decomposition of the tax base will be performed in a separate step, thereby bringing forward the cyclical decomposition stage, where a link between the tax bases was established. In the method of *Kremer et al.* (*2006*), the adjustment only occurs in the second stage, as the HP filtering of the tax bases is performed independently from each other. For the sake of clarity, the equations will be written differently from those in the previous method.

First, the difference between the tax base and the real trend of GDP is adjusted:

$$t_t^* = \frac{T_t^*}{T_{t-1}^*} - 1 \tag{16}$$

$$g_t^* = \frac{Y_t^*}{Y_{t-1}^*} - 1 \tag{17}$$

$$\frac{(T_i - (T_i - T_i^*))}{Y_i^*} = \frac{T_{i-1}^*}{Y_{i-1}^*} \frac{1 + t_i^*}{1 + g_i^*} \tag{18}$$

Where: T_t is the nominal, constant-price tax base, T_t^* is the trend value of the nominal, constant-price tax base, t_t^* is the trend growth rate of the nominal, constant-price tax base, Y_t^* is the potential level of the nominal, constant-price GDP and g_t^* is the potential real growth rate in period t.

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[11] The estimation is very difficult because the effect of the measures aimed at reducing tax evasion (or the loopholes increasing tax evasion as a side effect of other measures) is also difficult to quantify, and they cannot be appropriately distinguished from cyclical effects (*Krekó – P. Kiss 2008*).

Second, to ensure the decomposition into explanatory factors, household purchased consumption and private wages need to be adjusted for the different deflators of the tax base and GDP. This is because in the case of the tax rate derived in the traditional way, another distortion related to the taxes linked to wages and consumption is that there are different deflators in the numerator and the denominator. The denominator contains the GDP deflator, while the numerator contains the consumer price index in the case of wage and consumption taxes, consistent with their tax bases. Therefore even if the effect of the decoupling of the cycle and real trends is filtered, the tax rate changes due to the difference in the deflators even if no tax measures are taken. Unlike in the adjustment used by *P. Kiss – Vadas* (*2005a*), the following solution was chosen[12]:

$$\prod_{i=2000}^{t-1} \frac{(T_i - (T_i - T_i^*))\left(1 + \pi_{i+1}^T\right)}{Y_i^* \left(1 + \pi_{i+1}^Y\right)} = \prod_{i=2000}^{t-1} (\frac{T_{i-1}^*}{Y_{i-1}^*} \frac{1 + t_i^*}{1 + g_i^*}) \frac{1 + \pi_i^T}{1 + \pi_i^Y} \tag{19}$$

$$\prod_{i=2000}^{t-1} (\frac{T_{i-1}^*}{Y_{i-1}^*} \frac{1 + t_i^*}{1 + g_i^*}) \frac{1 + \pi_i^T}{1 + \pi_i^Y} = \frac{\prod_{i=2000}^{t-1} T_{i-1}^*(1 + t_i^*)\left(1 + \pi_i^T\right)}{\prod_{i=2000}^{t-1} Y_{i-1}^*(1 + g_i^*)(1 + \pi_i^Y)} \tag{20}$$

Where: π_t^T is the deflator of the tax base T and π_t^Y is the deflator of the constant-price GDP in the period *t*.

It should be noted in connection with the price gap that the difference between the GDP deflator and the consumer price index is often attributable to a government measure (public wage increase, which affects the price index of government consumption (π_t^{YG}), or an increase in administered prices (π_t^{TR})), so the adjustment using the price gap eliminates this effect, which could even be presented separately.

Based on Formula (19), the change in the major macroeconomic tax bases was broken down into three factors. If the change in tax revenues is examined, then it has to be supplemented with the elasticity of the effective tax burden ($\frac{1a}{T}$, where the no-policy-change elasticity is: $\varepsilon = \frac{\Delta 1a}{\Delta T} = 1$), which can be further broken down into tax measures[13] (or the effect of carry-forward losses in the case of corporate income tax[14]) and unexplained residuals. The decomposition of consumption and wage taxes is shown in *Figure 1.*

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[12] In the case of the constant-price indicators, there is always a base year (i), when the real variable and the nominal variable are the same. As the annual indices are identical in all cases, it does not matter from the perspective of decomposing the change whether 2000, 2005, 2010 or 2015 is chosen as the base year.

[13] Unlike in the approach of *Kremer et al.* (*2006*), measures here also included the so-called bracket-creeping or fiscal drag, arising from the absence of the tax rate's valorisation; therefore the effective tax burden increases, and the elasticity between the tax and the tax base will be greater than one. The absence of valorisation cannot be considered a neutral policy, as it is identical with a measure, so no elasticity other than unit elasticity is used, and instead bracket-creeping is also taken into account among measures.

[14] To ensure a better approximation, ΔT_t also affects the value of $1a_t$ and $1a_{t+1}$, so two elasticities can be estimated, ε_t and ε_{t+1}.

Figure 1
Decomposition of the evolution of consumption and wage taxes into factors
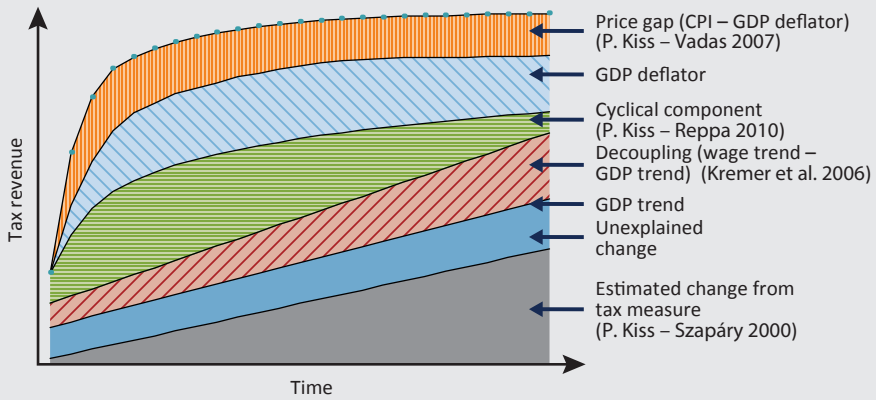
The cyclical adjustment and division by the nominal trend GDP eliminate the effect of the factors seen in the left-hand panel of *Figure 2* from the adjusted indicator (here the aggregate impact of the cycle is not zero, as only a short period is shown). The right-hand panel of *Figure 2* demonstrates the additional factors into which the resulting adjusted indicator can be broken down.

Figure 2
Decomposition of the evolution of consumption and wage taxes into factors
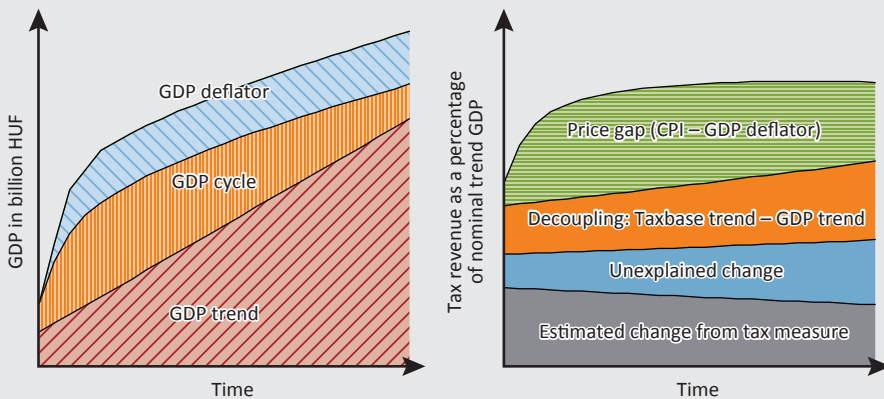
Unexplained residuals may be attributable to several things. These include the changes in tax evasion, resulting from the widening gap between the actual and estimated extent of tax evasion, from the business cycle or from a measure. As regards methodological reasons, the estimation of the impact of the individual tax measures may not be comprehensive or reliable.

Until now, the most important decomposition of revenues and expenditure has been discussed (*Table 1*). However, further decomposition of the revenue and expenditure structure is necessary when examining the episodes. First, private taxes are divided into taxes on capital and labour and indirect taxes, in line with the traditional classification. Second, current transfer expenditure ((11d) + (11e)) is divided into household and other (corporate and non-resident). The theoretical significance of the decomposition is explained by the classification based on the various effects of fiscal shocks (*Horváth et al. 2006; Hornok et al. 2008*). This breakdown is also supplemented with various groups of cyclical adjustment (*P. Kiss – Reppa, 2010*):

• The shocks on the product market contain the change in the purchase of goods and services and investments netted with taxes, without netting this item with the EU-funded portion [(8b), (8c), (9b), (9c)].

• The shocks affecting aggregate demand through household income include the changes to current and capital household transfers netted with taxes (the household components of (10b), (11d) and (11e)) and the changes in employee's taxes and contributions.

• The shocks on the supply side of the economy include the measures pertaining to the corporate tax rate,[15] employer's social contributions, total labour supply and the government sector's wages netted with taxes but unadjusted for the EU [(7b), (7c)] (separating the changes to the number of public sector employees and to per capita wage within wages).

• The shocks directly affecting prices (or the exchange rate) include the changes of indirect taxes, social transfers in kind provided through market producers (part of 11e) and sales revenue and fee income (4). Several groups were distinguished within indirect taxes. The first includes VAT and the excise duty that move together with consumption, the second comprises production taxes (local business tax) and customs duties, while the third contains other smaller taxes that do not relate to the main macroeconomic variables and are therefore left out of cyclical adjustment; finally, a new element was the mining royalty that fluctuates with energy prices and production (and thus has to be smoothed).

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[15] Besides current corporate taxes, there is also a capital tax, but it is so insignificant that it was left out of the cyclical adjustment.

2. Data

The data are mainly based on the statistics of the Hungarian Central Statistical Office published in the spring of 2017. The data published since then include methodological changes due to the gradual introduction of ESA2010 that would make some adjustments uncertain for us (see later the augmented (SNA) adjustments), as the concrete, quantifiable values of the changes are unknown. The detailed (ESA) revenue and expenditure structure of the government sector is available from 1995, with the latter also having a breakdown by functions. The GDP data were retroactively adjusted until 1995 due to the methodological changes (transition to the ESA2010). Since 1990, the government sector's balance has been determined from the financing side in the financial statistics of the Magyar Nemzeti Bank (MNB). The comparability of the expenditure structure is hampered by the fact that the passenger services of MÁV (Hungarian State Railways) were classified into the government sector in 2007. The distortive effect of this is filtered during the examination by presenting expenditure in 2006 in two structures: first using the actual figures without MÁV (where MÁV is included as a receiver of subsidy), and in an adjusted structure showing what would have happened had MÁV been reclassified sooner (when MÁV's sales revenue and purchases of goods and services would have been realised by the government sector).

With respect to revenues and expenditure, data from the annual budget execution law can be used prior to 1995 (going back until 1989). Back then, the institutional, legal coverage of the general government was not far from the statistical definition of the organisations classified into the government sector, and besides the cash-flow data, accrual-based adjustments were presented in several items for information purposes, which can also be taken into account to eliminate any major methodological difference between 1994 and 1995.

In order to determine the structural deficit, the factors distorting the deficit, such as creative accounting, need to be filtered. To this end, it is possible to use the MNB's analytical indicator calculated for the past two decades, the augmented (SNA) deficit, which has been available since 1990 (for details, see *P. Kiss 2011*). This indicator is based on the cash-flow deficit, and it adjusts for this in the items where creative accounting was detected (e.g. VAT refund, the quasi-fiscal deficits of MÁV and BKV (Budapest Transport Corporation), public investments outsourced to PPP projects). The reference point is not the ESA balance, partly because it is uncertain how much creative accounting was used to circumvent the ESA methodology's implementation back then and later when it was revised several times. The only thing that is certain is the extent of creative accounting at the level of the cash-flow balance (which does not change subsequently). This different baseline makes the situation more difficult when the ESA data need to be adjusted. First, the two indicators gradually converge towards each other, for example the augmented (SNA)

indicator incorporated the data on bills due to be paid, and the methodology of ESA2010 is equivalent to the augmented (SNA) indicator in recording the sales of mobile phone concessions, meaning that it distributes them for the concession period instead of recognising a one-off lump-sum revenue item. Since HCSO data published in the spring of 2017 was used, the adjustment had not been performed, and therefore the corresponding augmented (SNA) adjustment was considered instead.[16] However, there is another persistent difference related to the transformation of the funded pension system, because the augmented (SNA) methodology adjusts the deficit of that time with the contributions paid in that private funds, while the ESA methodology imputes a future interest expense and a contribution adjustment. Another methodological difference is that the significant transfers paid at the end of 2016 are recorded among ESA expenditure, while the recipients use these funds for an extended period of time (within the period determined in a government decree), so its real economy impact can appear in a protracted period. Therefore the augmented (SNA) indicator was adjusted for this.[17] The adjustments performed are summarised in *Table 7* of the Appendix.

In adjusting (netting) taxes and expenditure, *P. Kiss et al.* (*2009), P. Kiss – Szemere* (*2009*), *Szemere – P. Kiss* (*2011*) and *Ádám et al.* (*2016*) can be used as reference points (with the deviations described above in the methodological section). They perform adjustments based on ESA data (interest, public employer's social contributions, current and capital transfers received from the EU), so this section can be extended easily. Second, they are based on estimates that use the above-mentioned budget execution law's database (such as for the VAT paid by the government). Finally, the contributions and PIT payments of public employees can be estimated based on the average wage, number of employees and tax and contribution rates.

The ECB methodology chosen due to the smoothness of the trends requires that the time series be extended until 2030. For this, actual figures were used until 2019, along with the projections of the MNB's Inflation Report at the end of 2019 as well as their extension. In the case of GDP, this was done by ensuring that the output gap of –1.4 per cent derived for 2016 was close to the pre-crisis consensus (*Table 2*). The analysis should end at this point because the output gap estimates for 2016 revised later are close to each other, except for one outlier, and recent years may be revised due to the crisis starting in 2020, although this will probably only exert a marginal effect on the pre-2016 period.

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[16] The ESA adjustment was performed in the autumn of 2017, at least for recent years.

[17] An estimate was prepared for the schedule of absorption and for whether they were recorded among current or capital transfers in 2016 (we used this estimation to adjust the ESA data). Thus the uncertainty regarding 2016 is not significant, and this also justifies that the examination should end with that year. Moreover, similar expenditure items, albeit of differing volumes, were recorded at the end of subsequent years, and distributing them over the following years also requires estimation.

Table 2

Estimates of the output gap in 2016 before the crisis starting in 2020 (%)

Source	Time of estimate	Output gap in 2016
MNB (Inflation Report)	March 2020	−1.8
OECD (Economic Survey)	January 2019	−1.9
IMF (Article IV)	December 2019	−1.7
Convergence Programme	April 2018	−1.8
European Commission – Country Report	February 2019	0.4

Note: There is an estimate for 2016 in the 2017 Convergence Programme (−1.2), but in 2018 the 2017 output gap was reduced by 0.6 by the updated estimate, so the unpublished value for 2016 was adjusted with the same value.

From 2004, the trend estimated in real-time can be approximated based on the output gap estimated for the actual period, derived from the April or December Convergence Programme from the next year.[18] This can be used to identify how much the real-time perception about potential growth changed later, and how much the real-time neutral expenditure path following trend GDP differs from what is now considered neutral ex-post.

Among the parameters affecting the budget, inflation also plays a key role. In this context, the actual data can be compared to the inflation projection in the draft budget act submitted (in autumn or spring) in the previous year. If one wants to find out whether the private sector was surprised as well (for example, regarding wage-setting decisions), the inflation expectations of market analysts (Reuters) published early in the year or in the autumn should be compared to the actual data (*P. Kiss 2007*).

With respect to fiscal measures, compiled individual information can be found for the period between 1994 and 1997 *(P. Kiss 1998).* Second, a systematic database is available from 2002, mainly focusing on the tax side (compiled by the author). Finally, the estimation of the measures also utilised other sources:

• Data are available on the taxes and contributions related to wages until 1999 (*P. Kiss – Szapáry 2000*), and their changes can be considered the aggregate estimate of the measures.[19] This time series was extended by the author until 2016, supplemented with the estimations of PIT burden of mixed income using the budget execution laws and minimum required social security contribution based

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[18] The output gap of the actual period can basically change because of the trend, as the actual data of economic growth is revised only slightly ex-post.

[19] This calculation divides the PIT (related to the actual wage) by declared wages, resulting in an effective tax burden. And the change in this is considered a measure. The problems here may arise from the difference between the estimated and the declared wages in the macroeconomy, which is included in the unexplained residuals.

on the number of entrepreneurs. In the case of the social security contributions, the effect of the Job Protection Action Plan was also considered.[20] The impact of the contribution paid to the funded pension system was also adjusted, viewing it as if it had been the government's revenue all along. Data are available for most of this period, because reports had to be made to Eurostat[21] for some time.

• The corporate tax is distorted by carry-forward losses, for which *P. Kiss et al.* (*2009*) provide an estimate between 1995 and 2006, which was extended to 1994 and 2007–2009 using data from the budget execution laws, and to 2010–2016 using aggregate tax returns.[22] The effect of corporate tax allowances was determined using data from the budget execution laws for the entire period. The database available from 2002 was used for calculating the effects of the change in tax rates, and the budget execution laws were used for earlier years.

• In the case of the value-added tax and the excise duty, the list of measures maintained since 2002 was used, and the estimated impact of the previous measures and updated effects of this available list based on the budget execution laws. With respect to the excise duty paid on the quantity, measures were considered to comprise the valorisations in excess, or falling short, of inflation. In the case of VAT, the effect of the losses due to the introduction of the simplified business tax were also taken into consideration.

3. Robustness checks

3.1. Comparison to earlier results: What combination of taxes and net primary expenditure produced the primary structural balance?

The primary structural balance is an adjusted indicator that filters the evolution of interest rates, temporary fluctuations in the business or financial cycle and the timing of the deficit due to creative accounting, so it is a good starting point if fiscal sustainability is examined. Similar to an earlier article (*Szemere – P. Kiss 2011*), the change in the adjusted indicators is divided into two-year periods, to distinguish the change in the adjusted private tax/trend GDP (vertical axis) and the net primary expenditure/trend GDP (horizontal axis). The diagonal line shows the combinations of revenues and expenditure where the cyclically adjusted and revised primary balance is in equilibrium. Accordingly, the change in revenues and expenditure and the time profile of their balance can be demonstrated with a single line of the trajectory. In *Figures 3* and *4*, the distance from the diagonal line shows the revised,

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[20] It can be found in the budget execution law, e.g. 2016: https://www.parlament.hu/irom40/17578/adatok/altindmell/adokedvezmenyek.pdf
[21] Statistical office of the European Union.
[22] The estimate related to the percentage of the carry-forward losses that are effective, because the data suggest that a significant portion is never used. Therefore carry-forward losses are "discounted" in the year when they are realised, but the estimated discount factor is fixed for a longer period. If the discount factor continuously changed, that would explain much of the residual part of the change.

cyclically adjusted primary surplus (upwards) or deficit (downwards). Both on the revenue and the expenditure side, any shift towards the origin reflects a decline in redistribution. It has to be noted again that the change in tax revenues does not automatically mean a measure, as the change may also be attributable to other factors, as shown in *Section 1.*

The left-hand 1994–2004 trajectory in *Figure 3* clearly demonstrates the consolidation between 1994 and 1996, mainly based on reducing net expenditures (and raising taxes to a lesser extent). After this 1998 and 2000 barely differed from the situation in 1996. By the end of 2002, there was a realignment towards the 1994 balance, but with a much lower combination of redistribution/tax centralisation. This is because net expenditures were raised again, but the tax cuts could already be implemented, at that time. The tax cuts continued until 2004, but the reduction in net expenditures was greater than this. Overall, only a small portion of the expansion between 2000 and 2002 was adjusted. This adjustment is fully attributable to the curbing of the capital expenditures that proved to be temporary.

The right-hand 2004–2016 trajectory in *Figure 3* shows that after capital items reversed, 2004 and 2006 not only marked a return to the situation in 2002, as the position deteriorated even further. However, a major adjustment was completed until 2008, mostly based on raising taxes, and to a lesser extent on cutting net expenditures, once again temporarily curbing capital items. There was a smaller adjustment between 2008 and 2010, completing the adjustment of net expenditures on the one hand (even bringing it below the 1996–2000 levels), and offsetting half of the impact of the tax hikes implemented between 2006 and 2008 by cutting taxes on the other hand. After this, the improvement of the primary balance continued at a faster pace until 2012, through mitigating net expenditures. Between 2014 and 2016 tax revenues increased even without raising taxes due to measures that whitened the economy, while net expenditures increased slightly again between 2012 and 2016. All in all, the adjusted revenue and expenditure levels in 2016 were similar to those seen between 1996 and 2000.

These results should be compared to the adjusted expenditure and revenue path of *Szemere – P. Kiss* (*2011*) (*Figure 4*). It can be noticed that the values changed places in 1998 and 2000, and in 2002 and 2004. The difference is attributable to various methodological reasons. The growth rate was mostly affected by the fact that the authors smoothed net capital expenditure and current corporate subsidies. This may be the main reason behind the smaller expenditure in 1998 and 2002, when extraordinary expenditures were recorded for these items in the election years.

Figure 3
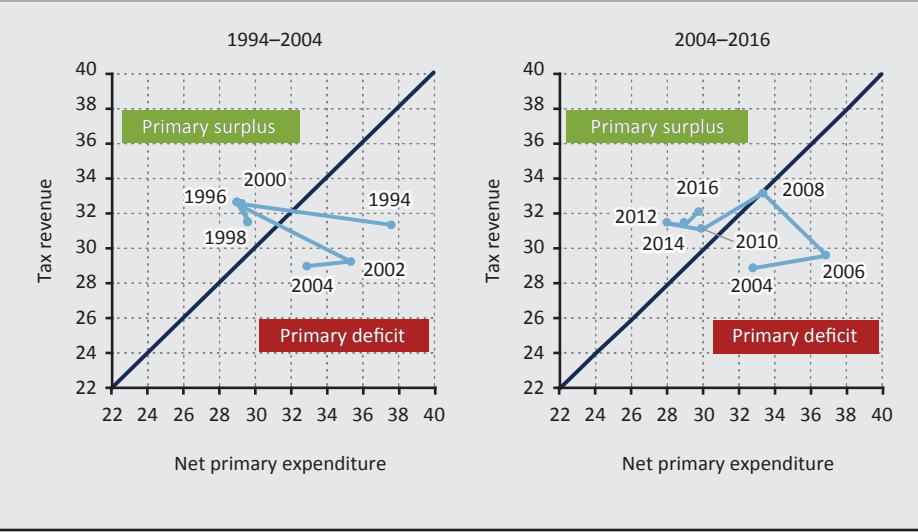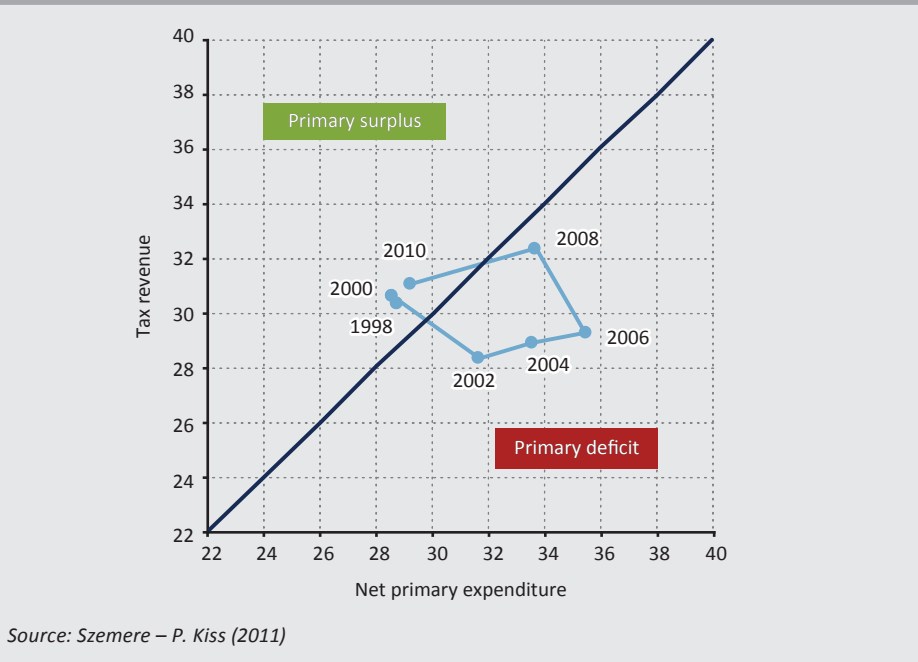**Comparable primary expenditures and tax revenues of the general government (% of trend GDP)**

Figure 4
Comparable primary expenditures and tax revenues of the general government (% of trend GDP)

Source: Szemere – P. Kiss (2011)

For the sake of simplicity, the period between 1994 and 2016 was divided into two-year sections in the analysis. Of course, the annual results should also be examined, because this enables a more accurate establishment of the different periods. The first episode can be identified in 1995–1996 and the second in 2007–2008. 2006 was special in that there were parliamentary and local government elections during the year, and therefore fiscal expansion occurred first, followed by fiscal tightening after the elections. However, the net result of the two was nevertheless perceptible expansion. Two further episodes can be identified in 2009 and 2011–2012 (*Figure 3*). The election year of 2010 should also be examined separately, as in principle the revenue/expenditure changes could be classified under the deficit reduction in both 2009 and 2011–2012. However, a more careful look at the situation makes it clear that while there were several deficit-increasing measures prior to the elections (e.g. cuts in contributions, municipal investments), major deficit-reducing measures were implemented after the elections. That is why 2010 should be linked to the episode of 2011–2012.

3.2. Extent of the unexplained part of the changes in cyclically adjusted taxes

If the extent of the annual fiscal measures is to be determined, all effects should be filtered that do not depend on measures. Accordingly, identifying the measure through the change in the primary structural balance, in line with the widely used practice, is not a good approach. First, as was shown, the trends of certain tax bases exceed the trend of economic growth (decoupling), and therefore the tax-to-GDP ratio changes even in the absence of measures. Second, further adjustment is required because over time deflators may continuously differ in the case of the tax bases and the GDP in the denominator of the tax rate.[23] Thus the change in the primary structural balance is adjusted in the calculations presented below through the difference between the tax base trends and the deflators to ensure a more accurate estimate of the measures. The unexplained part of the change indicates methodological errors and the change in tax evasion. Its extent can be compared to the similar residual values seen in other countries from *Kremer et al.* (*2006*).

As seen in *Figure 5* showing the decomposition of corporate tax, the share of the unexplained part is relatively large, but it is marginal on average over the entire period. A possible explanation for this may be that the effect of carry-forward losses was determined using the averages of the periods, that do not properly fit the individual years.

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[23] It may not necessarily be possible to conclusively determine whether the difference is temporary or permanent; therefore this is usually disregarded when examining sustainability.

Figure 5
Decomposition of the change in corporate tax (% of trend GDP)

Per cent

- ■ Change in carry-forward losses
- ■ Change of decoupling effect
- ■ Unexplained change
- ■ Change in tax benefits
- ■ Change due to tax measures
- — Change in cyclically adjusted corporate tax
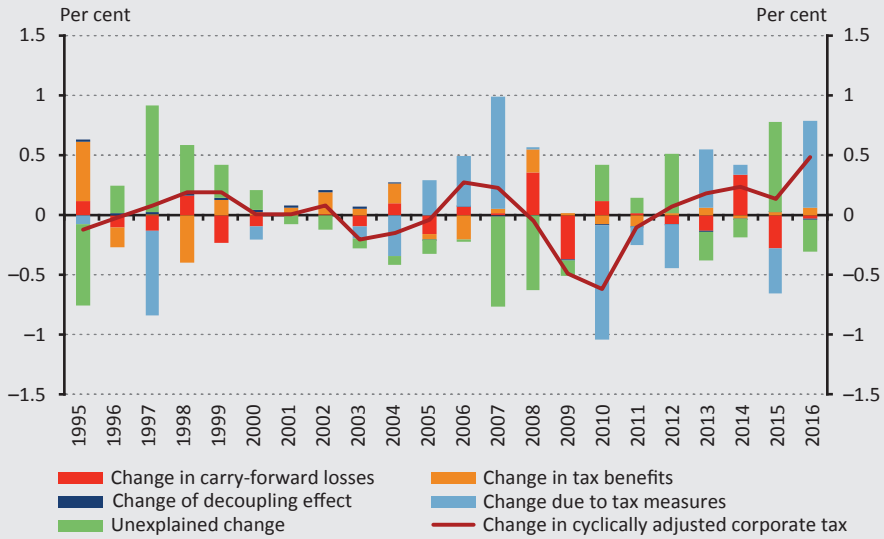
Figure 6
Decomposition of the changes in the taxes on private sector wages (% of trend GDP)

Per cent

- ■ Change in price gap effect
- ■ Change of decoupling effect
- — Change in cyclically adjusted payroll taxes
- ■ Change due to tax measures
- ■ Unexplained change
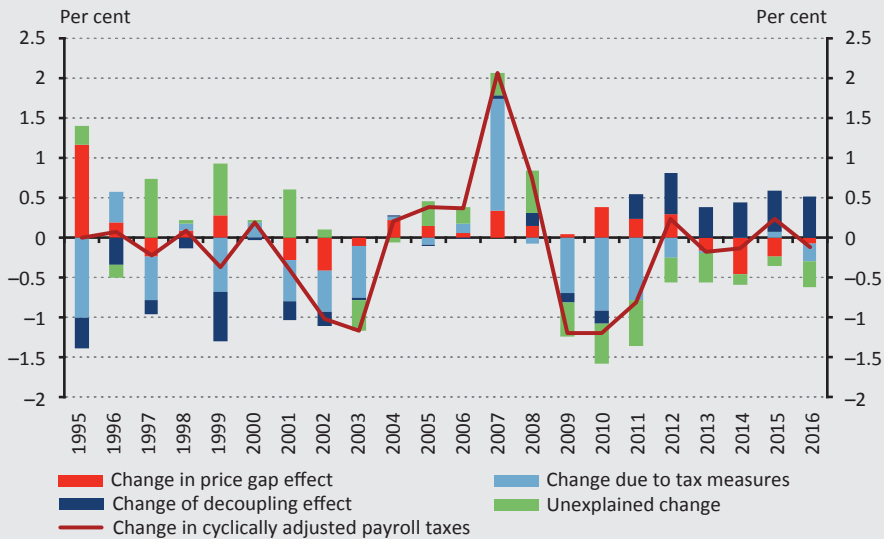
During the decomposition of the taxes on private sector wages, the methodological uncertainty was relatively lower, and the residuals were comparatively minor, and it may be closer to the impact of the change in tax evasion (for example, it does not deviate much from the value estimated for 2006–2007, see *Krekó – P. Kiss 2008*). *Figure 6* shows that the positive price gap in 1995–1996 improved revenues, because the unexpected inflation affected the GDP deflator less, and it also fell short of the GDP trend in the inflated wage bill's trend (negative decoupling). Between 2011 and 2016, revenues increased not because of measures but because the decoupling of the wage bill and GDP trends. However, this effect was mitigated between 2013 and 2016 by the negative price gap, i.e. the fact that the consumer price index was lower than the GDP deflator.

In the case of the consumption taxes seen in *Figure 7,* the unexplained part is greater, attributable to the more uncertain estimation of the measures. The residuals can be explained well by the decline in tax evasion in certain years. In 2006–2007 it is the same as the estimate by *Krekó – P. Kiss* (*2008*), and in 2014–2016 it is equivalent to the impact of online cash registers. The unexpected inflation of 1995–1996 had two-effects in the opposite direction: a highly positive price gap (the consumer price index exceeding the GDP deflator), along with smaller negative decoupling. Similar to wages, the impact of the negative price gap can be seen between 2013 and 2016.

Figure 7
Decomposition of the changes in consumption taxes in the private sector (% of trend GDP)
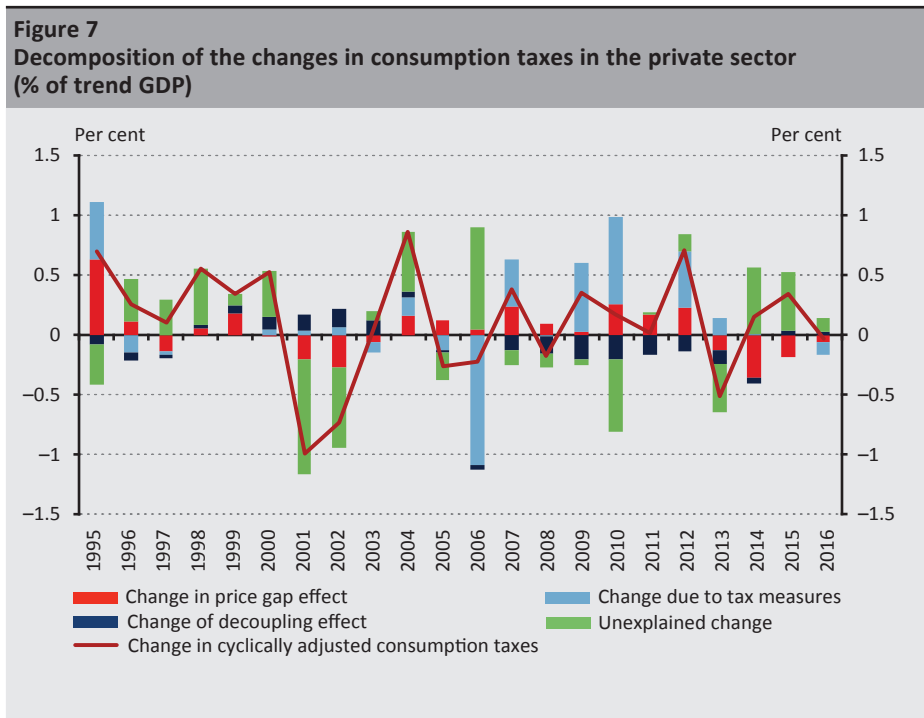
3.3. Change in net primary expenditures – implementation or planning error?

In the case of net expenditures, cyclical adjustment was only performed in the case of the unemployment contribution netted with taxes. The net expenditure adjusted in this way was not automatically affected by macroeconomic real variables, which made further filtering unnecessary. The expenditure items cannot be considered purely discretionary, as demographic effects also affected pensions and family subsidies, and certain transfers required the decision of recipients (e.g. home construction). These factors exerted an increasing or decreasing effect on spending, thereby creating and removing room for manoeuvre regarding the development of aggregate net primary expenditure.

The best point of reference for the measure is aggregate net primary expenditure, as if an expenditure rule applied to the whole coverage of items. This assumed expenditure rule regulates real growth in a way that the latter is identical with the potential/trend GDP rate. Any deviation from that means expansion or contraction. There are two problems with this logical framework. First, the real-time potential/trend GDP differs from subsequent revisions. Second, there is the problem of the deflators, where the planned and realised indices may differ, which also leads to deviations from planned and realised spending in real terms.

Real-time estimates of the output gap are available from 2003 thanks to the convergence programmes. If the latest output gap is taken as a reference, the neutral expenditure serving as the basis for the measure can be calculated, if the latest estimate of the output gap is taken into account instead of the real-time value. Based on the revision of the neutral level, the change in net primary expenditure would have developed differently, so the size of the originally intended measure differs from what can be ex-post established, due to the change in the neutral level. The two bottom rows in *Table 3* show the "measures" derived as a result of the different reference points used by the two different set of output gaps.

Table 3

Expenditure effect of estimating the output gap (% of GDP)*

	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Current	1.2	3.2	5.0	7.1	5.6	5.5	−2.6	−2.8	−2.1	−4.7	−4.4	−2.3	−0.9	−1.4
2004 CP	−0.4													
2005 CP		−0.2												
2006 CP			1.0											
2007 CP				1.2										
2008 CP					1.4									
2009 CP						3.8								
2010 CP							−4.6							
2011 CP								5.0						
2012 CP									−2.6					
2013 CP										−3.6				
2014 CP											−4.6			
2015 CP												−2.8		
2016 CP													−1.2	
2017 CP														−1.2
Difference	**1.6**	**3.4**	**4.0**	**5.9**	**4.2**	**1.7**	**2.0**	**2.2**	**0.5**	**−1.1**	**0.2**	**0.5**	**0.3**	**−0.2**
Change in net primary expenditures		−1.2	2.4	1.7	−2.6	−0.8	−1.9	−1.4	0.7	−2.6	−0.3	1.1	0.4	−0.2
Revised output gap		−1.8	2.1	0.9	−1.9	0.1	−2.0	−1.5	1.2	−2.1	−0.7	1.0	0.4	0.0

Note: *The change in net primary expenditure is the actual realised value, and the revised value shows the same value in a scenario where the planning would have been based on the current estimate instead of the real-time version. CP – Convergence Programme.

A key parameter of fiscal plans is inflation, as a large portion of the expenditure targets the public (social benefits, public sector wages). Where the realised inflation deviated substantially from the budgetary plan, the real value of government spending deviated from the planned figures. This could be attributed to exogenous factors, and also to government measures, such as in the case of the unexpected inflation in 1995–1996. At that time, the expenditure items determined in the Budget Act were not offset by the extent of the unexpected inflation during the year, and therefore expenditure diminished in real terms. If this contraction is expressed as a percentage of GDP, we get the values listed in *Table 4.*

	Actual consumer price index (CPI)	**CPI in the Budget Act**	**Statutory average**	**Difference**	**Cyclically adjusted primary expenditure**	**Loss in real value due to CPI, % of GDP**
1995	28.2	19.5	19.5	8.7	32.6	−2.8
1996	23.6	19–21	20.0	3.6	29.0	−1.0
1997	18.3	17–19	18.0	0.3	28.8	−0.1
1998	14.3	13–14	13.5	0.8	29.6	−0.2
1999	10.0	10–11	10.5	−0.5	29.8	0.1
2000	9.8	6–7	6.5	3.3	29.2	−1.0
2001	9.2	5–7	6.0	3.2	30.6	−1.0
2002	5.3	4–6	5.0	0.3	35.3	−0.1
2003	4.7	5	5.0	−0.3	34.1	0.1
2004	6.8	5.5–6	5.8	1.0	32.9	−0.3
2005	3.6	4.5	4.5	−0.9	35.3	0.3
2006	4.0	3.5–4	3.8	0.2	36.9	−0.1
2007	8.0	6.2	6.2	1.8	34.3	−0.6
2008	6.0	4.5	4.5	1.5	33.5	−0.5
2009	4.2	2.9	2.9	1.3	31.5	−0.4
2010	4.9	4.1	4.1	0.8	30.1	−0.2
2011	3.9	3.5	3.5	0.4	30.8	−0.1
2012	5.7	4.2	4.2	1.5	28.2	−0.4
2013	1.7	4.2	4.2	−2.5	27.9	0.7
2014	−0.2	2.4	2.4	−2.6	29.0	0.8
2015	0.0	1.8	1.8	−1.8	29.4	0.5
2016	0.4	0	0.0	0.4	29.2	−0.1

Table 4

Difference between the inflation projection in the Budget Act and actual inflation, and its impact on the real value of expenditure estimated with inflation

As the expenditure is shown relative to GDP, this ratio is directly influenced by the GDP deflator rather than inflation. The two deflators may differ significantly, for example the unexpected inflation in 1995–1996 specifically increased the consumer price index, while exerting a more muted effect on the GDP deflator. Therefore the loss in real value due to inflation was concealed by the lower GDP deflator. The difference between the two deflators is similar to what was seen at the taxes in the form of the price gap.

Table 5

Difference between the consumer price index and the GDP deflator, and its effect on expenditure

	GDP deflator	CPI	Difference	Cyclically adjusted primary expenditure	Change in the expenditure/ GDP ratio
1995	19.2	28.2	−9.0	32.6	2.9
1996	22.1	23.6	−1.5	29.0	0.4
1997	20.1	18.3	1.8	28.8	−0.5
1998	13.6	14.3	−0.7	29.6	0.2
1999	8.1	10.0	−1.9	29.8	0.6
2000	9.9	9.8	0.1	29.2	0.0
2001	11.3	9.2	2.1	30.6	−0.6
2002	8.4	5.3	3.1	35.3	−1.1
2003	5.5	4.7	0.8	34.1	−0.3
2004	4.9	6.8	−1.9	32.9	0.6
2005	2.4	3.6	−1.2	35.3	0.4
2006	3.5	4.0	−0.5	36.9	0.2
2007	5.4	8.0	−2.6	34.3	0.9
2008	5.0	6.0	−1.0	33.5	0.3
2009	4.0	4.2	−0.3	31.5	0.1
2010	2.3	4.9	−2.6	30.1	0.8
2011	2.2	3.9	−1.7	30.8	0.5
2012	3.4	5.7	−2.3	28.2	0.6
2013	2.9	1.7	1.2	27.9	−0.3
2014	3.4	−0.2	3.6	29.0	−1.0
2015	1.7	0.0	1.8	29.4	−0.5
2016	1.0	0.4	0.6	29.2	−0.2

By adding up the last rows of *Tables 4 and 5,* it can be seen that the impact of the unexpected inflation adjusted with the GDP deflator may have been just as pronounced as the effect arising from the ex-post revisions of the output gap. Considering all of this, the change in net primary expenditure can be considered an ex-post indicator of measures, but it does not show the real-time size of those discretionary actions.

It should also be noted that the decisions of local governments and budgetary units were also important in the case of wages, the purchase of goods and services and investments. They could not be classified under fiscal policy measures, because sometimes the implementation differed from the intention of the central government.

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Appendix

Figure 8
Output gap with different lambda (filtering the business cycle vs. the financial cycle)

Note: HP filter lambda values 30 and 100.

Figure 9
Output gap (filtering the financial cycle)

Figure 10
Profit

HUF billion

HUF billion

15,000

14,000

13,000

12,000

11,000

10,000

9,000

8,000

7,000

6,000

1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019

— Unadjusted time series — P. Kiss – Vadas — P. Kiss – Reppa - - - ECB

Figure 11
Wage bill

HUF billion

HUF billion

16,000

14,000

12,000

10,000

8,000

6,000

4,000

2,000

0

1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019

— Unadjusted time series — P. Kiss – Vadas

Figure 12
Average wage

Figure 13
Employment
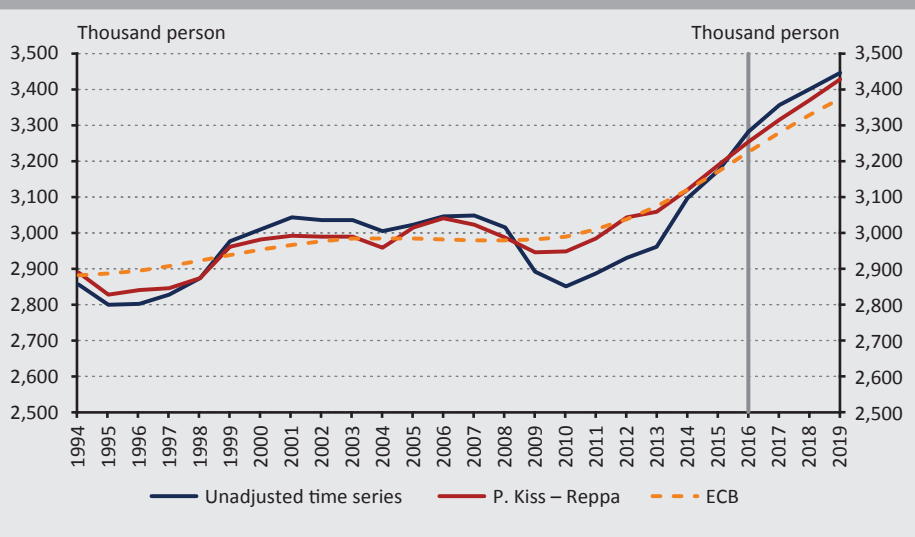
Figure 14
Unemployment

Thousand person   Thousand person

Unadjusted time series — P. Kiss – Reppa — ECB

Figure 15
Consumption

HUF billion   HUF billion

Unadjusted time series — P. Kiss – Vadas — P. Kiss – Reppa — ECB

Table 6

Cyclically adjusted primary ESA items revised for the impact of creative accounting (% of trend GDP, with episode boundaries)

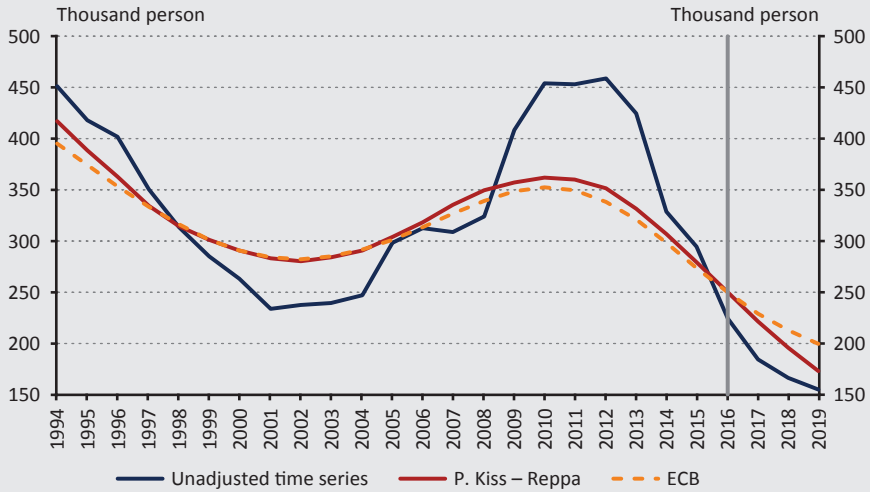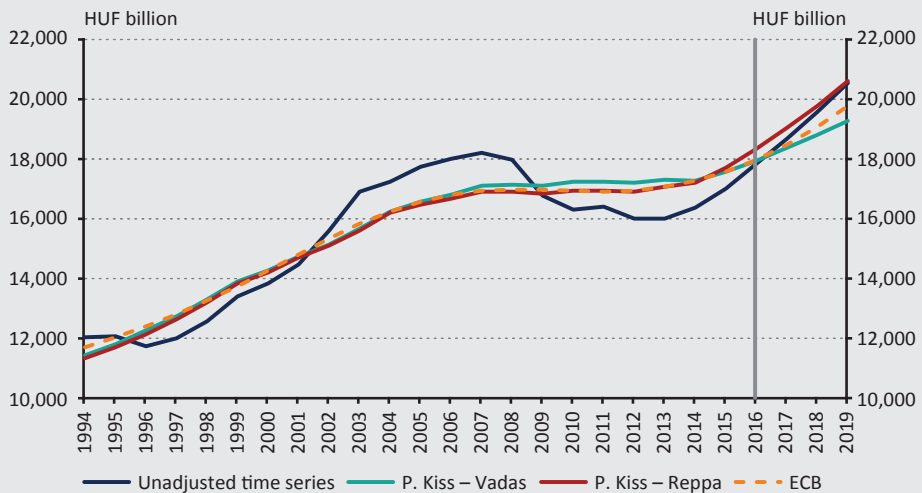|	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Cyclically adjusted social benefits	20.0	18.1	15.7	15.3	15.8	16.1	15.7	15.7	17.0	17.9	18.4	19.6	20.4	19.8	20.3	19.3	18.4	18.3	17.2	16.9	16.3	15.8	15.6
Net wages	6.4	5.6	4.8	4.9	4.9	4.9	4.8	5.0	5.7	6.4	6.2	6.3	6.1	5.4	5.3	4.9	5.2	5.3	5.0	5.2	5.5	5.8	6.0
Net purchase of goods and services	7.2	6.1	5.6	5.6	5.5	5.4	5.4	5.4	5.6	5.6	4.9	5.2	5.6	5.3	5.9	5.7	5.4	5.3	4.9	4.6	5.1	5.3	5.3
Sales revenues and fee income	4.3	3.7	3.4	3.2	3.1	3.2	3.0	2.9	2.9	3.0	3.1	3.1	3.4	3.3	3.3	3.1	3.1	3.0	3.0	3.3	3.3	3.4	3.4
Net operating expenditure	9.3	8.0	7.1	7.3	7.3	7.2	7.2	7.6	8.4	9.0	8.0	8.3	8.3	7.4	7.9	7.4	7.5	7.7	7.0	6.5	7.4	7.6	7.8
Net investment	5.3	0.5	1.5	2.3	2.5	2.8	2.9	3.3	4.4	3.8	3.6	4.2	4.5	3.4	2.9	2.5	2.0	1.1	1.5	1.3	1.8	2.0	2.4
Other current expenditures	2.0	0.9	1.3	0.9	1.2	1.6	1.0	1.7	2.3	1.6	1.8	1.9	1.9	2.1	1.6	1.1	1.0	1.5	1.2	1.9	1.9	1.9	2.2
Other capital expenditures	0.9	5.2	3.4	3.0	2.7	2.1	2.3	2.4	3.3	1.8	1.1	1.2	1.7	1.5	0.7	0.9	1.1	2.3	1.2	1.6	1.6	2.0	1.8
Cyclically adjusted net expenditure	**37.6**	**32.6**	**29.0**	**28.8**	**29.6**	**29.8**	**29.2**	**30.6**	**35.3**	**34.1**	**32.9**	**35.3**	**36.9**	**34.3**	**33.4**	**31.3**	**29.9**	**30.8**	**28.0**	**28.3**	**29.0**	**29.3**	**29.7**
Cyclically adjusted corporate tax	2.0	1.8	1.8	1.9	2.1	2.3	2.3	2.3	2.4	2.2	2.0	2.0	2.3	2.5	2.4	2.0	1.3	1.2	1.3	1.5	1.7	1.9	2.3
Cyclically adjusted PIT and contributions	15.4	15.5	15.5	15.3	15.4	15.0	15.2	14.8	13.8	12.6	12.8	13.2	13.5	15.6	16.4	15.2	14.0	13.2	13.5	13.3	13.1	13.4	13.3
Cyclically adjusted indirect taxes	13.8	15.4	15.1	13.7	13.8	14.4	14.8	13.7	12.9	13.4	13.9	13.6	13.6	14.3	14.2	14.4	15.6	15.7	16.6	16.4	16.4	16.7	16.5
Capital taxes	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cyclically adjusted private taxes	**31.3**	**32.8**	**32.5**	**30.9**	**31.3**	**31.7**	**32.3**	**30.9**	**29.2**	**28.3**	**28.8**	**28.8**	**29.5**	**32.5**	**33.1**	**31.6**	**31.0**	**30.1**	**31.4**	**31.2**	**31.3**	**32.0**	**32.1**

Table 7

Creative accounting adjustments related to primary ESA items (HUF billion)

	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total adjustment of the primary balance	**-44**	**3**	**-84**	**-53**	**125**	**-14**	**86**	**-10**	**-37**	**-85**	**17**	**-50**	**231**	**342**	**242**	**114**	**117**	**35**	**65**	**-54**	**-81**	**91**	**452**
MÁV-BKV	-19	-31	-8	-36	-21	-21	-29	-16	-83	-80	-95	-116	-32	-59	-105	-108	-61	-58	0	0	0	0	0
MÁV-BKV in ESA (1995–1997 capital adjustment, 1998 Postabank)		31			148		37		63					112	103			50				30	
PPP project								-19	-31	-8	-113	-251	-44	-29	-98	-156	-118						
PPP repayment and subsequent classification under ESA													8	9	12	12	34	34	52	50	53	49	68
Roadworks without partial performance										-120	-80												
The same roadworks under ESA											120	80											
Concession income dispersed	2	2	3	3	4	6	12	13	13	13	13	21	38	38	25	22	22	10	47	34	31	28	25
One-off concession revenue under ESA	-26	0	0	0	0	-35	-37	0	0	0	-17		-6	-23	0	0	0	0	-34	-126	-139		
Contributions paid into the funded pillar					32	57	78	94	111	156	206	235	267	294	330	344	242						
Adjustment of payments															0	0	0	0	0				
Indirect privatisation, and the repayment of privatisation debt, MFB (Hungarian Development Bank) spending		3	-16		5	-1	42	-54	-87	-47	-18	-19	-1		-25					-13	-27	-16	359