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What GDP does not reveal in analysis of economic growth and real convergence

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Abstract:
The commonly used GDP indicator in real terms does not catch a country trading gain or loss. The real gross domestic income rates of growth, which include the influence of terms of trade changes, were approximately 1 percentage point higher in annual average than the GDP rates in the Czech economy and belonged to the fastest in Central Europe. The real GDP rates of growth do not express the development of real convergence truthfully, too. A familiar statistical paradox in centrally planned economies is presented, as is a new paradox, which occurs in the Slovakian economy in relation to its neighbouring transitional countries. The analysis is also devoted to the relationship between real convergence with real appreciation of currency and with convergence of price levels and to the dissimilar GDP and national income development in the Czech Republic. In the conclusion implications for macroeconomic analysis and economic policy are inferred.

Keywords: gross domestic product, terms of trade, real gross domestic income, real convergence, qualitative changes, statistical paradox.

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1. Introduction

The wealth of a country does not depend on what volume of goods and services the given economy manages to produce, but rather on its appropriate structure and quality, which finds its reflection in advantageous foreign trade of products and services. This is especially true of small, open economies whose exports are a large share of total production.

The Czech economy in a European context is characterized by a certain specific – a marked long-term improvement in terms of trade. Without taking account of this it is not possible to understand the development of the economic level of the country, the maintenance of the macroeconomic balance, the real growth of real income and the progress of real convergence to economically developed countries.

With increased movement of capital and labour there likewise grows an ever more significant movement of incomes across the borders of the countries in which they were created. Economic analyses usually work with the indicator of real GDP, which however does not catch the success of the country in terms of trade, nor does it show the redistributing processes between the domestic economy and the world.

The aim of this work is to point out the inadequacy of generally accepted GDP indicators and the importance of supplementing them with other indicators available in the national accounts. In chapter 2 the influence of the terms of trade on real income in the Czech Republic and the development of the methodology of real gross domestic income indicators (RGDI) is analysed in an international context. An original attempt is also made here to compare RGDI rates of growth in central European countries based on the calculations of author. In chapter 3 the conditions under which real GDP growth does not fully describe the progress of real convergence are analysed. A familiar statistical paradox in centrally planned economies is presented, as is a new paradox, which occurs in the Slovakian economy in relation to its post communist neighbours.

The shorter chapters 4 and 5 are devoted to the relationship between real convergence with real appreciation of currency and with convergence of price levels and to the dissimilar GDP and national income development in the Czech Republic. In the conclusion implications for macroeconomic analysis and economic policy are inferred.

2. The Influence of Terms of Trade on Real Income

In the Czech economy in the short term there are marked fluctuations of import and export prices at work, which strongly influence the economic balance. In the long term there are here unusually significant trading gains from improving terms of trade. In analyses, which operate only using the "classic" indicator of gross domestic product, this phenomenon escapes.

2.1 Development of terms of trade

Terms of Trade (T/T) catch the relationship of import and export prices and thus express the success of a country in its foreign trading. Their short-term fluctuations are usually associated with price volatility in primary world raw materials (especially crude oil). These movements are, for purchasing countries and above all for smaller-scale economies, an exogenous variable.

A long-term tendency in terms of trade development is in greater part endogenous (provided of course it is not a longer-term phenomenon of redistribution between raw material and manufacturing countries). If over a long-term an individual country's position in T/T improves, then this fact increases its real income above the framework determined by total product. The Czech Republic undoubtedly belongs among such countries, which is clearly evident from the terms of trade development in the EU countries (see Table 1).

Table 1: Terms of trade in goods and services in chosen EU countries (1995 = 100)[1)]

	1996	1997	1998	1999	2000	2001	2002	2003	2004
Czech Rep.	102.9	103.3	109.4	108.8	105.9	108.4	111.8	112.3	113.4
Germany	99.2	98.5	99.5	98.8	96.7	96.7	97.6	97.5	97.0
Austria	98.8	98.2	98.3	98.4	97.0	97.3	99.1	100.1	99.2
France	99.4	99.8	101.1	101.3	98.4	99.4	101.8	102.0	103.2
Hungary	98.7	100.2	101.1	100.2	97.9	98.3	99.2	98.8	98.2
Poland	97.5	96.0	98.1	97.0	91.6	91.6	91.3	90.3	90.2
Slovakia	97.0	96.4	98.6	96.4	97.0	94.4	95.4	95.3	94.9
Slovenia	101.3	102.0	103.5	104.1	101.1	103.0	105.1	105.8	104.6

According to import/export deflator from national accounts.
Source: European Commission (2005), p. 84.

From the countries investigated, the development of the terms of trade in the Czech Republic is the most favourable. Whereas in the other NMS-4[1] T/T in 2004 in comparison with 1995 fell, in the Czech Republic it rose by 13.4% [2].

The Czech economy is very sensitive to one-off fluctuations in terms of trade in the short term. In some years the changes in T/T have a greater influence on the formation of real income than real GDP increase. For For example in 1998 there was a fall in GDP of 1.1%, but this decrease was largely overwhelmed by increased gains in terms of trade of 3.5% GDP. Conversely in 2000 a relatively high growth in GDP of 3.9% was demonstrated, but unfavourable T/T development lowered resources by 1.7% GDP, and so on aggregate real income growth was lower than in the year of the sharpest decline (1998). In 2002 the gain in T/T was 2.2% of GDP which was again greater than the gain in GDP growth, which achieved only 1.5 % (see Table 2).

Table 2: GDP rates of growth and influence of changes in terms of trade

	1996	1997	1998	1999	2000	2001	2002	2003	2004
GDP rate of growth in % (constant prices)	4.2	-0.7	-1.1	1.2	3.9	2.6	1.5	3.2	4.4
Change in T/T as % GDP	1.6	0.2	3.5	-0.3	-1.7	1.7	2.2	0.1	0.1
in bn. CZK	24	4	62	-6	-37	37	51	2	3

Source: Czech Statistical Office (2005), author's adjustment.

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[1] NMS-4 are new EU member states, which includes Czech Republic, Hungary, Poland and Slovakia. NMS -5 includes the above and Slovenia and NMS -8 are all post communist countries, i.e. NMS -10 with the exception of Malta and Cyprus.

[2] The rapid rise in T/T in the Czech Republic between the years 1995 and 2004 however partly compensated its deep fall at the start of the transformation. On the same basis (1995 = 100) T/T in the year 1990 were 109.1 %. During 1991 however they fell (after 3 devaluations of the Czechoslovak crown in the preceding year) by more than 24 percentage points to 84.7 %. They did not return to the previous level of 1990 until 1998.

In absolute terms the impact of the terms of trade was most remarkable in 1998, when this influence increased real income by 62 bn. Czech crowns. The fall of 37 bn. crowns in 2000, caused by a high growth in import prices, was countered by an equally high gain the following year. The subsequent favourable development in terms of trade in 2002 led to a growth in real income of 51 bn. crowns. Such large changes in real national income are difficult to ignore on analysis.

The long-term improvement in terms of trade is, contrary to short-term fluctuations, an endogenous factor. In it are manifested qualitative changes of production of the given country traded on the world market. These are **qualitative changes in the widest sense of the word**, and not just improvements in technical parameters, which statisticians try to include in price indices, according to the possibilities available. This concerns concerns a transfer to activities with a higher value added, to more sophisticated products, to superior technology, an improvement in the renown of domestic brands and an elimination of price reductions for 'goods from the east' and there is also a connection to an international market network, following of fashionable trends, etc. These factors increase the prices of exports and raise real income, without any growth in the 'physical volume' of exported goods and services ever taking place. Such changes started significantly to take root in the Czech economy with the inflow of foreign investment from the end of the 90s.

2.2 Real income indicator

Changes in terms of trade are excluded from GDP in constant prices indicators. This comes from the principle, 'what would happen if there were no changes either in domestic or foreign prices?' What is considered, then, is only the growth in volume of production, whilst its acceptance and valuation in the foreign market, as well as profitability of imports is not taken in to account. At the same time, however, in contrast to domestic price changes, export and import price changes influence the real income available for consumption and investment in a given country. For this reason GDP does not provide a full picture of the overall achievements of an economy.

To express the influence of terms of trade on aggregate indicators of economic activity was already a challenge for analysts as early as the second half of the last century. Although large world economies with an extensive domestic market do not strongly feel the effects of the influence of T/T on real income, it is important to appreciate that despite this, sophisticated USA statistics developed categories of this type. From the beginning of the 80s the Bureau of Economic Analysis has published a so-called „Command-basis GNP", which includes T/T changes (cf. Denison, 1981).

Of the economically–developed European countries a long–term tendency for favourable development in terms of trade is characteristic above all for Switzerland, which on measurement of economic growth using GDP indicators shows a very slow rate of growth. The author U. Kohli proposed a construction of this indicator on the basis of a production function.[3] In simple terms it is possible to calculate 'real' GDP (GDPV) according to the expression

$$GDPV = TDDV + XGSV \cdot (PXGS/PMGS) - MGSV, \qquad (1)$$

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[3] The expression "real" here does not mean an expression in constant prices, but product, which the country has in reality at its disposition (cf. Kohli, 2004).

where TDDV is real domestic demand, XGSV and MGSV are volumes of import and export (in real terms) and PXGS and PMGS are import and export deflators. **GDPV** shows in the long–term rates of growth **in Switzerland of approximately half a percentage point more than classic GDP**.[4] The influence of T/T is here bound with export on the grounds that on improvement or worsening of the terms of trade it is necessary to export a greater or lesser amount of real product (and thus weaken or strengthen resources for coverage of domestic demand).

In the 90s in the methodology of national accounts a comprehensive indicator was evolved, which included the influence of T/T changes. After revision of the methodology of SNA 93 and ESA 95 accounts systems they recognize and use **an indicator of real gross domestic income – RGDI.** The equation for calculation of trading gains or trading losses T has, in the national accounts (ESA 95), the following form:

$$T = (X – M) / P – (X / Px – M / Pm), \qquad (2)$$

where X is export of goods and services, M import of goods and services, Px price deflator of exports, Pm price deflator of imports and P average price deflator of foreign trade balance.

The balance of goods and services, adjusted for export and import price changes against the basic period (viz. expressions in the second brackets of the above equation), is compared with the balance in current prices, adjusted by a balance deflator. The difference in such adjusted balances represents the overall influence of T/T changes, added to GDP at constant prices (which, using the chain method, means prices from the previous year).

$$RGDI = GDP + T. \qquad (3)$$

The RGDI indicator in essence agrees with GDPV above. The difference lies only in the fact that whilst when construing GDPV the overall influence of T/T is added to export, in the national accounts export and import is calculated separately at the previous year's prices and the difference of the thus derived balance against the balance at current prices (adjusted around the average deflator) is added to GDP. On balanced foreign trade, both approaches show almost the same results.

2.3 The lead of real income growth over GDP growth in the Czech Republic

In the Czech Republic the positive influence of the terms of trade is even stronger than in Switzerland. **RGDI** here **grows approximately one percent faster than GDP**. In the years 1996–2004 the difference stood at 0.8 percent, whilst in the years 2001–2004 it had reached as high as 1.1 percent (see Table 3).

A favourable development in terms of trade enables faster growth of domestic demand – consumption and investment – than the GDP formation, without the external economic balance being disturbed. This is the situation in the Czech economy, where the positive impact of the terms of trade on the foreign trade balance has for a long time prevailed.

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[4] The calculation is quoted from the survey, "OECD Economic Surveys 2003-2004", part Switzerland, Box 1 - Command GDP: a real income indicator.

Key components of domestic use – household consumption and gross fixed capital formation – in the surveyed period 1996-2004 increased by an 3 % on annual average, while GDP only increased by 2.1 %. The development of these components, on which depend the standard of living and the future well being of the economy, corresponded to the development of RGDI, which likewise increased next to 3 %. The lead of overall domestic use rate of growth (including general government consumption and changes in the increase of stocks and reserves) before the formation of GDP stood at 0.7 percentage points.

Table 3: RGDI and GDP growth rate (in % of constant prices)

	1996	1997	1998	1999	2000	1996–2000 Annual average
Real gross domestic income	5.8	–0.5	2.3	0.9	2.1	2.1
Gross domestic product	4.2	–0.7	–1.1	1.2	3.9	1.5
Difference in percentage points	1.6	0.2	3.4	–0.3	–1.8	0.6
	2001	2002	2003	2004	2001–2004 Annual average	1996–2004 Annual average
Real gross domestic income	4.3	3.7	3.3	4.6	4.0	2.9
Gross domestic product	2.6	1.5	3.2	4.4	2.9	2.1
Difference in percentage points	1.7	2.2	0.1	0.2	1.1	0.8

Source: ČSÚ (2005), author's adjustment.

Thanks to the favourable development of T/T the external economic balance did not worsen on the lead of domestic GDP use over GDP formation growth. On On the contrary in the present decade the goods and services foreign trade deficit significantly diminished to an average rate of 1.7 % GDP, and in the year 2004 it dropped to a mere 0.3 % GDP (see Table 4).

Table 4: Foreign trade balance goods and services (current prices)

	1995–2000 annual average	2001	2002	2003	2004	1995–2004 annual average	2001–2004 annual average
bn. CZK	-61.7	-58.7	-49.5	-56.2	-9.9	-49.5	-43.5
% GDP	-3.3	-2.5	-2.0	-2.2	-0.4	-2.6	-1.7

Source: ČSÚ (2005), author's adjustment.

The real GDP indicator contains the foreign trade balance in constant prices, which do not correspond with changing conditions in foreign markets. These prices do not cover the real results of foreign exchange to the economy. In other post communist countries of central Europe the influence of changes in T/T on real income are different, as is shown in Table 1. If however we judge the development of an economy in international comparisons according to the 'more sophisticated' indicator of RGDI, **the rating of the countries on the growth scale changes.**

Real gross domestic income rates of growth per capita in the Czech Republic belong in the present decade to the fastest in the central European region.[5] In the years 2001–2004 this indicator grew at an average annual rate of 4.2 % (calculation from published data of the Czech Statistical Office relating to RGDI development and population

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[5] Indicators of GDP per capita, which measure the economic level and the progress of convergence, differ in different directions from overall GDP rates of growth in individual countries. The deviation is however only of the order of a few tenths of percent of annual average.

count). NMS–5 are currently not publishing data on RGDI. It can however be calculated according to data in National Accounts, published by EUROSTAT. According to author's calculations of the RGDI per capita using the formula of ESA 95 (based on equation 2 and 3 above),[6] the Czech economic growth is the most dynamic (see Table 5). In popular imagination, arising only from knowledge of GDP growth rates, it is in fact fixed as one of the slowest.

Table 5: Real gross domestic income and GDP per capita rates of growth in NMS-5 countries in 2001-2004 (Average annual rates in %)

	RGDI per cap.	GDP per cap.
Czech Republic	4,2	3,1
Hungary	4,0	3,9
Slovakia	4,0	4,7
Slovenia	3,7	3,2
Poland	2,5	2,9

Source: European Commission (2005), EUROSTAT, National Accounts, author's calculations.

Apart from objective processes, an influence on the different growth rates of real GDP in individual countries may also be made by differential "statistical quality" of price indices, which local statistical offices use to express production and services in constant prices. In view of the differential "strictness" of statistics, price indices either overvalue the level of inflation and thus undervalue economic growth, or conversely do not catch the full measure of inflation and thus increase fictitious real GDP growth indices.

This distortion is however difficult to estimate. Often Often it shows itself in the disparity between the reported rates of GDP growth and the development of real convergence, evaluated in purchasing power parity (see statistical paradoxes below). The transition to a chaining method on recalculating to constant prices to a large measure eliminates the distorting effect of "obsolete" constant prices, the so-called Gerschenkron effect, given the negative correlation between prices and the volume of production.[7] Czech statistics converted to this more sophisticated method among the first central European NMS, whilst the statistical offices of the other countries are still preparing for this step. This fact makes comparison more difficult with states who have until now been using constant prices from a long time ago (usually from 1995).

3. **Rates of GDP Growth and the Progress of Real Convergence**

Higher rates of GDP growth at constant prices (calculated per capita) are normally used as proof that lagging countries are approaching the economic level of more developed countries. However even for this purpose the dynamic of the real GDP indicator is not always authoritative. Resulting progress in approaching economic levels does not have to agree with that which is signalled by GDP growth rates.

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[6] The time series on export and import deflators for individual countries are drawn from the European Commission (2005), data on the volume of exports and imports, so as of GDP from the national accounts of relevant countries, published by EUROSTAT.

[7] This problem is generally known as "Index number relativity" and is intuitively explained as a negative correlation between volume growth of production in individual sectors and the development of their relative prices. In economic and statistical literature this problem is called the Gerschenkron effect after the economist who, shortly after WWII, analysed the development of soviet industrial production.

In comparisons of economic levels of different countries gross domestic product per capita in purchasing power parity is used in order to exclude price level differences. The purchasing power parity is an artificial international currency unit, drawn usually from the average price level in the group of countries under comparison, like PPS (Purchasing Power Standard) for European Union countries, giving the average price level in the EU-25 based on the EUR or for comparisons made within the framework of the OECD there is the 'international dollar', which records the average price level in the current 30 OECD countries.

In economic practice it is possible to find a paradoxical situation where a lead is demonstrated in GDP growth at constant domestic prices but the economic level of the given country does not approach that of the compared economies. Below a famous paradox will be shown from the period of the existence of centrally planned economies (CPE) as will a new (and as yet in literature unexplored) paradox, which can be observed during a comparison of the Slovak economy with its central European neighbours.

3.1 The statistical paradox of centrally planned economies

Centrally planned economies showed an unusually quick real GDP growth rate, however they did not approach the economic level of developed market economies but on the contrary distanced them. The long-term separation from the development of the more developed economies led to a worsening of the quality of goods and services (in the aforementioned wider sense of the word), which was not caught by the inflation indices and showed itself fictitiously as real GDP growth. In socialist Czechoslovakia this discrepancy showed itself very clearly. It is possible to illustrate this in a comparison with Austria. The reported Czechoslovak national income per capita grew in comparison with its level before the Second World War significantly more than in Austria (see Table 6).[8]

Table 6: Growth indices of national income and gross domestic product in Czechoslovakia and Austria between 1937 and 1990

	Total	Per capita
Czechoslovakia (NI)	6.9	6.3
Austria (GDP)	5.8	5.1

Source: Calculation on basis of FSÚ (1985), p. 871, connected statistical yearbooks of ČSFR and statistical yearbook of Austria.

The reported lead in economic growth rates however does not correspond to the development of economic level expressed as GDP per capita in purchasing power parity. Whereas before the start of the World War II the economic level of

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[8] For Czechoslovakia an index of national income is available, which is not quite comparable to the GDP index for Austria. However it is possible to show, on measuring the comparable GDP indicator that during the period of central planning in Czechoslovakia an even higher growth would be reported, especially given the growing share of services, which were not included in the national income.
(The total share of services in the number of employed persons in the national economy increased in Czechoslovakia between 1948 and 1990 from 23 % to 41 %.) A smaller influence was also a growing share in fixed capital consumption, which was not included in NI indicators. Higher GDP growth than NI also confirm data from 1986 to 1990 when Czechoslovakian statistics recorded both indicators simultaneously. Average annual NI growth in this period was 1.2 % while GDP increased on average by 1.7% annually.

Czechoslovakia according to existing estimates was slightly higher than that of Austria,[9] in the post-war period it gradually decreased in relation to its southern neighbour (see Table 7).

Table 7: GDP per capita in purchasing power parity in Czechoslovakia (Austria = 100)

1937[1]	1970[2]	1985[2]	1990[3]
> 100	98	83	50

Source: [1] Estimates (see note 9); [2] Heston, Summers (1988); [3] ECP 1990 acc. Auer, Müller (1993).

Even if we take into account the marked undervaluing of data from 1990, given the methodical differences of individual projects of International and the European comparison programmes ICP and ECP, the fall in position of Czechoslovakia in economic level against Austria and other economically developed western economies in the 70s and 80s was beyond question (see Figure 1).[10]

Figure 1: GDP per capita in PPP in Czechoslovakia and chosen developed market economies (1970 and 1985) (1000s constant I$ from 1980)
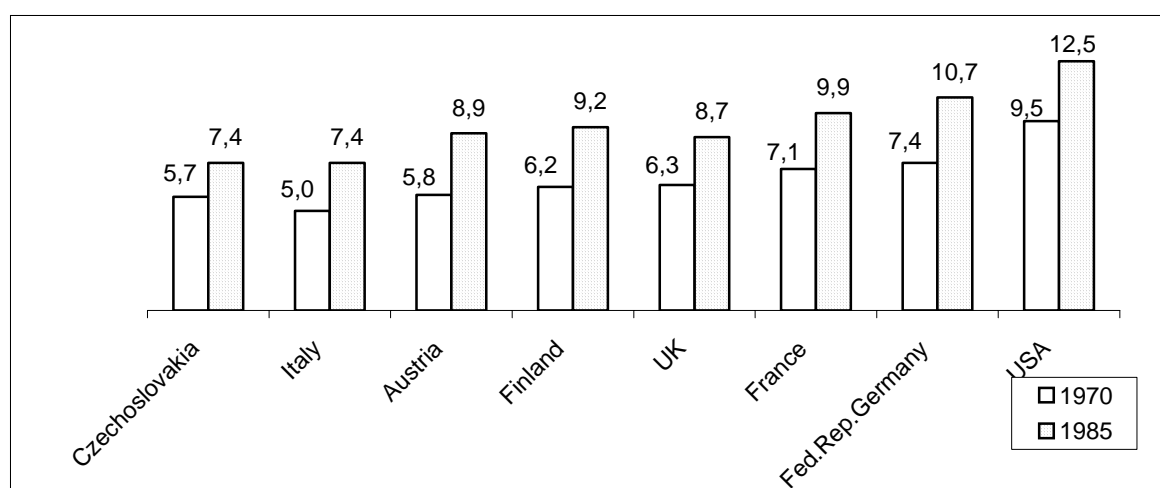
Note: I$ = International dollar, derived from average price levels in comparison countries.
Source: see Table 7.

In 1985 the international position compared to 1970 significantly worsened in relation to all countries with the exception of the slowly growing Switzerland. In comparison with Austria it fell by 15 percentage points (from 98 % to 83 %), with Finland by 13

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[9] The economic development of interwar Austria was less favourable than in Czechoslovakia, so on the eve of WWII the economic level of Czechoslovakia was already higher, according to a variety of different estimates. In older data averaged over the years 1925-1934 (according to calculations by C. Clark) national income per capita in Czechoslovakia is shown as $455 (for the Czech lands it was roughly $550), in Austria $511 (recalculated to a USA price base) (cf. Kubů, Pátek et al., 2000).

[10] GDP at purchasing power parity in the period of central planning is not directly available, because Czechoslovakia was not connected even to the international projects in which other Comecon countries participated in the 80s. Foreign experts quoted in Table 7 estimated using an indirect method that GDP per capita in Czechoslovakia in 1985 stood, at 1980 prices, at I$ 7,424 (I$ = international dollar, calculated on the basis of purchasing power parity within the framework of the participating countries). Thus indirectly derived data tend to be found on the upper margins. The distortion upwards may have been caused among other things by the lower share of services in Czechoslovakia when compared to other countries. (The economic level was estimated from the relationship of used national income per capita in the Comecon countries, in whose formation a greater part of services was not counted.)

percentage points and with Italy by 14 percentage points. It was still however always possible to talk of the Czechoslovak economy as being developed not only in its relationship with eastern European countries but also in its relationship with the market economies of the European south. (In the year in question its per capita GDP in purchasing power parity was similar to that of Italy.)

In economic analyses of the 1980s, published by western experts, the problem of overvalued volume indexes in CPE was known about. Its origins were identified from several different viewpoints, e.g. in the work of P. Marer from the World Bank group of economists.[11] The overall conclusion resulting from this work is that price regulation in CPE does not give an adequate "weight" to individual parts of aggregate product, because their relative price does not equal relative marginal cost. Deviations from this exist in market economies too, but in CPE they are much more noticeable.

This problem is greater the more volume growth indices of individual production components differ from each other and the more the range of price distortion correlates with growth in the volume indices. (Prices of products, whose market share rapidly increases, sharply fall, whereas prices of traditional products, whose market share falls, stagnate or grow.) In CPE inordinately high "weight" was systematically bound to rapidly growing economic sectors.

From a statistical point of view this problem was regarded as a failure of the methods in use from the existence of many accounting inaccuracies, which systematically distorted volume indexes. The motivation of lead workers in companies to fulfil a production plan led to artificial upwards distortion of value added volume indices. This led to an "on-paper" reporting of gross production on the basis of much and varied manipulation of numbers, whereas the reporting of intermediate consumption, which when calculating value added using the production method is subtracted from gross production, was not so much affected by these distorting influences. For example with new products high introductory "prototype" prices were used. With this, upon later-implemented serial production, price deflators were lowered and reported volume growth of gross production at constant prices was raised.

In CPE "obsolescence" of constant prices acted more intensively than in market economies. The older the basic year taken to be the basis of constant prices, the more these prices tend to show higher production growth. On sharp structural changes, which took place in post-war CPE, constant prices became very quickly obsolescent

The measurement of qualitative changes is a general problem in all economies. In CPE however, interest in fulfilling production quotas led to larger distortion. On confronting the results of different calculation methods marked differences between individual countries were established. Among the least distorted after the reforms of 1968 lay the volume production indices in Hungary, where businesses were not valued according to production growth, but according to increased profit. Czechoslovakia belonged, in the framework of CPE countries, among those countries with an average distortion.[12]

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[11] Marer, 1985, pp. 168-171.
[12] This conclusion applies as much when comparing official indices with those indices gained using Adjusted Factor Cost Approach as with indices constructed on the basis of physical indicators. The biggest distortion of official indices occurred in Romania, and this using both methods. The Adjusted Factor Cost Approach also shows large differences in Bulgaria. (cf. Marer, 1985, pp. 184-188).

Direct comparison of the economic level of Czechoslovakia and other Central European countries with developed market economies at the start of the transformation showed altogether different results from estimates made during the central planning period. The economic level of previous Comecon countries, measured by purchasing power parity, fell in relation to Western European economies (see Table 8).

Table 8: GDP per capita and comparative price level in central European transition countries in 1990 in comparison to Austria

	000s ATS–I[1]		Austria = 100		CPL[2]
	Parity	Exchange Rate	Parity	Exchange Rate	in %
Austria	232.4	232.4	100.0	100.0	100.0
Czechoslovakia	115.7	32.6	49.8	14.0	28.2
Hungary	88.2	33.6	38.0	14.4	38.1
Poland	71.0	19.1	30.5	8.2	26.9

[1] International Schilling, currency unit on comparing purchasing power parity in the stated ECP project in the 2nd country group (I = International).
[2] CPL, Comparative Price Level.
Source: ECP 1990. Auer, Müller (1993).

The fall of the economic level of Czechoslovakia in relation to Austria[13] from an estimated 83 % in 1985 to 50 % in 1990 is drastic and cannot only be interpreted as a characteristic of the movement of "physical volumes" of GDP. What this means is a real inequality of product in different social conditions. The structure and qualitative parameters of GDP have fundamentally changed.

In the central planning period the total product of Czechoslovakia and other Eastern Bloc countries was used predominantly in isolated domestic zones or was exchanged within the framework of the autarchic society of Comecon. Exchange with other world economies played only a limited part. The structure of production and its evaluation corresponded to this. Individual products and services satisfied existing demand in the given environment and there was full-value pricing. In the more demanding environment of developed economies these products would have been only marginally exchangeable or completely invalid as was later demonstrated on the fall of the eastern markets.

1990 was a watershed year when previous economic relationships collapsed. In the disintegrating Comecon societies sharp structural shifts began. Requirements of quality and composition of general product in domestic as well as foreign demand radically changed. In that year the central European countries under comparison had already begun to experience a transformation crisis. GDP fell most markedly in Poland, while in Czechoslovakia and Hungary a deeper fall, of 16 % and 12 % respectively, took place in 1991.

For the first time in methodical approaches there was a direct comparison of products and services in developed western economies and countries of the disintegrating eastern bloc

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[13] This concerns the results of the ECP'90 project, in which Czechoslovakia directly participated for the first time. Together with other transition countries it was placed in the 2nd group of countries in which Austria held the central position against which individual countries compared themselves bilaterally. (Multilateral comparisons were not conducted in this group, however Austria was multilaterally compared with other companies in group 1.)

during which different qualitative parameters were taken account of by a specific method. Corrections were made for example in the case of differing quality of public services. The volume of these services calculated using the cost approach was, in the transition countries, additionally lowered to show their lower productivity. In later programmes from 1996 these corrections fell away. Retropolation of data after these changes raised the GDP level in purchasing power parity in the Czech Republic in the starting year 1990 by 5 to 6 percentage points against the original results of the older projects.[14] (A methodical revision in 2004 had a similar result during which a variety of previously excluded items were included in the GDP of the new member states.)

Simple, less-sophisticated products of CPE were valued more favourably in the older than in the direct, detailed comparison of the new project, where the value of individual representatives and "weights" of individual groups on aggregation of production were determined by purchasing power parity discovered in the framework of the (mainly economically developed) comparison countries. On using international prices of this type it is necessary to take into account that they reflect the price relations of "rich" countries. These differ more from the price relation of "poorer" transition countries the more the economic level of these poorer countries is lower than the average for the compared whole.

After the fall of the eastern markets and the change to market economics the structure of domestic and foreign demand fundamentally changed. A more exacting demand grew up for quality, technical level, wider variety, fashion-consciousness and diversity of the market, to which the structure of production gradually adapted. **What is being compared, therefore, is a product of an altogether different structure and quality,** which is, de facto, only of limited comparability. In this is rooted the main problem of measuring economic level and the occurrence of a statistical paradox.

An even bigger divergence showed itself on measurement of GDP by exchange rate. The comparison of real and nominal convergence is interesting in this context because it characterises the width of the division between exchange rate and purchasing power parity in the period of real socialism in individual countries. From Table 8 a far greater deviation of exchange rate from purchasing power parity is apparent in Czechoslovakia than in Hungary. The ERDI coefficient[15] in their relationship with Austria in 1990 was 3.5 in Czechoslovakia whilst only 2.6 in Hungary. This was in greater part a consequence of the consciously more drastic devaluation of the crown than the forint at the start of the transformation. However the different long-term development in the post-war period also had a definite influence.

An examination of the statistical paradox from the central-planning period makes sense in order to understand present processes. The question arises whether the statistical paradox is not turning around and if there is not a gradual improvement in quality taking place in the widest sense, which real GDP indices do not sufficiently reflect. In such a case it can, even at slower rates of per capita GDP growth measured in constant domestic prices, lead to a faster attainment of the economic level of developed countries. "Domestic" price indices in themselves under those conditions hide changes

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[14] Schreyer, Koechlin, 2002, p. 16.

[15] ERDI (Exchange rate deviation index) is a reciprocal value of the comparative price level (CPL). It is calculated as a relation between purchasing power parity and exchange rate for the total GDP or for individual groups of expenditures (household consumption, gross fixed capital formation etc.).

of quality, which are in inflation differentials fictively shown as inflation. **A favourable development in terms of trade in the Czech economy, accompanied by a long-term real appreciation of the crown, does suggest a turnaround of the paradox.** Nominal and also real convergence may in this case occur quicker than it appears to according to GDP rates of growth.

3.2 The new "Central European" paradox

In data about the development of the economic level of central European countries in the transformation period it is possible to observe a new paradox. The reported lead in rates of GDP growth at constant domestic prices in Slovakia are not reflected in an adequate way in its economic level convergence with neighbouring countries. Per capita GDP growth rates, measured at constant domestic prices were, for the whole transformation period, faster in Slovakia than in the Czech Republic and were, almost curiously, at the same speed as in Hungary and Poland (see Table 9).

Figure 2: GDP per capita in Slovakia relative to Czech Republic, Hungary and Poland
(in %, current purchasing power parity)
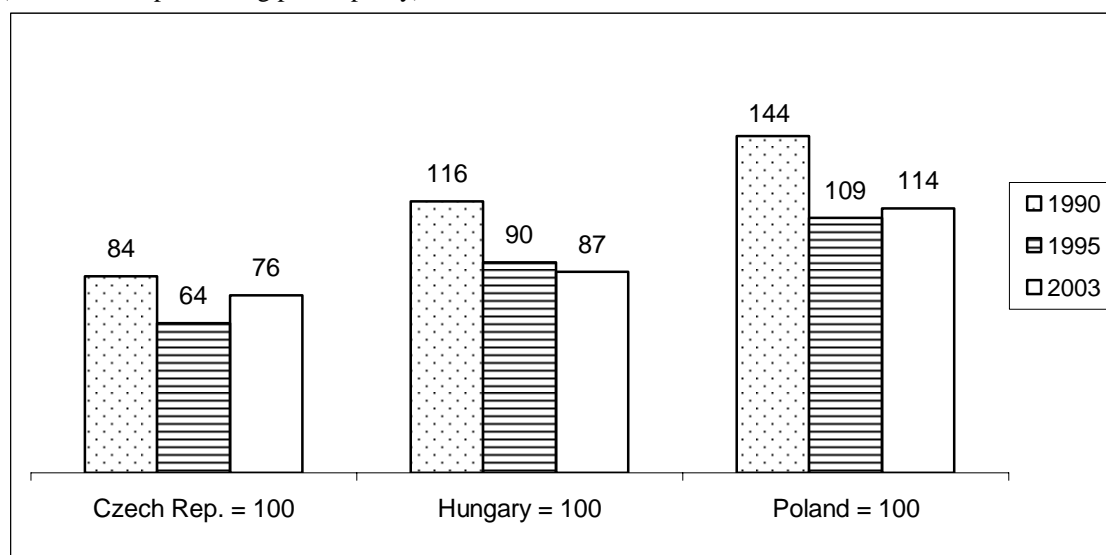
Source: ECP´90. Eurostat, Structural Indicators.

Contrary to the reported quicker or identical rates of economic growth the economic level of Slovakia did not get closer to its post communist neighbours compared with the basic year of transformation, or it did not maintain its achieved position but on the contrary distanced itself (in particular it lost part of its leading position to Poland). Whereas in 1990 Slovakian GDP per capita at purchasing power parity was above the level of that of Hungary (116 %), at present it is strongly below it (87 %), in relation to the Czech Republic it fell from 84 % to 76 % and its lead over Poland was lowered from 144 % to 114 % (see Figure 2).[16] **The fall in economic level of Slovakia relative to**

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[16] Comparability of data over the long term presents a certain problem here. For 1990 data is calculated for Czechoslovakia and other transition countries according to the ECP'90 project (comparison with Austria in international Schillings – see source from Table 8). Data for Czechoslovakian Federal Republic (ČSFR) were divided into Czech Rep. and Slovakia according to the relationship of GDP per capita in CSK, published in Czechoslovak statistical yearbook (cf. FSÚ, ČSÚ and SŠÚ, 1992). The years 1995 and 2003 in PPS are taken from EUROSTAT, Structural Indicators (2005), and author's adjustment. Between ECP for 1990 and ECP for 2003 several methodical corrections and revisions took place. These

its neighbour countries relates above all to the first half of the 90s. Later though the rate of decline with regard to Hungary lessened and with regard to the Czech Republic and Poland led to a partial return towards its starting position.

Table 9: GDP growth index per capita (in % of constant prices)

	2003/1990[1]	2003/1995[2]
Czech Republic	113.2	117.7
Slovakia	122.7	134.7
Hungary	122.4	137.6
Poland	122.5	138.1

Source: [1] EUROSTAT, Structural Indicators and national yearbooks, author's adjustment;
        [2] EUROSTAT, Structural Indicators, author's adjustment.

Adaptation of the Slovakian economy after the split of Czechoslovakia

Analysis of the real convergence of Slovakia in its relationship with its neighbours is complicated because the transformation processes over time mingled with the consequences of the split of Czechoslovakia. Slovakia lost earlier-relocated resources from the Czech lands, which represented 11 % of its GDP (the Czech Republic on the other hand released resources worth 4 % of its GDP, which it was possible to use in its domestic economy after the split of the common state).[17] Even if here we compare the formation of GDP and not domestic GDP use, which after the loss of the relocation apparently fell, the consequences of the split of the unified state showed themselves in formation of resources, too.

The separation of the Slovak economy called for an adaptation of prices, wages and also overall private and public consumption and of investment to the existing lower labour productivity. The range of this conversion was marked, because before the split of Czechoslovakia Slovakian GDP per employed person was at 88 % of the level in the Czech Republic, whereas average wages were almost identical to Czech average wages (reaching 97 %). In such a relation it was not possible in the independent state to continue without losses of competitiveness in the international market.

Maintaining competitiveness required harmonising of basic macroeconomic parameters, e.g. above all a reduction in the level of wages and finally even private and public consumption in relation to the neighbour countries, to allow reduction of relative prices of goods and services in international trade. The devaluation of the Slovak crown

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however related to all the comparison countries here in more or less the same measure. It is therefore possible to imagine then that their reciprocal relations are not to any extent distorted after these revisions. Over such a long term it is problematic to use the method of retropolation according to GDP rates of growth per capita at constant purchasing power parity, because such an approach clouds the contradiction under investigation, namely that between real domestic GDP growth rates and the development of relations of economic level at current purchasing power parity. For example on such retropolation by the OECD the relation of the economic level of Slovakia to the Czech Rep., measured in per capita GDP at purchasing power parity for 1992, emerged at 64 % (cf. OECD, 2005b). This strongly contradicts direct calculations carried out by FSÚ at the beginning of the 90s expressed in crowns – during the existence of a common currency and identical price levels in both republics of the united state. "Crown" comparisons, reflecting real division of incomes, showed the relation of the economic level of Slovakia to the Czech Rep. to be 76 %.

[17] Calculation on the basis of data from national economic balance, published in the Historic FSÚ yearbook and in the linked statistical yearbooks of FSÚ, ČSÚ and ŠSÚ (FSÚ, 1985, FSÚ, ČSÚ, ŠSÚ, 1992).

significantly helped with price competitiveness in the external market. Undercutting by means of a low exchange rate of course has its consequences in the form of non-returnable losses of real income upon worsening terms of trade.

Changes in macroeconomic parameters are possible to document in the relationship of main GDP expenditure components in the relationship to the Czech economy. The relationship of the level of households' consumption per capita significantly fell, as did the relation in the level of investment (see Figure 3). In 1990 the volume of investments calculated per capita in Slovakia was higher than in the Czech Republic, although in 2002 it only reached two thirds of the Czech level. There was a fall in the level in the relationship to the Czech Republic despite the exceptionally high investment-to-GDP ratio, which, in Slovakia during the transformation period, overtook the European average and was the highest within the framework of the transitive countries.

Figure 3: Relationship of Slovakia to Czech Republic in consumption and investment per capita in 1990 and 2002 (current prices and current parity, Czech Rep. = 100)
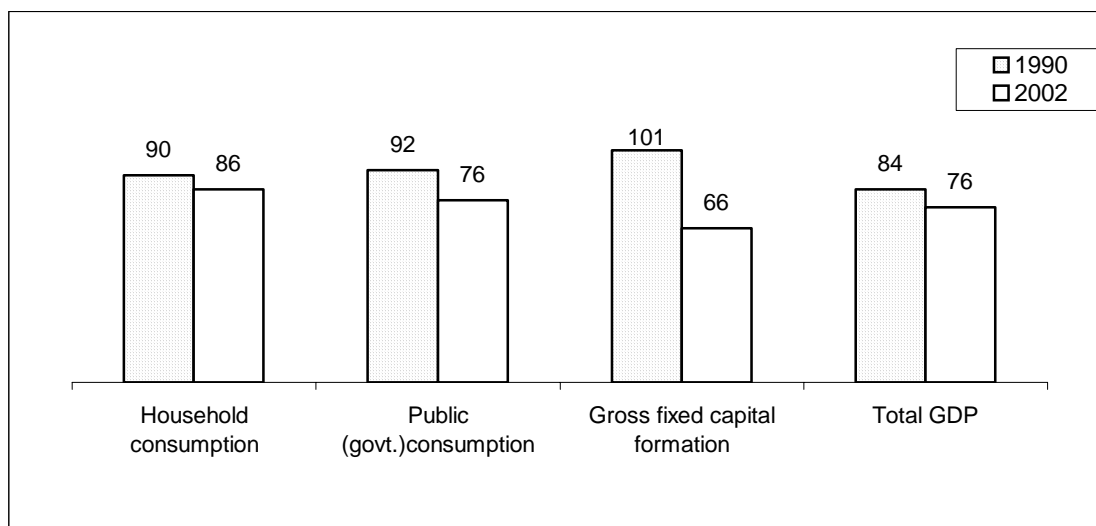
Note: 1990 from crowns (CSK), 2002 from PPS, acc. ECP'2004.
Source: Author's calculations based on FSÚ, ČSÚ and ŠSÚ (1992) and OECD - EUROSTAT (2004).

The deepest fall occurred in the level of average wages. Before the split of Czechoslovakia, Slovakian and Czech wages belonged among the highest within the central European transition countries. Slovakian wages were a mere 3 % lower than their Czech counterparts. **At present Slovakian wages (exchange rate adjusted) are the lowest in the central European zone** and with the exception of Latvia and Lithuania are the lowest within the framework of the whole EU–25. In comparison with Czech wages they nominally reach just under two thirds (346 Euros against 531 Euros in 2003). In comparison with neighbouring "old" EU member states, Slovakian wages only represent a fraction (see Table 10).

Lowering the nominal wages level in relation to neighbouring countries was achieved by a combination of slow nominal wages growth with exchange rate depreciation. The gap in real wages is due to the lower price level of Slovakia a little less than that of nominal wages. In relation to the Czech Republic real wages in 2003 fell from the previous almost identical level to 72 % (measured by purchasing power parity). A

similar fall took place in relation to other central European countries and also even relative to Poland, which has a lower economic level than Slovakia.

Table 9: Average gross monthly wages in NMS–8 countries in 2003 in comparison with Austria

	Exchange rate adjusted		In purchasing power parity	
	EUR	Austria = 100	EUR	Austria = 100
Czech Republic	531	21	994	43
Hungary	541	22	968	41
Poland	497	20	1006	43
Slovakia	346	14	719	31
Slovenia	1 083	43	1443	62
Estonia	430	17	751	32
Lithuania	298	12	620	27
Latvia	311	12	645	28
Austria	2 499	100	2337	100

Source: Havlik, Podkaminer, Gligorov et al. (2005), pp. 115–119, author's adjustment.

Where is Slovakian GDP losing itself?

The answer to the question of where the Slovakian GDP is getting lost can in part be found in the **consequences of market disintegration.** After the split of the federal state it was important to change over production, previously traded at regulated "cost" prices irrespective of the differences in labour productivity, to a foreign market. In the foreign marketplace foreign market prices applied, taking competition into account. In order to gain a market it was important for prices to accommodate to a lower productivity and important at the same time to undercut by a lower exchange rate in order to become established in the new markets. On the contrary on importing Slovakia was purchasing several times more expensive than it did previously on the domestic market with a lower price level.

The Slovak crown after the separation of the currencies lost value in its relationship to the Czech crown and in 2003 the relation was 77 CZK/100 SKK. Depreciation led to price undercutting, on which there was a worsening of terms of trade. Whereas **terms of trade in the Czech Republic in 2004 improved against 1992 by 28.3 %, in Slovakia on the contrary they worsened by 7.7 %.** On a great export-to-GDP ratio in both countries (in the Czech Republic at present around 70 % GDP, in Slovakia almost 80 %) different developments in T/T led to a different real income dynamic, determining the possibility of domestic GDP use. **Czech real income grew significantly more quickly than GDP, whereas the Slovakian in contrast grew markedly slower.**

Due to the slower growth of real gross domestic income than GDP in Slovakia, it was important to ensure lower growth of consumption and investment than GDP, in order that the external economic balance did not worsen. **The Slovakian economy shows a rapid GDP growth, a significant part of which however on foreign trade loses itself in gradually worsening terms of trade.**

From the end of the 90s the convergence of the Slovakian economic level with the Czech corresponds more to the demonstrated lead in GDP rates of growth. In the years 2001–2004 GDP per capita in purchasing power parity approached the level of that of the Czech Republic at an annual average of 0.1 percentage points (from 73,9 % in 2000

to 74,3 % in 2004). However, the Czech real gross domestic income per capita growth in 2001-2004 was faster than Slovakian one (see Table 6).

Slovakia improved its position in labour productivity. If immediately after the split of the federal state in 1992 GDP per employed person in Slovakia was indeed 11 % lower (in crowns), in 2003 it was, expressed in PPS, only lower by 5 % (i.e. by only 3 percentage points compared to EU-25 - see Table 11).

Table 11: Labour productivity and unit labour costs (ULC) in NMS–8 relative to EU–15 in 2003

	GDP per employed person EU–15 = 100[1]	Aggregate ULC[2]	
		on GDP unit EUR/PPS	EU–15 = 100
Czech Republic	58	0.30	46
Hungary	63	0.30	45
Poland	54	0.28	46
Slovakia	55	0.22	33
Slovenia	70	0.46	70
Estonia	45	0.30	45
Lithuania	39	0.22	33
Latvia	44	0.24	36

Note: Labour productivity measured by gross domestic product per *employed person* in PPS, labour costs calculated according to compensation of employees for each *employee* (shown in the statistics of the national accounts), exchange rate adjusted.
Source: [1] EUROSTAT (2005), Structural Indicators, author's adjustment;
[2] EUROSTAT (2004), Statistics in Focus, author's adjustment.

The consequences of the split of the common state have apparently already been overcome and the Slovakian economy has adapted to the new situation. However **it will take at least another decade before it even returns to the position, which it held relative to the Czech Republic in 1990** (i.e. 84 % of economic level). Full convergence of the economic (and thus also wage) levels of Slovakia in the foreseeable future is not possible to imagine. It is necessary to take this into account when estimating population migration flows from the east to the west in the framework of the former single state.

The Slovak economy has changed, thanks to low wages, into a **highly price-competitive economy** with the lowest unit labour costs in the framework of the EU (see Table 11). Here we have a typical "**low cost economy**". To compete under these conditions by analogically reducing wage (and tax) levels is not a realistic alternative for the Czech Republic. Here a greater importance is put on orientation towards non-price (qualitative) competitiveness.

4. Real Currency Appreciation and Price Level Convergence

Real gross domestic income which detects the influence of changes in terms of trade, expresses the influence of qualitative changes better than GDP, if only however in the part of the product undergoing foreign exchange. Overall the long term tendency towards improving or worsening of quality in the wide sense projects itself in real appreciation or depreciation of currency, which manifests itself in a quicker or slower advance of nominal convergence, measured as exchange rate adjusted GDP per capita.

Real currency appreciation occurs in two channels: on the basis of a positive inflation differential and of a strengthening of the nominal exchange rate. It appears in a convergence of relative price levels (CPL) towards the average for the EU–25 countries. It operates simultaneously with real convergence however due to the different economic policies of individual countries, both processes may continue at different speeds.

The Czech price level of total GDP in 2003 reached almost 54 % of the EU–25 countries and **approached the price level of the EU fastest of the central European transition countries.** Between 1995 and 2003 it increased with respect to the EU–25 by more than 15 percentage points. In a long-term development from 1990 there is a convergence of price levels to the average of that of the developed "old" member states of the EU in all transition countries, however to different extents. Of the comparison NMS–4 countries, Hungary was and remains the closest to the average price level of the EU countries. Price levels of total GDP in Czechoslovakia, Hungary and Poland were very different in the basic year of the transformation, and the Hungarian price level especially was more than a third higher than that of Czechoslovakia thanks to a less undervalued forint.[18] During the transformation there was a convergence of price levels of the Czech Republic with those of Hungary, whilst price levels in Slovakia and Poland with respect to these two economically more developed countries fell, and those with respect to the Czech Republic to a level around 91 % (see Table 12).

Table 11: Development of comparative GDP price levels (CPL) in NMS–4 (in PPS[1)], current parity)

Country	EU–25 = 100			Czech Rep. = 100
	1995	2003	Increase in %	2003
Czech Republic	38.3	53.7	15.4	100.0
Slovakia	41.2	48.6	7.4	90.5
Hungary	43.4	55.8	12.4	103.9
Poland	43.5	49.0	5.5	91.2

[1)] PPS = Purchasing Power Standard, purchasing power parity based on Euro, average of prices in EU–25.
Source: EUROSTAT, National accounts, May 2005.

Real appreciation of the crown is, alongside real convergence, which describes convergence of economic level, a further indicator of the increase in wealth of the Czech economy, because it occurs when there is a non-worsening foreign trade balance in goods and services.[19]

5. Domestic Product versus National Income

The indicator of gross domestic product has a further weakness, which on analysis of the reality of the Czech economy is starting to gain significance. It characterises the formation of product on the territory of a given state and does not register the division of incomes between the domestic economy and the world. Redeployments occur in the movement of primary incomes – wages of foreign workers and profits of foreign entrepreneurs – to and from abroad. Growing integration on free movement of capital and partly of workforce strengthens the significance of this factor. Under the influence

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[18] Author's calculation based on ECP´90 (cf. Auer, Müller, 1993).
[19] Some authors (e.g. Singer, 2005, p. 7) propose an alternative "euro" indicator of economic growth, where they recommend recalculation of GDP with a nominal Euro exchange rate and subsequent deflation of this indicator by average inflation in the Eurozone. This however confuses the indicators of real and nominal convergence.

of a great influx of foreign capital in the form of foreign direct investments a significant outflow of profits from the country happens at a certain level of their "maturity". Incomes are then utilised elsewhere than they are created.

The methodology of the national accounts reacted to this problem by also inserting, alongside "domestic" characteristics, the indicator of gross national income (GNI). The difference between GDP and GNI is relatively large in small, open economies. For example in Ireland, GNI achieves only 4/5 of the level of GDP and its rates of growth are markedly slower. The picture of the Irish economy on international comparison markedly changes with some knowledge of the redistributing processes. **If Ireland positions itself at 2nd place within the EU-25** (right after Luxembourg) **based on strength of GDP per capita at purchasing power parity, then based on GNI it moves down to 10th place,** which means that it only has a lead over countries of the "southern wing" and unified Germany. Within the thirty OECD countries it finds itself based on GDP at 4th place, however based on GNI it relegates to the second division, and as such to 17th place.[20]

In Czech professional circles the idea persists that the difference between the two indicators under local conditions is not substantial. This still applied about 10 years ago, and does not however today. At present the level of GNI in the Czech Republic is already 5 % lower than GDP. The outflow of profits of foreign owners together with the outflow of wages of foreign workers has lowered GNI rates of growth in comparison with GDP rates of growth in the last 5 years by 0.6 of a percentage point. Deeper analyses would reflect the development of this factor.

GNI better registers resources, which are at the disposal of the national economy and on whose magnitude depends final consumption and savings. In view of the fact that it better corresponds to the real financial resources of individual countries, GNI is taken as a basis for calculation of the contribution of member states to the budget of the European Union.

6. Conclusion

Analysis of the problems of the predictability of GDP and other related commonly used macroeconomic indicators does not have a merely technical or purely statistical character. What is important here are the analytical conclusions, which are drawn from such indicators, and also the consequences, which the misuse of such indicators may have on economic policy.

Neglecting the influence of the terms of trade on real income under Czech economic conditions significantly distorts contemplation of the development of the macroeconomic balance. For large economies with a wide-ranging internal market the differentiation of the development of real gross domestic income from that of GDP is not very interesting. It is not therefore a significant part of standard analytical approaches. In the Czech economy however a neglect of the differences in the development of GDP and RGDI could be reflected in inadequate measures in fiscal and monetary policy.

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[20] Data from 2003, quoted acc. OECD, 2005a.

If domestic demand, i.e. consumption and investment grows faster than GDP, then according to standard textbook knowledge such a configuration of macroeconomic indicators signals the threat of inflation or external economic misbalance. However, such an outcome will not arise as long as there exists a favourable development of terms of trade. Strict anti-inflationary monetary policy measures or over-restrictive fiscal policy would in such a case only pointlessly stifle economic growth.

For official institutions, answerable for fiscal and monetary policy – the ministry of Finance and the Central Bank – the dynamic of GDP at constant prices is a starting point for prediction and contemplation of economic policy. This approach is usual and professional institutions in other countries behave in this fashion as a standard procedure. The Czech specific however calls for a more sophisticated approach, to which local institutions are beginning gradually to pay attention.

However as is shown by discussions in economic publications,[21] where expert economic analysts present their opinions and approaches, knowledge of alternative indicators of the national account, which allow more sophisticated analysis, is not at all common. At the same time it must be added that the Czech Statistical Office was among the first of the new member states to start to publish these indicators and that they are thus readily accessible for analysts.

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[21] cf. Benáček, 2004, Kubíček, Tomšík, 2004a and 2004b.

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