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Foreign Controlled Companies in the Czech Economy

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Abstract

The article analyzes influx of foreign direct investment into the Czech Republic from the territorial point of view and partly from the perspective of receiving branches. However, it is primarily focused on impacts of this influx, i.e. creation of an institutional sub-sector of foreign controlled companies. They operate mainly in the sector of non-financial corporations and dominate in sector of financial institutions in the Czech Republic. This analysis is concentrated on the weight of foreign controlled companies on the performance and income characteristics of these two sectors and Czech economy as a whole, as well. Development of output, intermediate consumption and gross value added is used for non-financial foreign controlled companies as the performance characteristics and then profits and paid-out wages as the income characteristics. Problem of taxes paid by these companies to the state budget is mentioned and development of their investment in fixed assets, as well. Financial foreign controlled companies are viewed in terms of their proportion of total assets, loans and deposits, capital and reserves and capital adequacy ratio. Finally, impact of foreign direct investment on employment and gross value added in branches of economy is analyzed and double-tracking in industry is identified. Conclusion summarizes benefits and negative effects of the foreign controlled companies in the Czech Republic within their existing presence in 1995–2009.

INTRODUCTION

The foreign direct investment in the Czech Republic in form of foreign controlled companies has become a significant factor of the Czech economy which accelerated its output and capacity to export. The weight of these companies markedly increased in the period 1995 to 2009 in terms of output and income characteristics and especially of achieved profits and productivity level. This study monitors, save for the introductory part aimed at the inflow of direct foreign investment to the Czech Republic, its structure and development in time, position of foreign controlled companies in the economy or in the relevant sector. From among foreign controlled companies we look at financial institutions focusing on banking sector and, in wider scope, also on non-financial corporations. The study also deals with the contribution of foreign controlled companies in the relevant branch to the gross value added and employment and to employment in economy. The last chapter provides the analysis of the role of foreign controlled

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companies in the Czech industry including their position in the achieved revenues, number of the employed, average wage, and other similar things.

Data sources and methodological solutions

- Foreign controlled companies are in the system of national accountancy an institutional sub-sector inside institutional sectors. The institutional sector of non-financial corporations includes national private non-financial corporations and public non-financial corporations. The companies are included into sub-sectors according to the prevailing ownership representation in the company registered capital.
- The analysis proceeded from annual national accounts, production accounts, accounts of income formation and accounts of secondary distribution of income. From among the data provided by the Czech National Bank the table data from publications dealing with direct foreign investment (up to 2009), data characterising the investment position against foreign countries and the data from quarterly balance of payment financial account were used.
- From among industrial branch statistics the data structured by NACE classification valid from the end of 2008 were available. Monitoring of foreign controlled companies in the industrial branch and, in more detailed structure in manufacturing by selected parameters used in this analysis will be gradually supplied by the Czech Statistical Office according to CZ NACE.
- The empirical analysis proceeds from the original impulse, i.e. the inflow of direct foreign investment to the Czech Republic, its transformation into output of foreign controlled companies and determination of its weight according to selected parameters for the totals of sectors and economy.

1 INFLOW OF DIRECT FOREIGN INVESTMENT INTO THE CZECH REPUBLIC

Direct foreign investment is usually connected with know-how transfers, uses of cost effects in target country for an investor. Most often it is related to cheaper labour force compared to the home country and also with material investment be it in valuation of the existing equipment of purchased companies or new investment.

The Czech Republic received, during its existence from 1993 to the end of September 2011 including period until 1st January 1993 when the Czechoslovak federation collapsed, the total of CZK 2 498.951 billion of direct foreign investment.[2] By the end of 2010 the investment inflow accounted for CZK 2 435.618 billion. The inflow of investment achieved two peaks during this period in terms of volume, i.e. in 2002 and 2005 when the annual inflow exceeded the level of a quarter of trillion.

At the beginning the inflow of capital was focused on manufacturing but soon direct investment into other branches of the Czech economy prevailed. A great interest of foreign investors to invest was recorded mainly at the beginning of previous decade and its peak came in 2000. This consequently showed not only in growing investment imports necessary to equip new purchased operations but naturally in growing investment activity in general (for more details see chapter 4 thereof). In the period around 2000 a huge increase of gross fixed capital formation was recorded in the Czech Republic.

Where the inflow of direct foreign investment in the Czech Republic in 1993–2000 accounted, on average, for CZK 57 billion per year and in 2001–2010 CZK 129.2 billion, during the period of mere four

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[2] This applies to the data provided by the Czech National Bank concerning the balance of payment statistics and data on investment position against foreign countries, available at: <http://www.cnb.cz/cs/statistika/platebni_bilance_stat/investicni_pozice/index.html>. The data are defined as preliminary data on direct foreign investment and are published quarterly within the term T+90 as data of investment position against foreign countries. This refers to total balances of direct foreign investment in the Czech Republic and domestic investment in abroad broken by registered capital (incl. re-invested profit) and other capital.

years, i.e. 1999–2002, the Czech economy received from abroad CZK 226 billion on average per year in form of direct investment.

Since 1998 practically until the pre-crisis year 2008 the inflow of direct foreign investment in the Czech Republic exceeded the level of a hundred billion crowns. The second culmination of this investment wave took place in 2005, i.e. the year following the accession to the European Union. Though the main inflow of direct investment arrived to the Czech Republic later than to Poland or Hungary, at the beginning of millennium it was, converted per capita, one of the biggest in the world and became an important stimulus of domestic economy.

While until 2002 the strength of direct investment into the Czech Republic was determined by European capital (Figure 1) and mainly from Germany, an exception was the period 1998–2000, when the Czech Republic received investment also from other west European countries, in the years following the accession to the European Union the Czech Republic welcome a massive inflow of capital from non-European countries. This can be explained by increasing attractiveness of the Czech Republic as a member country of EU 27, which for many conservative out-of-Europe investors had a reputation of a country with EU reliability, and, therefore, lower assumed risk.

Figure 1 Annual inflow of foreign direct investment to the Czech Republic roughly broken by area (in CZK million)
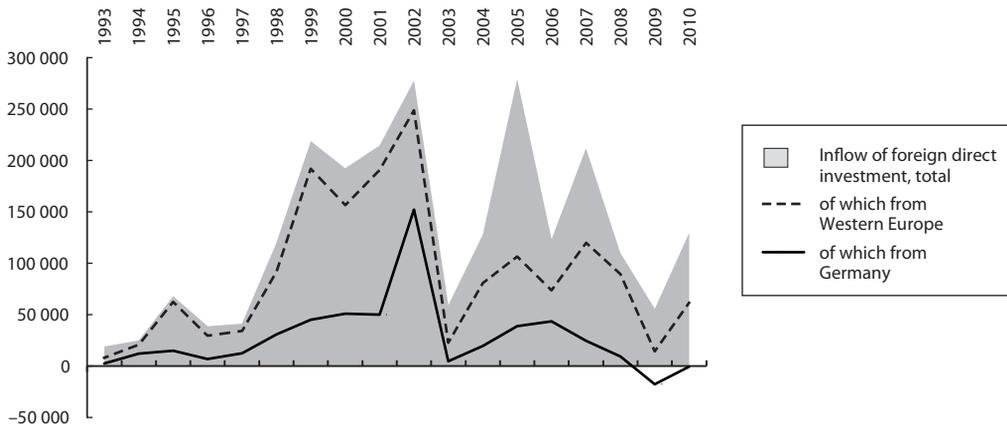
Source: Czech National Bank

1.1 Inflow of direct foreign investment from territorial and material aspect

It is convenient and beneficial for the Czech Republic, in respect of its geographic location, that it is situated in the territory near to the area of very high purchase ability. It is important mainly for its foreign trade. The capital flows show that in form of foreign investment the Czech Republic received capital from the nearest countries such as Germany and Austria. These two countries contributed by more than a quarter to the balance of direct border investment in the Czech Republic by the end of 2009.

Although it is generally accepted that the biggest direct investor to the Czech Republic is the Federal Republic of Germany, the German investors occupied the second place according to the recorded inflow of money by the balance of foreign direct investment in the Czech Republic by the end of 2009. The German investors transferred to the Czech Republic CZK 317.2 billion for the above period, mainly in form of equity capital (CZK 185.5 billion). Germen investors left in the Czech Republic CZK 134.4 billion in form of reinvested earnings.

The domain of German investors was, in terms of the amount of input capital, specifically the invest-ment into financial sector, trade and automobile industry. Direct German investment into retail-trade reached CZK 31.1 billion, along with the capital invested into the whole trade (CZK 24.2 billion) the trade branch thereby contributes by 17% to the inflow of direct investment into the Czech economy.

Despite this significant capital inflow into the Czech Republic, Germany occupies only the second place in the rating of countries. More than a double was the inflow from the Netherlands, in the amount of CZK 684.3 billion. Direct investment coming from Luxembourg (CZK 156.2 billion) was very signifi-cant, following Austria and occupying the forth place.

The Netherlands and Luxembourg were sought for as the registered office for companies whose capi-tal may not come from these countries at all. The reason is, as a rule, tax optimization and other specific conditions for business activities. If a company chooses as its registered office the country such as the Netherlands or Luxembourg and then invests in the Czech Republic, the capital inflow is understood to come from these countries.

Applying such approach, the Czech Republic received from the Netherlands the biggest amount of money to invest to electricity, gas, steam and air conditioning supply (CZK 127.5 billion) and also to manufacture of motor vehicles, trailers and semi-trailers (CZK 107 billion). Over CZK 65 billion flew to the management consultancy activities where there are also important re-invested profits in the amount of CZK 40 billion.

Figure 2 Annual inflow of foreign direct investment to the Czech Republic by industry (1993–2010, in CZK million)
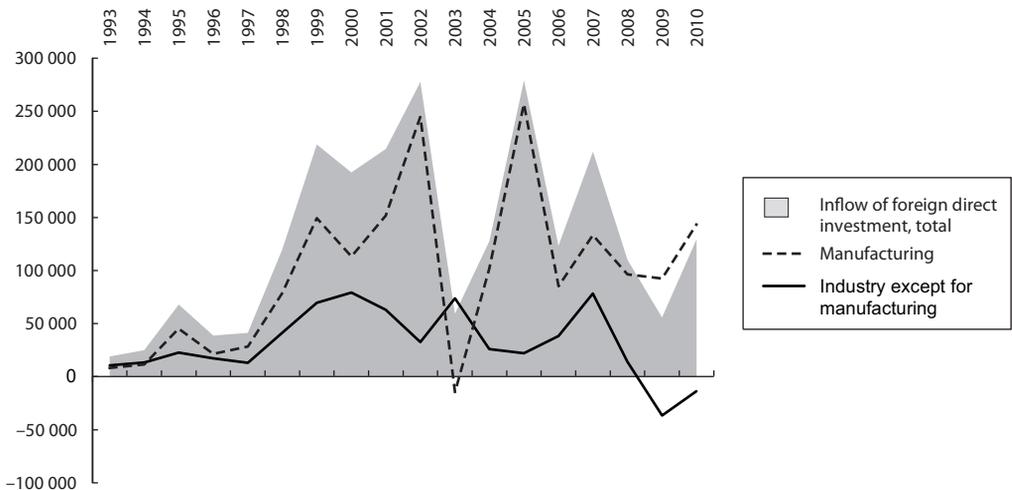
Source: Czech National Bank

In 2010 the Czech Republic received the biggest volume of direct investment from Austria (CZK 28.3 billion) especially in form of reinvested earnings (CZK 25.7 billion). In total, in 2010 the Czech Republic received CZK 129.5 billion of direct investment in which the reinvested earnings (CZK 82.6 billion) pre-vailed. Domination of reinvested earnings was apparent mainly for the group of old member-countries of the Union (EU 15).

The rest of the world except for Europe did not seek for the Czech Republic in 2010. It is attested to the fact that the recorded inflow of direct investment from the whole world in the amount of CZK 129.5 billion was lower than the inflow from European countries (CZK 133 billion). In this particular year the

outflow of foreign capital from the Czech Republic back to the countries of non-European direct investors took place.

Figure 3 Reinvested earnings in the Czech Republic by countries (end of 2009, in CZK billion)
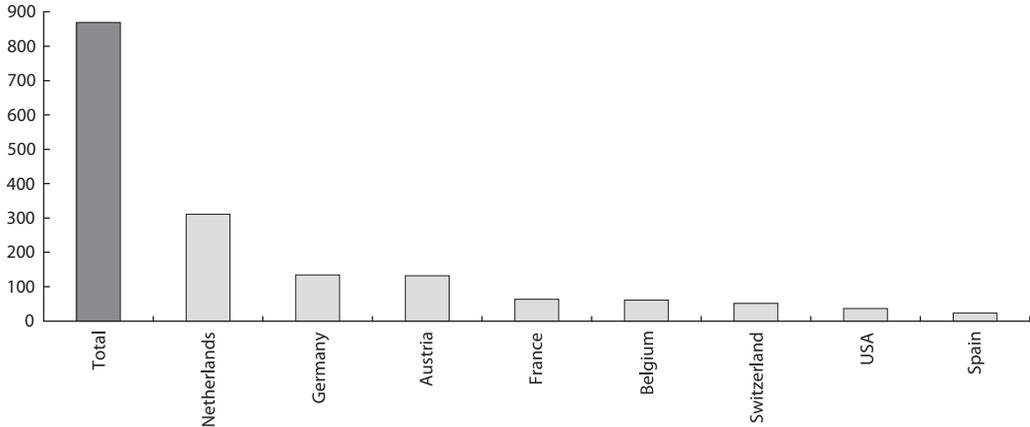
2 WEIGHT OF FOREIGN CONTROLLED COMPANIES IN THE CZECH ECONOMY

Foreign controlled companies form an important segment of the Czech economy which during 1995 to 2009 significantly strengthened its weight in production and gross value added of the whole sector of non-financial enterprises, in sector of financial institutions and in the economy as a whole. Its contributions to the outputs in economy showed multiplied increases and the same was recorded in contributions to income characteristics of their activities, i.e. achieved profits of paid-out wages.

In 1995 foreign controlled companies in the sector of financial institutions and non-financial corporations together contributed to the output parameters of the Czech economy ranging from 4% (in case of contribution to the net operation surplus and mixed income for economy) to 8.6% (in case of their contribution to intermediate consumption).

As early as then their contribution to profit in form of net operation surplus, i.e. profit of a "big" economy (mixed income is a characteristic feature recorded only for household sector where it is difficult to separate profit and wages in trader's activities) were significant. Contribution of foreign controlled companies to the net operation surplus in 1995 reached 8%.

The biggest strengthening of weight of foreign controlled companies took place in the Czech economy in 1995–2000 and especially in 1999 and 2000. Then the contributions in percentage from low bases recorded the biggest increase. This was due to the fact that in the latter half of the 90's the Czech Republic underwent monetary crisis and then it broke out from shallow recession. In 1999 it gained trust and still the assets offered for sale to foreign investors in form of attractive state shares in the biggest companies or those which they picked in other areas were cheap. This was an attraction for all investors. In addition to strong capital inputs into the financial sector the strong emergence of retail chains was observed in this period with the massive volume of the investment.

2.1 Contributions of foreign controlled companies to the outputs of economy

Foreign controlled companies between the years 1995–2000 increased their contribution to the production in economy from 7.3% to 23.3% and even more marked was the growth of their contribution to

intermediate consumption (from 8.6% to 27.2%). As early as then it pointed out higher rate of reprocessing characteristics of foreign direct investment in the Czech Republic (privatized by German capital was Škoda Mladá Boleslav as early as then).

This conclusion could proceed from the fact that the contribution of companies with prevailing foreign capital to the gross value added was substantially smaller than their contribution to intermediate consumption. In 2000 it exceeded a quarter (27.2%), while the contribution to the gross value added was only one sixth (15.3%). This can be partly explained by the reprocessing characteristics of investment. In addition, this can also be attributed to the fact that the sector of public services where the added value is formed mainly by wages of employees (e.g. in education, health care, state administration, etc.) is naturally included in the total of gross value added for economy. Thereby, the level of the indicator for economy increased, while production and intermediate consumption refer mainly to the sector of non-financial corporations. In this sector the weight of foreign controlled companies is higher than in economy.

In the period 2000–2005 the weight of foreign controlled companies continued to grow, however, not so markedly as in previous five years. In production, the weight increased from almost one quarter to more than a third (34.8%), for intermediate consumption it grew a little more by almost two fifths (+39.7%). Falling behind in gross value added was confirmed even thought the contribution of foreign companies in the Czech Republic to its total amount in the economy came close to a quarter (23.7%). See Table 1.

Table 1 Weigh of foreign controlled companies in the Czech economy (contributions of financial and non-financial foreign controlled corporations to the vales related to the Czech economy, in %)

	1995	2000	2005	2008	2009
Production	7.3	23.3	34.8	42.7	42.5
Intermediate production	8.6	27.2	39.7	47.8	47.7
Gross value added	4.8	15.3	23.7	30.3	30.6
Wages and salaries	5.5	17.2	26.7	33.3	33.0
Profit (Net operation surplus*)	8.0	37.8	48.8	56.1	60.0
Profit (Net operation surplus + mixed income**)	4.0	21.0	30.3	37.5	38.8

  * Net operation surplus.
** Net operation surplus and mixed income.
Source: Czech Statistical Office, own calculation

After the year 2000 a new phenomenon appeared affecting through companies of direct investors the Czech economy also the area of foreign trade. Foreign companies in the Czech Republic began to focus on exports. This was due to the fact that in some export branches the foreign capital has already been established (automotive industry) in other industries this process was under preparation. In connection with the life cycle of investment[3] could be observed that classic life cycle investment ran: until 2003 reinvested earning outweigh the amount of dividends, 2004 and 2005 showed roughly the same ratio and then investors converted a larger share of profits to the parent countries. Retained profits of foreign investors in the Czech Republic reached almost CZK 870 billion by the end of 2009.

At the same time, i.e after the year 2000 robust imports of investment nature took place when direct investors were equipping their new-gained production capacities by machinery, caused then a significant deficit in foreign trade. However, it was not a risk for external balance of the Czech economy just because the imports referred mainly to investment and not to consumption.

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[3] Mandel, M., Tomšík, V.: Foreign Direct Investment and the External Balance in the Transition Economy: the Application of Life Cycle Theory. *Political Economy*, 2003, No. 6, pp. 723–741.

Figure 4 Shares of foreign controlled financial and non-financial corporations in total economy (in %)
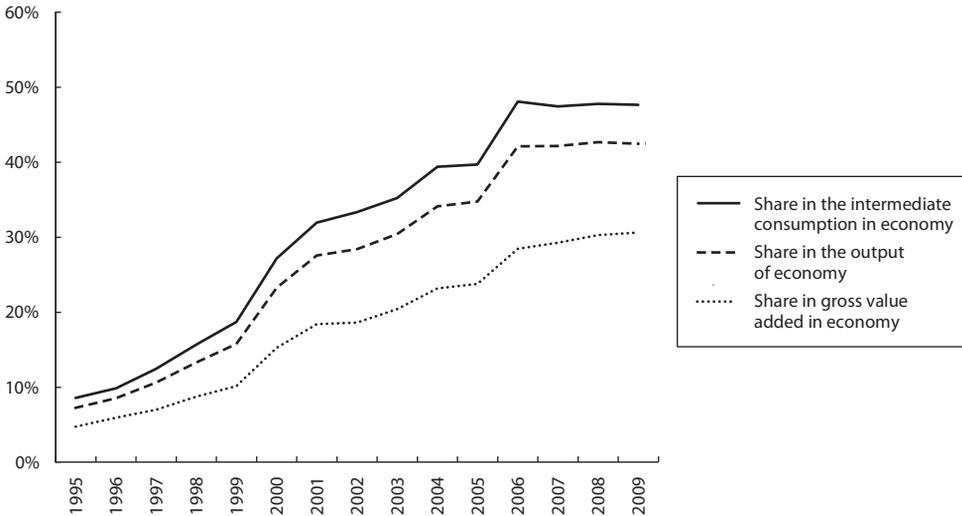
In the period of relatively long economic boom in the Czech Republic during which a significant conversion towards the average level of economic and monetary union in Europe took place, the weight of foreign controlled companies again increased in the economy as a whole and specifically in the sector of non-financial corporations.

While in 2005 the production of foreign companies reached in financial and non-financial sectors the total of CZK 2.646 trillion with a clear predominance of production of non-financial companies with CZK 2.485 trillion resulting from the character of given sector, after a robust economic growth the production increased in 2008 to CZK 4.156 trillion. The intermediate consumption of foreign controlled companies increased in 2005–2005 by more than a trillion (CZK 1 085.8 billion). These companies then consumed CZK 2.991 trillion for their production.

For more three years the production of these companies increased 1.57times and in the Czech economy as a whole only 1.28times. The intermediate consumption showed similar growth proportion (+157% compared to +130% for economy as a whole). Even for gross value added the foreign controlled companies recorded a growth comparable with the growth of production and intermediate consumption which does not apply to the Czech economy as a whole. The Czech economy recorded in 2005–2008 slower growth of VAT (+123.5%) than in total for foreign controlled financial and non-financial corporations.

This can be attributed to very high profits typical especially for foreign controlled companies while the wage growth in the economy including public sector was, despite very significant y-o-y nominal increases so sharp, as it was for profit dynamics measured by net operation surplus.

Contributions to values for economy as a whole increased proportionally to the above growths. In 2008 the share of foreign controlled companies performing business activities in non-financial and financial sectors was 42.7% of production of economy as a whole and 47.8% of intermediate consumption. This development took place mainly after a jump in 2006, when the share of foreign controlled companies in production increased by 7.3 p.p. and in the intermediate consumption even by 8.4 pp. The increase of contribution to gross valued added in 2006 compared to the production and intermediate production was significantly smaller (+4.8 p.p.).

The above suggests the following: in 2006 there was a culmination of economic boom in the Czech Republic mainly due to foreign controlled companies. Then, reprocessing character of foreign direct investment in the Czech Republic was apparent especially in 2006 when its contribution to the gross value added increased, y-o-y, significantly less that contributions to production and the intermediate consumption.

Also in 2008 which was affected by drop owing to sharp decrease of foreign demand as late as in the last quarter, the growth of foreign controlled companies in the Czech economy continued. The year-on-year stagnation of their contribution to the production in 2007 (42.2%) was followed by a mild increase (42.7%). In the intermediate consumption a drop in contribution in 2007 (47.4%) was also followed by an increase in 2008.

Contribution of foreign controlled financial and nonfinancial corporations to gross value added in the Czech economy grew continuously in 2005–2008 (it increased from 23.7% to 30.3% in 2008). These corporations formed gross value added in the amount of CZK 1.165 trillion and in the whole Czech economy the gross value added in 2008 amounted to CZK 3.848 trillion.

2.2 Contributions of foreign controlled corporations to income parameters of economy

Contribution of foreign controlled corporations to the profit in form of net operational surplus in the Czech economy increased from 8% in 1995 to 60% in 2009. Similarly, as for output characteristics even here the biggest increase was recorded in the latter half of the 90's (up to 37.8% in 2000). This can be attributed to a low base as it was mentioned above and also to massive privatisation wave taking place just in 1999 and 2000.

If, in addition to the net operation surplus, the profit included also mixed income and profit of traders in the household sector, the foreign controlled corporations contributed to the above defined profit in the economy in 2009 by almost two fifths (38.8%). A significant growth over the above mentioned fifteen years also took place because in 1995 the contribution of foreign controlled corporations was only 4%.

Figure 5 Share of foreign controlled financial and non-financial corporations in income in the economy (in %)
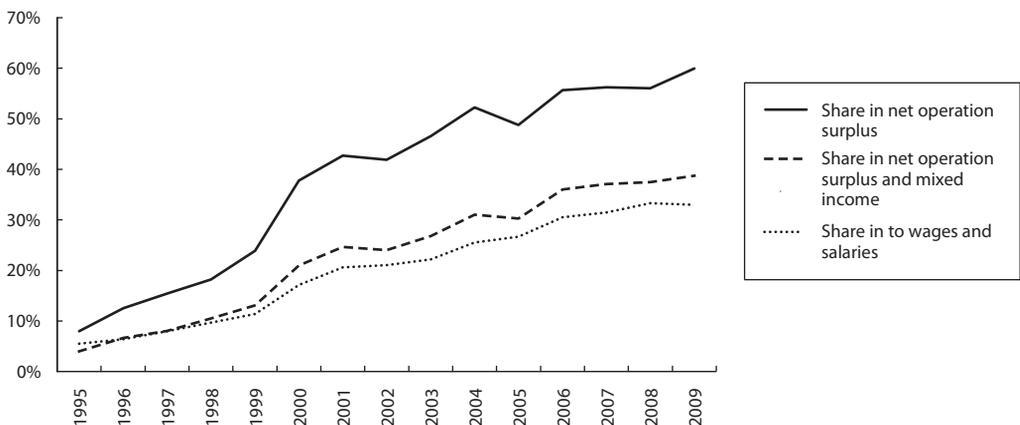
Source: Czech Statistical Office, own calculation

Profitability of foreign controlled corporations in the Czech Republic is significantly high. Half of all profits in the economy was exceeded by this segment as early as in 2004 (Figure 5) when the profits in form of net operation surplus for the whole Czech Republic (CZK 5.286 trillion) was contributed to by foreign controlled financial and nonfinancial corporations by 52.3% (CZK 2.764 trillion).

Figure 6 Volume of wages in foreign controlled corporations (in CZK million)
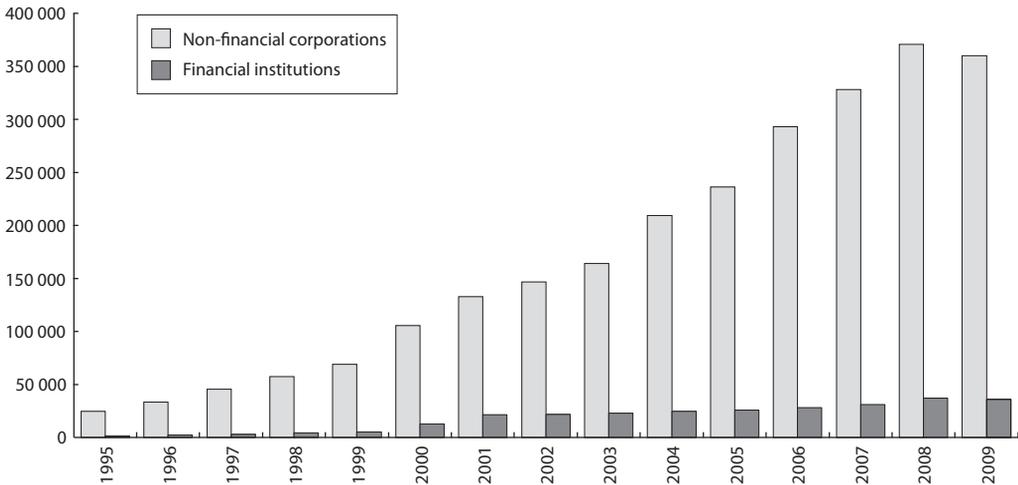
Growing profits of financial institutions in the crisis year 2009 (+11.6 billion) compared to 2008 caused that their drop in the whole segment of foreign controlled corporations was not so profound (CZK –15.4 billion). However, sharp drop of profits of the Czech (private national) national companies caused that in the economy as whole the net operation surplus in 2009 decreased compared to 2008 by CZK 79.1 billion.

In terms of next income parameter foreign controlled corporations paid out in 1995 only 5.5% of the volume of all wages and salaries in the economy. In 2000 the volume increased to 17.2%. During the

Figure 7 Production of foreign controlled financial and non-financial corporations (in CZK million)
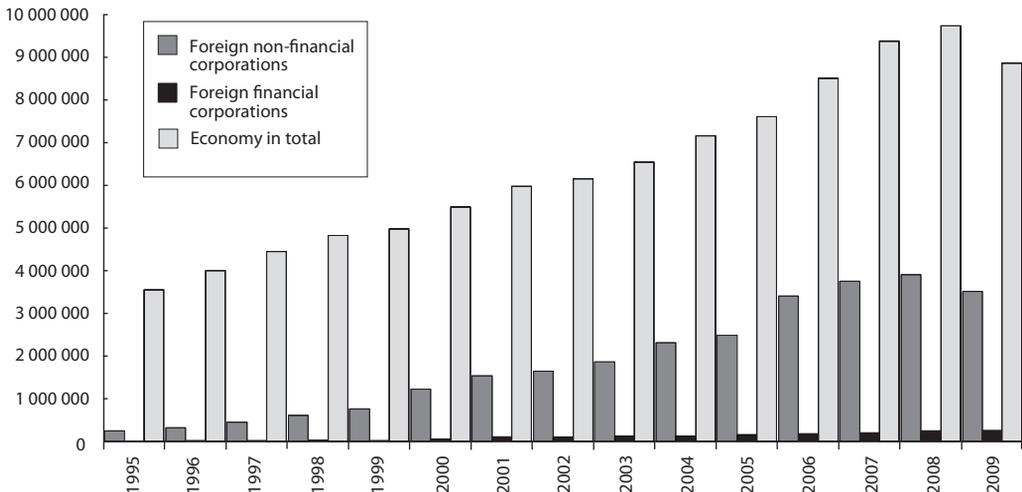
last decade the volume of wages of foreign controlled corporations in 2009 reached one third (33.3%) of the total volume of wages and salaries in the Czech economy. The y-o-y drop in crisis year 2009 then caused that compared to 2008 the contribution of this sector of economy decreased intangibly (by 0.3% down to 33%).

Relatively low contribution of wages of foreign controlled corporations in the Czech Republic is given by the public sector proportion to the total paid-out wages and salaries in the economy. Compared to the contribution of profit which is very high (60% in 2009) against massively lower contribution to wages and salaries (33% in 2009) it could be concluded that "productivity" of foreign controlled corporations is high since it forms with lower share of wages higher contributions to production and gross value added in the economy.

3 FOREIGN CONTROLLED FINANCIAL INSTITUTIONS

Financial sector in the Czech Republic is practically 100% owned by foreign capital. It is a result of massive privatization of the Czech state ownership interest in the biggest banks and by entering of foreign insurance companies and pension funds the Czech market.

As a result of such development in 2010 foreign controlled corporations represented, according to preliminary data, 97.1% of gross value added of the whole financial sector of the Czech Republic, while in 1995 they contributed by a mere one tenth (10.4%). In absolute figures the amount of gross value added formed by these corporations in 1995 was only CZK 4.5 billion but in 2000 it amounted to CZK 23.8 billion which made 45% of gross value added in the whole sector of financial institutions.

In the next decade a very sharp growth of gross value added took place shortly after the year 2000 upon privatization of state ownership interests in the biggest Czech banks, to reach CZK 146.5 billion in 2010 which represented the already mentioned 97.1% of gross value added of the whole Czech financial sector. Gross value added was increasing smoothly and its growth was not suspended by crisis in 2009 which the financial institutions in the Czech Republic, contrary to banks in Europe or banks with global impact mainly in the USA, endured without problems.

Figure 8   Gross value added in financial institutions as a whole and in segment of foreign controlled financial corporations (in CZK million)
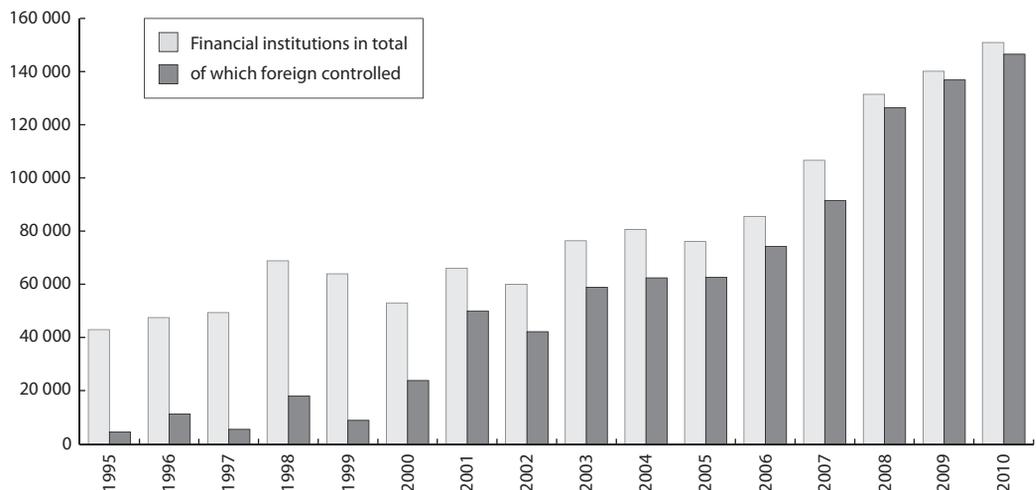
Source: Czech Statistical Office

Development of foreign controlled corporations in financial sector of the Czech Republic was largely affected by the sale of state ownership interests in the biggest Czech banks (see below in sub-chapter dealing with the commercial banks segment).

Foreign corporations in the Czech Republic dominate the financial sector logically also in the contribution of paid-out wages and numbers of employees. Although, in wages also this sector was in 2009 affected by unfavourable economic development, but the y-o-y drop in volume of wages can be attributed to the drop in the number of employees. By transfer of a large part of financial sector to foreign hands the numbers of employees increased in jumps in 2001 and they became employees of foreign controlled corporations.

Wages in financial sector belong to the biggest ones in the Czech Republic. Figure 9 shows differences by form of ownership of the financial corporation. It shows that the average wage in financial sector is determined by the wage growth in the foreign controlled segment.

Somehow astonishing is higher than average wage of employees in financial institutions where public ownership prevails. It can naturally be explained by the character of business activity of the institutions. The biggest banks in the Czech Republic represent majority of financial sector with large network of braches where the clerks at the counters do not reach such high wages as it is shown by average wage level for the whole sector or for a specific commercial banks. On the contrary, only a small number of financial institutions which are controlled by public sector, such as the Czech Export Bank, Export Guarantee and Insurance Corporation (EGAP), Czech-Moravian Guarantee and Development Bank are in terms of number of employees relatively small and are focused on more sophisticated work. Wages are not diluted by wages of lower income groups like in big commercial banks.

Wages grew a little faster than employment which affected also the change in average wage of employees of foreign controlled corporations in financial sector of the Czech Republic (deviation in connection with the purchase of decisive part of bank sector was mentioned above). Foreign controlled corporations in the financial sector of the Czech Republic paid out in 1995 to their employees in wages over CZK 1.5 billion. In 2000 wages amounted to CZK 12.8 billion while in this year an impact of privatization on wages (y-o-y growth by 146%) was apparent. However, in 2001 the volume of wages accounted for CZK

Figure 9 Average wage in financial sector by ownership (in CZK monthly)
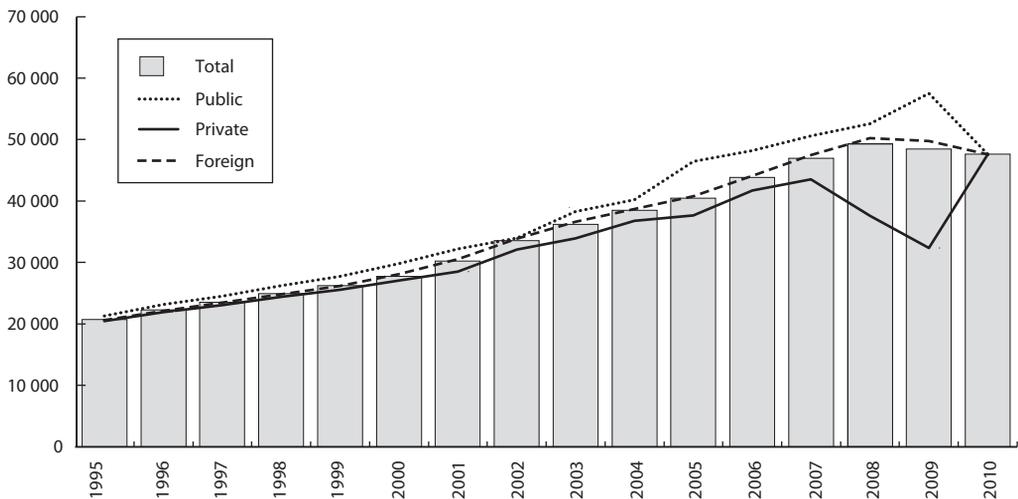
Source: Czech Statistical Office

21 billion and until 2010 it increased to CZK 36.5 billion. The biggest y-o-y growth of wages took place in the Czech financial sector in 2008 when the world coped with global financial crisis. The volume of wages increased by one fifth (+19.9%), i.e. by CZK 6.2 billion.

In terms of summary result of business activity in the sector of financial institutions in form of mutual relation between sources and their use according to the national book-keeping, it is obvious form the chart 10 that for the whole monitored periods this sector showed surpluses. In 2005 its business activity was balanced (CZK +0.09 billion). In 2008 the sector of financial institutions in the Czech Republic as a whole recorded the biggest surplus since 2005 when net loans reached CZK 29.5 billion. Along with the surplus in the household sector (CZK 11.8 billion) these two institutional sectors were able to finance deficits of other sectors of the Czech economy, and mainly of the government sector which recorded in 2005 a deficit of CZK 83 billion but also the sector of nonfinancial corporations (CZK –33 billion).

In 2009 the surplus of financial institutions sector shrank to its third lowest value in time series from 1995 due to deficit which appeared in other monetary institutions including commercial banks. Just this deficit was until 2006 a relevant segment for the aggregate result of the sector of financial institutions. In 2010 the surplus continued to shrink (more detailed data are not yet available).

Figure 10 Surpluses and deficits (net loans + / net borrowings –) in the sector of financial institutions (in CZK million)
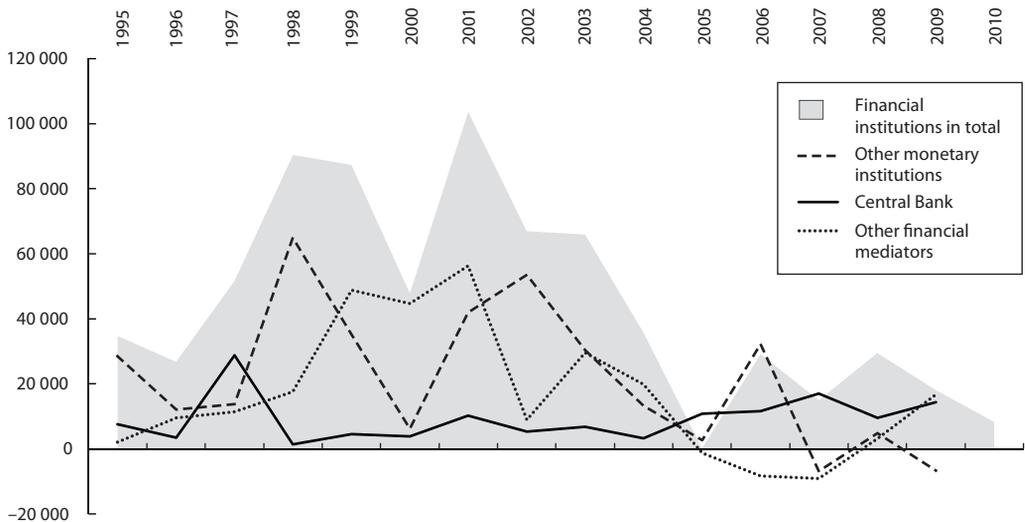
Source: Czech Statistical Office

3.1 Commercial banks

From the aspect of the ownership structure the most significant changes took place from the aspect of ownership structure of the Czech economy on which the analysis is focused, specifically in the financial sector of the Czech Republic in the period around the year 2000. Then the Czech state decided to privatize its ownership interests in the biggest banks in the country according to the time-schedule assuming that the sale will be completed by the end of 2000. And this actually happened. Gradually the Investment and Post Bank (IPB) was privatized through its sale to the Japanese investment bank Nomura, Československá obchodní banka (ČSOB) to the Belgic BC, Česká spořitelna (ČS) to Austrian Erste Bank and Komerční banka (KB) to the French Société Generále.

3.1.1 Privatization genesis and problem solution

In the latter half of the 90's the banking sector showed transfers to other than the existing owners of commercial banks which did not have character of state ownership interest privatization. It was rather a solution of bad situation of banks being sold which the new owners were supposed to rescue. This applied to the sale of Agrobanka, middle-size financial house aimed at small and middle-size companies to the hands of American GE Money. Although, in the latter half of the 90's in the Czech Republic the segment of small banks and partially also middle-sized banks practically collapsed mostly due to the equity crisis.

However, this did not apply to the difficulties of small and middle-size banks segment. Before privatization the state had to costly rescue credit portfolios of the biggest Czech banks which would almost throw them to the edge of the precipice. The cause was the overvaluation of mortgage loan securities. If this adjustment would not have taken place the sale of the state ownership interests would be impossible. The sale of banks into European private hands made the big Czech banks subsidiaries under foreign control which in many market aspects is practically 100% control.

The sale of a part of Investiční a poštovní banky (IPB) to Japanese Nomura was later challenged due to extremely low sales price mainly because Nomura was not a strategic but financial investor. By taking out of the most valuable assets held by IPB and their consequent sale to foreign investors which took place afterwards, resulted into the fact that marks related to the Czech "family silver" such as Plzeňský Prazdroj (new owner is a South-African brewery) passed to foreign hands.

IPB was well market-focused bank whose many transactions, however, attacked the level of acceptable risk. Following its actual failure in 2000 it became part of already privatized (into foreign hands) ČSOB. The ČSOB was provided by 100% state guarantee for all assets acquired from IPB (a merger, extremely advantageous for a new IPB owner and disadvantageous for the state took place). The above mentioned guarantee exceeded CZK 163 billion. Sales price did not at all took into account the fact what was valuable in IPP was that its financial group included subsidiaries – market leaders in their particular area, such as very successful Českomoravská stavební spořitelna with excellent marketing strategy and relatively strong pension fund in terms of the number of clients. IPB privatization can be assessed as badly done. Subsequent taking out of bad assets of the bank into Consolidation Agency was a burden for the Czech tax-payers who had to rescue also a huge mass of transferred bad claims from the KB and ČS portfolios.

For privatization of 52% of ownership interest in Česká spořitelna the state acquired CZK 19 billion for Austrian Erste Bank. However, the state had to take out for the balance of Česká spořitelna to Consolidation Bank[4] bad loans in the amount of CZK 33 billion and had to count with further expenses in relation to the state guarantee for some loans which remained in Česká spořitelna portfolio. The price was by 55% higher compared to the book value of net equity of Česká spořitelna at the end of 1999 and by 36% higher than market price of Česká spořitelna closely before the sale. Erste Bank agreed to increase within two years the registered capital of Česká spořitelna group by the total amount of four billion Czech crowns. Apart from obligation to pay the purchase price and to increase the registered capital Erste Bank offered a number of initiatives to support the Czech economy in the total of CZK 22 billion..

Česká spořitelna was purchased by a small Austrian Erste Bank whose client base was compared to 5 million clients of Česká spořitelna very small. Neither in belonged Austria Erste Bank to the biggest banks, however, it had a clear growth strategy with the aim to acquisitions in the Central Europe which it later implemented. In the Czech Republic Erste Bank actually supported small and medium-size companies by special (beneficial) programmes of financing and also by the manner how it financed the Czech housing market. It was just the product of Česká spořitelna called "Top living" which put in motion the Czech mortgage market since before the banks granted low numbers of mortgage loans to

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[4] Loss of the Consolidation Bank (later renamed to Consolidation Agency) was to be compensated from public means which actually happened.

a very narrow circle of clients with highest rating. The "subsidized" interest rates of mortgage loans from privatized Česká spořitelna attracted to large number of persons interested in mortgages, directly forced other banks to reduce their rates and may stand behind the boom of morgage loans which culmitnated in the half of the last decade.

Komerční banka (KB) was purchased in 2000 in tender procedure in competition with Bavarian Hypovereinsbank and French Credit Agricole finally by Société Generale, bank with global scope, at CZK 40 billion. A half of this sum was subsidized by the Transport Infrastructure Fund. Komerční banka was even before relatively well managed and focused mainly on companies. Its potential including financial groups was not as significant as in case of Česká spořitelna; however, we can say that even here the arrival of new owner increased sensitiveness for business projects of small and middle-size enterprises.

ČSOB was privatizes in half of 1999 by Belgian KBC Bank from KBC financial group. It was not purchased by Deutsche Bank as it was generally expected but again, like in case of Česká spořitelna, by a small bank, originally family enterprise. The sole shareholder of ČSOB became KBC Bank as late as in 2007 after the purchase of shares of minority shareholders. Upon the takeover of IPP the ČSOB following long and difficult merger focused on retail banking. Originally, it was established in the 60s of the last century as a bank serving foreign trade transactions of companies of the Czech Republic and securing also the foreign-exchange transactions.

3.1.2 Conduct of new owners

Arrival of new foreign owners was accompanied also by their logic efforts to enhance faster and more tangible return of invested capital. Erste Bank planned to reach this aim within two years from purchase of Česká spořitelna and its assumption concerning 18% return of the capital appeared unfeasible given the then expense-to-revenue ratio of Česká spořitelna. However, the aim was achieved, as well as conversion of information systems, introduction of Internet banking, enhanced risk management and new financial products.

Figure 11 Assets, loans and deposits in banking sector of the Czech Republic and weight of foreign controlled banks (in CZK billion)
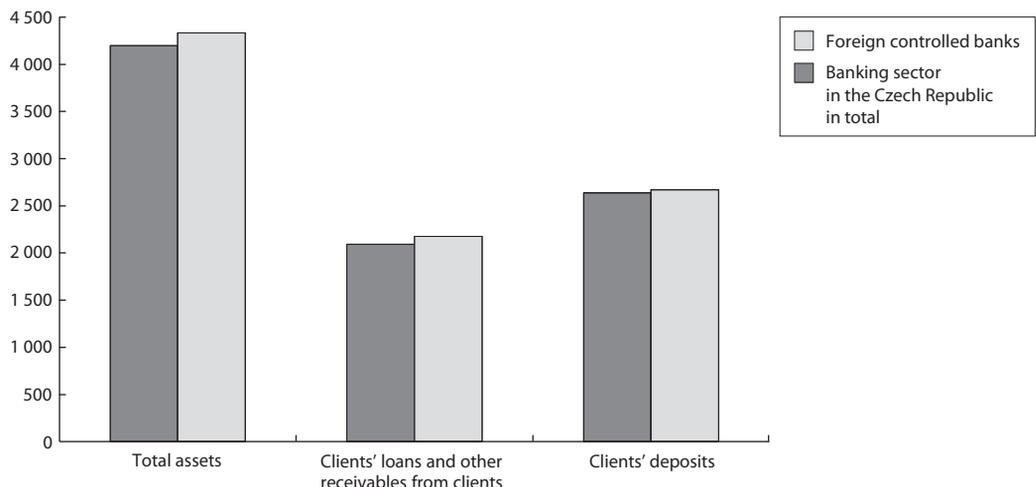
Source: Czech National Bank

Another thing, which is, however, unfavourable from the aspect of clients, was higher charges of bank services introduced by foreign owners. Given long-term low interest rate in the Czech economy which was kept down by weak consumer inflation, the net interest rate revenues of banks and revenues from charges and commissions practically equalled due to achieved margins.

By the end of 2010 it is possible to monitor prevailing dominance of foreign controlled banks in all more significant criteria for assessment of bank activities in the Czech Republic ranging from 96–99% (see Figure 11). The contribution of foreign controlled banks to total assets of banking sectors was 96.9%, i.e. CZK 4.197 trillion. Most of these assets is determined in Czech crowns (CZK 3.573 trillion) and the rest in Euro (CZK 524 billion) and in other currencies (CZK 100 billion).

Contributions approaching 100% show foreign banks in the Czech Republic also in client's loans (96.3%, i.e. CZK 2.094 trillion) and in securities purchased into their portfolios (96.8%, i.e. CZK 817 billion). This segment is dominated in main items by active side of balance of the Czech banking sector.

Absolutely biggest share of the sector as a whole is recorded for foreign banks in the Czech Republic in client's deposits. Clients entrusted them the total of CZK 2.637 trillion which makes 98.8% of all client's deposits in the Czech banking sector. At the same time, an overwhelming majority of this sum is represented by deposits in CZK (Figure 12). Therefore these banks have very cheap primary sources available for their active transactions.

Beside client's deposits as the most significant items of passive side of balance foreign banks have big shares also in reserves and capital. The registered capital of foreign controlled banks accounted at the end of 2010 "only" for CZK 72.7 billion, i.e. 91.6% of its amount for the whole banking sector. It was less than shares in transactions. However, the total of capital and reserves of foreign controlled banks by the end of 2010 amounted almost to half trillion (CZK 468.9 billion). This was due to high retained profit as non-distributed part of profit from the last years in the amount of CZK 124 billion. In the year 2010 the net profit of foreign controlled banks amounted to CZK 54.4 billion.

Figure 12 Deposits at foreign controlled banks (in CZK billion)

159.9; 6%   38.7; 2%

- CZK
- Euro
- except for CZK and Euro

2 356.6; 92%

Source: Czech National Bank

Due to accumulated profits, reserves and capital the banks in the Czech Republic have a thick "pillow" to cover their transaction risks. Capital adequacy ratio expressing the amount of capital against risk weighted assets is extremely high in the Czech banking sector. While, according to international regulations the limit for capital adequacy ratio is 8% to risk weighted assets, banks in the Czech Republic have this ratio significantly higher (Figure 13). In addition, in the crisis period it increased to 14.4% in 2009 and in 2010 it grew up to 15.5%.

Commercial success of foreign controlled banks acting in the Czech Republic along with high capitalization caused that they endured the financial crisis and economic recession unharmed although their parent companies faces problems.

There exist several reasons: foreign investors purchased banks adjusted for bad claims which allowed them for subsequent massive capitalization. As early as from 2002 profitability of foreign controlled banks

Figure 13 Capital adequacy ratio (in % of risk weighted assets)
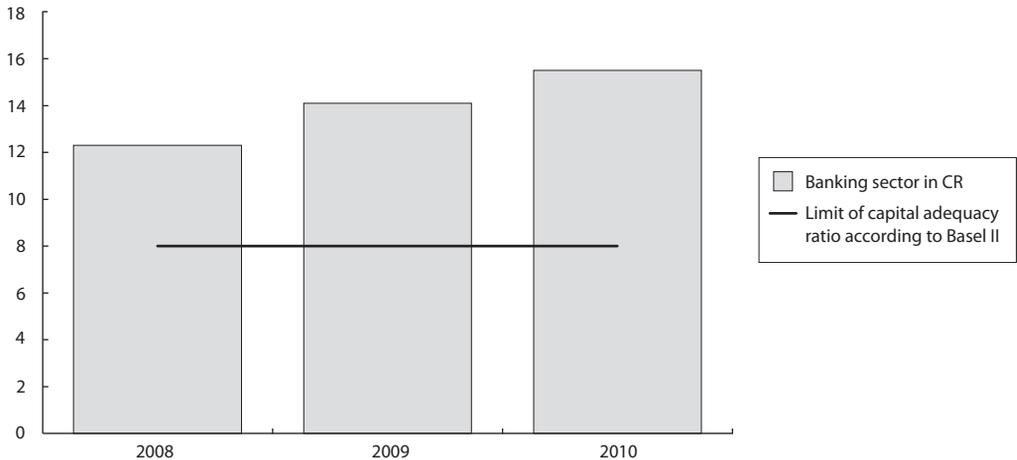
Note: Second of Basel agreements (recommendation for the bank law and regulation of Basel Committee for banking supervision).
Source: Czech National Bank

was very high and return of invested capital was above the global average. While western banks were forced to obtain significant part of sources in the capital market, banks in the Czech Republic could use the already mention very cheap deposits of clients. These are then used for transactions which allows for the growth of margins.

High capitalization rate creates space for active transactions and possibility to cover their risk is wide. Another important aspect of successful endurance of crisis in the years 2008 and 2009 was the fact that banks in the Czech Republic did not have stronger representation of risky structured instruments in their portfolios of securities which became for many global banks fatal.

4 SECTOR OF NONFINANCIAL CORPORATIONS

Non-financial corporations were the primary target of foreign capital flowing into the Czech economy. Foreign controlled companies increased their lower shares in 1995 (10.1% in the production of non-financial corporations and only 8.8% in their gross value added) to the above-half share in production of non-financial sector (52.5%) in 2008 and in production for economy they also approached a half (46.5%). The growth of the above mentioned shares continued in the crisis year 2009 although it might appear that just a strong drop of foreign demand may affect mainly foreign controlled companies in the Czech market aimed at export more markedly than the rest of economy.

Partly "reprocessing" character of foreign controlled non-financial corporations is attested to the fact that compared to shares of this segment in production or value added in the sector of non-financial corporations the shares of the segment in the intermediate consumption are higher. It means that these corporations consume in their production bigger mass of material, energies and other components of intermediate consumption to reach the final amount of production and gross value added than the rest of the sector of non-financial corporations (i.e. public and national private enterprises).

The share of foreign controlled non-financial corporations both in the production and value added of the sector of non-financial corporations in the period of strong boom of the Czech economy increased most slowly in the whole time-series 1995–2009. This might be caused also by the fact that private national (Czech) companies started to grow in this period. The most robust increment of this share was

recorded in 2000 and 2006. This might be related to intensive inflow of direct foreign investment into the Czech economy.

Production of foreign controlled companies exceeded the 50% level of the whole production of non-financial corporations sector as early as in 2006. Strong growths of shares at the beginning of the decade were apparent after the inflow of direct investment into branches manufacturing machinery and equipment (electrical, office, medical, transport) the inflow of investment recorded in 2000 compared to 1999 almost tripled (from CZK 15.6 billion to 40.6 billion).

The fact that also in 2008 and 2009 the growth of contribution of foreign controlled non-financial corporations to the total production of non-financial corporations was recorded is somewhat surprising. Upon a drop of foreign demand at the beginning of crisis it was more probable that most affected would be just foreign controlled companies aimed at export. Finally, it was the sector of domestic companies. The contribution of foreign controlled companies to the total production of nonfinancial corporations thereby increased and the y-o-y drop of their production was in 2009 less profound (−10.1% compared to the sector in total (−11.4%). Figure 14 shows how their output was affected by crisis.

The intermediate consumption of foreign controlled non-financial corporations increased in 1995–2009 roughly 14times, gross value added 14.7times. The strength of foreign controlled non-financial corporations in the Czech economy is attested to the act that compared to these extreme increments of intermediate consumption and gross value added in the period 1995–2000 in the sector of non-financial corporations these values increased in both case only 2.7times.

Figure 14 Dynamics of performance characteristics of foreign controlled non-financial corporations (y-o-y, in %)
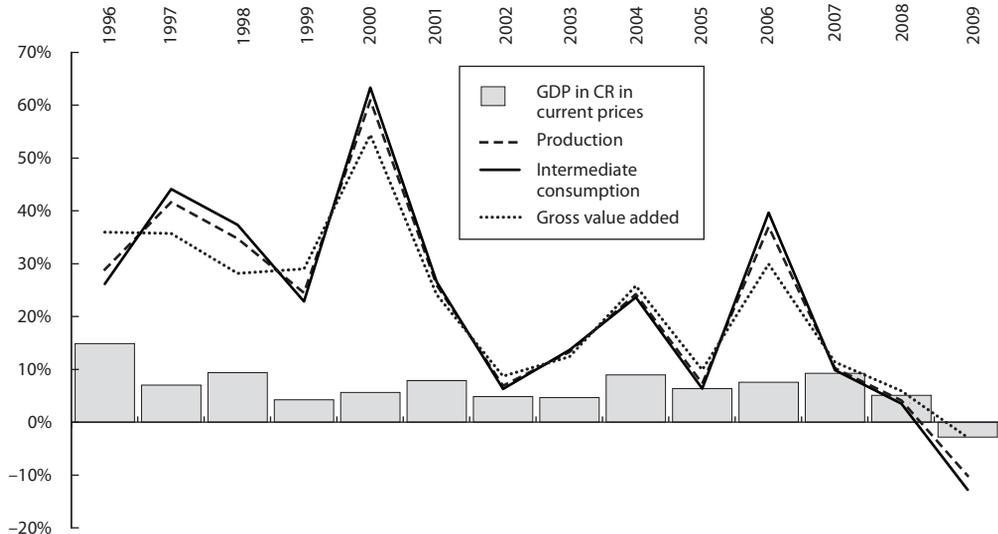
Financial results of foreign controlled corporations segment were for the whole period 1995–2009 markedly better than in the sector of non-financial corporations and the Czech economy as a whole. Profits of foreign controlled non-financial corporations (measured by net operation surplus) increased in 1995–2009 more than 20times (20.4times), in the sector of non-financial corporation only 3.1times. They did not decrease nor in 2009 by so much as did the whole sector of non-financial corporations, however,

their drop was recorded due to the earlier affects of crisis in 2008. In 2009 almost two thirds (64.2%) of profits of the sector and this contribution increased markedly compared to 2008 (59.8%) compared to 9.5% in 1995. Foreign non-financial corporations were in the Czech Republic from the beginning of their activity more profitable than the rest of the sector or economy, their contributions to production and gross value added were lower compared to the contribution to profit. They determine the development of profits in the Czech economy (correlation coefficient shows 0.99).

Figure 15 Dynamics of profit of foreign controlled non-financial corporations (net operation surplus including income in household sector, y-o-y, in %)
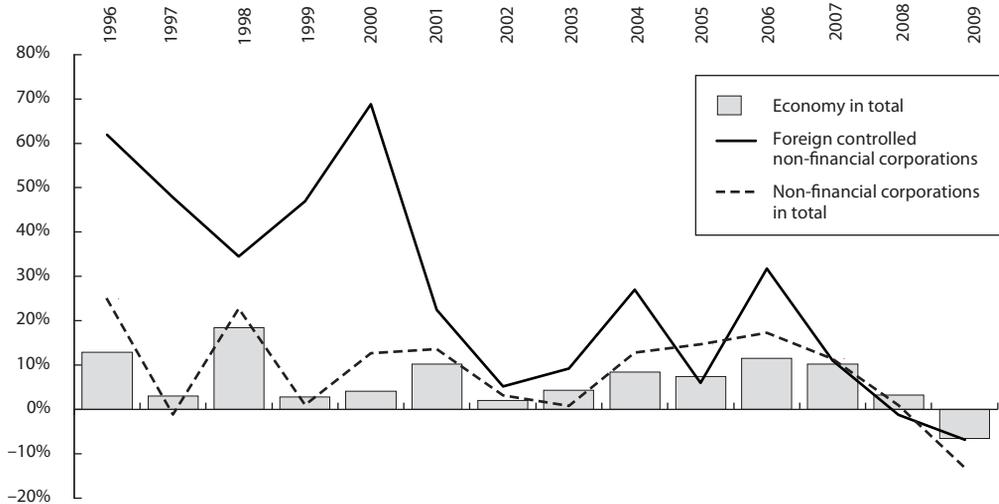
Source: Czech Statistical Office, own calculation

Growth of volumes of paid-out wages was significantly faster compared to the sector in total or for the economy which was due to changes in ownership structure of the Czech economy and non-financial corporations sector. Foreign companies contributed to paid-out wages in the sector in 2009 by 41.5% (in 1995 by 7.6%) which contribution is lower than contribution corresponding to proportions in output characteristics. Total volume of wages and salaries in the segment of foreign controlled non-financial corporations decreased in 2009 more markedly, y-o-y, (–2.9%) than in the sector (–2.1%) where employees received by almost CZK 11 billion less (for the sector by CZK 26 billion less in total).

Tax on revenues of foreign controlled non-financial corporations increased significantly less compared to their production and gross value added (for years 1995–2009 their volume grew by 9times, profits 20times). To taxes on production and import paid and showed on the account of income formation for the Czech economy the foreign controlled non-financial corporations contributed by only 21.5%. However, these corporations contributed in 2009 to the total of income taxes by 51.9% which shows that the dynamics of income tax coming from national private companies along with foreign controlled corporations of public sector was even lower compared to foreign controlled non-financial corporations.

However, the area of investment into fixed capital showed above-the-average growth rate. The investment activity of foreign controlled non-financial corporations was for the whole period 1995–2009 substantially more dynamic that for the rest of economy where the strongest wave was monitored in 2000 and 2001 with the y-o-y growth by 36% and 57% (annually fixed investment of these companies made then CZK 88 billion and 139 billion, respectively). The foreign controlled non-financial corporations

contributed to the investment of sector by 10.6% in 1995 and by 44.3% in 2009. However, crisis brought a sharp drop, as soon as in 2008 both public nonfinancial corporations and national private companies invested more, y-o-y, (CZK +9 billion and +11.5%, respectively). In the crisis year 2009 the investment for the whole Czech economy was lower by CZK 104 billion while practically this drop was due to the mitigation of non-financial corporations investment (CZK –95 billion). The limited investment of foreign controlled companies (CZK –39 billion) affected by more than 50% the drop of investment in this sector.

Figure 16 Dynamics of investment and gross value added of foreign controlled non-financial corporations (y-o-y, in %)
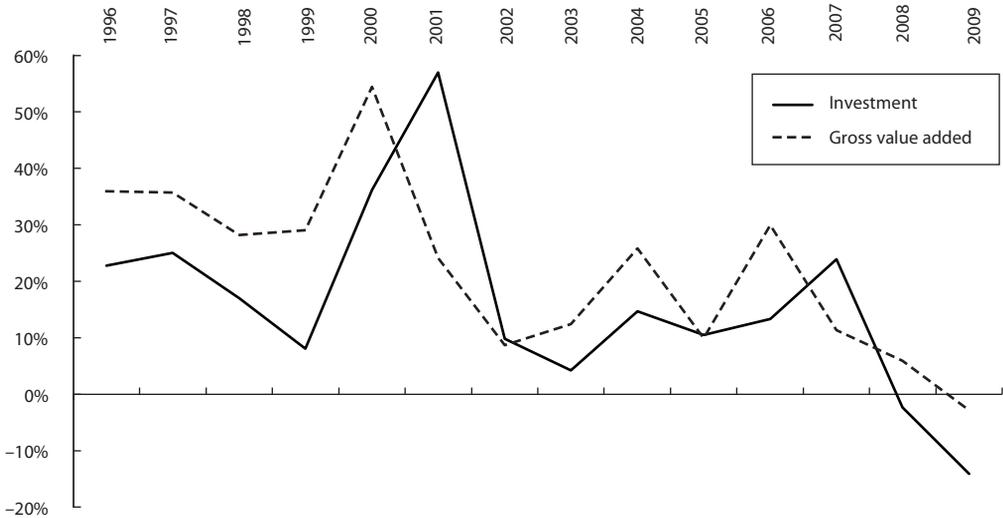
Source: Czech Statistical Office, own calculation

5 FOREIGN CONTROLLED COMPANIES LOOKED-AT BY BRANCHES

The biggest share is attributed to foreign capital in banking and insurance. In 2009 these foreign controlled financial companies contributed to the total value added in this branch as a whole by 91.7%. The rest fell upon the Czech (private national companies, i.e. 7.7%) and companies under control of public money (0.6%). According to preliminary data for 2010 this contribution increased for 2010 up to 97.1%. On the contrary, in manufacturing in 2009 the gross value added of foreign controlled companies made 57.6% of gross value added in the whole industry. Companies owned mainly by public money do not actually exist in this industry (0.8% share of gross value added). Czech companies form minority (56.1%). These companies in 1995 contributed by two thirds to the gross value added in manufacturing, foreign controlled companies by one tenth.

The second place in terms of weight in the output of the industry by gross value added is automotive industry with 90% (Figure 17). The relationship towards suppliers shows a strong position of foreign capital in manufacture of rubber and plastic products (70%). The third place belongs to mmanufacture of coke and refined petroleum products (88%). Due to mobile operators in telecommunications the share is high also in information and communication (70%) and also in manufacturing of construction materials. The last-mentioned manufacturing production area belongs to the manufacture of other non-metallic mineral products where the share of weight of foreign controlled companies is 65%. Shares of foreign companies to the output by gross valued added in majority of other industries are substantially lower.

Very low contribution of public service is logical, in 2009 it was only 0.5% in education which was even less compared to 1995 (0.6%). The other way round, in human health activities and social work activities it increased to 4% from 0.1% in 1995).

Figure 17 Share of foreign controlled non-financial corporations in gross value added in industry (in %)
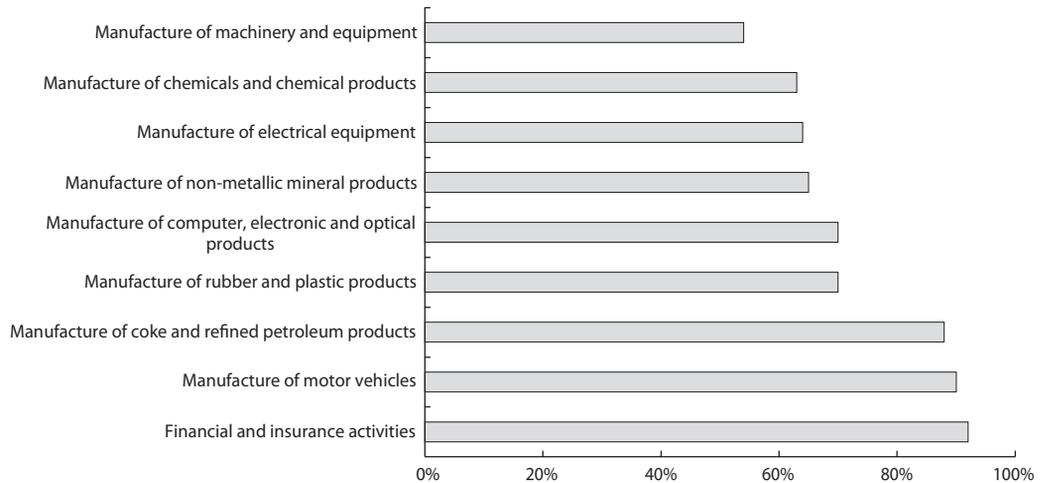
Manufacture of motor vehicles (automotive industry) forms through foreign controlled companies 90% of gross value added of its industry which is the second biggest share following financial and insurance activities. However, in employment the weight of these companies on the number of the employees in manufacture of motor vehicles as a whole is 87%, i.e. the biggest share among all other branches in the economy. High relative employment compared to the number of employees in the respective industry is recorded also in manufacture of electrical equipment and in manufacture of chemicals and chemical products, i.e. almost four fifths of persons employed in manufacture of electrical equipment worked in foreign controlled companies (79%), in manufacture of chemicals 75 %. A 70% employment in an industry is recorded for foreign controlled segment also in information and communication and in manufacture of coke and refined petroleum products. Almost two thirds of employees of the total number in industry employed by foreign companies are monitored also in manufacture of machinery and equipment (66%) or in manufacture of rubber and plastic products (65%).

By the end of 2009 in foreign controlled companies in the Czech Republic the total of 1.069 million workers were employed (roughly a fifth of all the employees in the Czech economy). Taking into account that contributions to the production or value added are substantially bigger than the above share it can be concluded on the basis of mutual proportion that foreign controlled companies show bigger productivity compared to other institutional sectors and economy as a whole.

Should we relate employment in foreign controlled non-financial corporations in individual branches to the total of employees in all foreign controlled companies in the Czech Republic, the relative weight of manufacture of motor vehicles compared to other industries shows the biggest value (Figure 18). In 2009 foreign companies in manufacture of motor vehicles (except for motorcycles), trailers and semitrailers employed 118.4 thousand persons, i.e. 11.2% of the total number of employees in foreign controlled companies in the Czech Republic. Along with the employed in manufacture of other transport vehicles and equipment (1.1%) their share was even bigger.

Figure 18 Share of foreign controlled non-financial corporations of the respective branch in total employment in the foreign controlled segment in economy of the Czech Republic (in %)
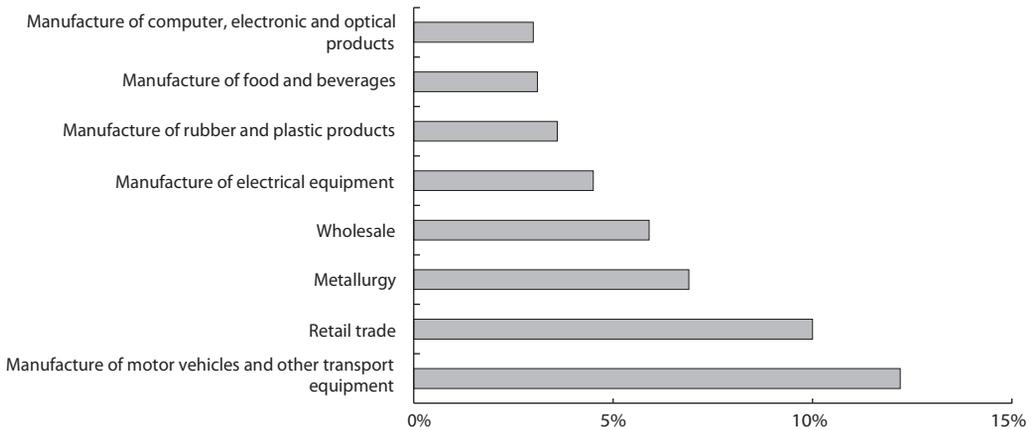
6 FOREIGN COMPANIES IN THE CZECH INDUSTRY

In manufacturing the weight of foreign controlled companies exceeded a half of all sales in 2002. Upon the culmination of boom in 2006 the weight of foreign companies in manufacturing on its aggregate sales was moderately decreasing until 2008 for which period the data covering industry under foreign control are available.[5] Even here according to industrial statistics there was an obvious difference between the weight of foreign controlled companies on sales and employments (Figure 18). Not only the gross value added but also sales show higher productivity of foreign controlled companies which recorded higher sales with lower number of employees.

Earnings of persons employed by foreign controlled industrial companies were, according to data for the period 2000–2008, higher compared to the wage average for the industry as a whole. This phenomenon is even more significant in manufacturing. In 2001, employees of foreign controlled companies earned by almost 17% (16.9%) more compared to the average in manufacturing. For the industry as a whole the excess accounted for 13.7%. The wage difference in favour of the employees of foreign companies gradually diminished. This trend in the year of culminating economic boom in the Czech Republic moderately slackened. However, in 2008 the wage excess of employees in foreign controlled companies in manufacturing was only 10.6% and 9.5% for all persons employed in the industry as a whole.

Industrial revenues show a strong focus of foreign controlled companies on export. Their contribution to industrial revenues from direct exports reached in 2006 three quarters (Figure 19); in manufacturing this level was even exceeded (76.6%). This strength has been obvious on long-term basis. As early as in 2001 the share of revenues of foreign companies in manufacturing achieved two thirds of these revenues in manufacturing as a whole (64.4%).

Industrial revenues of foreign companies in the domestic market they are not so significant in terms of weight as in direct exports. But it is due to the structure of the industry (e.g. in manufacture of food products demand for goods is focused predominantly to the domestic market). Despite this even here the share of foreign company is significant. From almost a one third share in 2003 and 2004 domestic

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[5] Analysis of foreign controlled companies in this part of the study ends by the year 2008 since until then the data of NACE in the required classification for foreign controlled companies were available. The Czech Statistical Office in switching to NACE CZ is completing this area in production statistics and relevant data will be available later.

revenues increased up to 44.1% in 2007. In this year the weight of industrial revenues of foreign companies generated from domestic market culminated. Weight was bigger in manufacturing but it reached its maximum in previous year (47.6% in 2006). In 2007 and 2008 the share of foreign companies in total industrial revenues from direct exports to 75.5% only stagnated and from domestic market even dropped in 2008. Regardless the following crisis in 2009 the chart shows that the potential of foreign controlled companies in the Czech industry culminated in the above years. Capacity of foreign companies in industry is probably close to saturation.

Figure 19 Share of foreign controlled companies in revenues in industry (in %)
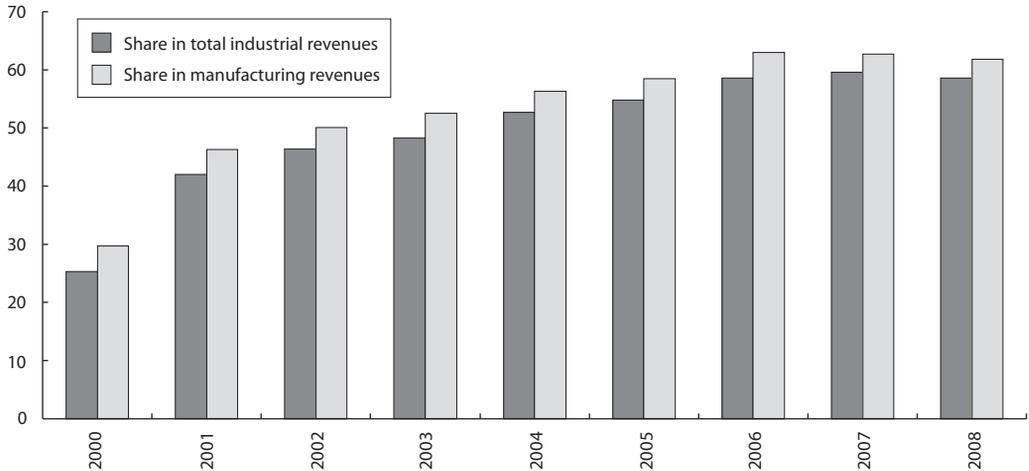
Source: Czech Statistical Office

CONCLUSION

Activities of foreign controlled companies in the Czech Republic are results of inflow of foreign direct investment. By the end of September 2011 it accounted for CZK 2 498.951 billion (including period before 1993 when the Czech Republic was a federation). The inflow of investment culminated around the year 2000 and the second peak followed the Czech Republic accession the EU. In 2002 and 2005 the annual inflow of direct investment was over a quarter of trillion. Until 2003 the biggest volume of investment to the Czech Republic came from Western Europe, in the period 2005–2008 from other than European investors. At the beginning the direct investment flew into manufacturing industry and from 1999 to other industries including services. German and Austrian direct investment contributed until the end of 2009 to the balance of direct investment to the Czech Republic by almost a quarters, more than a third of direct investment came from the Netherlands and Luxembourg.

Weight of foreign controlled financial and non-financial corporations in the Czech economy increased in 1995–2009 from less than a one tenth of contributions at the beginning of the monitored period up to 42.5% of the total production, to 47.7% in case of intermediate consumption and to 30.6% of gross value added in economy.

Overwhelming majority was recorded for foreign controlled companies in financial sector. According to preliminary data for 2010 their contribution to gross value added in the sector was 97.1%. The GVA growth in these companies showed even more dynamics in 2008–2010 when other economic areas were hit by economic crisis and financial institutions in Europe and of the rest of the world by global financial crisis.

The banking sector itself controls 96.9% of total assets of the Czech banking sector by its volume in the amount of CZK 4.197 trillion. The similar proportion shows the contribution to the sum of granted loans to clients (96.3%, i.e. CZK 2.094 trillion) and entirely biggest is its contribution to the amount of received deposits (98.8%, i.e. CZK 2.637 trillion) which are practically all denominated in CZK (CZK 2.357 trillion). Specific feature of development of foreign companies in the Czech banking sector which facilitated to go through the crisis without losses is their high capitalization, negligible amount of risky securities in its portfolios and very cheap primary sources available for their active transactions. Reserves and capital of foreign controlled banks in the Czech Republic approached by the end of 2010 the level of half of trillion CZK. Retained profit undivided from past years accounted for CZK 124 billion. Since 2002 these banks has showed high profit ratio, return on their capital has been above the European average for a long time. Capital adequacy ration in proportion to risk weighted assets is very high in foreign controlled banks and in 2008–2010 it continued to increase. In 2010 it was 15.5% which was almost a double of the amount required by international regulations supervision healthy bank operation (8%).

Foreign controlled non-financial corporations in the Czech Republic showed strong growth dynamics projecting in their growing weights both in the sector of non-financial corporations and in the economy as a whole. The value of their production, intermediate consumption and gross value added increased in 1995–2009 fourteen times (14.2times, 14times and 14.7times). In this particular period their output grew 6times faster than the whole sector. The amount of profits of foreign controlled non-financial corporations grew in 1995–2009 more than 20times, for the whole sector of non-financial corporations only 3.1times and their contribution to profits of non-financial corporations sectors approached two thirds (64.2%). In income characteristics dominating is the share of foreign controlled corporations to the amount of profits in economy in form of net operation surplus which increased from 8% in 1995 to 60% in 2009. This segment of economy contributed by one third to the volume of paid out wages and salaries.

Income taxes obtained by public sector from foreign controlled non-financial corporations increased compared to output and especially dynamics of profit substantially slower (8.9times for the period 1995–2009). This can be only partly attributed to investment incentives provided by the Czech state. However, the contribution of income taxes paid out by foreign controlled companies to total income taxes paid by the whole sector of non-financial companies reached in 2009 a half (51.9%). This results into small tax collection from segments of Czech companies (private national) and companies with predominating public ownership. This fact, however, may relate to lower profitability of these segments.

Economic recession affected foreign controlled non-financial corporations earlier than the rest of economy because of they were more seriously hit by the drop of foreign demand due to their predominating focus on export. This showed mainly by significant drop of intermediate consumption, less affected was gross value added. In respect of markedly worse development of the Czech companies in crisis when the gross value added in companies with prevailing public ownership even increased, y-o-y, in 2009, the contribution of foreign controlled non-financial corporations in 2008 and 2009 to the intermediate consumption and gross value added in the sector of non-financial corporations even increased.

Foreign controlled non-financial corporations massively invested into material fixed assets. In 1995–2000 their investment increased, y-o-y, by a quarter, in 1998–2002 even by a third, i.e. markedly more than for the economy as a whole (+4.7%). In the crisis year 2009, however, the level of investment of foreign controlled non-financial corporations recorded a significant drop (–14,1%) below the level recorded for the whole Czech economy. Their gross value added decreased by 2.9%.

Sectoral view suffers a surviving cliché that foreign capital is represented mainly in the manufacture of motor vehicles. This industry occupies, broken by contribution of foreign controlled companies to gross value added, with its 90% second place according to data for 2009. Financial and insurance activities dominate. Foreign controlled companies show the most significant contribution by formed gross valued added also in Manufacture of coke and refined petroleum products, rubber and plastic products, infor-

mation and communication. Employment in the whole segment of foreign controlled companies is most strongly contributed to by manufacture of motor vehicles (11.2%, i.e. 118 thousand employees) and also retail trade, manufacture of fabricated metal products, wholesale and manufacture of electrical equipment.

In the Czech industry the double-tract effect is given by better results of foreign companies not only in effectiveness but also in growth of revenues in foreign markets but also in domestic market. Wage excess of foreign industrial companies which was the biggest in 2001 and is obvious mainly in manufacturing, gradually decreased to 9.5% and 10.6% compared to average wage in the industry as a whole. In Electricity, gas, steam and air conditioning supply and also in mining and quarrying it was about a quarter higher. Contribution to revenues from direct export of foreign controlled companies in this indicator for industry as a whole has not showed any changes since 2006 and accounted for about three quarters. Originally even high contribution in manufacturing has been mildly decreasing since 2006. Revenues in industry from domestic market were contributed to by foreign controlled companies in the period preceding the boom of the Czech economy by almost 30%, in manufacturing by about one third. Since 2006 this contribution has settled at approximately 42%. In manufacturing it was about one half and then in 2007 and 2008 it was falling. In respect of falls of contribution of manufacturing recorded by foreign controlled companies both to direct exports revenues and domestic revenues of the industry and stagnation of these contributions for the whole industry we can carefully concluded that the capacity of foreign companies in industry is almost saturated.

More important potential for foreign investors offers the sector of services which was given from many aspects inadequate size and qualitative advantages should have been found in the Czech Republic, such as inventiveness of Czech people. However, direct investors may use sustaining potential of qualitative advantages such as lower wage costs although for the years 2000–2008 the increment of unit labour costs in the Czech Republic was the biggest in the EU.

Negative elements accompanying the entry of direct foreign investment was related mainly to the pre-privatization stage in the financial sector and partly in the nonfinancial sector when the Czech state before the sale of its ownership interest to foreign investors costly rescued the biggest Czech banks either in form of transfer of bad assets or in form of guarantees. This rescue accounted for hundreds billion of crowns. Another disputable issue is the reprocessing character of production of foreign controlled non-financial corporations which can be observed rather in their higher contribution to the output and intermediate consumption than in gross value added of the sector.

Benefit of foreign controlled companies in the Czech Republic subsists mainly in the area of employment because thanks to them the unemployment rate in the Czech Republic was for majority of the monitored period lower than in EU27. These companies left in the Czech Republic by the end of 2010 the amount of CZL 953 billion for re-investment. This amount, in respect of the stage of direct investment cycle which can be observed in the CR is so far higher than the volume of paid-out dividends. Their effect showed in higher productivity. Huge investment imports in 2000 had a negative affect on trade balance, however, later they contributed to their surpluses since they were transformed into production aimed at export. In addition, just business relation to mother countries enabled in the period of crisis, with a sharp drop of foreign demand at the beginning, to mitigate finally its impact. Some of foreign controlled non-financial corporations in the Czech Republic manufacture their products using the machinery and equipment of leading world quality.

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Quality Indicators of Development Dynamics at All Levels of the Economy

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Abstract

The paper answers one of the typical problems of economic theory – how it is in practice possible to measure and to interpret the quality of economic time series on all economic levels. The task is on the macroeconomic level solved by weighted geometric aggregation of input factors (labour and capital) into summary input factor (SIF) – the method is similar to the Cobb-Douglas production function. The papers shows differences of our approach to the approach of growth accounting – our approach is based on more general condition and covers not only situations of growth of economic indicators but also situations of their falls or stagnation. The approach allows also to distinguish the compensation of input factors. So, the methodology presented in the paper can be used in many practical applications, for instance it enables us to count clearly intensive and extensive parameters of economic growth.

Keywords	JEL code
Dynamic indicators, economic growth, intensive and extensive factors of change of indicators	*C22, C43*

INTRODUCTION

The question as to which factors cause the development dynamics of an economic unit (a firm, region, state, etc.) is one of the most discussed in the economics. Generally speaking, dynamics may be due to extensive or intensive factors; however, the effect of those factors needs to be properly quantified. This article summarises the knowledge from research in the quantification of the given factors, while following on the publications of Hrach, Mihola (2006), Mihola (2007a), Mihola (2007b), Hájek, Mihola (2008a), Hájek, Mihola (2008b), Hájek, Mihola (2009). The research is based on the crucial business criterion of the market economy, i.e. profit, while respecting the limits of the factors of production. In this context, the manner of achieving profit is not immaterial. The instruments included in the text are applicable to

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businesses as well as to the national economy and other sciences. The correct answer as to the method of generating profit and GDP has a significant impact on the management of large business groups, on seeking a forward-looking direction of national economies and transnational units, as well as on tackling the problems of tendering processes, outsourcing and other economic activities.

A crucial feature of the knowledge society is the application of new knowledge or the innovative application of existing knowledge. Schumpeter's economic analysis stresses the key role of dynamic processes based on permanent innovative efforts of businesses. However, innovation in all stages of business activities develops only in the environment which, owing to good education, fosters science and research as well as quality of human resources, and improves the use of innate human capacities. The innovation processes are also associated with the development of communication technologies, the management level, and a more efficient strategy and motivation. Such developments typically entail the use of qualitative or intensive factors of development in particular, as opposed to extensive expansion of the existing production.

In solving practical strategic tasks of the national economy and businesses, it is essential to use proper dynamic indicators that reflect the factor of time, without which neither a serious tendering process nor the increasingly popular outsourcing can exist. Before we derive the appropriate indicators of an innovative or, more generally, qualitative or intensive development, we will give one general illustrative example, which will help us with finding an appropriate basic correlation, on which the entire solution will be based.

1 INITIAL ILLUSTRATIVE EXAMPLE

Suppose we run a successful firm, which supplies the market with production, for which, over the given initial period (referred to as index *0*), it gains total revenue[4] TR_0, on which it spends total costs TC_0 over the same period. The difference between the two quantities defines the economic profit.

$$EP_0 = TR_0 - TC_0. \tag{1}$$

Then the total revenue / total cost ratio defines efficiency Ef_0, which expresses the portion of total revenue per CZK 1 of the total cost invested, that is:

$$Ef_0 = TR_0 / TC_0. \tag{2}$$

The economic profit / total cost ratio defines the cost profitability, i.e. the portion of profit per CZK 1 of the total cost. Then the correlation between efficiency and profitability can also be derived:

$$Ef_0 = (EP_0 + TC_0) / TC_0 = EP_0 / TC_0 + 1. \tag{3}$$

The following schema shows this initial situation.
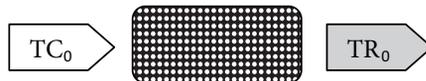
Suppose the market demand for the goods we produce doubles, with no other competing producer operating in the market. The production might be doubled in the two following specific ways: either we will build another production facility next to our existing one, or we will double the output of our existing facility solely through intensive factors of development.

In the first scenario, all inputs need to be doubled. We will need double our land. As the existing production method has worked well, we will build double production capacity of the same quality without

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[4] We will initially describe outputs and inputs using microeconomic symbols, flow variables, TR as the total revenue and TC as the total cost. In both cases, the domain of definition includes positive rational numbers. $TR \geq 0$ and $TC \geq 0$. If $TR \leq TC$, the economic profit will be negative $EP \leq 0$.

any improvements. To operate such a capacity, we will also need double the number of our employees with the same skills. We could even only use our existing staff if reorganised into two shifts. Thus we will double both our capital and labour. The following schema illustrates this purely extensive way of production expansion.
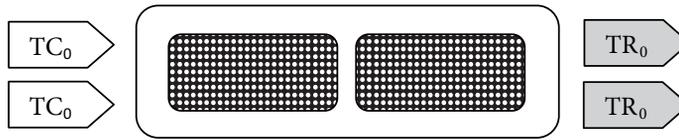
For the purely extensive development, the achieved economic profit and efficiency (referred to as index e) can be expressed by the total revenue and total cost commensurate with the initial situation before our production was doubled, as follows:

$$EP_e = 2 \times TR_0 - 2 \times TC_0 = 2 \times EP_0, \tag{4}$$

$$Ef_e = 2 \times TR_0 / 2 \times TC_0 = Ef_0. \tag{5}$$

That said, with the purely extensive development, the economic profit has doubled. Likewise, the total revenue and total cost have also doubled. However, the economic efficiency Ef_0 has not changed compared to the initial situation.

The second scenario includes the same inputs as the initial situation (referred to as index 0). We will double our production solely through innovations based on intensive factors. Hence we will do with the same land, and will consequently have the same number of employees and the same amount of capital, which we may innovatively change, however. Another admissible variant is the one of deploying a fewer number of higher skilled employees, who are paid better, however, and thus the total production costs will not change. Only the production will double.
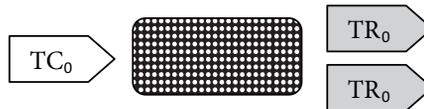
In the purely intensive development, the economic profit (referred to as index i) has more than doubled, as shown in the correlations below. In this scenario, the economic profit equals that of the purely extensive variant increased by the amount of total cost in the initial variant. The economic efficiency (referred to as index i) has exactly doubled:

$$EP_i = 2 \times TR_0 - TC_0 = 2 \times EP_0 + TC_0 = EP_e + TC_0, \tag{6}$$

$$Ef_i = 2 \times TR_0 / TC_0 = 2 \times Ef_0. \tag{7}$$

As the economic profit has increased in both variants, a more appropriate indicator of the economic development intensity is the efficiency, which remained unchanged in the purely extensive development, and increased as much as the output in the purely intensive development. This can be used very well in distinguishing the level of economic development intensity.

2 GENERALISATION OF THE INITIAL EXAMPLE

In effect, pure developments occur only rarely. Mixed developments, involving both components, are usual. The mixed development may also involve the compensation of individual factors, one of which may have an upside effect while the other may have a downside effect. The general expression of the

level of development intensity or extensity must be applicable to any production increase as well as to its decrease or stagnation.

Any developments may be shown in Figure 1, with axis x denoting the total cost TC while axis y denoting the economic profit EP. In this chart, we can also easily draw the isoquants of constant total production (grey parallels) as well as those of constant efficiency (a bundle of straight lines with an intersection at the beginning of the coordinates). In Figure 1, this is selected as the initial point with coordinates TC = 2; EP = 2; and thus TR = 2 + 2 = 4 and Ef = 4 / 2 = 2.

Figure 1 Total cost, total income and economic profit
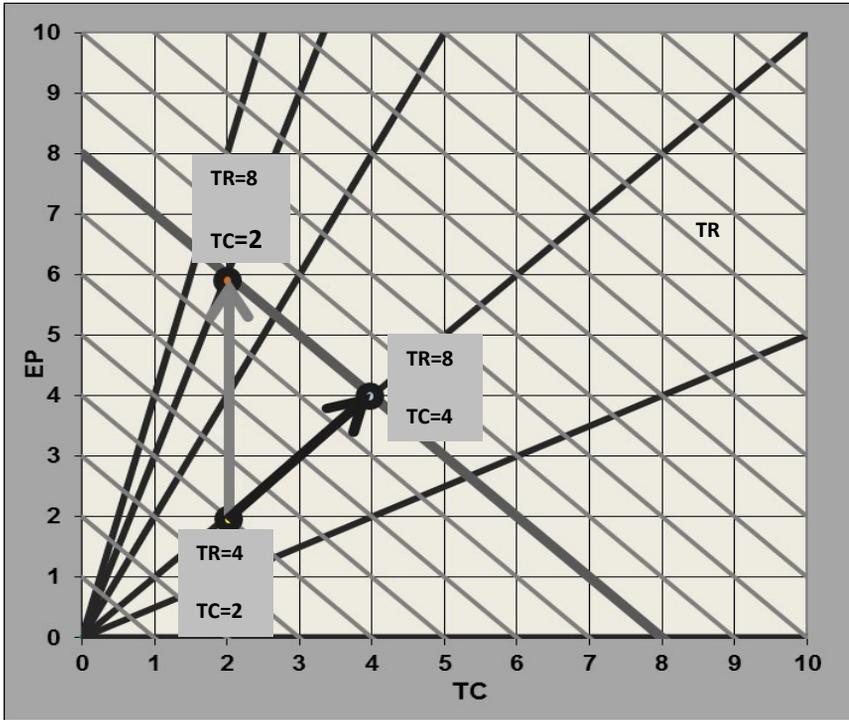
Source: Own construction

The light grey and dark grey arrows denote the above discussed special instances of doubling the production purely intensively and purely extensively. The purely intensive development, where the production increases at the constant total cost TC, is indicated by the light grey arrow. The purely extensive development, where the production increases at the constant efficiency Ef, is indicated by the dark grey arrow.

Figure 1 makes it clear that the required doubling of total revenue can be achieved in numerous mixed ways other than purely intensive or purely extensive ones. The highlighted grey isoquant for TR = 8 can also be reached from the initial point through the development at constant economic profit EP = 2 (this would be an arrow parallel to axis x), meaning a decline in efficiency Ef. We might also reach TR = 8 at the total cost decline to, for example, TC = 1. In that event, the total revenue would only double through an efficiency improvement, which will also cover the extensive diminution of TC.

Figure 1 also allows for analysing how a certain economic profit, e.g. EP = 3, may be reached if we again use the chosen initial point, where TC = 2; EP = 2, as the basis; that said, TR = 2 + 2 = 4 and

Ef = 4 / 2 = 2. This increase, as aptly illustrated by Figure 1, can be reached purely extensively on the dark grey line as well as purely intensively on the light grey line or in another mixed way. Economic profit EP = 3 can also be achieved at the constant total revenue TR = 4 if TC falls to 1. Efficiency again has to improve to the extent that it leads to an increase in economic profit and covers the extensive diminution of total costs TC.

Given this, it is evident that Figure 1 enables us to show and describe changes in movement from one point to another. If these points pertain to successive periods, we will be able to record a development or a trajectory of development of an economic unit. In any period, we will be able to analyse the development in terms of all the 4 monitored quantities TR, TC, EP, EF and the links among them, including the intensity level achieved.

If we need to express the share of the effect of economic profit EP or of total cost in the total revenue achieved, we can do so by using an additive expression derived, for example, from the correlation (1):

$$TR = EP + TC. \tag{8}$$

Then we only need to divide the expression (8) by quantity TR, and if the quotients are to be expressed as percentages, the linear equation must be multiplied by 100:

$$100 = 100 \times EP / TR + 100 \times TC / TR. \tag{9}$$

In the above considered scenario, the economic profit EP and the total cost TC in the initial situation make up 50% of the total revenue TR. In the purely extensive development, these shares remain unchanged, whereas if the production is doubled in a purely intensive manner, the share of profit in total revenue increases to 75% and the share of total cost in total revenue makes up for 25%.

If we wish to calculate the shares of the effect of a multiplicative link, such as the effect of efficiency and total cost on the total revenue, we can modify expression (2) as follows:

$$TR = Ef \times TC, \tag{10}$$

and subsequently convert expression (10) into a linear additive link using a logarithm. Thus we can also express the share of the effect of the qualitative magnitude in the form of efficiency Ef in the quantitative magnitude in the form of total cost TC.

The inputs and outputs of an economic unit may be of more than just the flow nature at the company level. In the national economy, the output may be expressed, for example, as gross domestic product (GDP) while inputs may be represented by functions of state such as labour L and capital K, which can be aggregated into a summary input[5] of factors SIF.

3 DYNAMIC PROBLEM

If the timeline of flow quantities such as TR, TC, EP, Ef and, where appropriate, the GDP, or of the functions of state such as the number of employees, essential means or the population constitutes what is known as the static problem, the changes in those quantities, measured by the dynamic characteristics of absolute or relative accrual (change rate) or index (change coefficient), constitute the dynamic problem.[6] In both events, we can express the extent to which the development is based on extensive or intensive factors of development at the levels of business, region or national economy.

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[5] More details available, for example, in Hájek and Mihola (2009, p. 745), where summary inputs are referred to as symbol N.

[6] Details of the definition of static and dynamic tasks available, for example, in Hájek, Mihola (2009, p. 745), or Mihola (2007b, p. 448).

If τ denotes the initial moment of a monitored period and T denotes the final moment, the number of monitored periods is:

$$m = T - \tau. \tag{11}$$

Then the development of each quantity over a timeline can be observed by means of one of the three following dynamic characteristics used for any characteristic of the relevant system, with the characteristic being referred to as A (a general denomination of a characteristic, which may be TR, NC, L, K, etc.):

- absolute accrual $\Delta(A) = A_T - A_\tau,$ (12)

- growth rate $G(A) = \dfrac{A_T - A_\tau}{A_\tau} = \dfrac{\Delta(A)}{A_\tau} = I(A) - 1,$ (13)

- change coefficient; (chain) index $I(A) = \dfrac{A_T}{A_\tau} = G(A) + 1.$ (14)

If $m = 1$, then we have dynamic characteristics of two successive periods. In addition to dynamic characteristics, we can also observe efficiency Ef, i.e. the correlation between input x and output[7] y over the given period of time. The expression of efficiency as a ratio does not necessarily require the same units of input and output quantities. The output quantity will be generally referred to as y (e.g. TR, GDP, etc.) and the input quantity as x (e.g. TC, capital K, labour L, SIF, etc.). This definition, which describes the given system by monitoring the changes in outputs, inputs and interrelations, corresponds to the cybernetic concept of the task. It provides us with information on efficiency,[8] i.e. the units of outputs per unit of inputs at time t:

$$Ef_t = \frac{y_t}{x_t}. \tag{15}$$

An inverted value interprets the cost requirements, and specifies how many inputs are required per unit of outputs. Expressions (13), (14) and (15) can be used to derive the following correlations among the specified homogeneous dynamic characteristics:[9]

$$G(y) = G(x) + G(Ef) + G(x) \times G(Ef), \tag{16}$$

$$I(y) = I(x) \times I(Ef). \tag{17}$$

After the derivation of universal correlations for the unambiguous classification of developments according to the shares of qualitative and quantitative (or extensive and intensive) factors, we need to describe these development types first. The detailed derivations of this typology, which is used as the basis for the derivation of universal dynamic characteristics to analyse the intensity of any development, are included in Mihola (2007a). In brief, this typology is evident from Table 1.

4 DYNAMIC PARAMETERS OF INTENSITY AND EXTENSITY

The derivation of the correlations expressing the share of the effect of intensive factors on the development of outputs can be based on both the partly additive expression (16) and the purely multiplicative

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[7] The domain of definition for inputs as well as outputs includes positive rational numbers: $x \in \langle 0, \infty \rangle$; $y \in \langle 0, \infty \rangle$ then $I(x) \in \langle 0, \infty \rangle$; $I(y) \in \langle 0, \infty \rangle$; $G(x) \in \langle -1, \infty \rangle$; $G(y) \in \langle -1, \infty \rangle$.

[8] This is how numerous authors define efficiency, e.g. Klacek (2006, p. 291), says: *"In general, we can define the total productivity of the factors of production as the ratio between the output of a production process and the summary of inputs of the factors of production. SP(t) = Q(t) / N(t), where Q is the product and N is the summary input"*.

[9] For details of the correlations, sorts and types of aggregations between a static task and a dynamic task, see Mihola (1979) and Mihola (2005).

expression (17). The existing theoretical analyses as well as numerous practical applications that allow for the easy interpretation of results and further generalisation, e.g. into multiple factors, indicate that a logarithmically calculated correlation[10] (17) is more appropriate as the basis for further computations. If expression (16) is used, we must either omit[11] the multiplicative part of that expression, i.e. $G(x) \times G(Ef)$, or split that term 'somehow'. This problem even increases if we consider more than 2 factors because the number of multiplicative terms and their extent increase rapidly.

Literature specifies certain solutions that are only applicable to positive accruals (e.g. Cyhelský, Matějka, 1978, Toms, Hájek, 1966, Toms, 1983, Toms, 1988) of both factors. However, a dynamic task also needs to reflect the instances of declines in the individual factors as well as in the output. Furthermore, both considered factors may have a downside effect on outputs. If one factor has an upside effect while the other has a downside effect, the effects will partly compensate each other, or the mutual compensation may even lead to zero output growth. The following expressions were derived (the derivation is detailed in Mihola, 2007a) to truly express all situations that may occur in a dynamic task.

The derivation result is a correlation for a dynamic parameter of intensity:

$$i = \frac{\ln I(Ef)}{\left|\ln I(Ef)\right| + \left|\ln I(x)\right|},$$ (18)

and a supplementary correlation for extensity:

$$e = \frac{\ln I(x)}{\left|\ln I(Ef)\right| + \left|\ln I(x)\right|}.$$ (19)

For the *purely intensive* development, expressions (18) and (19) generate $i = 1$ and $e = 0$ (or 100% and 0%, as appropriate), while for the *purely extensive* development, expressions (18) and (19) generate $i = 0$ and $e = 1$. Even in all the other instances, the given pair of dynamic parameters provides clear information on the type of development in the given sub-period or total period.

Adding up expressions (18) and (19) will derive the general correlation between the parameters of intensity and extensity:

$$i \times \mathrm{sgn}[G(Ef)] + e \times \mathrm{sgn}[G(x)] = 1, \quad \text{or} \quad |i| + |e| = 1.$$ (20)

The sum of both parameters in quadrant I, where both factors contribute to growth, equals 1. In quadrant III, the sum is −1, with both factors having a downside effect. In compensation quadrants II and IV, the sum of dynamic parameters of intensity and extensity equals 0. This can be used as guidance in the types of development. The sum of both dynamic parameters tells us whether it is quadrant I or III, or whether it is compensation. The fact that the sum of absolute values of both parameters equals 1 is used for designing well-arranged bar charts, for instance, which clearly express the shares of the effects of both factors.

The overview of values of the derived dynamic parameters for basic developments is included in Table 1.

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[10] Even though growth rates in economic calculations are often very low numbers, it is not always the case. This is particularly relevant in use of short time intervals and in a deeper hierarchical structure of the economy, e.g. at the enterprise level. An uncontrolled omission of this multiplicative term is a similar operation as a not quite correct omission of the powers of fluents used by Newton in his derivations. See e.g. Seife (2005, p. 133).

[11] However, use of this procedure for the growing quantities is nothing new at all. As long ago as in 1978, this expression was proposed in Cyhelský, Matějka (1978, p. 302).

Table 1 Values of intensity and extensity parameters for basic developments

	Names – basic developments	Characteristics	Occurrence	Output development	Type	Parameter value	
						Of intensity i (%)	Of extensity e (%)
1	Purely intensive growth	Growth in output y only influenced by Ef developments	Axis y	Growth	Net developments – effect of only one parameter	100	0
2	Purely non-intensive decline	Decline in output y only influenced by Ef developments		Decline		−100	0
3	Purely extensive growth	Growth in output y only influenced by x	Axis x	Growth		0	100
4	Purely non-extensive development	Decline in output y only influenced by x		Decline		0	−100
5	Combined intensive & extensive growth	The same effect of Ef and x on growth in output y	Symmetry axis of quadrants I and III	Growth	Consonant effect	50	50
6	Combined non-intensive & non-extensive decline	The same effect of Ef and x on decline in output y		Decline		−50	−50
7	Intensive compensation	Stagnation of output y by growth in Ef and decline in x	Zero growth hyperbola	Stagnation	Compensation	50	−50
8	Extensive compensation	Stagnation of output y by decline in Ef and growth in x				−50	50

Source: Own construction

Derived dynamic parameters can be used wherever we consider the effect that the development of the relevant absolute and relative quantities had on the result achieved. For example, the effect and inertia, i.e. steady motion, that a speed change (i.e. acceleration) had during accelerated linear motion over a distance achieved. These parameters can be used wherever any outputs and inputs variable over time exist and where the effectiveness or efficiency measurable by changes in effectiveness or efficiency usually varies.

The advantage of those parameters is that they can be compared in respect of time. That said, they are comparable without further modifications even though they have been calculated for timelines of different lengths. This is due to the automatic averaging because no root extraction (averaging) is necessary for base indices, as shown in expression (18) (where a base index for m years is considered):

$$i = \frac{\ln I^{1/m}(x)}{\left| \ln I^{1/m}(u) \right| + \left| \ln I^{1/m}(x) \right|} = \frac{(1/m)\ \ln I(x)}{(1/m)\left| \ln I(u) \right| + (1/m)\left| \ln I(x) \right|} \ . \tag{21}$$

Derived dynamic parameters are not limited in space, and allow for easily comparing different countries, sectors, businesses, etc., due also to the fact that it is a dimensionless quantity. This is because definition expressions (18) and (19) only include dynamic characteristics, i.e. indices. It is an advantage of any dynamic parameter because these are independent of a scale or the units of characteristics used in static tasks.

Correlations (18) or (19) operate with growths as well as declines in any combination, including compensations, at any type of output development. The correlations also work with the limit states of net developments without problems. Also, there is no need to adopt any special simplifying assumptions or to check whether or not an unacceptable distortion has occurred during an approximate calculation, if any. The calculation is transparent, repeatable any time, and will always yield the same result.

The result obtained has a clear interpretation and constant information substantiality. The parameter of intensity i indicates the proportion at which the intensive (qualitative) factor, which makes itself felt

as a change in efficiency, i.e. a change in the share of outputs and inputs over the given period of time, has contributed to the final development of outputs. The parameter of extensity e gives additional information on the proportion at which the extensive (quantitative) factor, i.e. the inflow of qualitatively unchanged inputs over the given period of time, has contributed to the final development of a product (outputs, effects).

A good interpretation of parameters leads to their easy application. Dynamic parameters aptly complement the existing characteristics with a fairly new perspective. The effort to express a share of influence or of the consequent contributions is evident in almost any economic analysis. The primary advantage of the solution presented here is that it comprehensively and systematically addresses all situations, including declines, decreases in one of the factors, and consequently in compensations. However, one should avoid any isolated assessment of those parameters irrespective of the distance from the point of stagnation, where all isoquants converge. Naturally, in assessing the developments which are very close to stagnation, the relevance of the assessment as to how intensively this was achieved disappears. For the same reason, it would be easy to manipulate the sizes of dynamic parameters.

5 MACROECONOMIC INTERPRETATION

Most practical applications have been subject to experiments using a classical macroeconomic task, where input y constitutes the GDP in constant prices and inputs are expressed by functions of state, namely labour L and capital K. Timelines and relevant dynamic characteristics of those quantities are also exogenous quantities of growth accounting.[12] A practical use of the growth accounting correlation is the specification of the residual quantity, which is the growth rate of the summary productivity of factors[13] G(SPF);[14] e.g. Mihola (2007, p. 111), specifies the correlations:[15]

$$G(Y) = G(SPF) + v_L \times G(L) + (1 - v_L) \times G(K), \tag{22}$$

$$G(SPF) = G(Y) - v_L \times G(L) - (1 - v_L) \times G(K). \tag{23}$$

Here the expression is derived, under special assumptions, from an additive identity of national economy,[16] as part of the reflections on the development of what is known as potential output. This includes weight vL as the labour elasticity of output, and weight vK as the capital elasticity of output. Assuming that the return to scale is constant, the sum of those weights equals 1:

$$v_L + v_K = 1. \tag{24}$$

In the expression (22), these weights are used in a weighted aggregation of the rates of growth of labour and capital. The assumption of the additive aggregation in a static task is not realistic just because one cannot imagine an economy without either of these factors, i.e. completely without labour or without

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[12] An analogous expression is derived in numerous studies and textbooks, e.g. Mihola (2007a, p. 108), or Hájek, Mihola (2009, p. 746). Today, this correlation constitutes the backbone correlation of growth theories that are primarily concerned with long-term economic growth of potential output.

[13] Robert M. Solow (see Solow, 1957) examines what is known as steady state growth, where the capital and labour growth rates reach equilibrium. Output growth per capita is subject to technological progress, which he sees as an exogenous factor here. Further elaboration of this idea has shown that not only technological progress but also the collective effect of all intensive factors of growth is relevant.

[14] For example Denison (1967, see p. 15) used the SPF growth rate for an international comparison of 9 developed countries.

[15] The calculation of the total factor productivity using this correlation has been discussed in a number of studies, such as OECD (2003), OECD (2004); some of Czech authors include Hurník (2005), Dybczak et al. (2006), Hájek (2006), Ministry of Finance (2009); in Slovakia: Zimková, Barochovský (2007).

[16] It also includes average wages and capital profitability dependent on labour or capital. In tackling this problem, one should also consider the issues of investment efficiency and the ongoing substitution of labour by technology.

any capital. While these factors are substitutable, they are substitutable relatively rather than absolutely. Hence the likely outcome is a multiplicative aggregation of these factors in a static task, with which a hyperbola-shaped isoquant is commensurate.

The growth rate of the summary productivity of factors G(SPF), calculated from expression (23), makes it possible, if the output growth rate is known, to calculate[17] also the share of the effect of the development of intensive factors on GDP developments, which can by ascertained from expression (18). To be able to use modified expression (18), we initially need to aggregate both inputs in a static task, i.e. labour L and capital.[18] This quantity is referred to as the summary input of factors (SIF). Both additive[19] and multipli cative aggregation functions are used to this end in static as well as dynamic tasks.[20] We believe that the most appropriate form of aggregation is the weighted geometric aggregation,[21] which is used, for example, in the form of Cobb-Douglas with technical progress:[22]

$$Y = SPF \times L^{\alpha} \times K^{(1-\alpha)}, \tag{25}$$

thus
$$SIF = L^{\alpha} \times K^{(1-\alpha)}, \tag{26}$$

which means
$$Y = SPF \times SIF. \tag{27}$$

Expression (27) is a macroeconomic application of expression (10), and can be derived from expression (15). Given the properties of indices, expression (27) can be easily used to derive its own dynamic form, analogous to expression (17):

$$I(Y) = I(SIF) \times I(SPF). \tag{28}$$

By the logarithmic calculation of this expression, we will obtain the initial correlation for a macroeconomic modification of macroeconomic dynamic parameters of intensity and extensity.

The macroeconomic form of the dynamic parameter of intensity is:

$$i = \frac{\ln I(SPF)}{\left| \ln I(SPF) \right| + \left| \ln I(SIF) \right|}. \tag{29}$$

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[17] In these events, literature usually uses the share of growth rates G(SPF) / G(GDP), which is approximately applicable to positive quantities only, where G(SPF) < G(GDP); otherwise the result is difficult to interpret.

[18] Unlike other authors, we consider the factors of labour and capital to be crucial factors variable in time and complementing each other. In the Czech Republic, e.g. Klacek, Vopravil (2008) – on the KLEM production function – deals with multiple factors.

[19] The additive aggregation of labour L and capital K in a static task can be ruled out because thus we would admit either the possibility of generating production solely on the basis of labour without any capital (and consequently without tools) or production solely on the basis of capital, i.e. completely without staff, and this is impossible even in the highest level of automation. As both scenarios are unrealistic, only a weighted or simple multiplicative aggregation or geometric mean comes into consideration.

[20] The additive aggregation of labour L and capital K in a dynamic task at the multiplicative link in a static task means the use of correlation (16), and this necessitates an omission of the multiplicative term of that expression, with this being unfair and possibly leading to serious inaccuracies. See, for example, Hájek, Mihola (2009, pp. 742–743).

[21] The sum of weights equalling 1 leads to a linear production-possibility frontier (PPF) in a 2 × 2 × 2 × 2 model. If these weights are identical, i.e. 0.5, it is a simple geometric mean, and the isoquants will be hyperbolae symmetric around the axis of the first quadrant. For asymmetric weights, the asymmetry of isoquants will primarily express the long-term prevailing substitution by technology. Thus the interpretation of weights will change vis-à-vis that in Hájek, Mihola (2009, p. 746).

[22] We believe that one of the most comprehensive studies of multiplicative type production functions with factors of labour, capital and technical process is the Barro and Sala-i-Martin book (1995), where p. 29 includes the Cobb–Douglas production function in the form of $Y = AK^{\alpha} \times L^{(1-\alpha)}$. The study also includes comparisons to the proposals by Leontief $Y = F(K,L) = min(AK, BL)$ from 1941; Harod from 1939; Domar from 1946; Solow from 1969; and many more. In the Czech Republic, see article Hájková, Hurník (2007), for instance.

The macroeconomic form of the dynamic parameter of extensity is:

$$e = \frac{\ln I(SIF)}{\left| \ln I(SPF) \right| + \left| \ln I(SIF) \right|} \ . \tag{30}$$

The calculation of the share of the effect of intensive and extensive factors using these parameters has numerous advantages vis-à-vis the calculation of the share of effect on the basis of correlation (23):

- It is applicable not only to an increase of the effect of sub-factors but also to their decrease and mutual compensations, i.e. opposing effects, which may lead to the complete compensation into zero output growth as well as to a GDP decline;
- It is not affected by any errors arising from the omission of multiplicative terms of the additive link in respect of growth rates;
- It allows for a very illustrative spatial representation of the trajectories of development (in a chart) of the change coefficients I(SPF) and I(SIF), where the isoquants (contour lines) of the rates of GDP growth and dynamic parameters of intensity as well as extensity can be shown concurrently.

The dynamic parameters of intensity and extensity are applicable not only to the measurement of intensity of economic developments but also whenever we need to find out how the absolute component such as time and the qualitative component such as speed have contributed to the development of a quantity. An interesting application of the above dynamic parameters is that of the assessment of development or innovation cycles or the analysis of demand or supply curves, where the use of dynamic parameters of intensity and extensity proves to be more universal than normally used elasticity, which lacks standardised values.

6 EXAMPLE – DEVELOPMENT OF THE CZECH ECONOMY

The use of the aforementioned correlations will be illustrated in an example analysing the Czech Republic's economy from 1995 to 2010. The initial data constitutes the timelines of real GDP (in constant prices for 2000), number of workers who represent labour L, and net fixed capital (in constant prices for 2000) which represents capital K. The first step includes the calculation of the summary input of factors SIF, correlation (26) (weight α was set at 0.57 ± 0.021). The total factor productivity was calculated by direct computation according to correlation (15). Dynamic characteristics and then the dynamic parameters of intensity i and extensity e, correlations (18) and (19) are calculated from all the quantities monitored.

Table 2 contains the annual growth rates[23] of all key quantities and the dynamic parameters of intensity and extensity.

Table 2 Growth rates of macroeconomic aggregates and parameters of intensity and extensity in the Czech Republic (in %)

	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
G(GDP)	4.0	−0.7	−0.8	1.3	3.6	2.5	1.9	3.6	4.5	6.3	6.8	6.0	2.5	−4.2	1.6
G(L)	0.9	0.2	−1.5	−3.4	−0.2	0.5	0.6	−1.3	0.3	1.0	1.6	2.7	1.2	−1.2	−1.9
G(K)	2.9	2.0	2.0	1.5	1.7	1.8	1.3	1.8	1.6	1.6	1.7	2.3	1.8	1.8	1.6
G(SIF)	0.9	0.9	1.4	−1.6	0.4	0.8	−0.5	−1.1	1.7	1.3	1.8	2.7	0.1	0.2	−0.2
G(SPF)	3.1	−1.6	−2.1	2.9	3.3	1.6	2.4	4.8	2.7	5.0	4.9	3.1	2.4	−4.4	1.8
i	78	−65	−61	65	90	66	83	80	61	80	72	54	97	−95	89
e	22	35	39	−35	10	34	−17	−20	39	20	28	46	3	5	−11

Source: Czech Statistical Office (2011), ECFIN (2011), own calculation

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[23] Authors who calculated the SPF using growth accounting have arrived at similar results, e.g. Šindel (2009), slide 47, specifies the following G(SPF) for years 1996 to 2004: 2.9; −1.3; −1.2; 1.7; 3.5; 1.5; 0.4; 2.8; 3.7%.

The above growth rates of real GDP were generated with the effects of intensive and extensive factors shown in Figure 3. The height of each bar is 100%, the bar is divided into intensive and extensive effects, and each of those components may be positive or negative. We saw partial compensations of both effects in 1997 to 1999; in 2002; 2003; 2009 and 2010, one of the dynamic pair parameters was negative but they were not of the same size in the absolute value.

Table 1 and Figures 2 and 3 show the developments in the individual years of the analysed period. In 1997; 1998 and 2009, the real GDP declined. This decline occurred while the summary inputs were up by 0.9% in 1997, by 1.4% in 1998 and by 0.2% in 2010 but the SPF was down by 1.6% in 1997, by 2.1% in 1998 and by 4.4% in 2009. Thus the contribution of extensive factors was outweighed by the decline of intensive factors. The effects of extensive factors on economic growth were 35% in 1997; 39% in 1998 and 5% in 2009. By contrast, the downside effects of intensive factors on growth were 65% in 1997; 61% in 1998 and 95% in 2009.

As concerns the share of the effect of intensive factors, 1999 was an interesting year, as the increase in real GDP by 1.3% was achieved at the decline in summary inputs by 1.6%, and this decline was more than counterbalanced by a 2.9% SPF rise. In that year, the share of intensive factors in real GDP growth was 65% while extensive factors had a 35% downside effect. A similar situation, albeit more moderate, reoccurred in 2002; 2003 and 2010. In 2002, the real GDP went up by 1.9% at the moderate decline in summary inputs by 0.5%, which was more than counterbalanced by a 2.4% SPF rise. In that year, the share of intensive factors in real GDP growth was 83% while extensive factors had a 17% downside effect. In 2003, the effect of intensive factors was stronger because real GDP growth of 3.6% was generated at the decline in summary inputs by 1.1%. This decline was more than counterbalanced by a 4.8% SPF rise. In that year, the share of intensive factors in real GDP growth was 80% while extensive factors had a 20% downside effect. In 2010, the effect of intensive factors was even stronger because real GDP growth of 1.6% was generated at the decline in the summary inputs by 0.2%. This decline was easily counterbalanced by a 1.8% SPF rise. In that year, the share of intensive factors in real GDP growth was 89% while extensive factors had an 11% downside effect. The type of developments shown in the four years described was exceptional because real GDP growth was fuelled by such a strong increase in intensive (qualitative) factors that it outweighed the decrease in extensive factors.

Figure 2 Rates of real GDP growth in the Czech Republic in 1995–2010 (in %)
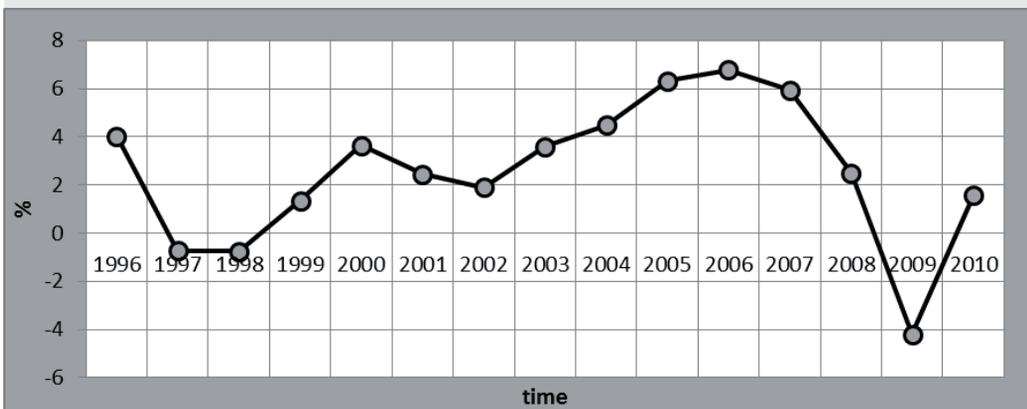
Source: Czech Statistical Office (2011)

In all the other years, i.e. 1996; 2000; 2001, and in the last four years, 2004 to 2008, both factors, i.e. intensive and extensive, always had an upside effect. Intensive factors were always predominant, with their

share being twice to eight times greater than that of extensive factors. Only in 2007, the predominance of the intensive factor was modest. During those years, the shares of extensive factors ranged between 1/8 and 1/2 while the corresponding intensive factors ranged between 7/8 and 1/2. The greatest intensity of 90% was achieved in 2000. The lowest positive intensity of 54% was achieved in 2007.

Figure 3 Shares of the effects of intensive and extensive factors in real GDP of the Czech Republic (in %)
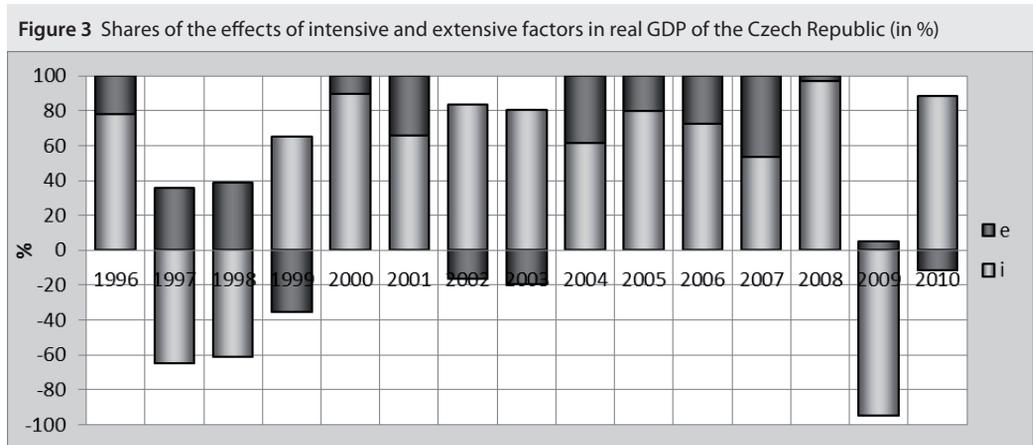
Source: Czech Statistical Office (2011), ECFIN (2011), own calculation

The first period examined (1997–1998) saw a recession, arising from the instable political climate, making itself felt in highly restrictive monetary and fiscal policies. Uncoordinated interventions even led to a monetary crisis in 1997. Institutional barriers had the strongest impact on the banking sector, which found itself in a critical situation. The privatisation that was frequently unconsidered, and thus too spontaneous, led to instability, which delayed the required restructuring of enterprises and the launch of a more stable and more forward-looking innovative management. Investment stagnation was also accompanied by the poor inflow of foreign direct investments. There was still the aftermath of the strong past structural focus on heavy industry. The effect of high ecological investments was also evident.

Although the institutional environment was not yet refined in the subsequent period of 2000 to 2007, it improved significantly with the preparations for and the accession to the EU in 2004. The consequences of the growth-oriented economic policy and a more rational behaviour of the banking sector after its increased consolidation as well as the post-privatisation behaviour of enterprises had a positive effect. Domestic investments increased significantly, as did the inflow of foreign investments. Enterprises under strong foreign control were gaining ground, and exports were rising. However, the growth acceleration was not yet accompanied by the key long-lasting qualitative factors in HR improvement, and science and research development as a precondition of boosting the innovation process. The increasing openness of the economy had a positive effect on its performance but its dependence on and consequently its susceptibility to external environment increased somewhat as well. In addition, this vulnerability is boosted by the narrow portfolio of primary activities, particularly focused on the automotive industry, which is highly overgrown to the detriment of other transport alternatives as concerns ecology.

In 2008, the country lost its growth rate. The strong impact of intensive factors is due to the pre-crisis ousting of workforce rather than other factors. This became fully evident during the 2009 restriction, which was a result of the Czech economy reflecting the impacts. While 2010 was a year of adaptation to the new conditions, the adaptation is probably not based systematically, in a change of the structure of the economy. The negative extensity of 2010 was due to the post-crisis reduction of the economy in respect of both factors considered.

CONCLUSION

Development intensity is one of the major indicators of the quality of economic developments. At the macroeconomic level, it can be measured as the ratio between real GDP and summary input, which includes labour and capital. Its increase is a result of qualitative, i.e. intensive, factors of growth. To aggregate the factors of labour and capital in the summary input SIF, we used the weighted geometric aggregation.

To find out the shares of intensive (i.e. qualitative) and extensive factors in real GDP growth, we used the dynamic parameter of intensity and extensity. These parameters allow for measuring their shares if the factors have opposing effects as well as if the real GDP declines, are universally applicable, and are easy to compare in respect of time and space. This makes it possible to extend economic analyses with a new perspective. The application of the suggested methodology to the analysis of the Czech Republic's developments in 1995–2010 has shown that these parameters aptly complement conventional analysis tools.

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At-Risk-of-Poverty Threshold

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Abstract

European Statistics on Income and Living Conditions (EU-SILC) is a survey on households' living conditions. The main aim of the survey is to get long-term comparable data on social and economic situation of households. Data collected in the survey are used mainly in connection with the evaluation of income poverty and determination of at-risk-of-poverty rate. This article deals with the calculation of the at risk-of-poverty threshold based on data from EU-SILC 2009. The main task is to compare two approaches to the computation of at risk-of-poverty threshold. The first approach is based on the calculation of the threshold for each country separately, while the second one is based on the calculation of the threshold for all states together. The introduction summarizes common attributes in the calculation of the at-risk-of-poverty threshold, such as disposable household income, equivalised household income. Further, different approaches to both calculations are introduced and advantages and disadvantages of these approaches are stated. Finally, the at-risk-of-poverty rate calculation is described and comparison of the at-risk-of-poverty rates based on these two different approaches is made.

Keywords	JEL code
EU-SILC, at-risk-of-poverty threshold, at-risk-of-poverty rate, income poverty	D31

INTRODUCTION

The European Union – Statistics on Income and Living Conditions[2] (EU-SILC) is the main data source on income and living conditions of European households. In 2009 the survey took place in 27 Member States of the European Union and in Switzerland, Norway and Iceland.

The main aim of the survey is to obtain data, comparable in the long-term, on the social and economic situation of households. Data obtained in the survey are used mainly to explore the at-risk-of-poverty threshold and the at-risk-of-poverty rate (e.g. European Commission, 2010a).

The quality of life could be evaluated on the basis of material and living conditions, which could be measured by indicators of income poverty, material deprivation and social exclusion. Evaluation of the at-risk-of-poverty rate and the comparison of the results obtained by calculation and the results of European countries would not be possible without the data on income. To get a credible and complete picture of the financial situation of households in terms of their income, it was necessary to capture all their incomes, not just those from work. All necessary information on households' income as a whole and individuals over 16 years is provided just the EU-SILC survey.

All the outputs in this article are based on data from EU-SILC 2009. The reference period for income variables is the year 2008. An exception is the United Kingdom, where the income reference period is related to the current situation in the survey period.

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[2] For more information on the EU-SILC, see:
<http://epp.eurostat.ec.europa.eu/portal/page/portal/income_social_inclusion_living_conditions/introduction#>.

Data used in the analyses are only for EU Member States (Austria, Belgium, Bulgaria, Czech Republic, Cyprus, Denmark, Estonia, Spain, Finland, France, Great Britain, Hungary, Ireland, Italy, Latvia, Luxembourg, Lithuania, Malta, Netherlands, Poland, Portugal, Romania, Greece, Sweden and Slovakia). Due to the refusal to provide data, Germany and Slovenia could not be included. Non-EU states (Switzerland, Iceland and Norway) are not included in the analyses either, although data from these countries are available.

The calculation of the at-risk-of-poverty threshold is based both on the obtained household income and income of household members aged 16 years and over. The computation of income variables is based on the binding methodology provided by the European Statistical Office (Eurostat).[3] The variables of household income include income from rental of a property or land, social benefits received (Assistance in material need, Family / Children allowances, Housing allowances), regular inter-household cash transfers received, income received by people aged under 16 years, and interests, dividends, profit from capital investments in unincorporated business. The income collected for persons aged 16 years and over includes gross cash employee income, gross non-cash employee income (e.g. company car), gross cash profits or losses from self-employment, unemployment benefits, old age benefits, survivors' benefits, disability benefits, sickness benefits and education-related allowances (e.g. European Commission, 2010b).

All these incomes are included in the variable Total household gross income, after deduction of the mortgage interest, regular taxes and employer's social insurance contributions, and regular inter-household cash transfer paid created the variable Total disposable household income. Total disposable household income is the main variable in the calculation of the at-risk-of-poverty threshold and indicators evaluating income poverty.

The methodology of Eurostat sets the at-risk-of-poverty threshold at 60% of median equivalised income (e.g. European Commission, 2010c). Equivalised income is defined as the share of the total disposable household income and the sum of consumption (equivalent) units that is equivalised household size. Conversion to the equivalent units is useful because it takes into account the size and demographic composition of the household. For calculating equivalised income, the modified OECD scale,[4] is used. This equivalence scale gives a weight of 1.0 to the first adult in the household, 0.5 to any other household member aged 14 and over and 0.3 to each child below 14.

This equivalised income is assigned to all household members, regardless of whether they are adults or children. From the set of all persons ranked in ascending order according to their equivalised income, the median equivalised income is determined. The at-risk-of-poverty threshold is calculated as 60% of median equivalised income. The at-risk-of-poverty rate is the share of people with an equivalised income below the at-risk-of-poverty threshold.

Despite the common methodology the income disparity between EU Member States must be taken into account. Income in each of the states is influenced both by its direct government interventions or regulations, and indirect effects such as the result of market forces. The fiscal policy (tax system) and the social policy are the main influences from the government. The main indirect effects include current distribution of wealth and market-determined differentiation of income from employment and income from self-employment carried on by the profession.

If we compare the at-risk-of-poverty rate between EU Member States, it is very important how the at-risk-of-poverty threshold is constructed. The main aim of this article is to compare two approaches to the calculation of the at-risk-of-poverty threshold, so that one could assess the risk of income poverty rate of Member States.

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[3] For detailed information on the total household income, see:
    <http://epp.eurostat.ec.europa.eu/portal/page/portal/income_social_inclusion_living_conditions/methodology/main_concepts_and_definitions#>.
[4] For more information on the OECD scale see: <http://www.oecd.org/dataoecd/61/52/35411111.pdf>.

The first approach to the calculation of the at-risk-of-poverty rate is based on common poverty threshold for all countries. The common poverty threshold allows for comparing the risk of income poverty in all EU states same to a large degree. It better reflects different income levels across countries but, on the other hand, it does not take into account different tax and social systems in these countries.

The second approach uses the standard indicators published by Eurostat.[5] It is based on calculating the at-risk-of-poverty threshold for each state separately. The direct comparison of the at-risk-of-poverty rate between countries is therefore not fully correct, but its advantage is that it takes into account the different conditions in individual countries.

Each of the two rates is warranted, and the difference between them only proves how difficult it is to find an objective criterion for international comparison.

1 THE CZECH REPUBLIC

The Czech Republic is divided into 14 regions NUTS 3. The at-risk-of-poverty threshold (regional poverty threshold) is calculated for each region separately and then the at-risk-of-poverty rate is computed. Along with the calculation of the regional poverty threshold nationwide at-risk-of-poverty threshold for the Czech Republic as a whole is calculated. Similarly, the poverty threshold is calculated for individual EU Member States and the whole EU.

The comparison of the at-risk-of-poverty rate of the Czech Republic and its regions serves as an example of how could it appear when there is the same economic and social system, similar level of population and similar market mechanism affecting for instance income according to occupation in all EU Member States.

1.1 At-risk-of-poverty threshold, CZ

In 2009, the at-risk-of-poverty threshold in the Czech Republic accounted for CZK 109 184. If we compare the different regional poverty thresholds with this nationwide poverty threshold, we find out that only four regions are above this threshold (Figure 1 non dotted). Regional poverty threshold higher than CZK 115 thousand was in Praha and the Stredocesky region.

Figure 1 Regional at-risk-of-poverty thresholds according to the nationwide at-risk-of-poverty threshold in 2009 (in CZK)

Source: EU-SILC, own construction

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[5] Main tables are available at:
<http://epp.eurostat.ec.europa.eu/portal/page/portal/income_social_inclusion_living_conditions/data/main_tables>.

1.2 At-risk-of-poverty rate, CZ

In the following two figures we compare the degree of at-risk-of-poverty rate by the nationwide poverty threshold (Figure 2) and subsequently by the regional poverty thresholds (Figure 3).

In the case of the first concept, which is based on the nationwide poverty threshold, the poverty rates in regions have a much higher variability than in the case of the second approach, which takes into account the regional poverty thresholds.

Both figures confirm the variability of each poverty rates. In the first figure, regions are situated in all used scales, while in the second one more than half of the regions are located in the range between 7.1% and 11.0%.

Figure 2 At-risk-of-poverty rate according to the nationwide poverty threshold in 2009 (in %)

Source: EU-SILC, own construction

Figure 3 At-risk-of-poverty rate according to the regional poverty threshold in 2009 (in %)

Source: EU-SILC, own construction

When comparing the at-risk-of-poverty rate according to the nationwide poverty threshold, the lowest risk of poverty rate shows Praha (4.6%), while the highest risk of poverty rate can be observed in the Olomouc region (15.8%). The result reflects the real situation in income level in regions.

From the point of view of calculating the regional at-risk-of-poverty threshold, the Jihocesky region has the lowest income poverty rates –5.3%. On the other hand, the highest poverty rate amounting to 12.4% is registered for Praha.

1.3 CZ regions by at-risk-of-poverty rate
In the following three figures there is an analysis of ranking of regions according to the level of at-risk-of-poverty rate.

Figure 4 Ranking of regions by poverty rate based on the nationwide poverty threshold

Source: EU-SILC, own construction

Figure 5 Ranking of regions by poverty rate based on the regional poverty threshold

Source: EU-SILC, own construction

Figure 4 shows the ranking of the regions by poverty rate derived from the nationwide poverty threshold. Praha and the Jihocesky region occupy the first two positions and the last two positions belong to the Karlovarsky and Olomoucky region.

Figure 5 reflects the order of the regions by poverty rate calculated from the regions' poverty thresholds. The Jihocesky and Kralovehradecky region holds the first two positions, and the last two belong to Praha and the Stredocesky region.

Praha shows the biggest fall in the ranking as monitored in Figure 6. Praha dropped from the first position to the last one. Next highest slump was registered in the Stredocesky region, which fell from the 7th to the 13th place. The Jihocesky region shifted from the second position to the first one. These changes in the order of regions could be explained by using coefficients of income distribution.

Figure 6 The difference in the ranking of regions by poverty rate based on nationwide and regional poverty threshold

Source: EU-SILC, own construction

1.4 Coefficients of distribution of income, CZ

We see certain relationship between the at-risk-of-poverty rates by region and coefficients of income inequality. If we compare these coefficients with the risk of poverty rate, we observe a clear dependence, the higher these coefficients are, the higher the risk of poverty rate is.

Specifically, the Gini coefficient (see Figure 7) shows inequality in person's income in the area. The higher value Gini coefficient gives, the higher differences in income of persons are. Correlation between the Gini coefficient and the at-risk-of-poverty rates is 0.724, indicating medium dependence between these indicators. The overall Gini coefficient takes values 25 for the Czech Republic, which is rather lower value. At the regional level Gini coefficient varies from 20 to 31.

If we focus on Praha, we see that it lies in the upper right corner, while the Jihocesky region is situated in the lower left corner. This might explain the previously mentioned decline of Praha from the lowest at-risk-of-poverty rate derived from the nationwide poverty threshold to the highest risk of poverty rate derived from the regional poverty threshold.

The second coefficient measuring income inequality is the coefficient S80 / S20. It is the share of 20% of the population with the highest total disposable income (top quintile) and 20% of the population with the lowest total disposable income (lowest quintile). The higher coefficient, the bigger income differentia-

tion is. In practice, this coefficient ranges from 2 to 12. Overall, the coefficient S80 / S20 acquired value 3.5 in the CZ. In the regions the coefficient S80 / S20 varied between 2 and 5. The correlation coefficient between S80 / S20 and the at-risk-of-poverty rate is 0.796, indicating medium dependence. Figure 8 shows the same situation of the regions as we see in Figure 7.

Figure 7 Relationship between the regional poverty rates and the Gini coefficient
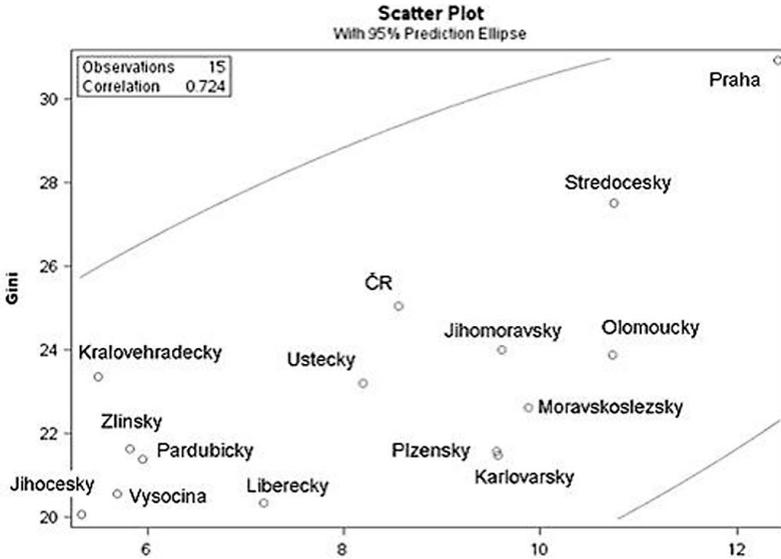
Source: EU-SILC, own construction

Figure 8 Relationship between the regional poverty rates and coefficient S80 / S20
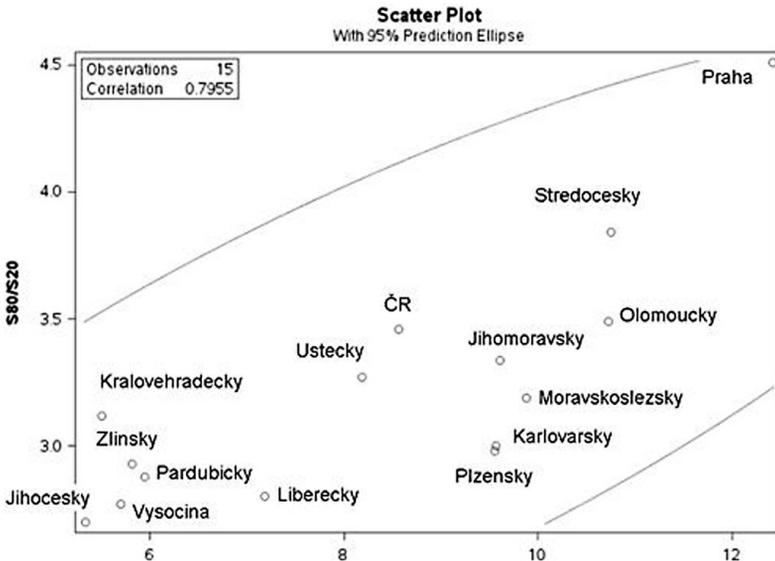
Source: EU-SILC, own construction

2 THE EUROPEAN UNION

In this part, attention will paid to the comparison of the at-risk-of-poverty rate between EU Member States. The calculations could not cover Germany and Slovenia, which do not provide their data for analytical purposes. Given the fact that Germany belongs to developed countries, we can assume that its inclusion would increase the final European at-risk-of-poverty threshold. On the other hand, Slovenia can be judged as a state, which has similar level as the Czech Republic and would probably not affect the results. In comparison, we must assume that EU Member States have different economic and social systems, market mechanisms acting differently, different levels of population, etc.

The analysis is based on similar procedure as in the case of the Czech Republic. It compares two approaches for calculating the at-risk-of-poverty threshold and the at-risk-of-poverty rate.

The first approach to the calculation of the at-risk-of-poverty rate is based on a poverty threshold, which covers all EU states – the EU is a single unit. The poverty threshold calculated in this way can be used to compare the risk of income poverty rate of people in all EU countries equally. To calculate the European poverty threshold the total disposable household income, which is calculated in all these states by the same methodology, is used. Disposable income is calculated in Purchasing Power Standards[6] (PPS) in 2009. PPS is used in order to enable a comparison between countries. PPS is an artificial reference currency unit that eliminates differences of prices levels or exchange rate between countries. Disposable income in PPS gives us a comparable income in all EU Member States according to their purchasing power.

The second approach to the at-risk-of-poverty rate calculation is based on the national income poverty threshold and the national at-risk-of-poverty rate. At-risk-of-poverty rate in this case is a relative measure of risk of poverty. At-risk-of-poverty threshold among the Member States is calculated from the total national disposable income. Thus created indicator of the risk of poverty rate is more suitable for evaluation of the national at-risk-of-poverty rate, because it evaluates its own situation, regardless of the rest of states.

2.1 At-risk-of-poverty threshold, EU

The European poverty threshold is 8 160 PPS taking the EU as a whole. Based on this threshold, states were divided into two groups - the states with a national poverty threshold below the European poverty threshold (Figure 9 dotted) and the states with a national poverty threshold above this threshold (Figure 9 non dotted). Luxembourg has the only poverty threshold higher than 12 000 PPS. Poverty threshold from 10 501 to 12 000 PPS have Cyprus, the Netherlands, Austria, Sweden, Denmark, France and Ireland. On the other hand, the states having their value of the national poverty threshold lower than 5 000 PPS are Romania, Bulgaria, Hungary, Latvia, Lithuania, Poland, Slovakia and Estonia.

It can be deducted from the foregoing figure that there is a considerable difference between the EU15 and New Member States (NMS12). Among the EU15, only two states have national poverty threshold lower than the European poverty threshold. It is Portugal, which has a national poverty threshold in the range 5 001–6 500 PPS (5 646 PPS) and Greece, whose national poverty threshold is located in the interval of 6 501–8 160 PPS (7 578 PPS). Cyprus is the only state among the NMS12 that has its national poverty threshold (11 785 PPS) above the European poverty threshold.

Looking at the results in Figure 9, we can get basic idea of degree of the at-risk-of-poverty rates for each EU Member State derived from the European poverty threshold.

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[6] More on information about PPS, see:
  <http://epp.eurostat.ec.europa.eu/portal/page/portal/purchasing_power_parities/introduction>.

Figure 9 The national poverty thresholds according to European poverty threshold in 2009 (PPS)
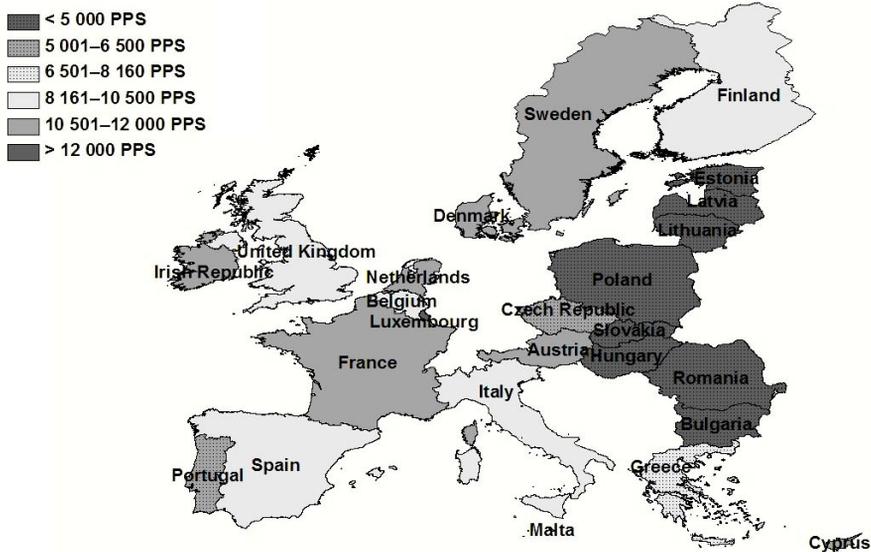
Source: EU-SILC, own construction

2.2 At-risk-of-poverty rate, EU

European at-risk-of-poverty rate established on the European poverty threshold is 29.3%. While it might appear that almost 30% is a high number, we must realize that the risk of the income poverty rate varies from 0 to 100% in constituent states. This is confirmed by the variation in the at-risk-of-poverty rates. In case of the first approach based on the European poverty threshold there is a much higher variability than in the second concept. This conclusion is confirmed by the following figures.

The first figure shows the poverty rate according to the European poverty threshold. There is an obvious link to the Figure 9 that shows the national poverty thresholds. The states that have national poverty threshold above the European threshold have at-risk-of-poverty rates based on the European poverty threshold only up to 25%. Luxembourg had the highest national poverty threshold and so it has the lowest at-risk-of-poverty rate of all, less than 1%. On the other hand, Romania had the lowest national poverty threshold and so it has the highest at-risk-of-poverty rate, amounting to almost 99%.

Figure 10 shows a noticeable difference between the at-risk-of-poverty rate of EU15 and NMS12. Low poverty rates have only two states in the group of New Member States – Cyprus 7.0% and Malta 35.1%.

Taking into account the national at-risk-of-poverty rates under the national poverty thresholds, the risk of poverty rates variability is not so high, ranging between 8 and 26%. Using the same scale as in the previous Figure 10, all states belong to the same range between 5 and 25%, except for Latvia, which has 26% poverty rate so it belongs to the range from 25 to 45% (see Figure 11).

To overview the differences of individual rates of poverty, it is necessary to use a different scales (see following Figure).

Figure 10 At-risk-of-poverty rate by a European poverty threshold in 2009 (in %)
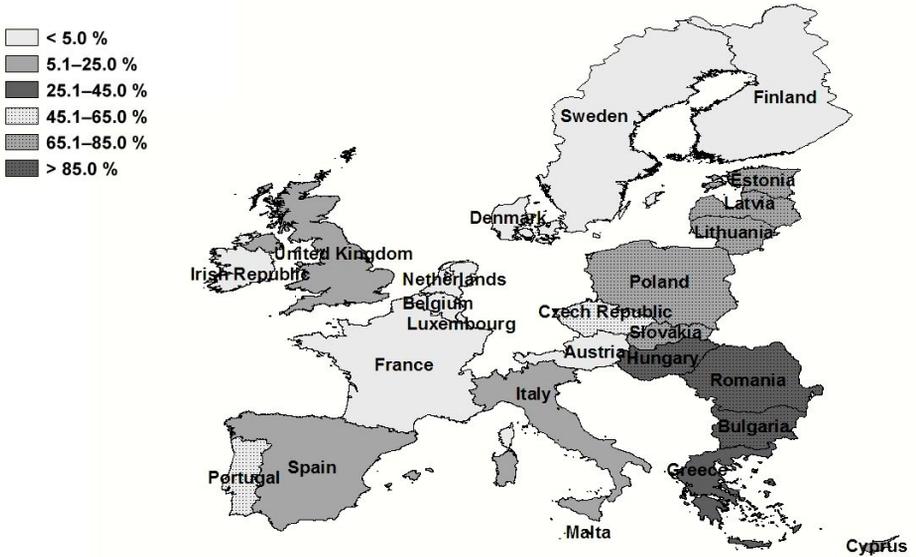
Source: EU-SILC, own construction

Figure 11 At-risk-of-poverty rate according to the national poverty threshold in 2009 (in %)
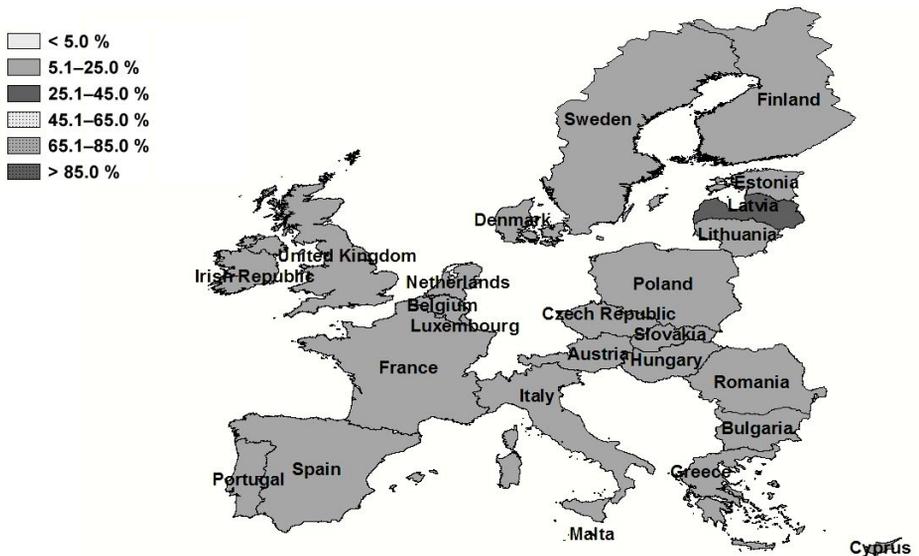
Source: EU-SILC, own construction

Figure 12 At-risk-of-poverty rate according to the national poverty threshold in 2009 (in %)
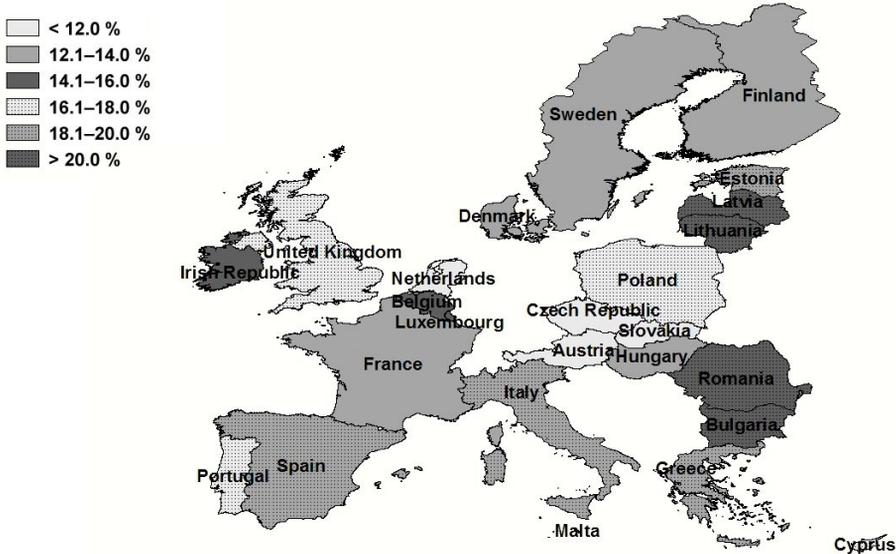
Source: EU-SILC, own construction

Figure 12 shows the at-risk-of-poverty rate calculated according to national poverty threshold. Eurostat usually publishes these poverty rates. As opposed to the Figure 10 there is not a clear distinction between the EU15 and the NMS12. The lowest national at-risk-of-poverty rates have the Czech Republic, Slovakia, the Netherlands and Austria. The highest national at-risk-of-poverty rates have Romania, Bulgaria, Lithuania and Latvia. The lowest level of income and highest income differentiation are likely causes of the fact that Romania and Bulgaria are the countries with the highest at-risk-of-poverty rates in terms of both concepts.

2.3 The EU member states by at-risk-of-poverty rate

The following three figures show the difference in the sequence of the states, ranked by the at-risk-of-poverty rate calculated according to the European poverty threshold (Figure 13), followed by at-risk-of-poverty rates derived from the national poverty thresholds (Figure 14). Finally, there are states ranking of at-risk-of-poverty rates calculated on the basis of European poverty threshold subtracted from the ranking of states by poverty rates calculated on the basis of national poverty threshold (see Figure 15). Move up in the order was recorded mainly for the NMS12 (for example CZ advanced from the 21st place to the first one) and a decrease in the order was recorded for the EU15 (for example Italy has fallen from 15th place to 21st place).

Figure 13 compares the risk of poverty rate for all states derived from the European poverty threshold. There is again a noticeable difference between the EU15 and the NMS12. On top, those states, which have the lowest at-risk-of-poverty rate, are Luxembourg, Finland, Ireland, the Netherlands and Austria. On the other side, Romania, Bulgaria, Hungary and Poland were on the last rungs with the highest risk of income poverty rate.

Figure 14 shows the ranking of the states by at-risk-of-poverty rate based on the national poverty threshold. The order of the states has changed especially in the leading positions that in this respect belong to the Czech Republic, Slovakia, the Netherlands, Austria and Hungary.

Figure 13 At-risk-of-poverty rate according to the national poverty threshold in 2009 (in %)

Source: EU-SILC, own construction

Figure 14 Ranking of states by poverty rate based on the national poverty threshold

Source: EU-SILC, own construction

Figure 15 The difference in the ranking of states by poverty rate based on European and national poverty threshold
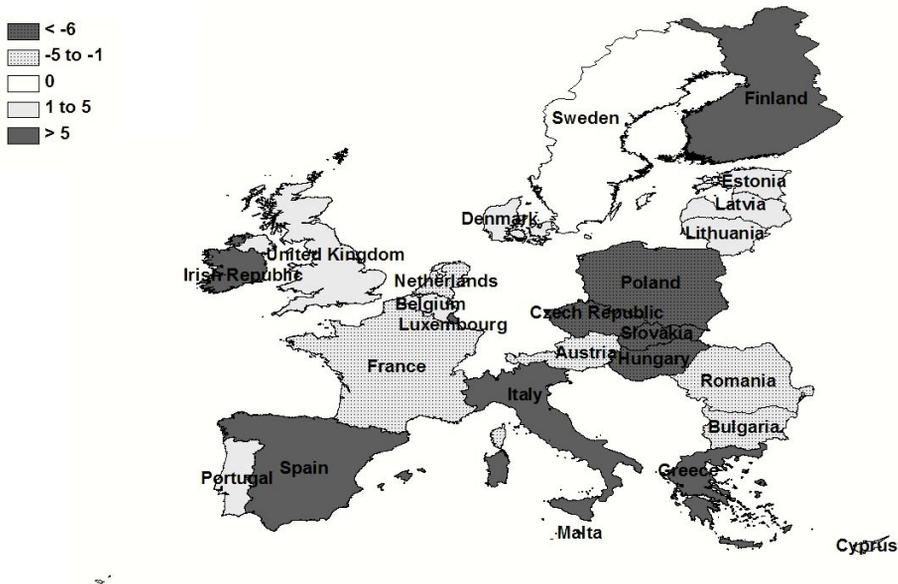
Source: EU-SILC, own construction

Figure 15 indicates the change in the order of the states according to the risk of poverty rate. The dotted states achieved the highest decline in the order, while the non dotted states recorded the highest upward shift. Hungary is an interesting example, which, according to the European poverty threshold was placed with the highest at-risk-of-poverty rate at the lowest position, but according to national poverty threshold finds itselves with the lowest at-risk-of-poverty rate.

2.4 Coefficients of distribution of income, EU

In comparison of the national at-risk-of-poverty rates and coefficients of income distribution an undoubted relationship can be seen. If we compare these coefficients with the risk of income poverty rate based on the national poverty thresholds, we find a clear dependence. The higher these coefficients, the higher the at-risk-of-poverty rate is (e.g. Atkinson, A. B., 2003).

In case of the Gini coefficient, which indicates inequality of distribution of income, the correlation between the Gini coefficient and national at-risk-of-poverty rates is 0.932, indicating a strong correlation between these indicators. The overall Gini coefficient for the EU takes a high value 40.2. At the national level varies from 22 to 37.

If we focus in Figure 16 on states with the lowest national risk of income poverty rate, it is obvious that these states lie in the lower left corner. These are the Czech Republic, Slovakia, the Netherlands, Hungary and Austria. States with the highest national risk of poverty rate are situated in the opposite corner of the graph; these are Lithuania, Latvia, Romania and Bulgaria.

The second coefficient used for measuring the income inequality is the coefficient of income inequality S80 / S20. In the Member States this coefficient takes values from 3 to 7. Overall, for the EU as a whole the coefficient achieves the value of 11. The correlation coefficient between S80 / S20 and national at-risk-of-poverty rates is 0.939, which indicates a strong dependence as well as the Gini coefficient. The following Figure 17 shows the similar situation of states as in the previous Figure 16.

Figure 16 Relationship between national poverty rates and the Gini coefficient
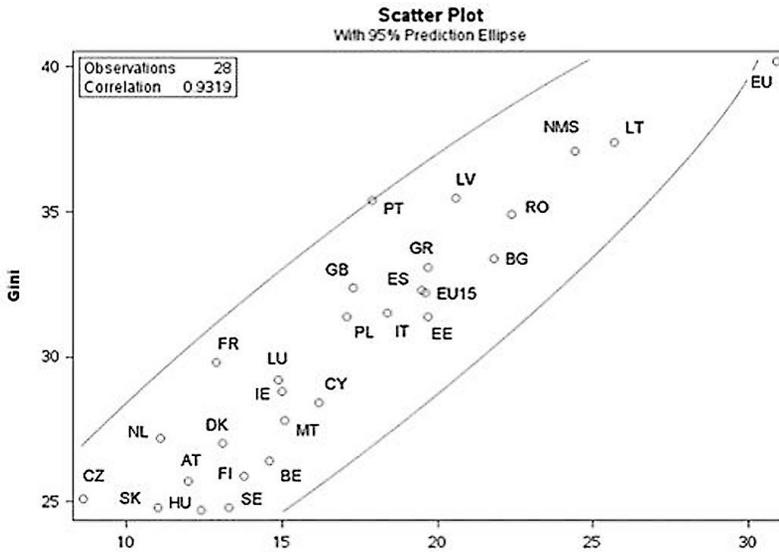
Source: EU-SILC, own construction

Figure 17 Relationship between national poverty rates and the coefficient S80 / S20
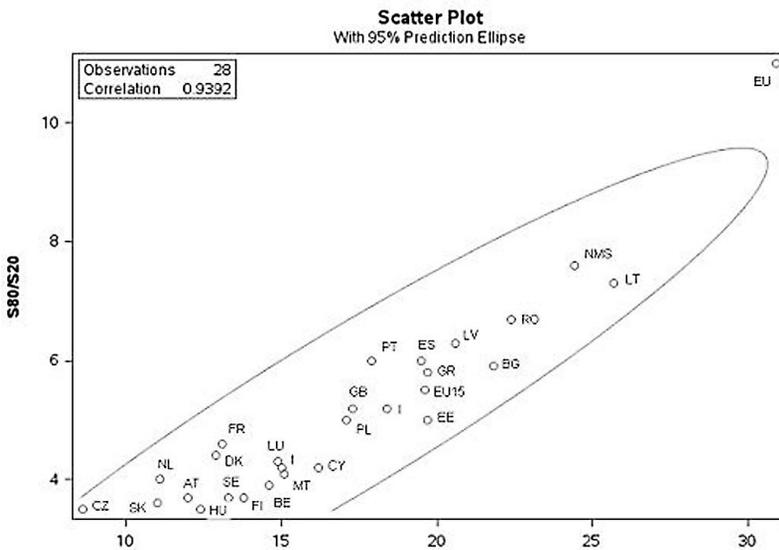
Source: EU-SILC, own construction

3 OLD MEMBER STATES – EU 15

The following analysis focuses only on the EU15 without Germany. For computation of the at-risk-of-poverty rate total disposable household income in PPS was used. On this basis, the EU15 poverty threshold and the at-risk-of-poverty rate of each country were calculated.

3.1 At-risk-of-poverty threshold, EU15

The at-risk-of-poverty threshold for the EU15 as a whole is 10 142 PPS. The national poverty threshold above EU15 poverty threshold belongs mainly to states in the North Europe (non dotted in Figure 18). On the contrary, states with the national poverty threshold below the EU15 poverty threshold are situated in the South Europe; i.e. Portugal, Spain, Greece and Italy (Figure 18 dotted).

Figure 18 National poverty thresholds according to the EU15 poverty threshold in 2009 (PPS)
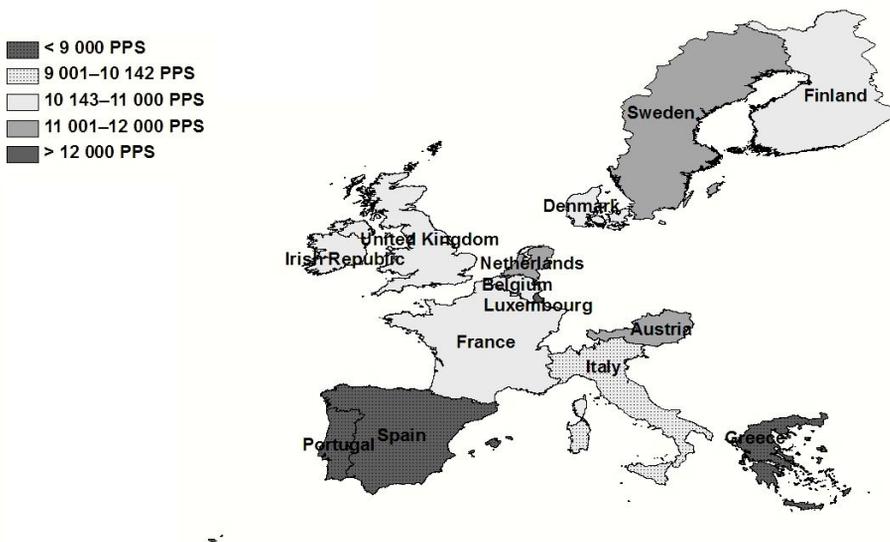
Source: EU-SILC, own construction

3.2 At-risk-of-poverty rate, EU15

Figure 18 illustrates the value of the national poverty threshold in the EU15 compared to the EU15 poverty threshold. If states had their risk of poverty threshold higher than the EU15 poverty threshold, these states had a lower at-risk-of-poverty rate and vice versa.

The Figure 19 shows that the risk of income poverty is most affected Portugal (64.5%), Greece (40.8%) and Spain (31.9%). The number of states with lower risk of income poverty (to 10%) is nine. From these states, Luxembourg has the lowest at-risk-of-poverty rate (1.3%), in the Irish Republic and the Netherlands the risk-of-poverty rate shows around 4% and in other states it ranges from 5 to 10%.

Figure 19 At-risk-of-poverty rate according to the EU15 poverty threshold in 2009 (in %)
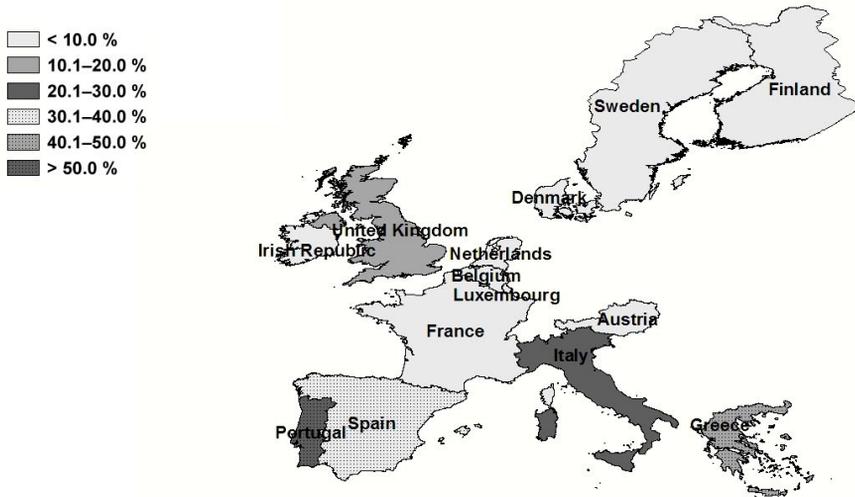
Source: EU-SILC, own construction

4 NEW MEMBER STATES – NMS12

The chapter is focused on new Member States except of Slovenia, which is not included due to failure to provide the required data.

4.1 At-risk-of-poverty threshold, NMS12

The at-risk-of-poverty threshold for new Member States is 2 690 PPS. The highest national poverty threshold of these countries has Cyprus (11 785 PPS), the lowest one has Romania (2 066 PPS). Only 2 states have national poverty threshold below the NMS12 poverty threshold – Romania and Bulgaria.

Figure 20 National poverty thresholds according to the NMS12 poverty threshold for 2009 (PPS)
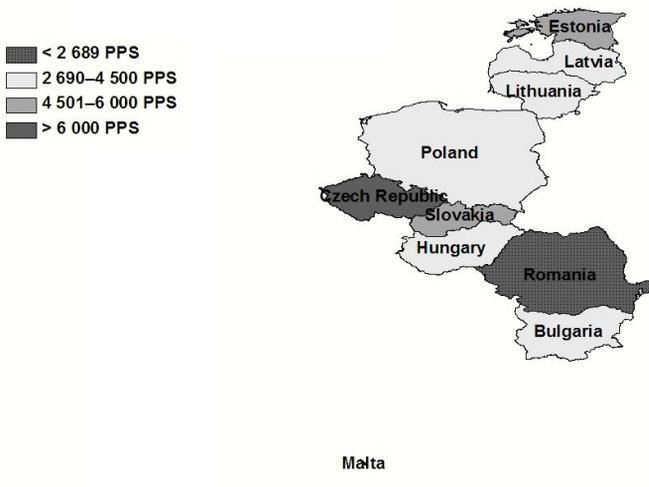
Source: EU-SILC, own construction

4.2 At-risk-of-poverty rate, NMS12

As it is shown in Figure 21, the at-risk-of-poverty rates to 10% have Cyprus (0.1%), the Czech Republic (1.9%), Slovakia (5.9%) and Estonia (6.6%). The highest risk of poverty rate among the NMS12 shows Romania (65.1%) and Bulgaria (46.3%). These conclusions about at-risk-of-poverty rate correspond to the conclusions in chapter 4.1.

Figure 21 At-risk-of-poverty rates according to the NMS12 poverty threshold in 2009 (in %)
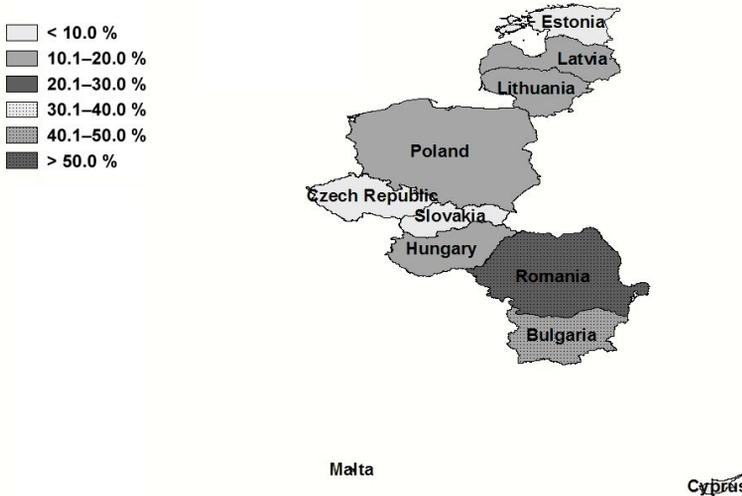
Source: EU-SILC, own construction

CONCLUSION

The introductory chapter describes the general principle of computing the indicators of the at-risk-of-poverty rate. The aim of this article is to obtain the at-risk-of-poverty rate for constituent states, which could be compared with EU states that are included in the analysis. This comparison is achieved by calculating the at-risk-of-poverty rate based on one poverty threshold for the whole area.

The second chapter focuses on the calculation of the at-risk-of-poverty rate in the Czech Republic. It is shown, how would the comparison of poverty rate look like, if we took the CZ as a whole Europe and regions as its individual states. The difference between this example and the whole Europe subsists in the fact that the Czech regions have the same economic and social system, a similar population and similar effect of the market mechanism.

Comparing the at-risk-of-poverty rates by the regional poverty threshold and the nationwide threshold is especially interesting for Praha. Taking into account one poverty threshold for the CZ, Praha has the at-risk-of-poverty rate 4.6%, the lowest rate of all regions. On the contrary, 12.4% of the population in the region has the equivalised income below the Praha region poverty threshold, which is the highest at-risk-of-poverty rate in all regions. This difference is due to high variability of income distribution, which is confirmed by the Gini and S80 / S20 coefficients. The lowest income variability can be observed in the Jihocesky region, which is thus placed at the forefront in both concepts.

The third chapter deals with a similar analysis as for the Czech Republic conducted for the EU and its Member States. The difference in the level of the at-risk-of-poverty rate comes from the fact that there are more disparities between individual EU states than between the Czech regions. It is shown on the based on European poverty threshold that there are considerable differences between Member states of

the EU15 and New Member States (NMS12). Only two states of EU15 are below the European poverty threshold – Portugal and Greece. Among the NMS12, only one country – Cyprus, has a national poverty threshold that goes beyond the European one.

If we look at the at-risk-of-poverty rates according to the European poverty threshold, the lowest rate is observed in Luxembourg (1%), while the highest is in Romania (99%). Taking into account the poverty rate based on the national poverty threshold, the lowest poverty rate has the Czech Republic (8.6%), the highest has Latvia (25.7%). As well as in the case of the CZ and its regions, the relationship between the coefficients of income inequality and at-risk-of-poverty rate based on the national poverty threshold was confirmed.

The analysis identifies significant differences in the level of poverty among the EU15 and NMS12. For that reason, a separate analysis for these two areas in the fourth and fifth chapter is carried out. EU15 states could be divided, on the basis of the at-risk-of-poverty rate by the poverty threshold of this area, into northern states, which are characterized by higher poverty threshold and lower income poverty rate, and the southern ones that are characterized by lower poverty threshold and higher poverty rate. From the NMS12, Cyprus, the Czech Republic, Slovakia and Estonia have the highest poverty threshold and the lowest at-risk-of-poverty rates, while the lowest poverty threshold and the highest poverty rate could be seen in Bulgaria and Romania. Romania and Bulgaria are the only two states whose poverty threshold is lower than the poverty threshold for the NMS12 as a whole.

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Revision of Regional Accounts 2011

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Abstract

This paper builds on an extraordinary revision of regional accounts whose results were published in November 2011 following previous revision of the national accounts time series (September 2011). The first chapter provides description of working procedures and results of the gross value added (GVA) revision for the period 1995–2007. The second chapter deals with methodological corrections and models whose revision had the biggest impact on the change of the GDP regional structure. The most important was the implementation of a new method of the regional allocation of imputed rent, new regional GVA estimates from individual housing construction and from a segment of illegal economy. The following chapters provide results of regional accounts revision carried out in standard way, i.e. sets of accounts for 2008 and 2009 and preliminary versions for 2010 including the analysis of economic devolution in regions in the above years. Finally, the article deals with the impact of revision on international position of the Czech regions specifically in relation to the EU average.

INTRODUCTION

Selected national accounts indicators broken by more detailed territorial units form a subject matter of regional accounts which except for specific regional classification (NUTS) use the same conception and definitions like the national accounts. The year 2011 was in the area of national accounts fundamentally affected by long prepared extraordinary time series revision which had an impact on the total amount of the GDP of the Czech Republic and many other indicators. As the definition of regional accounts suggests it was necessary to carry out respective revisions of the regional GDP. Concurrently, the results of regional accounts revision were monitored with the increased interest, among other things, also because of expected impacts on rights of the NUTS 2 Czech regions to the possibility of aid from EU structural funds (in respect to the expected increase of the total level of GDP per capita, i.e. criterion for re-allocation of regional subsidies).

Like in national accounts, an extraordinary revision of regional accounts linked mainly with the transition to a new classification of economic activities NACE was also used for the implementation of some long prepared methodological changes in calculations and assessments especially in the area of housing services, non-observed and illegal economy. EUROSTAT was informed in advance about the changes under preparation and a part of those changes at the national as well as regional level resulted directly

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from its requirements and recommendations. The applied procedures in calculation of the regional GDP was, among other things, acknowledged also during the control visit from EUROSTAT in September 2011 aimed at the regional accounts in the CZSO.

The difficulties related to concept of measurements of all regional transactions and treating the regions as independent economic areas explain why regional accounts are limited to monitoring of some aggregate indicators and to partial accounts of institutional sectors. Regional accounts are aimed at creation of the following macroeconomic indicators: gross value added by industries, gross domestic product, gross fixed capital formation, employment indicators (total employment, employees, hours worked), compensation of employees and households sector accounts (allocation of primary income account, secondary distribution of income account). Taking into account that the biggest volume of works and changes in the revision 2011 was aimed at the regional gross value added indicators and those of gross domestic product this paper is focused exclusively on changes implemented in these key indicators and in this respect also on changes produced by the revision of the regional GDP and their impact on international position of the Czech regions.

WORK PROCEDURES AND RESULTS
1 REVISION OF REGIONAL GROSS VALUE ADDED IN 1995–2007

In the whole time series from 1995 transition from classification CZ-NACE rev. 1 to NACE rev. 2 took place in connection with the revision of classification of economic activities implemented on international basis. The period 1995–2007 can be divided from the aspect of revision methods into two sub-stages (until 2001 incl. and from 2002 on). Until 2002, the information for calculation of data by the "bottom-up" method is not available and the assessment of the gross value added development is therefore determined according to the volume of wages in individual industries. Since 2002, current mixed method of regionalization of GVA (with the prevailing "bottom-up" method or the "pseudo-bottom-up" method)[2] has been used.

For the years 1995–2001 the transfer of regional GVA by CZ-NACE rev. 1 broken by letters to NACE rev. 2 broken by letters was realized through matrixes created for each region separately according to wages from the work statistics report in 2008. The values of regional GVA whose development prior to the revision copied the development of wages were converted. In connection with the revision the indices of converted GVA were applied only to the reported regional GVA in 2002 and further modification for the completeness of economy were allocated separately in the regional structure of the year 2002 (these modification prevailingly do not relate to wages, concurrently, however, their regional structures before 2002 are not available).

For the years 2002–2007 transition from the two-digit NACE rev. 1 to the two-digit NACE rev. 2 classification took place on the basis of wage matrixes for the year 2008 created separately for each region. Transferred were only previously observed values of GVA before methodological corrections and grossing-ups to the national accounts aggregate for each region separately.

In some industries it was necessary to modify the two-digit wage matrices when e.g. for the previous industry communications two new industries were created: postal activities and telecommunications while most of wages flew to postal activities but about 80% of GVA in the national account was directed to telecommunications (in such case matrices included instead of wages the already mentioned contributions of GVA of industries to national accounts, in all regions identical). The total impact of revision on the regional GDP in 2007 is shown in Table 1.

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[2] Data on gross value added are obtained directly for local units, or assessed for local units by distribution of data from the enterprise level (pseudo-bottom-up method) according to the structures of compensations of employees.

Table 1 Change of the regional GDP after the revision, the year 2007 (last final version of regional accounts before revision) in CZK million

Territory, year 2007	Previously published	Revised	Difference	Change of GDP in %
Czech Republic	3 535 460	3 662 573	127 113	3.6
Capital of Prague	880 566	909 016	28 449	3.2
Středočeský Region	381 062	392 597	11 536	3.0
Jihočeský Region	185 742	193 864	8 123	4.4
Plzeňský Region	175 609	183 162	7 553	4.3
Karlovarský Region	74 503	80 355	5 852	7.9
Ústecký Regon	224 047	235 905	11 859	5.3
Liberecký Region	114 071	118 481	4 409	3.9
Královéhradecký Region	160 439	166 175	5 736	3.6
Pardubický Region	145 872	151 391	5 519	3.8
Vysočina Region	147 647	152 657	5 010	3.4
Jihomoravský Region	357 437	369 283	11 847	3.3
Olomoucký Region	162 741	168 073	5 332	3.3
Zlínský Region	165 157	170 213	5 056	3.1
Moravskoslezský Region	360 568	371 399	10 832	3.0

Source: Czech Statistical Office, own calculation

2 METODOLOGICAL MODIFICATIONS AND MODELS

At regional level *some methodological modifications and adjustments to reach the completeness of economy* were allocated independently, some of which on entirely new basis other through revised methodological procedures. This referred to the following adjustments:

a) Imputed rent (IR) – its regional allocation is realized by more precise method when real market rent is newly considered while previous regional structure was based on market values of dwellings;[3] computation of imputed rent is made newly by *stratification method* while data are available also broken by regions. GVA from the imputed rent is thereby allocated in regional structure of production of imputed housing from the national accounts (the time series is available from 2007, previously the regional development is assessed according to the development of values of dwellings in private ownership).

The impact of this most important item of revision was rather uneven in regional aspect (see Table 2) either due to a different contribution of privately owned dwellings in regions and also due to uneven impact of a change of methods of calculation on the total amount of imputed rent (transition from key of market value to actual market rent). More detailed causes of significantly above-average increment of impute rental values in the Karlovarský and Ústecký Regions and, on the contrary, below-average increase in Prague, are more explained in chapter 3.

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[3] Regionalization of the imputed rent was made on the basis of the estimated value of all dwellings in private ownership in individual regions based on the following formula: total areal of all dwellings in private ownership determined in the Population and Housing Census in square metres * average purchase price of a dwelling per a square metre published by price statistics (data on the number of dwellings were updated annually on basis of information on housing construction, privatization of municipal and co-operative dwellings and liquidation of housing fund).

Table 2 Impact of a change of imputed rent computation on regional GDP

Territory	Revision of IR in CZK million					Revision of IR in % of GDP				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Czech Republic	25 189	29 085	29 806	40 556	49 630	0.8	0.9	0.8	1.1	1.3
Capital of Prague	−745	−135	−261	1 275	2 060	−0.1	0.0	0.0	0.1	0.2
Středočeský Region	4 139	4 665	4 691	6 911	8 550	1.3	1.3	1.2	1.7	2.2
Jihočeský Region	1 943	2 123	2 080	3 049	3 339	1.1	1.1	1.1	1.6	1.7
Plzeňský Region	572	634	696	800	1 428	0.4	0.4	0.4	0.4	0.8
Karlovarský Region	1 789	1 772	1 747	2 068	2 186	2.5	2.4	2.2	2.5	2.7
Ústecký Region	3 413	3 508	3 865	4 406	6 346	1.7	1.6	1.6	1.8	2.5
Liberecký Region	997	1 190	1 199	1 274	1 857	0.9	1.0	1.0	1.1	1.6
Královéhradecký Region	1 057	1 272	1 266	2 199	2 405	0.7	0.8	0.8	1.3	1.4
Pardubický Region	1 820	2 092	2 080	2 299	2 834	1.4	1.5	1.4	1.5	1.9
Vysočina Region	1 429	1 604	1 562	1 896	2 387	1.1	1.1	1.0	1.2	1.6
Jihomoravský Region	2 546	2 982	3 144	3 579	5 749	0.8	0.9	0.9	0.9	1.5
Olomoucký Region	1 348	1 571	1 680	2 296	2 669	0.9	1.0	1.0	1.3	1.5
Zlínský Region	2 131	2 479	2 448	3 109	3 103	1.5	1.6	1.4	1.7	1.7
Moravskoslezský Region	2 748	3 328	3 608	5 396	4 717	0.8	1.0	1.0	1.4	1.3

Source: Czech Statistical Office, own calculation

b) Individual housing construction (IHC) – regionalization of gross value added from construction of new dwellings built by households for themselves was processed according to the regional structure of value of these dwellings; part of IHC formed by reconstruction of housing fund is regionally allocated on the basis of structure of the total number of dwellings owned by household sector.

Table 3 Impact of regional allocation of individual housing construction on regional GDP

Territory	IHC in CZK million					IHC in % of GDP				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Czech Republic	8 952	10 441	12 591	14 099	11 324	0.3	0.3	0.3	0.4	0.3
Capital of Prague	532	626	746	864	493	0.1	0.1	0.1	0.1	0.1
Středočeský Region	2 210	2 418	2 866	3 143	2 687	0.7	0.7	0.7	0.8	0.7
Jihočeský Region	613	741	860	1 002	825	0.4	0.4	0.4	0.5	0.4
Plzeňský Region	509	618	700	818	619	0.3	0.4	0.4	0.5	0.4
Karlovarský Region	241	257	303	338	267	0.3	0.3	0.4	0.4	0.3
Ústecký Region	438	493	700	758	590	0.2	0.2	0.3	0.3	0.2
Liberecký Region	320	370	461	501	453	0.3	0.3	0.4	0.4	0.4
Královéhradecký Region	432	568	631	765	532	0.3	0.4	0.4	0.4	0.3
Pardubický Region	459	543	618	747	586	0.4	0.4	0.4	0.5	0.4
Vysočina Region	494	586	758	783	595	0.4	0.4	0.5	0.5	0.4
Jihomoravský Region	987	1 272	1 438	1 534	1 310	0.3	0.4	0.4	0.4	0.3
Olomoucký Region	423	501	692	764	612	0.3	0.3	0.4	0.4	0.4
Zlínský Region	492	568	716	770	635	0.3	0.4	0.4	0.4	0.4
Moravskoslezský Region	804	880	1 102	1 313	1 120	0.2	0.3	0.3	0.3	0.3

Source: Czech Statistical Office, own calculation

In compliance with expectations the regional allocation of individual housing construction lead to the biggest increase of related gross value added in regions with the largest construction of new family houses (especially in the Středočeský Region), nevertheless, there are no significant differences between the regions as in case of imputed rent and also the total contribution of individual housing construction to the GDP is markedly lower (see Table 3). Regional allocation of individual construction was made for the first time in 2011 and thereby it affected regional structure of GDP in full force.

c) Consumption of fixed capital (on roads and railways) – this item has been included into regional GVA earlier, however, newly this adjustment is broken by two NACE economic activities (auxiliary transport activities and public administration) by type of roads – independent regional allocation of consumption of fixed capital on roads, highways, local roads and railways is implemented on the basis of structure of length of individual types of roads in regions.

Regional allocation of consumption of fixed capital on roads showed more significant impact on regional structures of GVA as early as at the moment of implementation of this item into regional accounts in 2005. Revision in 2011 showed only minor changes in methodology of calculations and classification of individual adjustments by industry. The total amount of regional consumption of fixed capital on roads and its contribution to GDP (i.e. not only the impact of the 2011 revision) is shown in Table 4. Bigger contribution is recorded mainly in some more extended and less populated regions which show more significant length of roads and railways (Vysočina and the Jihočeský Regions) and the smallest contribution is observed, on the contrary in the Capital city of Prague.

Table 4 Impact of regional allocation of the consumption of fixed capital (on roads and railways) on regional GDP

Territory	CFC in CZK million					CFC in % of GDP				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Czech Republic	45 219	46 724	48 613	51 515	53 234	1.5	1.4	1.3	1.3	1.4
Capital of Prague	1 248	1 289	1 339	1 405	1 449	0.2	0.2	0.1	0.1	0.2
Středočeský Region	7 025	7 314	7 617	8 143	8 364	2.2	2.0	1.9	2.0	2.1
Jihočeský Region	4 124	4 211	4 370	4 608	4 738	2.4	2.3	2.3	2.4	2.4
Plzeňský Region	3 386	3 504	3 631	3 838	3 946	2.1	2.0	2.0	2.2	2.2
Karlovarský Region	1 536	1 566	1 639	1 734	1 789	2.1	2.1	2.0	2.1	2.2
Ústecký Region	3 454	3 630	3 767	3 987	4 150	1.7	1.6	1.6	1.6	1.7
Liberecký Region	2 316	2 369	2 468	2 604	2 679	2.1	2.1	2.1	2.2	2.3
Královéhradecký Region	2 954	3 089	3 189	3 351	3 461	2.0	2.0	1.9	1.9	2.0
Pardubický Region	2 624	2 719	2 806	2 949	3 061	2.1	2.0	1.9	1.9	2.1
Vysočina Region	3 374	3 460	3 585	3 764	3 857	2.6	2.5	2.3	2.5	2.6
Jihomoravský Region	3 986	4 107	4 267	4 512	4 630	1.3	1.2	1.2	1.1	1.2
Olomoucký Region	2 953	3 032	3 177	3 444	3 605	2.0	2.0	1.9	1.9	2.1
Zlínský Region	2 000	2 063	2 125	2 260	2 335	1.4	1.3	1.2	1.2	1.3
Moravskoslezský Region	4 238	4 372	4 633	4 916	5 169	1.3	1.3	1.2	1.2	1.4

Source: Czech Statistical Office, own calculation

d) Regional allocation of a segment of illegal economy – entirely new in the regional GVA is regional assessment of a segment of illegal economy especially with respect to items with expected regional specifics (drugs, prostitution); data sources are similar to those in the national accounts, in case of drugs the regional value of consumed drugs is estimated, common regional structure is then applied to GVA

resulting from cultivation, production and sales of drugs to individual NACE; for the prostitution the regional production of services provided by the number of prostitutes is estimated.

Total weight of regionally independently allocated segments of illegal economy (it means only drugs and prostitution) is not too significant either in national or regional GDP. Approximately 1% was in the observed years monitored in the Karlovarský Region, in other regions its contribution ranged from 0.3 to 0.6% of GDP (see Table 5). Lower values of regionally independently allocated illegal economy are, however, affected by the fact that more important parts of non-observed economy (especially intentional misreporting) are not regionally known and their distribution into regions is made in proportion to the total observed regional GVA.

Table 5 Impact of regional allocation of a segment of illegal economy (N.2) on regional GDP

Territory	N.2 in CZK million					N.2 in % of GDP				
	2005	2006	2007	2008	2009	2005	2006	2007	2008	2009
Czech Republic	12 270	12 444	12 472	12 339	11 610	0.4	0.4	0.3	0.3	0.3
Capital of Prague	3 177	2 796	3 052	2 857	2 295	0.4	0.3	0.3	0.3	0.2
Středočeský Region	777	772	738	842	836	0.2	0.2	0.2	0.2	0.2
Jihočeský Region	1 063	1 061	961	944	738	0.6	0.6	0.5	0.5	0.4
Plzeňský Region	876	873	844	867	818	0.6	0.5	0.5	0.5	0.5
Karlovarský Region	921	883	813	739	654	1.3	1.2	1.0	0.9	0.8
Ústecký Region	1 278	1 278	1 199	1 155	1 178	0.6	0.6	0.5	0.5	0.5
Liberecký Region	356	348	325	485	424	0.3	0.3	0.3	0.4	0.4
Královéhradecký Region	372	411	529	442	404	0.3	0.3	0.3	0.3	0.2
Pardubický Region	278	278	294	329	326	0.2	0.2	0.2	0.2	0.2
Vysočina Region	275	281	343	338	309	0.2	0.2	0.2	0.2	0.2
Jihomoravský Region	1 237	1 421	1 440	1 376	1 329	0.4	0.4	0.4	0.3	0.3
Olomoucký Region	518	699	558	570	728	0.4	0.5	0.3	0.3	0.4
Zlínský Region	384	485	574	503	635	0.3	0.3	0.3	0.3	0.4
Moravskoslezský Region	758	858	803	892	937	0.2	0.3	0.2	0.2	0.3

Source: Czech Statistical Office, own calculation

For economic activity NACE 97 (activity of households as employers of household personal) a key was used in form of the structure of managers and chiefs in the region in the whole time series. The reason was an absence of suitable statistical data and expected bigger correlation of the mentioned indicator with the economic activity of industry compared to previously used disposable income of households or total GVA.

3 IMPACT OF REVISION ON REGIONAL GDP

Aggregate impact of revision on the structure of regional GVA was not of fundamental importance especially because individual methodological and other *adjustments showed often a contradictory effect.* While the new approach to regional allocation of imputed rent reduced the contribution of Prague and increased that of the Středočeský Region, adjustments to reach a completeness of economy (especially intentional misreporting) in respect of bigger weight of services compared to industry increased, on the contrary, the contribution of Prague and reduced that of Středočeský Region. Similarly, e.g. individual housing construction increased the contribution of the Středočeský Region compared to Prague, and illegal economy (drugs, prostitution), on the contrary, reduced the contribution of the Středočeský Region compared to Prague.

The biggest impact on the absolute GDP amount showed the revision in the Karlovarský Region whose contribution to the national GDP is, however, very low (only 2.1%). In 1995–2010 total GDP was increased there by 8.3%, on average, mainly due to the revision of regional allocation of the imputed rent and illegal activities. The same impacts at lesser extent, showed in the above-average increase of the revised GDP in the neighbouring Ústecký Region (5.6%) and partly also in the Liberecký Region (4.8%), see Figure 1.

Figure 1 Average change of GDP after revision in period 1995–2010 (in %)
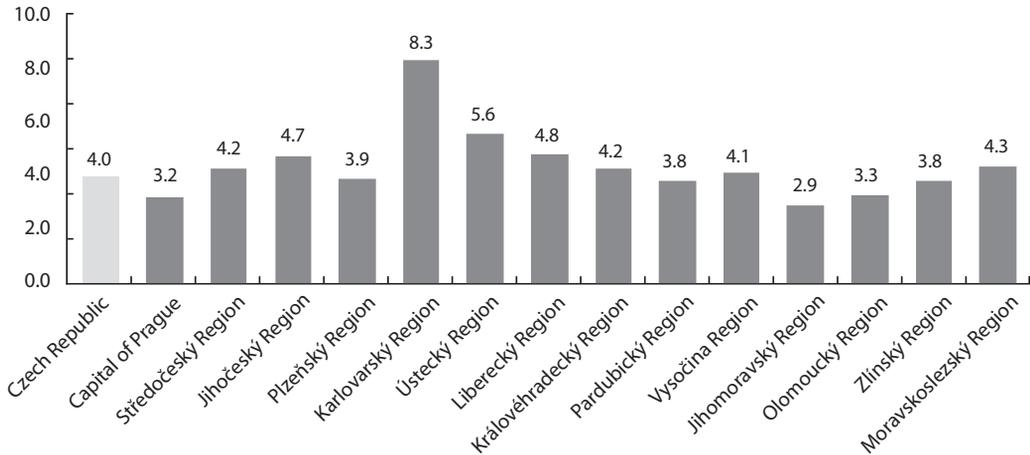
Source: Czech Statistical Office

In these above mentioned regions the key reason of more significant GDP growth after the revision was the difference between market prices of dwellings used earlier for allocation of imputed rent and actual market rent currently applied. In the Karlovarský and Ústecký regions market prices of dwellings compared to market rent and compared to other regions were significantly lower which made the earlier calculations of imputed rent undervalued. The opposite cases were Prague and Jihomoravský regions where market prices of dwellings compared to market rent were higher and imputed rent were therefore overvalued and total revision of GDP was a bit below the average (3.2% for Prague and 2.9% for the Jihomoravský Region) compared to the nation-wide average, as shown in Figure 1.

4 REVISION OF REGIONAL GVA IN 2008−2009

In addition to revision of time series until 2007 the regional GVA of the last two years (published the year before) was made more detailed on standard basis. The impact of the revision on regional structures of GVA was much bigger than usual due to some reasons. First of all during these years the above mentioned methodological modifications and adjustments to reach the completeness of economy were also made and moreover previous estimates for both years published in 2010 were based only on preliminary version of regional accounts.

The biggest changes of revised values were monitored in 2009. As opposed to preliminary version, bigger revision of regional GVA took place especially for the Capital of Prague (drop of contribution to the national GVA by 0.8 p.p.). The cause subsisted mainly in the fact that the development of regional GVA was in preliminary version in individual industries assessed on the basis of wage volumes which, however, may not in the particular moment copy the development of GVA since the operating surplus in the period of economic crisis often falls faster than the compensations of employees (their contribution to GVA in 2009 increased).

Main factors affecting regional GVA and GDP in 2008

In 2008 in three regions signs of upcoming global economic recession appeared causing general y-o-y fall of GDP (in the Jihočeský, Plzeňský and Karlovarský regions) by 0.7% up to 3.6% while in the Vysočina Region the growth almost stopped (increase only by 0.3% was registered). This referred to regions relatively more dependent on export to West European markets (mainly to Germany) where the start of economic recession came earlier than in the Czech Republic. The drop of GDP in these regions often correlated also with bigger growth of registered unemployment rate.

The contribution of the *Capital of Prague* to the formation of gross value added in the Czech Republic increased y-o-y from 24.8% to 25.4% mainly due to the development in electricity, gas and heat supply (administrative headquarters of companies), land transport, wholesale, retail sale and insurance. At constant prices, however, the y-o-y growth of GDP (3.2%) does not deviate from the national average which was attested to higher deflators in key industries in Prague.

In the *Středočeský Region* the above-average growth of GDP at constant prices continued (7.7%). Crucial was the growth of value added in manufacture of machinery and equipment, manufacture of fabricated metal products, land transport and in construction. Traditional industry such as manufacture of motor vehicles, trailer and semi-trailers and manufacture of other transport equipment at current price has shown almost no changes this year (growth by 0.3%). Contrary to Prague the contribution of region to the total GVA in the Czech Republic at current prices basically stagnated (growth by 0.1 p.p.).

In the *Jihomoravský Region* in 2008 the above-average increase of GDP was recorded for the second consequent year (5.1% at constant prices) which was most contributed to by commercial services (real estate activities, data processing and other business services).

The big growth of GDP in *Zlínský Region* by 9.4% at constant prices was, as in previous years, most contributed to by manufacture of rubber and plastic products, manufacture of food products, and also by manufacture of chemicals and chemical products and construction.

Main factors affecting regional GVA and GDP in 2009

The year 2009 was characterised by the biggest y-o-y drop of real GDP in the Czech Republic from the beginning of the 90th. All regions reported negative development of the real GDP, however, the drop rate was significantly different. Quite unexpectedly, the area of Central Bohemia and Prague, which previously recorded the biggest increases of economic performance, belonged to regions most affected by crisis.

Relatively less favourable development of GVA in *Capital of Prague* (GDP index 94.3% at constant prices) was mainly due to drop in construction of buildings (y-o-y index 74.8% at current prices), wholesale (86.0%), accommodation (68.8%) and also e.g. in insurance, public administration and defence. Wholesale and retail trade, accommodation and food service activities recorded also at the national level a bigger drop of GVA compared to e.g. manufacturing both at current and constant prices. In addition, in Prague the GVA drop in these industries was more marked than in other regions. In Prague, in addition to the above, a drop in electricity, gas, steam and heat supply at constant prices was recorded which was an important factor for decrease of real GDP.

In the *Středočeský Region* after two years of big GDP increases a drop of GDP both at constant (–6.8%) and current (–5.0%) prices was recorded. Among industries with regional importance showing most marked drops belong manufacturing of motor vehicles (GVA index at current prices 86.1%) and building construction (74.8%).

The GDP growth at current prices in the *Ústecký Region* (1.2%) was pulled mainly by the development in electricity, gas, steam and heat supply (index 126.2% at current prices), also by mining of coal and lignite (index 114.7%), manufacturing of basic metals (index 114.7%) and developments in land transport or retail trade. At constant prices, however, also this region recorded a drop by 0.2% due to stagnation of GVA in electricity, gas, steam and heat supply.

In the *Liberecký Region* (drop of GDP at constant prices by 6.2%), like in previous years, structural problems were monitored first in manufacturing of glass (traditional industry) and, subsequently, in manufacturing of machinery and equipment. At current prices the drop of gross value added by 3.9% was recorded.

A significant drop of GDP in the *Moravskoslezský Region* in 2009 (index 92.9% at current prices, 92.4% at constant prices) was caused mainly by fall in mining of coal (index 61.0%), manufacture of basic metals and fabricated metal products (index 41.0%) and related industries (manufacturing of coke, manufacturing of metal structures and metal products) – drop in these industries was only in part compensated by growth of manufacturing of motor vehicles industry (GVA index 141.0%).

In other regions the drop of regional GDP at constant prices ranged from –2.6% to –4.8%, i.e. by growth rates not much deviating from the national level.

5 PRELIMINARY VERSION OF REGIONAL GDP IN 2010

Preliminary version of regional GDP for 2010 was based on estimate of the development of regional GVA in compliance with the index of development of the volume of wages in industries and regions. Except for the Karlovarský Region (drop by 0.9%) all regions recorded a growth of the regional GDP at constant prices, the biggest increase was monitored for the Středočeský Region (5.5%), the Liberecký Region (4.2%) and Prague (3.4%), i.e. regions which in previous year showed more significant drops of GVA. In other regions the growth of regional GDP at constant prices ranged from 1.0% to 3.1%, i.e. by growth rates which did not much deviate from the national growth rates.

Contribution of the region in the GVA of the Czech Republic at current prices recorded the biggest growth in Prague (+0.5 p.p.) and in the Středočeský Region (+0.1 p.p.). In Prague, the GVA at current prices was most contributed to by financial and insurance activities (index 109.0%). In other regions the contribution to the national GVA either stagnated (the Jihočeský, Liberecký Vysočina, Olomoucký and Moravskoleszský Regions) or dropped by 0.1 p.p. (all remaining regions). Change of regional contributions to the national GDP between two border years of revised period 1995–2010 is shown in Figure 2.

Figure 2 Regional contribution to GDP of the Czech Republic in years 1995 and 2010 (in %)
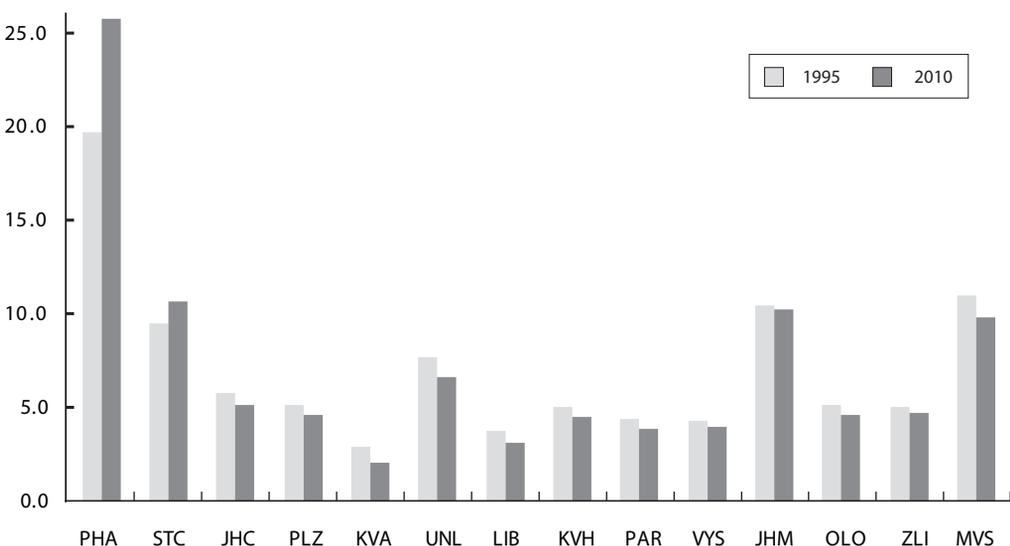
Source: Czech Statistical Office

6 IMPACT OF REVISION ON INTERNATIONAL POSITION OF CZECH REGIONS

Results of regional accounts revision in 2011 were expected mainly due possible impacts on rights of NUTS 2 Czech regions to drawing subsidies from the EU structural funds. For international comparison the indicator of total GDP is converted to the units of purchasing power standard (PPS)[4] according to coefficients used by EUROSTAT. In case of the GDP increase due to revision it was generally expected that also an increase of the regional GDP per capita in international comparison will take place and, as a consequence, it was assumed that two Czech NUTS 2 regions (Central Bohemia and the South-East) may exceed 75% of the GDP average per capita in PPS in EU 27. The limit of 75% is a criterion for subsidies from the structural funds and probably will stay as limit indicator also in new budget framework for the years 2014–2020.

EUROSTAT converted data on national gross domestic product into PPS for the purpose of international comparison in December 2011. At the regional level for the whole EU 27 the data were converted in March 2012. Contrary to expectations, an increase of nominal GDP of the Czech Republic resulted in the increase of regional and national GDP per capita in purchasing power standard compared to the EU average to a minimum extent only. This was due to the fact that also other EU member countries revised their national accounts and first of all the nominal increase of GDP in the Czech Republic was, according to EUROSTAT methodology in major part included into the growth of domestic price level and did not lead to a real increase of GDP in international comparison. This was linked mainly to the methods of calculation of paid and imputed rents. The increase of total housing expenses resulted into an increase of housing costs (prices). The result had therefore an almost negligible impact on the position of the Czech Republic and their regions in international comparison in PPS as opposed to the current prices data.

Figure 3 Deviation of GDP per capita from 75% of the EU average in NUTS 2 regions (in p.p.)*

* (average of the period 2007–2009)
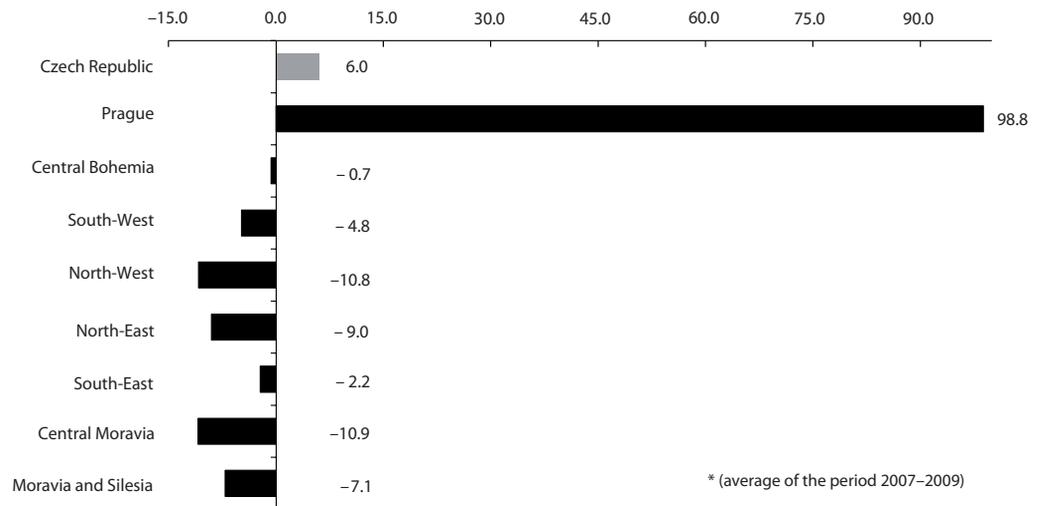
Note: average for 2007–2009 is chosen because this refers to the most probable period on the basis of which regions entitled to aid from the EU structural funds in 2014–2020.
Source: Eurostat

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[4] PPS (Purchasing Power Standard) is artificially created monetary unit used for international comparison to express the volume of economic aggregate indicators. Using this unit the conversion of value of all items of GDP to the average price level in the EU is made and thus to exclude difference in price levels (or malformation related with exchange rates of national currencies against EUR).

EUROSTAT publishes regional GDP two years after the reference period which means that the latest available data at the European level date back to the year 2009. Years 2007–2009 will probably serve as reference period on the basis of which the regions entitled to aid from the EU structural funds in new budget framework for the years 2014–2020 will be determined (if the budget is approved in 2012, which is not for sure – in case of late approval a reference period will be changed to years 2008–2010). All regions NUTS 2 outside Prague continue to remain below the 75% of the EU average (see Figure 3).

In the data for 2009 the position of the Středočeský Region (to date, in addition to Prague, the most economically effective region) compared to other NUTS 2 regions worsened (73.6% of the EU average) due to relatively less favourable development of economy affecting traditionally export-aimed industries in the region (e.g. y-o-y drop of GVA in manufacturing of motor vehicles by 13.9%). The biggest GDP per capita outside Prague was reached in 2009 in the NUTS 2 region South-East (74.6% of the EU average) that depends less on export industries than Středočeský Region.

CONCLUSION

Revision of regional accounts in 2011 enabled besides a change of classification of economic activities (NACE) to implement a number of methodological improvements and specification in calculation of regional gross value added. In the first place, emphasize should be placed on revision of the method of regional allocation of imputed rent which for the first time takes into account actual market rent. New calculation is made by the stratification method "bottom up", i.e. like in the national accounts. Entirely new estimate of regional gross value added was made from individual housing construction (i.e. construction of new dwellings built by households for themselves) and for segments of illegal economy for which certain regional specific features not depending on real reported gross value added are assumed (i.e. drugs, prostitution).

In almost fifteen-year history of regional accounts in the Czech Republic it was the second important revision of time series with more marked impact on regional structure of GDP (the first important change was transition from universally used "top-down" method to prevailing "bottom-up" method completed in 2005). At present, preparations for the upcoming extraordinary revision of national and regional account scheduled for 2014 are in process. The revision will include in addition to impacts of changes of national accounts methodology (resulting from transition to methodological standard ESA 2010) also changes, if any, in data sources and improvement of method of calculations and estimates. Methodological changes will be introduced retroactively into time series of national and regional accounts depending on availability of necessary information, however from 2010, at minimum. Regional accounts time series based on the extraordinary revision will be published in November 2014. It will definitely apply, also in future, that revisions of annual national accounts in future, if any, should directly follow revisions of regional accounts to ensure consistency of national and regional data.

In addition to revisions of regional accounts the attention will focus on possible further development beyond the regional GDP and GVA. In the area of household accounts there is a demand at a European level for regionally disaggregated final consumption of households. As another possible area appears to be the regional allocation of government accounts in some limited number of parameters, mainly for items of government expenditure (so called regional tables of the government sector). The regional tables for the government sector may serve as model of the impact of government spending (including EU funds) on the development of the regional GDP.

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ANNEX

Table 6 Regional structure of GDP in % (CR = 100)

Territory	1995	2000	2005	2006	2007	2008	2009	2010
Capital of Prague	19.7	22.5	24.1	24.3	24.8	25.4	25.3	25.8
Středočeský Region	9.5	10.4	10.2	10.7	10.7	10.8	10.6	10.7
Jihočeský Region	5.8	5.7	5.6	5.5	5.3	5.1	5.2	5.2
Plzeňský Regionj	5.2	5.0	5.1	5.1	5.0	4.6	4.7	4.6
Karlovarský Region	2.9	2.6	2.3	2.2	2.2	2.1	2.2	2.1
Ústecký Region	7.7	6.7	6.6	6.6	6.4	6.4	6.7	6.6
Liberecký Region	3.8	3.8	3.5	3.4	3.2	3.1	3.1	3.1
Královéhradecký Region	5.0	5.1	4.7	4.5	4.5	4.5	4.6	4.5
Pardubický Region	4.4	4.3	4.1	4.1	4.1	4.0	4.0	3.9
Vysočina Region	4.3	4.2	4.2	4.2	4.2	4.0	4.0	4.0
Jihomoravský Region	10.5	10.2	10.0	10.0	10.1	10.3	10.4	10.3
Olomoucký Region	5.2	5.0	4.7	4.6	4.6	4.6	4.6	4.6
Zlínský Region	5.0	4.9	4.6	4.7	4.6	4.8	4.8	4.7
Moravskoslezský Region	11.0	9.7	10.4	10.1	10.1	10.2	9.8	9.8

Source: Czech Statistical Office

Table 7 Regional GDP per capita in % (CR = 100)

| Territory	1995	2000	2005	2006	2007	2008	2009	2010
Capital of Prague	168.2	195.7	210.0	210.4	214.1	216.1	213.5	216.5
Středočeský Region	88.5	95.8	91.0	93.8	93.2	92.5	89.5	89.9
Jihočeský Region	95.1	93.3	90.6	90.3	86.5	83.6	86.0	85.5
Plzeňský Regionj	96.3	93.1	94.7	95.2	92.6	85.4	86.7	85.4
Karlovarský Region	97.0	87.2	78.0	74.7	74.1	71.5	74.0	72.3
Ústecký Region	96.2	82.8	82.2	81.9	80.5	80.1	84.0	83.4
Liberecký Region	91.4	90.3	83.0	81.3	77.3	75.0	74.5	74.8
Královéhradecký Region	93.6	95.0	87.0	84.8	85.1	85.0	86.9	86.1
Pardubický Region	89.4	86.1	82.0	83.6	83.8	81.4	80.8	79.0
Vysočina Region	84.6	83.5	83.7	83.7	83.9	80.3	82.3	81.5
Jihomoravský Region	94.9	92.1	90.3	91.0	91.7	94.2	94.5	93.6
Olomoucký Region	84.0	79.6	75.2	73.8	74.0	74.6	75.3	75.5
Zlínský Region	86.3	83.7	80.6	81.3	81.3	84.9	85.8	84.0
Moravskoslezský Region	87.9	78.2	84.9	83.2	83.8	85.3	82.3	82.8

Source: Czech Statistical Office

Table 8 Regional GDP volume indices (previous year = 100)

| Territory	1996	2000	2005	2006	2007	2008	2009	2010
Czech Republic	104.5	104.2	106.8	107.0	105.7	103.1	95.3	102.7
Capital of Prague	105.7	104.1	106.3	105.9	109.1	103.2	94.3	103.4
Středočeský Region	103.9	106.4	106.5	114.2	107.9	107.7	93.2	105.5
Jihočeský Region	104.6	103.8	108.4	105.6	100.7	99.3	97.2	102.0
Plzeňský Region	106.0	105.7	105.5	107.8	102.1	96.4	97.0	101.5
Karlovarský Region	98.8	104.8	103.3	101.5	103.2	97.4	97.4	99.1
Ústecký Region	102.7	101.1	105.6	107.4	103.5	101.8	99.8	101.3
Liberecký Region	102.4	105.2	113.1	106.3	101.5	103.8	93.8	104.2
Královéhradecký Region	104.3	105.9	106.1	104.2	105.3	104.2	96.7	101.9
Pardubický Region	102.5	104.2	105.9	109.0	105.5	101.0	95.2	101.0
Vysočina Region	104.2	106.6	109.0	106.9	104.5	100.3	97.4	102.4
Jihomoravský Region	104.4	103.8	105.9	106.8	106.2	105.1	95.8	101.9
Olomoucký Region	107.0	104.1	104.1	104.6	104.8	103.4	96.4	103.1
Zlínský Region	102.6	104.7	108.9	109.2	105.9	109.4	97.0	101.8
Moravskoslezský Region	106.6	101.6	108.2	104.9	104.1	101.5	92.4	102.9

Source: Czech Statistical Office

Figure 4 GDP at constant prices, year 2010, 1995 = 100
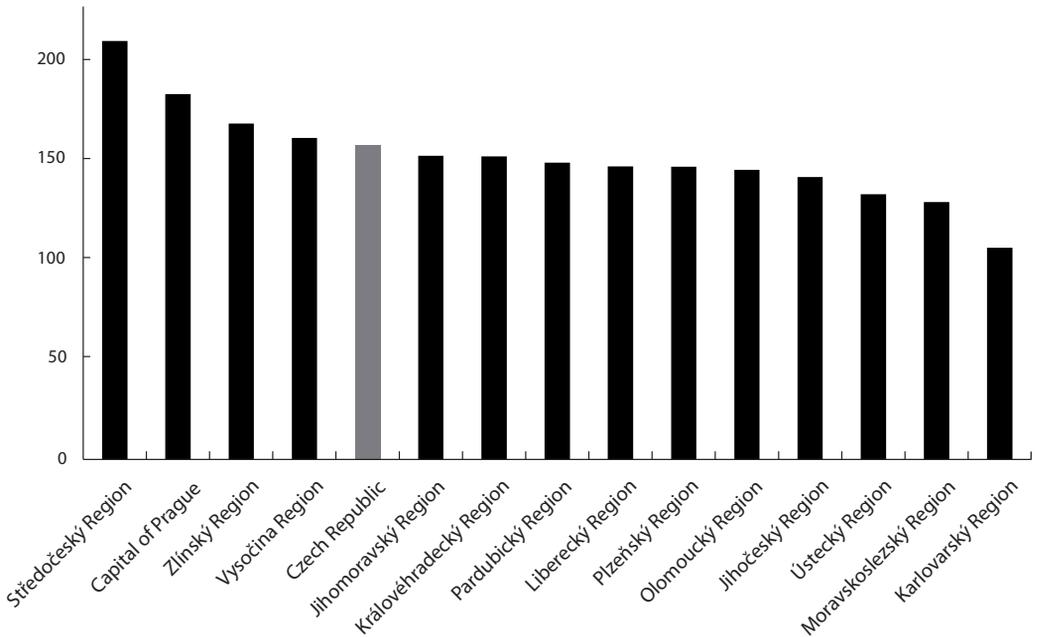
Source: Czech Statistical Office

Figure 5 Contribution of four best economically performing regions in the total GDP of the Czech Republic in %
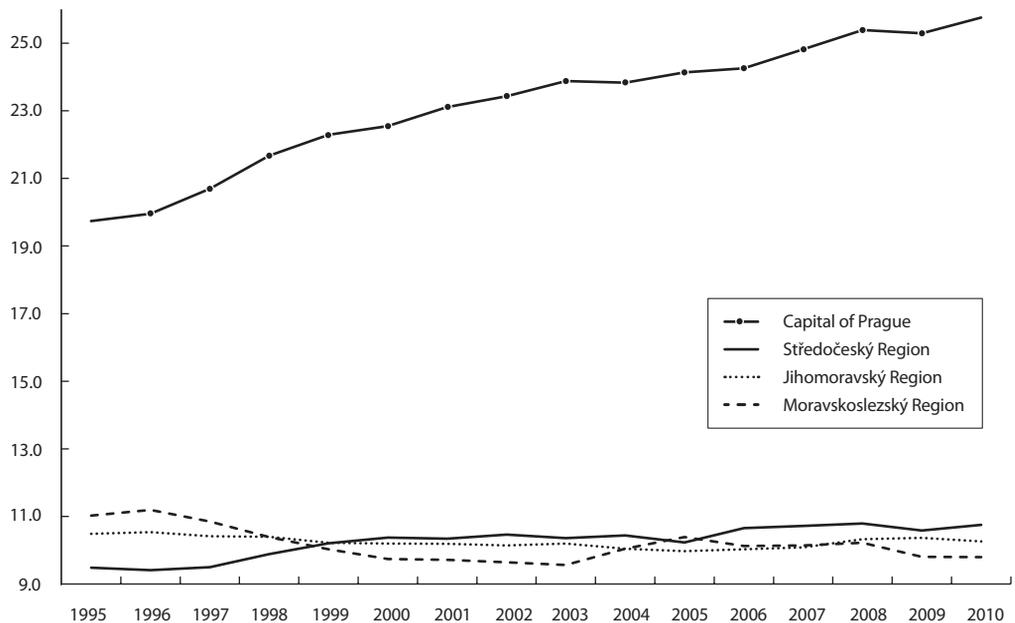
Source: Czech Statistical Office

Harmonisation of the Average Earnings Information System (MoLSA) with the Wage Statistics (CZSO)

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Abstract

In 2011, the methodology of the Average Earnings Information System (ISPV) was harmonized with the methodology applied in the wage statistics of the Czech Statistical Office (CZSO). The benefit of the harmonisation rests in improved quality of the published wage statistics. Within the harmonisation, the ISPV population was extended by economic subjects not monitored before. The extension of the ISPV population allowed to calculate more accurate numbers above all on employees, and thus since 2011, all ISPV publications has newly stated weighed numbers of employees. Due to the harmonisation, the gross monthly wage median for the wage sphere decreased in 2011. Despite the harmonisation, there are still differences between both surveys due to the specifics of the ISPV survey.

Keywords	JEL code
Sample survey, population, sample design, stratification, harmonisation of statistics, wages and salaries	*C42, C43, J31, J45*

INTRODUCTION

Nowadays, almost all the countries in the world face increasing challenges in the generation, analysis, usage and dissemination of statistics in support of decision-making and policy formulation, monitoring and evaluation. In some cases, there is also the problem of lack of comparability and credibility among data sets due to different methodologies employed to collect data. All the measurement tools and indicators would be meaningless without appropriate and reliable statistical data, without strong capacities for statistical development, including the promotion of the development of improved and integrated statistical databases (UN, 2009).

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As for the labour market statistics in the Czech Republic, the challenges might be similar as the above mentioned. Trying to measure labour market changes, one can encounter problems concerning lack of information needed although there are many results from labour market surveys available in the Czech Republic. The most likely disadvantage concerning labour market indicators is the fact that each of the key aspects of the labour market (i.e. employment as well as remuneration) is so far surveyed and evaluated separately, although they are closely related (Duspivová, Spáčil, 2011).

In order to handle these imperfections and to get comprehensive and more accurate results of wage statistics used in the Czech Republic, the Ministry of Labour and Social Affairs (MoLSA) deepened its cooperation with the Czech Statistical Office (CZSO), and these two institutions put collective effort into the project of harmonisation of the Average Earnings Information System (ISPV) conducted by the MoLSA with the Wage Statistics conducted by the CZSO.

The main aim of this paper is to investigate the possibility of the harmonisation of wage statistics in the Czech Republic which enables the compilation of data and results comparable between individual statistics involved. We will focus on the results of the above mentioned project from the point of view of both the methodology and possible implications for the Czech wage statistics.

The structure of the paper is as follows: section 1 presents the project, section 2 presents dataset and methods used, the main empirical results are presented in section 3, section 4 describes differences between the ISPV and the Wage Statistics of the CZSO, and the last section concludes the paper.

1 PROJECT OF WAGE STATISTICS HARMONISATION

The main aim of the statistical system is to provide public with reliable and consistent data on different areas of the economic development. As for the wage statistics in the Czech Republic, the status quo before the harmonization was not in full accordance with this aim. In order to contribute to the development of the Czech statistics on labour market, the harmonization of individual wage statistics was essential.

Status quo ante harmonization
As mentioned above, the most likely disadvantage concerning labour market indicators in the Czech Republic is the fact that each of the key aspects of the labour market (i.e. employment as well as remuneration) is so far surveyed and evaluated separately, although they are closely related. What is more, many used and established labour market indicators are the most common and one would think that are the most well-known as far as their information capability is concerned, as well. This assumption has been questioned during the recent economic crisis because a lot of experts have used these indicators in a misleading way.

As far as remuneration is concerned, there are two different data sources available, namely surveys concerning Labour Statistics conducted by the CZSO and the Average Earnings Information System (ISPV) conducted by the MoLSA. Within the Labour Statistics of the CZSO, there are surveyed the number of employees and sum of earnings in the enterprise, so an average gross monthly wage can be calculated. On the contrary, the ISPV gathered data on individual employees in the enterprise, so – in addition to the average wage – the wage distribution is known. The results of individual surveys were impossible to compare with each other not only because of the methodological issues, but also because of the population covered. The users were often confused and compared e.g. average gross monthly wage issued by the CZSO with the proportion of employees remunerated with lower wage than the average gross monthly wage issued in the ISPV. This status quo did not comply with the generally accepted vision of the Czech statistical system, so the MoLSA and CZSO investigated the possibilities of preparing a mutually interconnected system of wage statistics which would eliminate imperfections of wage statistics handled independently and the idea of harmonisation of wage statistics was brought forth.

Main aim of harmonisation and state of the art

The project of harmonisation of wage statistics in the Czech Republic aimed to provide more accurate and reliable data on remuneration. Within this project, the population of the ISPV survey was extended by the missing economic subjects, so the whole employees' population has been covered. The extension of the ISPV population enables – among others – calculation of more accurate numbers above all on employees and thus all ISPV publications has newly stated weighed numbers of employees since 2011.

To achieve the above mentioned aim, economic subjects classified into the institutional sector of households (i.e. own-account workers) with more than 10 employees has been surveyed since the years 2008 and economic subjects classified into the institutional sector of non-profit institutions serving households since 2010. Economic subjects with less than 10 employees were surveyed during the year 2011 with the reference period 2010. In other words, in the end the ISPV population was extended by the employees of economic subjects previously not surveyed, namely by employees of:

– the legal persons with less than 10 employees and
– the natural persons and non-profit institutions regardless of the number of employees.

Within the project of wage statistics harmonisation, the MoLSA has deepened its cooperation with the CZSO as well. These two institutions started interchanging of data on economic subjects concerning remuneration and number of employees which contributed to a successful achievement of the main aim of the project.

2 METHODOLOGY

The methodology developed within the project of harmonisation of wage statistics was fitted to meet the requirements of both wage statistics producers, i.e. the MoLSA and the CZSO. The current statistical approaches concerning sample surveys (e.g. Fuller, 2009, Levy, Lemeshow, 2008, Elliot et al., 2000) offer wide scope of methods but these methods are in most cases narrowly specialized and do not provide for a complex solution of specific needs. For this reason, the methods used within the harmonisation were drawn on the best international experiences as far as individual methods are concerned, and these individual methods were combined to achieve the best-quality results.

The first part of this chapter will devote to basic methods used within the harmonisation. More detailed description of individual methods will follow the first part.

2.1 Basic methods used within the harmonisation

As for the wage statistics harmonisation, the individual methods used were as follows:

– definition of the population involved and sample design;
– simulation of individual employees' records;
– economic subjects' weights and imputation for non-response;
– post-stratification and grossing-up methods.

The population and an actual sample are defined on the basis of both the population taken over from the Wage Statistics carried out by the CZSO and the data surveyed within the ISPV. The most important part of the procedure is the stratification which precedes simulations, weighting and post-stratification. For more detailed information on the ISPV population and the sample see section 2.2.

Since 2011, detailed information on wages and working hours of individual employees has been surveyed in the ISPV every half-year in order to remove the burden from the respondents in odd quarters so that a simulation of individual employees' records is necessary to quantify statistical characteristics (above all quantiles) in each odd quarter. In a given odd quarter, the half-year individual employees' records and the basic data about wages, working hours and number of employees for the whole economic subject are used for simulation which results in simulated individual employees' records in a given period. The above mentioned quantiles are quantified on the basis of these simulated data. As for the economic

subjects with up to 9 employees, the half-year data are simulated as well because of the four-year survey period. More information on the simulation you can find in section 2.3.

The previous activities are followed by the weighting procedure. The weighting aims to assign such a weights to each economic subject in the sample, so that the grossed-up sample is of the same size and structure as the population. For more detailed information on the weighting see section 2.4.

Last but not least, the post-stratification and grossing-up to the population are carried out. In the first step, number of employees in individual strata is grossed up. In the next step, volume of wages is grossed up according to the individual economic activity (CZ-NACE) sections. More information on the post-stratification can be found in section 2.5.

2.2 Population and sample design

The population of the ISPV survey is taken over from the Wage Statistics carried out by the CZSO. Economic subjects (or employees as the case may be) in the population are classified into the wage or salary sphere according to the form of remuneration[3] which is obtained from the data sources of the Ministry of Finance.[4] To minimize the sampling error and to make the best of the organisational structure of the ISPV survey, the sample is divided into following 5 *sectors in the wage sphere:*
  – non-financial corporations and financial corporations with 10 and more employees; general government providing remuneration in the form of wages (not salaries),
  – households (own-account workers) with 10 and more employees,
  – non-financial corporations and financial corporations with 1–9 employees,
  – households (own-account workers) with 1–9 employees,
  – non-profit institutions serving households with more than 1 employee

and into one sector of economic subjects classified into the salary sphere regardless of the number of employees.

The population is divided into 5 size categories:
  – 1–9 employees,
  – 10–49 employees,
  – 50–249 employees,
  – 250–999 employees,
  – 1000 and more employees.

The population of the wage sphere is further divided into 6 basic economic activity groups:
  – agriculture, forestry and fishing,
  – industry and transportation,
  – construction,
  – wholesale and retail trade,
  – market services,
  – other services.[5]

In these economic activity groups, the cluster analysis is used to separate more detailed strata using two variables – the wage level and structure of occupations.

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[3] The wage sphere includes economic subjects who provide remuneration in the form of wages pursuant to Section 109 (2) of Act No. 262 / 2006 Coll., the Labour Code, as amended. Economic subjects belonging to the salary sphere provide remuneration in the form of salaries pursuant to Section 109 (3) of Act No. 262 / 2006 Coll., the Labour Code, as amended.

[4] The population of the ISPV salary sphere (ISPV-PLS) is a set of economic subjects defined by the Automated Budget Information System (ARIS) administered by the Ministry of Finance. ARIS includes information from the accounting and financial reports of the organization units of the state, state budget chapters, state-funded institutions, state funds, territorial self-administration units and state-funded institutions in the Czech Republic.

[5] For NACE sections classified into the individual sectors of economic activity groups see the Annex.

The sample consists of respondents that participated in the survey in a given period (i.e. without nonresponse). For each odd quarter, the economic subjects classified into the salary sphere, and for each period, the economic subjects with up to 10 employees are added (i.e. the sample is completed). The ISPV is a longitudinal survey, so the problems concerning this fact occur. To be more specific, the institutional sector, size category or economic activity sector can change in the long run so the original stratum differs from the actual one. Other problems occur during the process of linking the ISPV records with the CZSO's structural business survey records because the number of employees may not be identical in both surveys. All these issues are verified before the economic subject is classified into the sector for a given period.

Last but not least, both of the wage surveys complement one another. As mentioned above, the population of the ISPV survey is taken over from the Wage Statistics carried out by the CZSO. On the other hand, the data surveyed within the ISPV are used by the CZSO (e.g. the data on large non-profit institutions), so the cooperation of wage statistics producers disburdens the respondents of individual surveys.

2.3 Simulation of individual employees' records

Since 2011, detailed information on wages and working hours of individual employees has been surveyed every half-year so that a simulation of individual employees' records is necessary to quantify statistical characteristics (above all quantiles including median) in each odd quarter. As for odd quarters, the weighted historical imputation method is used. Data on odd quarters are simulated using current individual employees' records (i.e. half-year data). Specific case is the group of economic subjects with up to 9 employees that is surveyed once in a four-year period. Between individual two surveys, individual employees' records are simulated quarterly using, among others, the data from wage statistics carried out by the CZSO. As far as the algorithm and computational capacity are concerned, this part is the most demanding one.

By way of illustration, the simulation is described for the 1st quarter 2011 in brief.

Process of the simulation of the 1st quarter 2011 data

In the 1st quarter, there is no information on employees (i.e. individual employees' records) available because these data are surveyed in even quarters. To deal with the lack of data needed, the historical data from the same period of the previous year are corrected to correspond to the current aggregate data (from the business statistics) on a given economic subject. This approach guarantees that the development trends will not be interfered.

The data extraction from the employees' records surveyed in the previous year

As for the data structure, the most suitable data on individual employees' records were found the half-year 2010 data. These records concern the period from January up to June so that an expert algorithm was used to split this half-year into the 1st and 2nd quarter. To put it simply, the algorithm split wages or worked hours of individual employees into two quarters according to the proportion of working days in given quarters. In addition to that, information on the last day of being included into the staff and on the number of worked days by individual employees is used to split corresponding items into the right quarter.

Forward movement factor

The very extraction of the quarterly individual employees' records from the 1st half-year 2010 is not sufficient, so the forward movement factor is applied on the extracted 1st quarter 2010 data in order that the sum of gross monthly wages, bonuses, worked hours, hours of illness etc. of employees of a given economic subject corresponds to the actual value reported by the economic subject in the current quar-

ter, i.e. in the 1st quarter 2011. This procedure is applied to all ISPV sectors so the individual employees' records are simulated for the population as a whole for the 1st quarter 2011.

2.4 Economic subjects' weights and imputation for nonresponse

The main aim of the weighting procedure is to assign corresponding weights to each economic subject in the sample, so that the grossed-up sample is of the same size and structure as the population. The individual weights of economic subjects are calculated on the basis of the sample probabilities and modified in case of nonresponse (or mistakes made by respondents as the case may be). These weights represent the current structure of the surveyed population.

In the subpopulation of non-financial corporations and financial corporations with more than 10 employees, individual economic subjects are stratified according to the size (10–49, 50–249, 250–999, 1 000 and more employees), sector of economic activity and region (where two groups are distinguished – Prague and the other NUTS 3). Each of the tridimensional strata gets assigned stratum weight, i.e. proportional share in the population via corresponding weights. Each of the economic subjects gets assigned maximum weight according to the corresponding stratum and the sample probability. If the surveyed respondents classified into the strata in question does not represent all the economic subjects in the corresponding stratum, the second stage of weighting follows. In the second stage, the economic subjects of the same size, region and economic activity group are used as a support for weighting. In case of economic subjects with 250 and more employees, weighting is used just to compensate for non-response because this subpopulation is supposed to be surveyed entirely.

As for households (own-account workers) with more than 10 employees, a simplified single stage grossing-up method is used. In case of these economic subjects, their size is not important for stratification (special stratum is made just for economic subjects with more than 250 employees).

Non-financial corporations, financial corporations and households (own-account workers) with up to 9 employees are surveyed once every 4 years. In the current year, the economic subjects' weights are used to gross up the results to the universe. In the following years (i.e. in years when the survey is not conducted), the values in question are multiplied by the forward movement factor (in this case by an average increase in wages of similar units surveyed by the CZSO). In association with post-stratification, the appropriate size and structure of this sector are achieved.

Non-profit institutions serving households (NPISH) are divided into two subpopulations. The subpopulation of NPISHs with more than 65 employees is surveyed entirely. As for the subpopulation of NPISHs with less than 65 employees, the sample survey is conducted once every 4 years as a part of small economic subjects survey (see above). Grossing-up procedures are similar to those used for the small economic subjects.

As for the salary sphere, the entire population is surveyed (i.e. sample probability equals 1), so the grossing-up procedures are of not great importance in this sphere. The only adjustments made in the salary sphere concern treatment of nonresponse (see below).

In practice, even a carefully planned survey suffers from nonresponse of some type (Yung and Rao, 2000). Kalton and Kasprzyk (1986) divided nonresponse types into two groups – unit nonresponse and item nonresponse. As for unit (total) nonresponse, it arises e.g. because of refusals, inability to participate, not-at-homes and untraced elements, so none of the survey responses are available for a sampled element. Item nonresponse arises e.g. because of item refusals, "don't knows" and omissions, so some but not all of the responses are available. The distinction between unit and item nonresponse is useful, because different methods are usually used to compensate for the missing data (e.g. Brown, 1990) or to analyze datasets with missing data (e.g. Little, Rubin, 2002). As for the salary sphere, the unit nonresponse is compensated for by weighting adjustments (i.e. the weights of respondents are increased so that they represent the nonrespondents). As for the economic subjects with more than 1 000 employees in the

wage sphere, weighted historical imputation method is used for unit nonresponse. Weighted historical imputation uses previous value multiplied by the forward movement factor (in this case by an average increase concerning given variable in group of similar units) as a current value.

2.5 Post-stratification and grossing-up methods

The closing step of harmonisation is the post-stratification and grossing-up to the population on the basis of the Wage Statistics carried out by the CZSO. The data on wages and employees from the business statistics are passed on from the CZSO to the MoLSA according to an agreement made by the MoLSA and the CZSO. The business statistics carried out by the CZSO covers more economic subjects and the aggregate results are of lower variability in comparison with the ISPV. The post-stratification is realized in two steps.

In the first step, the sample is post-stratified according to the spheres (wage and salary sphere), 6 basic sectors (5 of them in the wage sphere and 1 in the salary sphere), size groups (0–9, 10–49, 50–249, 250–999, 1 000 and more employees) and economic activity (21 CZNACE sections). These strata are combined within the economic activity sections and spheres so that every stratum is representative in a sense of sufficient number of respondents (at least 10 respondents optimally). In these strata, the number of employees (in full-time equivalent) is get using the corresponding weights of economic subjects and these numbers are grossed up to the current population using post-stratification weights. After the first step of the weighting procedure is finished, the number of employees in individual strata corresponds to that of the population.

In the next step, the sample is post-stratified according to the spheres (wage and salary sphere) and 21 CZ-NACE economic activity sections. In these strata, volume of wages is grossed up using the corrective coefficients that are calculated within the sample using weights of economic subjects and post-stratification weights. As in case of number of employees, the volume of wages in individual strata corresponds to that of the population.

3 RESULTS

The above mentioned changes concerned the wage sphere in particular. For this reason, this part will focus on the results of harmonisation in the wage sphere.

Number of employees and wage level

As for the population of the wage sphere, it was extended by the employees of legal persons with less than 10 employees and of natural persons and non-profit institutions regardless of the number of employees within the harmonisation. The main benefit of the harmonization rests in improved quality of the published wage statistics because the extension of the ISPV population allowed to calculate more accurate numbers above all on employees (and thus all ISPV publications has newly stated weighed numbers of employees since 2011). On the other hand, the gross monthly wage median for the wage sphere decreased in 2011 by about 1 900 CZK due to the above mentioned harmonisation (Malenovský, 2011a). To be more specific, the wage decrease was caused by the extension of the population of wage sphere for economic subjects employing fewer employees. The impact of inclusion of smaller (in terms of number of employees) economic subjects is illustrated by the table 1 which shows the number of employees and average gross monthly wage in institutional sectors of the wage sphere divided according to the size of economic subject.

It is evident that wages of employees in economic subjects with less than 10 employees (i.e. in newly included economic subjects in the population) were lower than wages of those employed by economic subjects with 10 and more employees (i.e. by economic subjects included in the population before). As for non-financial and financial corporations, the difference was 8 611 CZK in favour of employees of big-

ger employers in the first half of 2011. As far as the institutional sectors are concerned, the lowest wages were identified in the institutional sector of households, i.e. the employees of own-account workers were paid on average the lowest wage in the first half of 2011 (15 217 CZK).

Table 1 Number of employees and average gross monthly wage in institutional sectors of the wage sphere divided according to the size of economic subject in the first half-year of 2011

Institutional sector (Wage sphere)	Employees (Full time quivalent, thousand)	Average monthly gross wage (CZK)
Non-financial corporations with 10 and more employees and Financial corporations with 10 and more employees	2 261.9	26 717
Non-financial corporations with 1–9 employees and Financial corporations with 1–9 employees	290.4	18 106
Households (own-account workers) with an employee / employees	220.9	15 217
Non-profit institutions serving households with an employee / employees	44.0	20 350
Total	**2 817.2**	**24 828**

Source: ISPV, own calculation

Of course, this methodological inconsistency affects the time series of majority of statistical characteristics and variables of the ISPV. This inconsistency is an inevitable product of harmonisation. In order to be able to carry out a correct comparison of the wage development, the data for 2010 were revised as well and the year-to-year indices were calculated using the revised data for 2010.[6]

Quality of estimations

As the data come from a survey, all the results are sample-based estimates and therefore subject to differing degrees of sampling variability, i.e. the true value for any measure lies in a differing range about the estimated value. This range or sampling variability increases as the detail in the data increases, for example regional data are subject to higher variability than the whole area data (National Statistics for Wales, 2012).

Structural statistics tend to be more detailed thus information on quality of each estimate is demanded by users. And so further to the above mentioned harmonisation, the quality of an estimate of gross monthly wage median was introduced in the ISPV results for the first time in 2011 (see MoLSA, 2011).

The quality of an estimate of gross monthly wage median in the ISPV was inspired by the structural statistics (the Annual Survey of Hours and Earnings, ASHE) produced by the Office for National Statistics in the United Kingdom. To determine the accuracy of the results from the survey, the ONS uses a measure called the coefficient of variation (CV) which is defined as the standard error of the estimate divided by the estimate itself, expressed as a percentage. ONS subsequently class all estimates with a CV of 5 per cent or less as being 'precise'. Estimates with a CV of more than 5 per cent and up to 10 per cent are classed by ONS as 'reasonably precise'; those with a CV of more than 10 per cent and up to 20 per cent are classed as 'acceptable'; and those with a CV of 20 per cent or more are suppressed for quality reasons (ONS, 2011a). In published tables, the ASHE uses colour coding as a quick reference guide to the CV of the estimates (ONS, 2011b). The colour coding indicates the quality of each estimate (e.g. jobs, median, mean and percentiles) but not the annual percentage change.

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[6] In addition to that, there were significant changes made as far as classification of occupations is concerned. The original classification KZAM-R was changed in 2011 for the new classification CZ-ISCO. Due to the change of the classification, results according to the occupation specified in the half-year publications for 2011 for the wage (or salary as the case may be) sphere in the tables MZS-M7 and MZS-M8 (or PLS-M7 and PLS M8 as the case may be) cannot be subject of the year-to-year comparison with the results specified in the tables for the business (or non-business as the case may be) sphere until 2010 (tables PS-M1 and PS-M5, or NS-M1 and NS-M5 as the case may be).

As for the ISPV, quality of an estimated gross monthly wage median by job subgroups and categories of the CZ-ISCO classification is divided into 3 qualitative categories "A", "B" and "C". The categories were defined as follows:

- – the category "A" characterizes the best quality estimates of the gross monthly wage median with the average standard error of the estimate ± 1.5%,
- – the category "B" characterizes the estimates of the gross monthly wage median with the average standard error of the estimate ± 5.0%,
- – the category "C" characterizes the estimates of the gross monthly wage median with average standard error of the estimate ± 10.0%.

In addition to that, symbols "A", "B" or "C" stated in brackets identify those jobs in relation to that there is a natural dominance of one or two economic subjects. To be more specific, this concerns those occupations where more than 80% of employees are employed by the only one or two economic subjects.

4 DIFFERENCES BETWEEN ISPV AND WAGE STATISTICS OF THE CZSO CARRIED OVER THE HARMONISATION

As was mentioned above, the ISPV methodology was harmonized with the methodology applied in the Wage Statistics of the CZSO in 2011. Nevertheless there are still differences between both surveys due to the specifics of the individual surveys.

The Wage Statistics conducted by the CZSO aims to describe the Czech labour market from the macroeconomic point of view. It surveys data on gross wages and registered number of employees that is used for calculation of an average gross monthly wage broken down by characteristics of economic subjects (above all by the sector of economic activity according to the classification CZ-NACE). Contrary to the CZSO's Wage Statistics, the ISPV is aimed at structural statistics of earnings and provides users with results concerning the level as well as the structure of earnings and working period of employees in the Czech Republic. Thanks to the ISPV, the development of wages and salaries can be analysed not only from the macroeconomic (i.e. from the economic subjects' perspective), but also from the social perspective (i.e. from the employees' perspective). The ISPV results are broken down by social-economic characteristics of employees (e.g. occupation according to the classification CZ-ISCO, age, sex, education, etc.) as well as by characteristics of economic subjects (e.g. sector of economic activity according to the classification CZ-NACE).

Detailed information about differences between ISPV and the Wage Statistics of the CZSO is shown in the following tables (Tables 2, 3 and 5). Main aims and concepts of individual wage surveys in the Czech Republic are shown in the table 2, methodological differences in Table 3.

It stems from Table 3, that the ISPV results concerning wage statistics are standardized using the fulltime equivalent concept of employment which is further adjusted for the fully paid worked hours – it means that all employees temporarily not paid e.g. because of sickness are excluded from the calculation of statistical characteristics concerning wages. What is more, employees with less than one paid month at their employer or / and less than 30 working hours a week are excluded from the ISPV calculations as well. The latter condition is stipulated by the statistical office of the European Union (Eurostat) concerning the Structure of Earnings Survey (see the Council Regulation (EC) No. 530 / 1999 concerning structural statistics on earnings and labour costs, and the Commission Regulation (EC) No. 1738 / 2005 amending the Commission Regulation (EC) No. 1916 / 2000 as regards the definition and transmission of information on the structure of earnings). The standardisation used in the ISPV makes the international comparison of the results possible.

It is evident, that methods of standardisation of results of individual wage statistics differ because the CZSO's method covers all employees, i.e. also the employees temporarily not paid. The impact of the standardisation method used on the statistical characteristics concerning wages is shown in Table 4.

Table 2 Main aims and concepts of individual wage surveys in the Czech Republic

Comparison from the point of view of the	Wage Statistics conducted by the CZSO	ISPV conducted by the MoLSA
Main aim of the survey	1. Macroeconomic indicators 2. Results of the CZSO wage statistics used as reference values for Czech laws and decrees	1. Level and structure of remuneration according to the occupations (CZ-ISCO classification) 2. Harmonisation with the Structure of Earnings Survey (SES)
The most important classifications	1. National version of the Statistical Classification of Economic Activities in the European Community (CZ-NACE) 2. Institutional sectors (Business and non-business sphere) defined according to the ESA (or possibly to the SNA)	1. National version of the International Standard Classification of Occupations (CZ-ISCO) 2. Education 3. Age 4. Sex 5. Citizenship 6. Wage and salary sphere defined according to the Act No. 262 / 2006 Coll., the Labour Code
Survey periodicity	1. Quarterly	1. Quarterly: basic results according to the sector of economic activity (CZ-NACE) 2. Half-year: detailed results 3. Annual: Regional Earnings Statistics (RSCP)

Note: ESA means the European System of Accounts, SNA means the System of National Accounts. For more detailed information see ESA 2010 (or possibly ESA 1995) and SNA 2008 (or possibly SNA 1993). The SES is conducted under the Council Regulation (EC) No. 530 / 1999 concerning structural statistics on earnings and labour costs, and the Commission Regulation (EC) No. 1738 / 2005 amending the Commission Regulation (EC) No. 1916 / 2000 as regards the definition and transmission of information on the structure of earnings).
Source: Own construction

Table 3 Methodological differences between wage surveys carried out in the Czech Republic

Comparison from the point of view of the	Wage Statistics conducted by the CZSO	ISPV conducted by the MoLSA
Statistical unit	Economic subject (employer)	Individual employee, secondarily economic subject (employer)
Sample	A) Economic subjects with 10 and more employees: entire population surveyed (sample probability equals 1) B) Economic subjects with 1–9 employees: sample survey	A) Economic subjects with 250 and more employees in the wage sphere: entire population surveyed (sample probability equals 1) B) Economic subjects in the salary sphere: entire population surveyed (sample probability equals 1) C) Economic subjects with less than 250 employees: sample survey
Standardisation of earnings	Concept of full-time equivalent (FTE)	1. Concept of full-time equivalent (FTE) adjusted for the fully paid worked hours (e.g. hours of sickness are excluded) 2. Exclusion of employees with less than 1 paid month at their employer or / and less than 30 working hours a week
Average gross monthly wage	Gross monthly wage per FTE	Gross monthly wage per FTE adjusted for the fully paid worked hours

Source: Own construction

Table 4 shows three methods of calculation of number of employees in full-time equivalent and of the average gross monthly wage. The first method corresponds to the method used by the CZSO in processing its wage statistics (i.e. no employees' records are excluded). The second one corresponds to the CZSO's method but only those employees' records were taken into consideration that met the requirements of the ISPV (i.e. the auxilliary variable fHMM equals 1). To be more specific, individual records were excluded because of errors, shorter working hours (less than 30 working hours a week) or shorter paid period (less than 1 paid month at individual employer) than required by the ISPV. The last one corresponds to the ISPV method of standardisation, i.e. in addition to the second method the adjustments for the fully paid worked hours were made.

Table 4 A comparison of methods of standardisation used in the wage statistics applied to the ISPV data (the wage sphere, first half-year of 2011)

Sector of economic activity (CZ-NACE classification)	CZSO method		CZSO method modified for fHMM = 1		ISPV method		
	Employees (Full time equivalent, thousand)	Average monthly gross wage (CZK)	Employees (Full time equivalent, thousand)	Average monthly gross wage (CZK)	Employees (Full time equivalent, thousand)	Average monthly gross wage (CZK)	Monthly gross wage median (CZK)
A Agriculture, forestry and fishing	97.2	17 049	89.9	17 674	86.1	18 447	17 073
B Mining and quarrying	35.1	30 001	34.5	30 298	33.2	31 472	27 890
C Manufacturing	1 061.9	22 952	1 019.2	23 429	980.5	24 354	20 731
D Electricity, gas, steam and air conditioning supply	28.3	41 177	27.9	41 478	27.4	42 288	34 404
E Water supply; sewerage, waste management and remediation activities	46.6	22 600	43.8	23 335	42.5	24 047	21 927
F Construction	230.0	21 126	217.3	21 737	206.4	22 888	19 022
G Wholesale and retail trade; repair of motor vehicles and motorcycles	480.6	21 464	455.1	22 066	441.7	22 732	17 649
H Transportation and storage	235.2	22 907	225.0	23 097	217.5	23 901	21 241
I Accommodation and food service activities	104.2	12 388	95.9	12 892	93.1	13 280	10 434
J Information and communication	94.4	43 523	91.3	44 196	89.5	45 074	34 498
K Financial and insurance activities	68.6	49 707	66.5	49 929	65.0	51 084	34 940
L Real estate activities	45.8	20 368	42.4	21 468	41.1	22 159	18 787
M Professional, scientific and technical activities	142.3	27 660	134.3	28 293	131.1	28 989	22 064
N Administrative and support service activities	139.6	16 202	129.9	16 704	124.1	17 482	14 250
O Public administration and defence; compulsory social security	8.8	31 028	8.5	31 471	8.3	32 289	26 095
P Education	61.1	26 916	59.4	27 215	58.4	27 663	24 122
Q Human health and social work activities	120.8	23 330	114.6	23 778	110.9	24 568	21 450
R Arts, entertainment and recreation	23.6	18 938	22.1	19 380	21.7	19 738	16 980
S Other service activities	41.8	18 972	40.1	19 491	38.6	20 216	17 551
Total	**3 065.8**	**23 412**	**2 917.8**	**23 973**	**2 817.2**	**24 828**	**20 085**

Note: fHMM equals 1 for those employees' records that meet the requirements of the ISPV calculations, i.e. only employees with more than 1 paid month at their employer or / and more than 30 working hours a week are included. The error records are excluded of course.
Source: ISPV, Malenovský (2011a)

As for the definition of the monthly gross wage, it is the same for the Wage Statistics conducted by the CZSO as well as for the ISPV conducted by the MoLSA. Monthly gross wage includes basic wage, bonuses, extra pay, wage compensations, overtime bonuses, bonuses for readiness to work on call and other wage components payable by an employer to an employee in return for work done by the latter during the accounting period. Gross monthly wage does not include wage compensations which employers continue to pay to their employees in case of sickness. Monthly gross wage includes values of any social contributions, income taxes, etc. payable by an employee.

As for other variables and statistical characteristics, the wage surveys in the Czech Republic differ. Main differences between the Wage Statistics conducted by the CZSO and the ISPV conducted by the MoLSA shows Table 5. Differences shown in the table 5 stem from the main aims of individual surveys. The ISPV is aimed at the wage differentiation and structure of earnings, contrary to the Wage Statistics conducted by the CZSO. So it is obvious, that the corresponding variables and characteristics are surveyed solely in the ISPV.

Table 5 Main variables and statistical characteristics used in individual wage surveys in the Czech Republic

Comparison from the point of view of the	Wage Statistics conducted by the CZSO	ISPV conducted by the MoLSA
Wage differentiation		Median, quartiles, deciles
Structure of earnings		Basic wage, bonuses, extra pay, wage compensations, overtime bonuses, bonus for readiness to work on call
Monthly worked and non-worked hours	Not surveyed	Monthly worked hours (close attention paid to overtime hours) and monthly non-worked hours (close attention paid to holidays and sickness)
Hourly earnings		Surveyed every half-year

Source: Own construction

CONCLUSION

The project of harmonization of the Average Earnings Information System (ISPV) conducted by the Ministry of Labour and Social Affairs with the Wage Statistics conducted by the Czech Statistical Office (CZSO) was finished in 2011. The main aim of the harmonization of the above-mentioned statistics was to get comprehensive and more accurate results of wage statistics in the Czech Republic.

Within the process of harmonisation, both wage statistics defined the population of economic subjects in the same way for the first time, so the results of individual wage statistics are consistent as far as the number of employees and the aggregate wages are concerned. The ISPV population was extended above all by the employees of the legal persons with less than 10 employees and of the natural persons and non-profit institutions regardless of the number of employees.

Methods developed within the harmonisation of wage statistics were drawn on the best international experiences. To be more specific, simulation, imputation, clustering, (post)stratification and grossing-up techniques were used to achieve the best results. In pursuit of getting the best results, the quality of an estimate of gross monthly wage median was introduced in the ISPV in 2011 further to the harmonization. The quality of an estimate is measured using the average standard error of an estimate.

The main benefit of the harmonisation rests in improved quality of the published wage statistics because of the extension of the ISPV population. On the other hand, the gross monthly wage median for the wage sphere decreased in 2011 by about 1 900 CZK. The wage decrease was caused by inclusion of smaller (in terms of number of employees) economic subjects where the wage level is lower than of those economic subjects already included into the ISPV.

Despite the harmonisation, the differences between wage surveys remain due to the specifics of individual surveys. As for the ISPV, further adjustments are made to comply with the European Union regulation concerning the Structure of Earnings Survey (e.g. those employees are excluded those working hours were shorter than 30 hours a week) so the published figures do not correspond to those of the CZSO at first sight.

The project of harmonisation of the wage statistics in the Czech Republic showed that the joint effort of two institutions can have synergetic effect. On one hand the better results of wage statistics are produced, so the economic policy can work on improved assumptions. On the other hand, cooperation of wage statistics producers may disburden the respondents of individual surveys.

Even if the harmonisation project of the ISPV and the wage statistics conducted by the CZSO is finished, the further development is still the most challenging one as far as algorithms and computational capacity improvements are concerned.

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ANNEX

CZ-NACE sections classified into the individual economic activity groups in the wage sphere

Economic activity group	CZ-NACE section	Title
Agriculture, forestry and fishing	A	Agriculture, forestry and fishing
Industry and transportation	B	Mining and quarrying
	C	Manufacturing
	D	Electricity, gas, steam and air conditioning supply
	E	Water supply; sewerage, waste management and remediation activities
	H	Transportation and storage
Construction	F	Construction
Wholesale and retail trade	G	Wholesale and retail trade; repair of motor vehicles and motorcycles
Market services	J	Information and communication
	K	Financial and insurance activities
	L	Real estate activities
	M	Professional, scientific and technical activities
Other services	I	Accommodation and food service activities
	N	Administrative and support service activities
	O	Public administration and defence; compulsory social security
	P	Education
	Q	Human health and social work activities
	R	Arts, entertainment and recreation
	S	Other service activities
	T	Activities of households as employers; undifferentiated goods- and services-producing activities of households for own use
	U	Activities of extraterritorial organisations and bodies

Source: Own construction

Recent Publications and Events

New Publications of the Czech Statistical Office

DUBSKÁ, D. *Firmy se zahraniční majetkovou účastí v ekonomice ČR: oslabily nebo dále sílí?* (Enterprises with Foreign Capital Participation in the Economy of the CR: Have they Weakened or Strengthening?) [online]. Prague: Czech Statistical Office, 2012. <http://www.czso.cz/csu/2011edicniplan.nsf/p/1158-11>.

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OECD. *National Accounts at a Glance 2011.* Paris: OECD, 2011.

Promoting Excellence in European Statistics. Lisbon: CMFB (Committee on Monetary, Financial and Balance of Payments Statistics), 2011.

SMITH, G. *Essential Statistics, Regression, and Econometrics.* Waltham, San Diego, London: Elsevier Inc., 2012.

UN. *Statistics on International Migration. A Practical Guide for Countries of Eastern Europe and Central Asia.* New York, Geneva: United Nations, 2011.

Conferences

The *13th Doctoral Conference in Accounting and Finance* was held on *1st June 2012 in Prague, Czech Republic*, organized by the Faculty of Finance and Accounting, University of Economics, Prague. It is the biggest conference focused solely on PhD students of finance and accounting in the Central and Eastern European region. More information is available at: *https://convention.vse.cz/index.php?option=com_content&view=category&id=1&Itemid=2.*

The *6th Annual International Conference on Mathematics and Statistics Education* was held from *11th to 14th June 2012 in Athens, Greece*, organized by the Athens Institute for Education and Research. More information is available at: *http://www.atiner.gr/mathematics.htm.*

The *7th Stereology, Spatial Statistics and Stochastic Geometry International Conference* took place from *25th to 28th June 2012 in Prague, Czech Republic*, organized by the Faculty of Mathematics and

Physics, Charles University in Prague; the Institute of Physiology, Academy of Sciences of the Czech Republic; the Faculty of Electrical Engineering, Czech Technical University in Prague; the Faculty of Science, Charles University in Prague; the Private University College of Economic Studies, Ltd. and CONFORG, s.r.o. Main topics of the conference were: application of stereology in life sciences and materials sciences; application of spatial statistics in ecology, environmental and other sciences; methodology of spatial statistics, geostatistics; stochastic geometry and random sets; integral geometry and theoretical stereology and image processing and mathematical morfology. More information is available at: *http://s4g.karlin.mff.cuni.cz*.

The *8th World Congress in Probability and Statistics* will be held from *9th to 14th July 2012 in Istanbul, Turkey,* jointly organized by the Bernoulli Society and the Institute of Mathematical Statistics. Scheduled every four years, it is a major worldwide event for statistics and probability, covering all its branches, including theoretical, methodological, applied and computational statistics and probability, and stochastic processes. It features the latest scientific developments in these fields. More information is available at: *http://www.worldcong2012.org*.

The *International Conference on Trends and Perspectives in Linear Statistical Inference (LinStat) 2012* and the *21st International Workshop on Matrices and Statistics (IWMS) 2012* will take place from *16th to 20th July 2012 in Bedlewo*, near *Poznań, Poland*, organized by the Faculty of Mathematics and Computer Science, Adam Mickiewicz University, Poznań; the Institute of Socio-Economic Geography and Spatial Management, Adam Mickiewicz University, Poznań and the Department of Mathematical and Statistical Methods, Poznań University of Life Sciences. More information is available at: *http://linstat2012.au.poznan.pl*.

The *27th International Workshop on Statistical Modelling (IWSM)* will be held from *16th to 20th July 2012 in Prague, Czech Republic*. Organizing Institutes are the Department of Probability and Mathematical Statistics, the Faculty of Mathematics and Physics, Charles University in Prague and the Faculty of Informatics and Statistics, University of Economics, Prague. More information is available at: *http://iwsm2012.karlin.mff.cuni.cz/*.

The *20th International Conference on Computational Statistics (COMPSTAT 2012)* will take place from *27th to 31st August 2012 in Limassol, Cyprus.* The conference is sponsored by the European Regional Section of the IASC (International Association for Statistical Computing) and is organized by Cyprus University of Technology and the University of Cyprus. The conference aims at bringing together researchers and practitioners to discuss recent developments in computational methods, methodology for data analysis and applications in statistics. More information is available at: *http://www.compstat2012.org*.

The *15th International Scientific Conference AMSE 2012 (Applications of Mathematics and Statistics in Economy)* will be held from *30th to 31st August 2012 in Liberec, Czech Republic*, organized by the Faculty of Economics, Matej Bel University, Banská Bystrica, Slovakia; Faculty of Informatics and Statistics, University of Economics, Prague, Czech Republic and Wroclaw University of Economics, Wroclaw, Poland. The conference will be focused on applications of mathematics and statistics in economy. Aim of the conference is to acquaint participants of the conference with the latest mathematical and statistical methods that can be used in solving of theoretical and practical economic problems. More information is available at: *http://amse2012.vse.cz*.

The **ROBUST 2012 Conference** will be held from ***9th to 14th September 2012 in Němčičky, Czech Republic***, organized by the Czech Statistical Society, the Group for Computational Statistics of the Czech Mathematical Society, the Union of Czech Mathematicians and Physicists and the Department of Probability and Mathematical Statistics, Faculty of Mathematics and Physics, Charles University in Prague. The conference will be devoted to selected trends in mathematical statistics, probability theory and data analysis. More information is available at: *www.robust.nipax.cz.*

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Language

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Times 12 (main text), 1.5 spacing between lines. Page numbers in the lower right-hand corner. *Italics* can be used in the text if necessary. *Do not* use **bold** or underline in the text. Paper parts numbering: 1, 1.1, 1.2, etc.

Headings

1 FIRST-LEVEL HEADING (Times New Roman 12, bold)
1.1 Second-level heading (Times New Roman 12, bold)
1.1.1 Third-level heading (Times New Roman 12, bold italic)

Footnotes

Footnotes should be used sparingly. Do not use endnotes. Do not use footnotes for citing references (except headings).

References in the Text

Place reference in the text enclosing authors' names and the year of the reference, e.g. "White (2009) points out that…", "… recent literature (Atkinson et Black, 2010a, 2010b, 2011, Chase et al., 2011, pp. 12–14) conclude…".

Note the use of alphabetical order. Include page numbers if appropriate.

List of References

Arrange list of references alphabetically. Use the following reference styles: [for a book] HICKS, J. *Value and Capital: An inquiry into some fundamental principles of economic theory.* Oxford: Clarendon Press, 1939. [for chapter in an edited book] DASGUPTA, P. et al. Intergenerational Equity, Social Discount Rates and Global Warming. In PORTNEY, P., WEYANT, J., eds. *Discounting and Intergenerational Equity.* Washington, D.C.: Resources for the Future, 1999. [for a journal] HRONOVÁ, S., HINDLS, R., ČABLA, A. Conjunctural Evolution of the Czech Economy. *Statistika, Economy and Statistics Journal,* 2011, 3 (September), pp. 4–17. [for an online source] CZECH COAL. *Annual Report and Financial Statement 2007* [online]. Prague: Czech Coal, 2008. [cit. 20.9.2008]. <http://www.czechcoal.cz/cs/ur/zprava/ur2007cz.pdf>.

Tables

Provide each table on a separate page. Indicate position of the table by placing in the text "insert Table 1 about here". Number tables in the order of appearance Table 1, Table 2, etc. Each table should be titled (e.g. Table 1 Self-explanatory title). Refer to tables using their numbers (e.g. see Table 1, Table A1 in the Annex). Try to break one large table into several smaller tables, whenever possible. Separate thousands with a *space* (e.g. 1 528 000) and decimal points with a *dot* (e.g. 1.0). Specify the data source below the tables.

Figures

Figure is any graphical object other than table. Attach each figure as a separate file. Indicate position of the figure by placing in the text "insert Figure 1 about here". Number figures in the order of appearance Figure 1, Figure 2, etc. Each figure should be titled (e.g. Figure 1 Self-explanatory title). Refer to figures using their numbers (e.g. see Figure 1, Figure A1 in the Annex).

Figures should be accompanied by the *.xls, *.xlsx table with the source data. Please provide cartograms in the vector format. Other graphic objects should be provided in *.tif, *.jpg, *.eps formats. Do not supply low-resolution files optimized for the screen use. Specify the source below the figures.

Formulas

Formulas should be prepared in formula editor in the same text format (Times 12) as the main text.

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